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National Aeronautics
and Space Administration

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SUMMARY

An experiment has been conducted to determine wing-alone supersonic aerodynamic characteristics at high angles of attack. The wings tested varied in aspect ratio from 0.5 to 4.0 and taper ratio from 0 to 1.0. The wings were tested at angles of attack from -5° to 60° and Mach numbers from 1.60 to 4.60. Aerodynamic forces and moments and center-of-pressure locations were obtained by integrating pressure measurements over the wing surface.

The longitudinal and lateral center-of-pressure locations approached the wing-area centroids at the maximum test angles of attack. For angles of attack greater than approximately 30°, the center-of-pressure locations were not significantly affected by Mach number.

Increasing the aspect ratio resulted in a general increase in normal-force coefficient C_N. Increasing the taper ratio λ from 0 to 0.5 resulted in an increase in C_N but further increases in λ had little effect on C_N. Peak pitching-moment coefficients were measured at the approximate angle of attack at which free-stream pitot pressure was first measured on the windward surface in the wing-apex region. At the maximum test angle of attack (60°), pitching-moment coefficient was not significantly affected by either aspect ratio or taper ratio.

INTRODUCTION

The high-maneuverability requirements of missiles often necessitates flight at high angles of attack. At these high angles of attack, potential-flow methods and linear theories have very limited applications, and the missile designer generally resorts to semiempirical methods based on wind-tunnel data for preliminary design purposes. However, there is a lack of a systematic data base of wing-alone forces and moments as a function of aspect ratio, taper ratio, and Mach number at high angles of attack (ref. 1). This lack of a data base results, in part, from the difficulty associated with obtaining data unaffected by support interference at the higher angles of attack. In order to provide some of the needed data for high angle of attack, an experimental program was conducted at the NASA Langley Research Center using pressure models and a sting support system that was designed to minimize sting interference effects for the test range of angles of attack. Aerodynamic forces and moments and center-of-pressure locations were obtained by integrating the pressure measurements.

The wings tested varied in aspect ratio from 0.5 to 4.0 and in taper ratio from 0 to 1.0. Angle of attack varied from -5° to 60° at Mach numbers from 1.60 to 4.60. Both aerodynamic forces, aerodynamic moments, and pressure data are presented and discussed.

SYMBOLS

$\mathcal{R}$	aspect ratio
b	wing span
b_{PS}	semispan of wing center-planar section (fig. 8)
b_{tip}	span of wing tip (fig. 8)
C_A	axial-force coefficient (see appendix)
C_b	bending-moment coefficient (see appendix)
C_m	pitching-moment coefficient (see appendix)
C_N	normal-force coefficient (see appendix)
C_n	yawing-moment coefficient (see appendix)
C_p	pressure coefficient, $\frac{p - p_\infty}{q}$
$\bar{c}$	mean aerodynamic chord
F_A	axial force
L	centerline length (l in computer-generated tables, tables I to X)
L_{LE}	length of leading edge (fig. 8)
L_{PS}	length of wing center-planar section (fig. 8)
L_{TE}	length of wing trailing edge (fig. 8)
M	free-stream Mach number
M_b	bending moment
M_{nom}	nominal free-stream Mach number
M_Y	pitching moment
M_Z	yawing moment
N	normal force
p	static pressure
p_∞	free-stream static pressure

p_t free-stream stagnation pressure

q free-stream dynamic pressure

R free-stream Reynolds number, per meter

S wing planform area

T_t free-stream stagnation temperature

t wing thickness

V_∞ free-stream velocity

x longitudinal distance measured downstream from wing apex (fig. 5)

x' longitudinal distance measured upstream from wing trailing edge, $x' = L - x$

$x_{c,w}$ value of x at wing-area centroid

$x_{c,\Delta S}$ value of x at area centroid of element of planform area ΔS

x_{cp} value of x at wing longitudinal center-of-pressure location (see appendix)

x_{LE} downstream distance from wing leading edge (fig. 8)

x_{PS} downstream distance from forward edge of wing center-planar section (fig. 8)

x_{TE} downstream distance from aft edge of wing center-planar section (fig. 8)

y perpendicular distance from wing centerline measured in plane of wing (fig. 5)

$y_{c,w}$ value of y at wing half-panel area centroid

$y_{c,\Delta S}$ value of y at area centroid of element of area ΔS

y_{cp} value of y at wing lateral center-of-pressure location for wing half panel (see appendix)

y_{PS} spanwise distance from axis of symmetry on wing center-planar section (fig. 8)

y_{tip} spanwise distance from outer edge of wing center-planar section (fig. 8)

z perpendicular distance from wing horizontal plane of symmetry (fig. 5)

$z_{c,\Delta S}$ value of z at area centroid of element of area ΔS

z_{cp} value of z at wing vertical center-of-pressure location (see appendix)

α angle of attack

ΔS element of planform area

Λ sweep angle

λ taper ratio

Subscripts:

LE leading edge

TE trailing edge

APPARATUS AND METHODS

Wind Tunnel and Test Conditions

The tests were conducted in both the low and high Mach number test sections of the Langley Unitary Plan Wind Tunnel, which is a variable-pressure continuous-flow facility (ref. 2). Asymmetric sliding-block nozzles lead to the test sections and permit a continuous variation in Mach number from about 1.50 to 2.90 in the low Mach number test section and from about 2.30 to 4.70 in the high Mach number test section.

The tests were conducted at angles of attack ranging from -5° to 60° for test conditions listed in the following table:

M	P_t, kPa	T_t, K	R, per meter
1.60	54.63	339	6.56×10^6
2.16	68.47	↓	↓
2.86	98.44		
3.50	137.99		
4.60	249.26	352	

Since friction drag cannot be determined from pressure measurements, and since the size of artificial roughness required to trip the boundary layer at the highest supersonic Mach numbers can distort the inviscid flow field, no attempt was made to artificially trip the boundary layer on any of the wings.

Models and Instrumentation

The wings tested consisted of 10 models that had aspect ratios ranging from 0.5 to 4.0 and taper ratios ranging from 0 to 1.0. Figure 1(a) is a photograph of the models, figure 1(b) shows a typical assembly consisting of one of the models and the dogleg sting, and figure 1(c) gives the basic sting dimensions. The sting was designed to minimize support interference effects on the wing surface opposite the sting-attachment point. This opposite surface was instrumented with pressure orifices. Locations of the pressure orifices for the 10 models are shown in figure 2. Since the wings are symmetrical about the longitudinal centerline, most of the pressure instrumentation was located on only half a wing panel. Two orifices were located on the opposite panel to insure flow symmetry. Also given in figure 2 are the basic model dimensions and the wing-area centroid locations. All wings had planform areas of 232.26 cm^2, a maximum thickness of 1.27 cm, and had leading edges, tips, and trailing edges consisting of sharp wedges with a total angle of 30° measured in a plane perpendicular to the edges.

Since only one side of the wings was instrumented with pressure orifices, windward and leeward measurements at a given angle of attack were obtained by testing the model assembly in the attitudes shown in figure 3. Shown in figure 3(a) is the attitude of the assembly with the instrumentation windward and in figure 3(b) is the attitude of the assembly with the instrumentation leeward. The attitude of the assembly shown in figure 3(b) was obtained by simply rotating the complete assembly 180° from the attitude shown in figure 3(a).

Data Reduction

The pressure measurements for both the windward and leeward surfaces were reduced to coefficient form and are presented in tables I to X. Forces and moments were obtained by integrating the pressures over the windward and leeward surfaces using the equations shown in the appendix. These integrated values were combined to obtain the total forces and moments as illustrated in figure 4 for the case of normal-force coefficient. Since the angles of attack for the windward and leeward tests differed slightly (by 0.02° or less), the integrated forces and moments were evaluated at the nearest integer value of angle of attack by using a second-order Lagrangian interpolation before combining the results from the two surfaces. The angles of attack shown for the tabulated pressure measurements are the averages of the windward and leeward values.

The moment-center locations and sign conventions are shown in figure 5. It should be noted that since the forces and moments were evaluated for only half a wing panel, the reference areas used to determine the force and moment coefficients were half the wing planform area, or 116.13 cm^2. However, the values of C_N, C_A, C_m, x_{cp}, and z_{cp} would also be applicable for a complete wing panel as presented, since the flow is symmetrical about the longitudinal axis of symmetry.

RESULTS AND DISCUSSION

A complete tabulation of the pressure measurements that were integrated over the instrumented surface to obtain the aerodynamic characteristics are presented in tables I to X.

Presented in figure 6 is a comparison of C_N, x_{cp}, and y_{cp} from the present tests with some previously published wing-alone data. The Hill data (ref. 3) are force-balance data from a sting-supported model. The Falunin et al. data (ref. 4) are from both force-balance and pressure measurements, and the Baker data (ref. 5) are from force-balance measurements of semispan wings attached to a reflection plane. The Nielsen et al. results (ref. 6) are a data base that was compiled from existing wind-tunnel data including references 3 to 5. It should be noted that most of the referenced data were not directly available for the aspect ratio, taper ratio, or nominal free-stream Mach number indicated in figure 6 but were determined for this comparison by a linear interpolation of the available data with respect to these variables.

The comparisons shown in figure 6(a) are for a nominal free-stream Mach number of 2.00, $A = 0.5$, and $\lambda = 0$. In general, good agreement is shown between the various sets of data with the exception of the reference 5 reflection-plane data at the larger angles of attack. The reference 5 data is believed to be influenced at the larger angles of attack by flow separation on the reflection plane that was induced by the large pressures on the wing windward surface. This effect (as shown in fig. 6(a)) results in a reduction in normal force and an outboard movement of the lateral center of pressure. The longitudinal center-of-pressure location is not significantly affected by this separation phenomenon.

Agreement similar to that shown in figure 6(a) is also shown in figure 6(b) for $M_{nom} = 3.00$. The onset of the effect of separation for the reference 5 reflection-plane data occurs at a lower angle of attack at $M_{nom} = 3.00$.

Shown in figure 6(c) are data comparisons for wings having $A = 1.0$ and $\lambda = 0$ at $M_{nom} = 2.00$. The present data are in good agreement with the reference 4 data throughout the angle-of-attack range and with the reference 5 data for the angles of attack below the onset of the reflection-plane separation. The values of C_N from both references 3 and 6 are generally greater than the other data presented. The extracted data base of reference 6 is based on the reference 3 data for the case of $\lambda = 0$, with the other sources of data being used to determine the effects of taper ratio. Therefore, the reference 6 data base would be expected to agree with the reference 3 data. The good agreement between the other three sets of data suggests, however, that the reference 3 data are suspect. Similar results are shown at $M_{nom} = 3.00$ in figure 6(d).

Data for wings with $A = 2.0$ and $\lambda = 0$ were only available from references 4 and 5 and these results are compared with the present data at nominal free-stream Mach numbers of 2.0 and 3.0 in figures 6(e) and 6(f). With the exception of the reflection-plane data affected by separation, the data are generally in good agreement.

Shown in figure 6(g) are data comparisons for wings with $A = 1.0$ and $\lambda = 0.5$ at a nominal free-stream Mach number of 3.00. For this case, data

for comparison purposes were available only from references 5 and 6, although, as previously mentioned, the reference 6 data are an extension of the reference 3 data for $\lambda = 0$. The trends shown in figure 6(g) are basically the same as shown in the previous figures for $\lambda = 0$.

Forces and moments for the rectangular wings ($\lambda = 1.0$) were estimated from pressure distributions determined from oblique-shock and Prandtl-Meyer-expansion relations (shock-expansion method) and are compared with the measured data in figure 7. The estimations are shown for angles of attack up to 25°, which is the approximate angle of attack for shock detachment on the leading edge at Mach 4.60. The results show generally good agreement between measured and calculated pitching-moment coefficients and axial-force coefficients; however, the calculated normal-force coefficients and bending-moment coefficients generally overpredict the measured values. The extent of this disagreement decreases with increasing aspect ratio since the two-dimensional assumption of the theory is more nearly satisfied at the higher aspect ratios. It should be noted that the measured and calculated axial-force coefficients were determined from pressure distributions and, therefore, do not include any friction drag. The pressure distributions shown in figure 8 offer an explanation for the comparison trends between the measured and calculated force and moment coefficients shown in figure 7. Pressure distributions are presented for the longitudinal centerline of the wings and for one lateral station of each wing for $\alpha = 20^{\circ}$. The measured and calculated centerline pressure distributions are generally in good agreement for the leading and trailing edges for all three models. Since the leading and trailing edges are the only surfaces contributing to the axial force and since only small lateral pressure gradients occurred on the leading and trailing edges (not shown in fig. 7), this good agreement between measured and calculated pressures results in the good agreement between measured and calculated axial-force coefficients. The pitching moment about the area centroid ($x/L = 0.5$) is also dominated by the forces on the leading and trailing edges and, therefore, results in the good agreement shown between measured and calculated pitching-moment coefficients shown in figure 7.

The measured pressure distributions on the windward planar sections indicate a significant effect of aspect ratio both longitudinally (fig. 8(a)) and laterally (fig. 8(b)). The longitudinal centerline pressure measurements for $\mathcal{R} = 0.5$ are less than the calculated distributions for $x_{PS}/L_{PS} > 0.2$; however, the measurements for $\mathcal{R} = 1.0$ and 2.0 are generally in good agreement with the calculations. The spanwise pressure distributions (fig. 8(b)) show that the pressures fall below the two-dimensional calculations with increasing lateral distance from the longitudinal centerline, which is probably due to the pressure relief at the wing tip created by the finite aspect ratios. The extent of this effect decreases with increasing aspect ratio. This effect of aspect ratio on the pressure distributions is consistent with the effects of aspect ratio on C_N and C_b shown in figure 7 and with the fact that these measured coefficients fall below the calculated two-dimensional values.

Summary figures of the present aerodynamic data showing effects of aspect ratio, taper ratio, and Mach number are shown in figures 9, 10, and 11, respectively. A complete set of the aerodynamic data is shown in figures 12 to 14.

The summary figure showing the effects of aspect ratio (fig. 9) is for $M = 2.16$ and $\lambda = 0.5$; however, the trends that are discussed are also applicable for the full range of taper ratios and Mach numbers. As shown in figure 9, increasing aspect ratio results in an increase in C_N, C_A, C_n, and C_b throughout the range of angles of attack and an increase in C_m at all but the maximum test angles of attack. At $\alpha = 60^\circ$, pitching-moment coefficient is essentially independent of aspect ratio. The angle of attack at which maximum pitching moment occurs for a given wing is approximately equal to the angle of attack at which free-stream pitot pressure is first measured on the windward surface of the wing-apex region, as shown, for example, by the measurements from tube 1 in tables II(b), V(b), VIII(b), and X(b) for the case of $\lambda = 0.5$ and $M = 2.16$. With increases in angle of attack, the location of this stagnation region moves downstream from the wing leading edge toward the wing-area centroid resulting in a decrease in C_m. This downstream movement of the stagnation region also corresponds to a decrease in C_A. The increase in C_A with increasing aspect ratio results in part from the decrease in leading-edge sweep and the increase in span associated with an increase in aspect ratio for these wings.

As shown in figure 9, increasing aspect ratio results in an upstream movement of the longitudinal center-of-pressure location, except at the larger angles of attack. At the larger angles of attack, the center-of-pressure location becomes relatively independent of aspect ratio and approaches the wing-area centroid location at the maximum test angle of attack. The wing-area centroid location (which, for these wings, is independent of aspect ratio) is located at $x/L = 0.611$. At $\alpha = 60^\circ$, the measured values of the longitudinal center-of-pressure locations are independent of aspect ratio and are located approximately 5 percent of the root chord ahead of the wing-area centroid. The locations of the lateral centers of pressure are relatively independent of aspect ratio for $\alpha \geq 20^\circ$ and approach a location that is approximatey 3 percent of the semispan inboard of the semispan-area centroid, which is located at $y/(b/2) = 0.444$. The vertical center-of-pressure locations z_{cp} are relatively insensitive to aspect ratio and approach a location on the windward leading edges that is approximately 50 percent of the wing half thickness.

Shown in figure 10 is a summary of the effects of taper ratio on the wing aerodynamic characteristics for $\mathcal{R} = 1.0$ and $M = 2.16$. Increasing taper ratio results in a general increase in C_A, C_n, and C_b through the test range of angles of attack and an increase in C_m for all but the maximum test angles of attack. Since wing span is constant for these three models, the increase in C_A with an increase in taper ratio is primarily due to the decrease in sweep with increasing taper ratio. Increasing taper ratio from 0 to 0.5 results in an increase in C_N but a further increase in taper ratio from 0.5 to 1.0 has little effect on C_N. The increase in C_b resulting from the increase in taper ratio from 0.5 to 1.0 is associated with an outboard movement of the lateral center-of-pressure location, since C_N is not affected by this increase in taper ratio. Similar to the effects of aspect ratio shown in figure 9, the effects of taper ratio on C_m also diminish as α approaches 60° due to the stagnation point approaching the moment center or wing-area centroid. This movement of the stagnation point towards the wing-area centroid is also indicated by the variation of x_{cp}/L with α shown in figure 10.

As shown in figure 10, increasing taper ratio results in an upstream movement of the longitudinal center-of-pressure location and an outboard movement of the lateral center-of-pressure location, both of which approach the wing-area centroids at the maximum test angle of attack. The vertical center-of-pressure locations are relatively insensitive to taper-ratio effects. Although the effects of taper ratio shown in figure 10 are for an aspect ratio of 1.0, the trends discussed are applicable for the test range of aspect ratios.

Shown in figure 11 are the effects of Mach number on the wing having $A = 1.0$ and $\lambda = 0.5$. These results are also representative of the Mach number effects for the other nine wings. Increasing Mach number results in a general decrease in C_N and C_b for the test range of Mach numbers. Except for the maximum test angles of attack, increasing Mach number from 1.60 to 2.86 results in a decrease in C_m. Further increases in Mach number have little effect on the pitching-moment coefficient for the test range of angles of attack. At the maximum test angle of attack of 60°, C_m is essentially independent of Mach number for the test range of Mach numbers. The angle of attack corresponding to maximum measured C_m increases with increasing Mach number, which is probably associated with the increase in turning angle required for shock detachment that occurs with increasing Mach number.

The center-of-pressure data presented in figure 11 show that for angles of attack greater than 30°, Mach number has little effect on the longitudinal, lateral, or vertical center-of-pressure locations for the complete test range of Mach numbers. For angles less than 30°, increasing Mach number results in a decrease in x_{cp}/L for the test range of Mach numbers and a decrease in $y_{cp}/(b/2)$ for Mach numbers from 1.60 to 2.86. For $M > 2.86$, $y_{cp}/(b/2)$ is insensitive to Mach number for angles of attack greater than approximately 10°. For angles of attack from 0° to about 25°, increasing Mach number resulted in an increase in $z_{cp}/(t/2)$.

CONCLUSIONS

An experiment has been conducted to determine wing-alone supersonic aerodynamic characteristics at high angles of attack. The wings tested varied in aspect ratio from 0.5 to 4.0 and taper ratio from 0 to 1.0. The wings were tested at angles of attack from -5° to 60° and Mach numbers from 1.60 to 4.60. Aerodynamic forces and moments were obtained by integrating pressure measurements over the wing surfaces. Results from these tests lead to the following conclusions:

1. Longitudinal and lateral center-of-pressure locations approached the wing-area centroids at the maximum test angles of attack.

2. For angles of attack greater than 30°, longitudinal, lateral, and vertical center-of-pressure locations were not significantly affected by Mach number.

3. Peak pitching-moment coefficients were measured at the approximate angles of attack at which free-stream pitot pressure was first measured on the windward surface in the wing-apex regions.

4. At the maximum test angle of attack (60°), pitching-moment coefficient was not significantly affected by either aspect ratio or taper ratio.

5. Increasing aspect ratio resulted in a general increase in normal-force coefficient C_N. Increasing taper ratio from 0 to 0.5 resulted in an increase in C_N but further increases in taper ratio had little effect on C_N.

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APPENDIX

EQUATIONS FOR DATA REDUCTION

Normal-force coefficient:

$$C_N = \frac{N}{q(S/2)}$$

where

$$N = \Sigma\ p\ \Delta S$$

Axial-force coefficient:

$$C_A = \frac{F_A}{q(S/2)}$$

where

$$F_A = \Sigma\ (p\ \Delta S \tan 15^\circ \cos \Lambda)_{LE} - \Sigma\ (p\ \Delta S \tan 15^\circ)_{TE}$$

Pitching-moment coefficient:

$$C_m = \frac{M_Y}{q\bar{c}(S/2)}$$

where

$$M_Y = \Sigma\ p\ \Delta S\ (x_{c,w} - x_{c,\Delta S})$$

Bending-moment coefficient:

$$C_b = \frac{M_b}{q(b/2)(S/2)}$$

where

$$M_b = \Sigma\ p\ \Delta Sy_{c,\Delta S}$$

Yawing-moment coefficient:

$$C_n = \frac{M_Z}{q\bar{c}(S/2)}$$

where

$$M_Z = \Sigma\ (p\ \Delta Sy_{c,\Delta S}\ \tan 15^\circ \cos \Lambda)_{LE} - \Sigma\ (p\ \Delta Sy_{c,\Delta S}\ \tan 15^\circ \sin \Lambda)_{LE} - \Sigma\ (p\ \Delta Sy_{c,\Delta S}\ \tan 15^\circ)$$

Longitudinal center-of-pressure location:

$$x_{cp} = x_{c,w} - \frac{C_m\bar{c}}{C_N}$$

Lateral center-of-pressure location:

$$y_{cp} = \frac{C_b(b/2)}{C_N}$$

Vertical center-of-pressure location:

$$z_{cp} = \frac{\Sigma\ (p\ \Delta Sz_{c,\Delta S}\ \tan 15^\circ \cos \Lambda)_{LE} - \Sigma\ (p\ \Delta Sz_{c,\Delta S}\ \tan 15^\circ)_{TE}}{qC_A(S/2)}$$

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TABLE I.–PRESSURE COEFFICIENTS FOR MODEL 1
(a) M = 1.60

			α =													
			−4.8		.2		5.3		10.3		15.3		20.3		25.2	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	−.0035	.0453	.0249	.0177	.0589	−.0084	.1150	−.0427	.1909	−.0890	.2989	−.1420	.4240	−.2393
2	.822	0.000	−.0040	.0468	.0201	.0182	.0590	−.0046	.1142	−.0421	.1938	−.0883	.2947	−.1424	.4229	−.2258
3	.762	0.000	−.0065	.0469	.0185	.0178	.0589	−.0034	.1172	−.0405	.1938	−.0857	.2982	−.1377	.4215	−.2243
4	.764	.117	−.0138	.0465	.0201	.0178	.0580	−.0267	.1102	−.1650	.1790	−.2406	.2742	−.3059	.3896	−.3591
5	.703	0.000	−.0060	.0475	.0186	.0181	.0602	−.0047	.1165	−.0470	.1971	−.0920	.2989	−.1441	.4225	−.2295
6	.644	0.000	−.0033	.0498	.0196	.0185	.0563	−.0037	.1179	−.0427	.1980	−.0849	.3029	−.1380	.4234	−.2256
7	.646	.117	−.0023	.0507	.0203	.0191	.0562	−.0031	.1146	−.1027	.1889	−.2125	.2900	−.2808	.4062	−.3303
8	.647	.234	−.0704	.0518	.0209	.0194	.0563	−.0802	.1066	−.1571	.1701	−.2362	.2591	−.3024	.3655	−.3506
9	.600	0.000	−.0054	.0504	.0206	.0201	.0568	−.0046	.1178	−.0429	.1980	−.0853	.2998	−.1391	.4226	−.2226
10	.558	.086	−.0037	.0515	.0188	.0181	.0539	−.0063	.1137	−.0614	.1954	−.1412	.2934	−.2059	.4136	−.2780
11	.560	.203	−.0023	.0530	.0214	.0201	.0551	−.0127	.1117	−.1609	.1876	−.2445	.2804	−.3108	.3956	−.3583
12	.562	.320	−.0663	.0527	.0231	.0216	.0548	−.0754	.1024	−.1596	.1660	−.2387	.2471	−.3044	.3518	−.3516
13	.501	0.000	−.0163	.0424	.0084	.0084	.0433	−.0230	.0969	−.0587	.1827	−.1022	.2829	−.1571	.4030	−.2423
14	.502	.141	−.0077	.0478	.0153	.0141	.0490	−.0132	.1030	−.0898	.1853	−.1925	.2840	−.2619	.4042	−.3158
15	.504	.258	−.0137	.0502	.0195	.0181	.0509	−.0368	.1008	−.1702	.1779	−.2379	.2710	−.3063	.3849	−.3546
16	.506	.375	−.0661	.0526	.0226	.0207	.0518	−.0786	.0928	−.1635	.1585	−.2403	.2395	−.3081	.3414	−.3529
17	.442	0.000	−.0121	.0421	.0079	.0070	.0427	−.0209	.0956	−.0594	.1743	−.1003	.2814	−.1518	.4057	−.2391
18	.443	.200	−.0077	.0482	.0141	.0109	.0491	−.0169	.0993	−.1239	.1754	−.2327	.2792	−.3002	.4013	−.3427
19	.445	.317	−.0363	.0507	.0169	.0139	.0515	−.0706	.0969	−.1657	.1679	−.2387	.2646	−.3049	.3810	−.3535
20	.447	.434	−.0671	.0522	.0192	.0160	.0514	−.0847	.0886	−.1679	.1480	−.2444	.2315	−.3107	.3353	−.3544
21	.383	0.000	−.0113	.0444	.0079	.0064	.0425	−.0211	.0956	−.0585	.1746	−.1008	.2733	−.1514	.3992	−.2402
22	.383	.082	−.0126	.0439	.0067	.0046	.0421	−.0221	.0958	−.0618	.1741	−.1142	.2723	−.1675	.3966	−.2528
23	.384	.259	−.0116	.0498	.0138	.0089	.0476	−.0247	.0989	−.1588	.1711	−.2529	.2645	−.3161	.3876	−.3595
24	.386	.376	−.0625	.0533	.0173	.0133	.0505	−.0922	.0976	−.1685	.1646	−.2415	.2518	−.3040	.3685	−.3537
25	.388	.493	−.0690	.0530	.0199	.0156	.0494	−.0905	.0875	−.1736	.1424	−.2483	.2180	−.3095	.3222	−.3547
26	.324	0.000	−.0118	.0439	.0103	.0064	.0424	−.0206	.0962	−.0577	.1752	−.1018	.2731	−.1510	.3902	−.2411
27	.324	.109	−.0126	.0434	.0086	.0044	.0423	−.0213	.0961	−.0627	.1746	−.1201	.2728	−.1755	.3880	−.2581
28	.325	.318	−.0121	.0400	.0120	.0078	.0443	−.0304	.0957	−.1762	.1680	−.2512	.2624	−.3171	.3723	−.3652
29	.327	.435	−.0807	.0426	.0151	.0108	.0458	−.0966	.0921	−.1703	.1584	−.2441	.2474	−.3102	.3503	−.3569
30	.329	.552	−.0695	.0417	.0178	.0136	.0455	−.0919	.0820	−.1762	.1367	−.2537	.2126	−.3125	.3043	−.3554
31	.236	0.000	−.0120	.0440	.0111	.0068	.0446	−.0174	.0973	−.0558	.1738	−.0997	.2716	−.1504	.3841	−.2436
32	.236	.151	−.0138	.0383	.0108	.0067	.0449	−.0186	.0971	−.0667	.1725	−.1299	.2693	−.1887	.3818	−.2696
33	.236	.264	−.0139	.0360	.0059	.0014	.0434	−.0188	.0954	−.0991	.1702	−.1930	.2659	−.2561	.3769	−.3140
34	.237	.407	−.0247	.0420	.0111	.0064	.0474	−.0566	.0948	−.1793	.1657	−.2524	.2545	−.3206	.3595	−.3652
35	.239	.524	−.0883	.0456	.0146	.0092	.0476	−.0961	.0908	−.1718	.1567	−.2493	.2383	−.3168	.3371	−.3606
36	.241	.640	−.0694	.0460	.0172	.0114	.0458	−.0929	.0794	−.1775	.1326	−.2567	.2019	−.3224	.2918	−.3583
37	.147	0.000	−.0140	.0375	.0091	.0041	.0425	−.0192	.0969	−.0599	.1725	−.1033	.2672	−.1594	.3860	−.2463
38	.147	.192														
39	.147	.336	−.0139	.0394	.0064	.0008	.0427	−.0174	.0973	−.1265	.1702	−.2159	.2617	−.2781	.3752	−.3284
40	.149	.495														
41	.150	.612														
42	.152	.729	−.0692	.0537	.0223	.0177	.0536	−.0917	.0869	−.1746	.1292	−.2629	.1959	−.3292	.2856	−.3664
43	.088	0.000	−.0125	.0407	.0103	.0069	.0422	−.0166	.0979	−.0612	.1745	−.1045	.2687	−.1594	.3890	−.2446
44	.088	.220	−.0129	.0425	.0123	.0082	.0438	−.0159	.0992	−.0720	.1740	−.1409	.2683	−.2000	.3878	−.2732
45	.088	.385	−.0121	.0417	.0112	.0063	.0461	−.0170	.1014	−.1338	.1726	−.2299	.2648	−.2893	.3828	−.3358
46	.090	.554	−.0692	.0529	.0178	.0142	.0554	−.0985	.1057	−.1961	.1664	−.2608	.2496	−.3245	.3606	−.3749
47	.092	.671	−.0898	.0580	.0254	.0214	.0634	−.1005	.1082	−.1671	.1600	−.2704	.2347	−.3319	.3390	−.3728
48	.093	.787	−.0832	.0661	.0340	.0263	.0706	−.1014	.1057	−.1798	.1434	−.2738	.2023	−.3403	.2936	−.3695
49	.059	.703	−.1028	.0561	.0250	.0188	.0602	−.1115	.1061	−.1866	.1621	−.2733	.2347	−.3313	.3347	−.3723
50	.044	0.000	−.2847	−.2650	−.2708	−.2743	−.2633	−.2886	−.2384	−.3273	−.1989	−.3552	−.1457	−.3815	−.0846	−.4163
51	.044	.236	−.2967	−.2734	−.2853	−.2855	−.2747	−.3015	−.2463	−.3412	−.2079	−.3758	−.1575	−.4006	−.0964	−.3978
52	.044	.412	−.3043	−.2655	−.2756	−.2736	−.2578	−.3098	−.2329	−.3426	−.1961	−.3447	−.1492	−.3653	−.0877	−.3840
53	.044	.837	−.1075	.0422	.0223	.0139	.0525	−.1227	.0912	−.1877	.1362	−.2800	.1988	−.3407	.2788	−.3651
54	.029	0.000	−.3029	−.2836	−.2929	−.2940	−.2689	−.3079	−.2520	−.3121	−.2140	−.3554	−.1613	−.3798	−.0997	−.3826
55	.029	.236	−.3073	−.2824	−.2962	−.2952	−.2755	−.3109	−.2484	−.3203	−.2114	−.3496	−.1602	−.3721	−.0984	−.3866
56	.029	.412	−.3040	−.2573	−.2706	−.2705	−.2533	−.3129	−.2256	−.3199	−.1856	−.3443	−.1333	−.3700	−.0662	−.3830
57	.029	.599	−.3209	−.2905	−.3187	−.3212	−.2833	−.3252	−.2546	−.3207	−.2103	−.3369	−.1519	−.3603	−.0620	−.3803
58	.015	0.000	−.2772	−.2672	−.2736	−.2705	−.2462	−.2848	−.2351	−.2865	−.2166	−.3163	−.1637	−.3438	−.1007	−.3780
59	.015	.236	−.2854	−.2716	−.2729	−.2715	−.2569	−.2927	−.2433	−.2921	−.2098	−.3282	−.1573	−.3599	−.0929	−.3851
60	.015	.412	−.2965	−.2534	−.2637	−.2580	−.2484	−.3051	−.2242	−.3140	−.1839	−.3418	−.1283	−.3671	−.0593	−.3831
61	.015	.733	−.3398	−.2927	−.3454	−.3418	−.2756	−.3376	−.2779	−.3551	−.2499	−.3739	−.2091	−.3821	−.1668	−.3857
62	.329	−.552	−.0621	.0411	.0207	.0131	.0501	−.0878	.0837	−.1673	.1365	−.2406	.2098	−.2981	.3014	−.3372
63	.044	−.837	−.0985	.0387	.0241	.0148	.0507	−.1151	.0911	−.1906	.1343	−.2764	.1923	−.3321	.2689	−.3552

TABLE I.—Continued
(a) Concluded

			α =													
			30.3		35.3		40.3		45.3		50.3		55.3		60.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	.5679	−.3084	.7185	−.4336	.8756	−.4274	1.0339	−.4597	1.1853	−.4630	1.3132		1.4099	
2	.822	0.000	.5669	−.3034	.7157	−.4633	.8762	−.4511	1.0306	−.4662	1.1809	−.4737	1.3134		1.4220	
3	.762	0.000	.5638	−.2981	.7146	−.4638	.8720	−.4765	1.0252	−.4852	1.1733	−.4761	1.3071		1.4142	
4	.764	.117	.5235	−.3906	.6650	−.4780	.8135	−.4992	.9539	−.4939	1.0985	−.4729	1.2236		1.3303	
5	.703	0.000	.5629	−.3043	.7139	−.4625	.8674	−.4798	1.0226	−.4686	1.1744	−.4780	1.3092		1.4117	
6	.644	0.000	.5666	−.3053	.7167	−.4572	.8658	−.4672	1.0218	−.4549	1.1720	−.4737	1.3040		1.4062	
7	.646	.117	.5440	−.3495	.6905	−.4699	.8357	−.4750	.9867	−.4357	1.1293	−.4856	1.2599		1.3634	
8	.647	.234	.4911	−.3753	.6273	−.4686	.7619	−.4696	.9003	−.4354	1.0362	−.4865	1.1560		1.2538	
9	.600	0.000	.5640	−.2995	.7118	−.4312	.8616	−.4530	1.0181	−.4569	1.1652	−.4634	1.2962		1.4000	
10	.558	.086	.5526	−.3184	.6962	−.4659	.8435	−.4507	.9966	−.4250	1.1429	−.4541	1.2736		1.3763	
11	.560	.203	.5290	−.3758	.6664	−.4651	.8077	−.4496	.9529	−.4281	1.0946	−.4582	1.2204		1.3206	
12	.562	.320	.4755	−.3746	.6013	−.4627	.7294	−.4436	.8661	−.4319	.9966	−.4549	1.1105		1.2053	
13	.501	0.000	.5427	−.3117	.6866	−.4092	.8421	−.4161	.9943	−.4583	1.1377	−.4260	1.2659		1.3708	
14	.502	.141	.5414	−.3417	.6842	−.4679	.8300	−.4364	.9797	−.4268	1.1237	−.4319	1.2513		1.3498	
15	.504	.258	.5170	−.3818	.6521	−.4618	.7906	−.4366	.9359	−.4333	1.0745	−.4325	1.1964		1.2930	
16	.506	.375	.4628	−.3755	.5852	−.4592	.7154	−.4301	.8471	−.4367	.9760	−.4285	1.0878		1.1783	
17	.442	0.000	.5427	−.3089	.6890	−.3993	.8372	−.4167	.9917	−.4552	1.1364	−.4048	1.2624		1.3631	
18	.443	.200	.5345	−.3591	.6756	−.4637	.8132	−.4222	.9636	−.4290	1.1067	−.4071	1.2299		1.3249	
19	.445	.317	.5093	−.3804	.6433	−.4587	.7750	−.4241	.9186	−.4398	1.0549	−.4071	1.1723		1.2656	
20	.447	.434	.4531	−.3743	.5764	−.4553	.6988	−.4179	.8291	−.4454	.9547	−.4041	1.0636		1.1513	
21	.383	0.000	.5344	−.3104	.6812	−.3888	.8295	−.4186	.9862	−.4339	1.1283	−.3875	1.2493		1.3487	
22	.383	.082	.5318	−.3122	.6786	−.4190	.8273	−.4088	.9821	−.4252	1.1235	−.3871	1.2450		1.3437	
23	.384	.259	.5196	−.3720	.6573	−.4561	.7955	−.4134	.9446	−.4266	1.0836	−.3920	1.2014		1.2959	
24	.386	.376	.4948	−.3788	.6277	−.4536	.7584	−.4157	.9012	−.4406	1.0331	−.3914	1.1461		1.2369	
25	.388	.493	.4379	−.3721	.5594	−.4514	.6812	−.4101	.8110	−.4450	.9322	−.3879	1.0370		1.1224	
26	.324	0.000	.5233	−.3118	.6706	−.3847	.8226	−.4208	.9756	−.4101	1.1143	−.3844	1.2310		1.3310	
27	.324	.109	.5210	−.3151	.6689	−.4202	.8197	−.4014	.9721	−.4062	1.1092	−.3835	1.2257		1.3241	
28	.325	.318	.4965	−.3840	.6362	−.4528	.7799	−.4064	.9255	−.4227	1.0526	−.3837	1.1667		1.2585	
29	.327	.435	.4700	−.3827	.6029	−.4509	.7404	−.4102	.8787	−.4363	1.0026	−.3826	1.1106		1.2011	
30	.329	.552	.4154	−.3736	.5361	−.4463	.6641	−.4065	.7920	−.4346	.9050	−.3792	1.0062		1.0925	
31	.236	0.000	.5240	−.3089	.6689	−.3797	.8182	−.3949	.9659	−.3561	1.0904	−.3780	1.1978		1.2952	
32	.236	.151	.5179	−.3171	.6601	−.4192	.8088	−.3526	.9556	−.3623	1.0769	−.3745	1.1860		1.2837	
33	.236	.264	.5125	−.3396	.6534	−.4465	.8017	−.3496	.9456	−.3759	1.0664	−.3748	1.1717		1.2679	
34	.237	.407	.4882	−.3882	.6229	−.4465	.7652	−.3775	.9010	−.4049	1.0173	−.3742	1.1192		1.2098	
35	.239	.524	.4593	−.3813	.5877	−.4468	.7233	−.3877	.8540	−.4123	.9656	−.3718	1.0627		1.1512	
36	.241	.640	.4037	−.3723	.5204	−.4450	.6453	−.3885	.7677	−.4084	.8679	−.3697	.9601		1.0457	
37	.147	0.000	.5232	−.3120	.6669	−.3788	.8166	−.3342	.9415	−.3454	1.0454	−.3671	1.1378		1.2298	
38	.147	.192														
39	.147	.336	.5109	−.3506	.6512	−.4463	.7955	−.2764	.9177	−.3635	1.0155	−.3623	1.1057		1.1981	
40	.149	.495														
41	.150	.612														
42	.152	.729	.3954	−.3803	.5119	−.4442	.6334	−.3136	.7348	−.3720	.8201	−.3537	.8964		.9832	
43	.088	0.000	.5246	−.3093	.6703	−.3710	.7917	−.3430	.8814	−.3555	.9547	−.3579	1.0255		1.1109	
44	.088	.220	.5222	−.3175	.6664	−.4136	.7855	−.3182	.8743	−.3582	.9493	−.3541	1.0173		1.1052	
45	.088	.385	.5127	−.3538	.6538	−.4150	.7696	−.3055	.8566	−.3612	.9288	−.3501	.9980		1.0859	
46	.090	.554	.4822	−.3971	.6161	−.4049	.7266	−.2919	.8102	−.3674	.8804	−.3458	.9486		1.0382	
47	.092	.671	.4556	−.3896	.5824	−.4028	.6890	−.2849	.7700	−.3600	.8379	−.3428	.9051		.9968	
48	.093	.787	.3984	−.3830	.5155	−.4047	.6134	−.2641	.6904	−.3523	.7547	−.3398	.8194		.9102	
49	.059	.703	.4440	−.3890	.5489	−.3758	.6095	−.2776	.6570	−.3454	.7009	−.3351	.7681		.8980	
50	.044	0.000	−.0219	−.4275	.0278	−.4005	.0558	−.3733	.0854	−.3602	.1320	−.3501	.3045		.5044	
51	.044	.236	−.0346	−.4129	.0129	−.3806	.0397	−.3757	.0695	−.3578	.1509	−.3445	.2972		.4932	
52	.044	.412	−.0260	−.4030	.0238	−.3672	.0541	−.3753	.0955	−.3547	.1841	−.3406	.2887		.5735	
53	.044	.837	.3601	−.3788	.4238	−.3567	.4606	−.2720	.5032	−.3260	.5543	−.3294	.6756		.8069	
54	.029	0.000	−.0357	−.4052	.0176	−.3822	.0600	−.3497	.1185	−.3409	.2269	−.3460	.4576		.8494	
55	.029	.236	−.0339	−.4033	.0202	−.3735	.0664	−.3422	.1398	−.3382	.2370	−.3405	.5246		.8498	
56	.029	.412	.0046	−.4016	.0668	−.3606	.1186	−.3321	.1874	−.3359	.2517	−.3359	.6995		.8300	
57	.029	.599	.0351	−.4014	.1047	−.3538	.1627	−.3167	.2423	−.3327	.3697	−.3316	.6660		.8034	
58	.015	0.000	−.0337	−.4029	.0262	−.3611	.0844	−.3264	.1694	−.3296	.2815	−.3406	.7384		.7770	
59	.015	.236	−.0239	−.4021	.0411	−.3607	.1058	−.3101	.1922	−.3285	.2614	−.3351	.7323		.7728	
60	.015	.412	.0151	−.4015	.0851	−.3556	.1531	−.2894	.2452	−.3271	.4232	−.3305	.7162		.7647	
61	.015	.733	−.0828	−.4002	−.0110	−.3339	.0260	−.2594	.1301	−.3178	.2771	−.3233	.6712		.7469	
62	.329	−.552	.4110	−.3948	.5303	−.3828	.6599	−.4557	.7855	−.4153	.8990	−.3780	.9998		1.0874	
63	.044	−.837	.3522	−.3964	.4148	−.3757	.4563	−.3342	.4985	−.3126	.5518	−.3403	.6725		.8009	

TABLE I.–Continued
(b) M = 2.16

			α =													
			−3.7		1.3		6.3		11.3		16.3		21.3		26.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	.0125	.0459	.0316	.0148	.0734	−.0065	.1357	−.0385	.2256	−.0791	.3351	−.1380	.4642	−.1846
2	.822	0.000	.0025	.0439	.0245	.0127	.0655	−.0099	.1297	−.0439	.2185	−.0847	.3305	−.1429	.4573	−.1941
3	.762	0.000	.0023	.0417	.0232	.0127	.0650	−.0084	.1299	−.0419	.2185	−.0820	.3292	−.1343	.4586	−.1919
4	.764	.117	−.0009	.0417	.0240	.0127	.0642	−.0640	.1233	−.1360	.2064	−.1846	.3093	−.2172	.4302	−.2413
5	.703	0.000	.0028	.0410	.0229	.0109	.0640	−.0113	.1299	−.0469	.2170	−.0864	.3302	−.1410	.4609	−.1922
6	.644	0.000	−.0001	.0411	.0219	.0117	.0642	−.0092	.1289	−.0428	.2180	−.0814	.3310	−.1408	.4595	−.1969
7	.646	.117	.0027	.0411	.0223	.0110	.0638	−.0136	.1258	−.1103	.2103	−.1720	.3210	−.2055	.4448	−.2380
8	.647	.234	−.0424	.0420	.0246	.0135	.0625	−.0759	.1182	−.1349	.1939	−.1856	.2970	−.2150	.4112	−.2406
9	.600	0.000	−.0021	.0416	.0222	.0135	.0612	−.0115	.1275	−.0407	.2178	−.0806	.3294	−.1367	.4575	−.1868
10	.558	.086	−.0005	.0395	.0219	.0102	.0604	−.0130	.1254	−.0661	.2139	−.1248	.3222	−.1739	.4476	−.2145
11	.560	.203	.0025	.0403	.0238	.0119	.0610	−.0418	.1224	−.1406	.2080	−.1899	.3118	−.2185	.4322	−.2449
12	.562	.320	−.0466	.0411	.0256	.0113	.0604	−.0772	.1137	−.1369	.1901	−.1883	.2850	−.2168	.3961	−.2423
13	.501	0.000	−.0132	.0299	.0123	.0020	.0492	−.0243	.1117	−.0579	.1996	−.0964	.3093	−.1530	.4352	−.1995
14	.502	.141	−.0047	.0351	.0180	.0072	.0549	−.0181	.1172	−.0977	.2028	−.1621	.3127	−.1981	.4342	−.2259
15	.504	.258	−.0034	.0380	.0215	.0103	.0578	−.0697	.1161	−.1391	.1979	−.1877	.3029	−.2183	.4191	−.2442
16	.506	.375	−.0463	.0405	.0248	.0108	.0582	−.0793	.1089	−.1392	.1812	−.1898	.2776	−.2179	.3844	−.2411
17	.442	0.000	−.0120	.0281	.0077	.0016	.0487	−.0226	.1107	−.0574	.1958	−.0937	.3082	−.1514	.4347	−.1965
18	.443	.200	−.0062	.0332	.0154	.0049	.0533	−.0238	.1151	−.1256	.1966	−.1880	.3062	−.2146	.4281	−.2338
19	.445	.317	−.0207	.0361	.0190	.0080	.0552	−.0864	.1141	−.1387	.1911	−.1895	.2940	−.2193	.4120	−.2435
20	.447	.434	−.0487	.0381	.0229	.0096	.0548	−.0832	.1056	−.1425	.1736	−.1928	.2677	−.2197	.3768	−.2410
21	.383	0.000	−.0127	.0271	.0062	.0034	.0486	−.0222	.1099	−.0585	.1922	−.0958	.3000	−.1522	.4298	−.1951
22	.383	.082	−.0137	.0262	.0063	.0022	.0479	−.0230	.1086	−.0628	.1910	−.1073	.2995	−.1616	.4290	−.1974
23	.384	.259	−.0078	.0309	.0097	.0020	.0534	−.0383	.1105	−.1457	.1901	−.1979	.2956	−.2237	.4189	−.2419
24	.386	.376	−.0390	.0346	.0165	.0067	.0560	−.0865	.1093	−.1413	.1848	−.1914	.2857	−.2194	.4041	−.2436
25	.388	.493	−.0514	.0364	.0204	.0070	.0546	−.0865	.1000	−.1455	.1667	−.1943	.2595	−.2199	.3682	−.2410
26	.324	0.000	−.0142	.0264	.0092	.0029	.0476	−.0221	.1082	−.0587	.1911	−.0956	.2956	−.1539	.4218	−.1951
27	.324	.109	−.0152	.0261	.0092	.0020	.0473	−.0221	.1082	−.0656	.1908	−.1105	.2947	−.1653	.4202	−.1992
28	.325	.318	−.0107	.0311	.0107	.0033	.0510	−.0568	.1075	−.1516	.1873	−.1958	.2877	−.2245	.4085	−.2453
29	.327	.435	−.0570	.0336	.0137	.0050	.0527	−.0879	.1046	−.1457	.1802	−.1934	.2763	−.2206	.3921	−.2427
30	.329	.552	−.0557	.0359	.0183	.0060	.0528	−.0884	.0956	−.1479	.1616	−.1950	.2502	−.2202	.3569	−.2394
31	.236	0.000	−.0129	.0291	.0116	.0019	.0458	−.0218	.1061	−.0601	.1868	−.0967	.2956	−.1540	.4160	−.1968
32	.236	.151	−.0143	.0295	.0126	.0030	.0460	−.0232	.1046	−.0745	.1858	−.1204	.2925	−.1726	.4130	−.2038
33	.236	.264	−.0157	.0262	.0088	−.0011	.0446	−.0234	.1041	−.1080	.1858	−.1619	.2901	−.1981	.4092	−.2174
34	.237	.407	−.0170	.0318	.0126	.0013	.0488	−.0882	.1058	−.1508	.1829	−.1974	.2824	−.2236	.3952	−.2452
35	.239	.524	−.0644	.0346	.0158	.0037	.0495	−.0914	.1023	−.1490	.1753	−.1975	.2699	−.2221	.3767	−.2420
36	.241	.640	−.0578	.0365	.0180	.0033	.0484	−.0888	.0923	−.1478	.1556	−.1980	.2420	−.2221	.3398	−.2399
37	.147	0.000	−.0134	.0296	.0081	−.0006	.0417	−.0251	.1016	−.0641	.1824	−.0989	.2858	−.1566	.4087	−.1989
38	.147	.192														
39	.147	.336	−.0151	.0300	.0068	−.0044	.0415	−.0298	.1011	−.1263	.1805	−.1774	.2827	−.2062	.4041	−.2238
40	.149	.495														
41	.150	.612														
42	.152	.729	−.0579	.0360	.0182	.0022	.0455	−.0867	.0879	−.1470	.1499	−.1962	.2326	−.2225	.3340	−.2375
43	.088	0.000	−.0140	.0294	.0073	−.0021	.0414	−.0263	.0992	−.0646	.1830	−.1011	.2859	−.1577	.4052	−.2005
44	.088	.220	−.0142	.0301	.0071	−.0025	.0420	−.0260	.0995	−.0800	.1835	−.1289	.2843	−.1774	.4032	−.2061
45	.088	.385	−.0142	.0291	.0056	−.0052	.0421	−.0351	.0992	−.1330	.1815	−.1842	.2809	−.2107	.3973	−.2268
46	.090	.554	−.0505	.0336	.0095	−.0022	.0455	−.1036	.0984	−.1522	.1763	−.1965	.2706	−.2249	.3807	−.2462
47	.092	.671	−.0671	.0364	.0138	.0014	.0487	−.0907	.0959	−.1553	.1684	−.1980	.2585	−.2246	.3640	−.2414
48	.093	.787	−.0583	.0411	.0203	.0057	.0516	−.0844	.0877	−.1462	.1491	−.1981	.2318	−.2268	.3292	−.2414
49	.059	.703	−.0685	.0385	.0152	.0026	.0502	−.0907	.0954	−.1610	.1648	−.2030	.2560	−.2285	.3606	−.2446
50	.044	0.000	−.1656	−.1483	−.1563	−.1601	−.1494	−.1762	−.1290	−.2106	−.0865	−.2292	−.0324	−.2407	.0312	−.2522
51	.044	.236	−.1742	−.1569	−.1611	−.1646	−.1576	−.1868	−.1357	−.2206	−.0948	−.2347	−.0418	−.2306	.0201	−.2509
52	.044	.412	−.1855	−.1572	−.1608	−.1624	−.1546	−.2003	−.1326	−.1964	−.0916	−.2155	−.0377	−.2251	.0238	−.2442
53	.044	.837	−.0669	.0430	.0240	.0060	.0548	−.0910	.0903	−.1509	.1448	−.2023	.2258	−.2292	.3221	−.2419
54	.029	0.000	−.1824	−.1678	−.1730	−.1764	−.1657	−.1946	−.1417	−.2105	−.1005	−.2255	−.0475	−.2259	.0154	−.2431
55	.029	.236	−.1873	−.1702	−.1736	−.1759	−.1681	−.1990	−.1411	−.2017	−.1007	−.2187	−.0474	−.2257	.0149	−.2443
56	.029	.412	−.1917	−.1629	−.1674	−.1678	−.1566	−.2095	−.1324	−.1952	−.0904	−.2159	−.0337	−.2245	.0318	−.2437
57	.029	.599	−.2019	−.1793	−.1892	−.1903	−.1732	−.2014	−.1445	−.2027	−.1028	−.2206	−.0472	−.2247	.0185	−.2434
58	.015	0.000	−.1790	−.1733	−.1763	−.1727	−.1687	−.1871	−.1444	−.1905	−.1047	−.2088	−.0513	−.2242	.0119	−.2425
59	.015	.236	−.1866	−.1748	−.1790	−.1786	−.1695	−.1950	−.1431	−.1949	−.1032	−.2151	−.0493	−.2246	.0137	−.2431
60	.015	.412	−.1880	−.1640	−.1709	−.1722	−.1580	−.1924	−.1327	−.1953	−.0913	−.2160	−.0346	−.2245	.0331	−.2441
61	.015	.733	−.1924	−.1939	−.2020	−.2034	−.1872	−.1974	−.1654	−.2093	−.1321	−.2217	−.0822	−.2227	−.0217	−.2423
62	.329	−.552	−.0394	.0379	.0301	.0096	.0611	−.0792	.1020	−.1353	.1699	−.1779	.2539	−.2020	.3573	−.2199
63	.044	−.837	−.0535	.0412	.0330	.0064	.0604	−.0861	.0946	−.1439	.1492	−.1939	.2288	−.2167	.3242	−.2326

TABLE I.–Continued
(b) Concluded

			α =													
			31.3		36.3		41.3		46.3		51.3		56.3		61.3	
Tube	x'/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	.6236	−.2374	.7810	−.2527	.9341	−.2526	1.0940	−.2518	1.2546	−.2555	1.4030	−.2483	1.5402	−.2334
2	.822	0.000	.6056	−.2420	.7674	−.2538	.9363	−.2631	1.0952	−.2620	1.2476	−.2655	1.3901	−.2507	1.5288	−.2369
3	.762	0.000	.6041	−.2280	.7565	−.2582	.9177	−.2652	1.0774	−.2690	1.2328	−.2680	1.3782	−.2483	1.5190	−.2348
4	.764	.117	.5675	−.2457	.7104	−.2437	.8631	−.2628	1.0125	−.2692	1.1612	−.2760	1.2987	−.2497	1.4281	−.2342
5	.703	0.000	.6067	−.2291	.7592	−.2567	.9205	−.2658	1.0781	−.2680	1.2309	−.2749	1.3771	−.2478	1.5153	−.2326
6	.644	0.000	.6075	−.2367	.7592	−.2547	.9195	−.2687	1.0775	−.2729	1.2318	−.2728	1.3771	−.2469	1.5105	−.2328
7	.646	.117	.5885	−.2224	.7360	−.2514	.8913	−.2764	1.0438	−.2819	1.1937	−.2780	1.3344	−.2473	1.4630	−.2317
8	.647	.234	.5430	−.2343	.6807	−.2586	.8241	−.2743	.9662	−.2792	1.1064	−.2742	1.2350	−.2448	1.3534	−.2303
9	.600	0.000	.6048	−.2280	.7611	−.2479	.9187	−.2660	1.0770	−.2721	1.2288	−.2730	1.3714	−.2528	1.5020	−.2373
10	.558	.086	.5921	−.2048	.7457	−.2591	.9005	−.2748	1.0529	−.2773	1.2060	−.2731	1.3461	−.2443	1.4746	−.2325
11	.560	.203	.5704	−.2250	.7193	−.2692	.8693	−.2763	1.0161	−.2775	1.1618	−.2752	1.2959	−.2435	1.4191	−.2321
12	.562	.320	.5232	−.2310	.6616	−.2709	.8006	−.2766	.9367	−.2767	1.0709	−.2759	1.1943	−.2427	1.3070	−.2314
13	.501	0.000	.5790	−.2463	.7308	−.2602	.8885	−.2647	1.0472	−.2654	1.2025	−.2568	1.3410	−.2376	1.4676	−.2320
14	.502	.141	.5785	−.2058	.7284	−.2722	.8824	−.2724	1.0357	−.2687	1.1886	−.2637	1.3262	−.2387	1.4512	−.2329
15	.504	.258	.5575	−.2272	.7017	−.2738	.8493	−.2710	.9972	−.2690	1.1416	−.2687	1.2735	−.2398	1.3939	−.2326
16	.506	.375	.5121	−.2304	.6446	−.2734	.7808	−.2697	.9169	−.2678	1.0516	−.2692	1.1718	−.2388	1.2817	−.2328
17	.442	0.000	.5792	−.2417	.7280	−.2627	.8865	−.2662	1.0480	−.2619	1.1988	−.2497	1.3397	−.2358	1.4653	−.2340
18	.443	.200	.5700	−.2130	.7163	−.2751	.8699	−.2640	1.0243	−.2583	1.1695	−.2537	1.3069	−.2359	1.4285	−.2340
19	.445	.317	.5468	−.2314	.6884	−.2757	.8355	−.2628	.9823	−.2610	1.1223	−.2566	1.2522	−.2359	1.3689	−.2341
20	.447	.434	.4998	−.2298	.6309	−.2771	.7670	−.2620	.9026	−.2596	1.0309	−.2552	1.1517	−.2353	1.2576	−.2338
21	.383	0.000	.5756	−.2410	.7259	−.2626	.8824	−.2665	1.0342	−.2588	1.1898	−.2469	1.3330	−.2347	1.4523	−.2337
22	.383	.082	.5736	−.2208	.7237	−.2731	.8799	−.2613	1.0308	−.2538	1.1859	−.2467	1.3292	−.2345	1.4474	−.2334
23	.384	.259	.5585	−.2181	.7050	−.2769	.8562	−.2586	.9998	−.2534	1.1474	−.2484	1.2853	−.2350	1.4013	−.2329
24	.386	.376	.5378	−.2321	.6786	−.2783	.8228	−.2592	.9607	−.2554	1.1023	−.2468	1.2316	−.2345	1.3428	−.2329
25	.388	.493	.4891	−.2302	.6198	−.2768	.7526	−.2580	.8800	−.2550	1.0105	−.2446	1.1304	−.2347	1.2319	−.2319
26	.324	0.000	.5624	−.2392	.7110	−.2608	.8648	−.2659	1.0247	−.2560	1.1787	−.2417	1.3205	−.2346	1.4358	−.2262
27	.324	.109	.5610	−.2171	.7087	−.2718	.8616	−.2589	1.0207	−.2524	1.1744	−.2409	1.3140	−.2340	1.4287	−.2261
28	.325	.318	.5414	−.2224	.6834	−.2725	.8282	−.2574	.9807	−.2520	1.1244	−.2415	1.2558	−.2344	1.3653	−.2267
29	.327	.435	.5185	−.2343	.6548	−.2750	.7940	−.2584	.9394	−.2542	1.0766	−.2405	1.2029	−.2340	1.3071	−.2265
30	.329	.552	.4730	−.2324	.5982	−.2694	.7265	−.2568	.8607	−.2524	.9864	−.2388	1.1032	−.2332	1.2023	−.2253
31	.236	0.000	.5549	−.2381	.7042	−.2578	.8591	−.2596	1.0150	−.2370	1.1662	−.2369	1.3000	−.2297	1.4071	−.2195
32	.236	.151	.5508	−.2137	.6989	−.2658	.8495	−.2521	1.0055	−.2378	1.1546	−.2369	1.2864	−.2292	1.3936	−.2197
33	.236	.264	.5456	−.2086	.6911	−.2711	.8416	−.2528	.9968	−.2422	1.1444	−.2373	1.2741	−.2298	1.3781	−.2200
34	.237	.407	.5273	−.2279	.6660	−.2719	.8097	−.2583	.9585	−.2469	1.0981	−.2377	1.2211	−.2311	1.3206	−.2202
35	.239	.524	.5026	−.2360	.6356	−.2735	.7740	−.2594	.9162	−.2477	1.0488	−.2367	1.1667	−.2302	1.2633	−.2198
36	.241	.640	.4559	−.2323	.5772	−.2706	.7060	−.2589	.8375	−.2466	.9598	−.2354	1.0695	−.2300	1.1589	−.2191
37	.147	0.000	.5484	−.2349	.6950	−.2542	.8468	−.2266	1.0032	−.2310	1.1551	−.2338	1.2669	−.2251	1.3557	−.2183
38	.147	.192														
39	.147	.336	.5409	−.2132	.6815	−.2675	.8288	−.2253	.9817	−.2333	1.1283	−.2339	1.2361	−.2258	1.3231	−.2183
40	.149	.495														
41	.150	.612														
42	.152	.729	.4452	−.2345	.5644	−.2608	.6869	−.2500	.8144	−.2338	.9382	−.2317	1.0308	−.2244	1.1025	−.2177
43	.088	0.000	.5422	−.2381	.6890	−.2545	.8436	−.2297	1.0035	−.2304	1.1212	−.2326	1.1918	−.2214	1.2509	−.2180
44	.088	.220	.5390	−.2127	.6847	−.2621	.8402	−.2215	.9973	−.2295	1.1144	−.2322	1.1835	−.2217	1.2435	−.2175
45	.088	.385	.5308	−.2163	.6741	−.2553	.8263	−.2268	.9792	−.2287	1.0941	−.2320	1.1609	−.2226	1.2206	−.2177
46	.090	.554	.5071	−.2361	.6433	−.2612	.7879	−.2434	.9314	−.2288	1.0426	−.2321	1.1077	−.2209	1.1650	−.2169
47	.092	.671	.4853	−.2407	.6156	−.2574	.7526	−.2430	.8915	−.2289	.9988	−.2312	1.0624	−.2217	1.1194	−.2168
48	.093	.787	.4409	−.2387	.5611	−.2594	.6873	−.2363	.8114	−.2242	.9159	−.2311	.9763	−.2195	1.0298	−.2159
49	.059	.703	.4805	−.2431	.6100	−.2503	.7437	−.2320	.8556	−.2211	.9054	−.2304	.9311	−.2169	.9765	−.2137
50	.044	0.000	.1060	−.2682	.1850	−.2517	.2636	−.2379	.3174	−.2261	.3404	−.2290	.3677	−.2171	.5087	−.2152
51	.044	.236	.0942	−.2666	.1729	−.2470	.2491	−.2367	.3010	−.2252	.3230	−.2295	.3571	−.2174	.5023	−.2146
52	.044	.412	.0976	−.2625	.1767	−.2451	.2535	−.2334	.3087	−.2239	.3390	−.2290	.4063	−.2167	.4985	−.2143
53	.044	.837	.4304	−.2400	.5451	−.2404	.6525	−.2135	.7181	−.2158	.7415	−.2265	.7759	−.2127	.8680	−.2099
54	.029	0.000	.0890	−.2631	.1687	−.2496	.2489	−.2312	.3090	−.2223	.3552	−.2252	.4450	−.2141	.5853	−.2120
55	.029	.236	.0889	−.2572	.1687	−.2441	.2475	−.2280	.3099	−.2219	.3638	−.2259	.4712	−.2137	.6578	−.2121
56	.029	.412	.1096	−.2527	.1961	−.2409	.2836	−.2249	.3574	−.2201	.4171	−.2261	.4878	−.2130	.8883	−.2111
57	.029	.599	.0978	−.2508	.2079	−.2384	.3151	−.2194	.3977	−.2182	.4636	−.2270	.5707	−.2123	.7712	−.2104
58	.015	0.000	.0852	−.2615	.1663	−.2479	.2487	−.2213	.3181	−.2181	.3899	−.2200	.5110	−.2097	.9789	−.2088
59	.015	.236	.0873	−.2523	.1698	−.2415	.2549	−.2166	.3324	−.2185	.4127	−.2209	.5092	−.2101	.9674	−.2083
60	.015	.412	.1130	−.2498	.2022	−.2380	.2939	−.2131	.3780	−.2171	.4600	−.2221	.5933	−.2096	.9438	−.2087
61	.015	.733	.0390	−.2458	.0985	−.2321	.2223	−.1996	.2457	−.2137	.4177	−.2226	.4845	−.2084	.8886	−.2066
62	.329	−.552	.4717	−.2451	.5945	−.2305	.7211	−.2499	.8518	−.2415	.9841	−.2266	1.0985	−.2192	1.1975	−.2118
63	.044	−.837	.4311	−.2486	.5446	−.2486	.6493	−.2185	.7129	−.2106	.7389	−.2171	.7753	−.2046	.8651	−.2034

TABLE I.—Continued
(c) M = 2.86

			α =													
			−5.0		0.0		5.2		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	−.0089	.0359	.0106	.0084	.0493	−.0098	.0993	−.0373	.1818	−.0639	.2882	−.0941	.4152	−.1139
2	.822	0.000	−.0114	.0369	.0084	.0092	.0479	−.0117	.0998	−.0389	.1809	−.0668	.2880	−.0988	.4151	−.1173
3	.762	0.000	−.0111	.0381	.0089	.0089	.0477	−.0130	.1004	−.0388	.1799	−.0677	.2865	−.0991	.4145	−.1199
4	.764	.117	−.0526	.0370	.0100	.0098	.0492	−.0384	.0992	−.0891	.1743	−.1114	.2755	−.1265	.3968	−.1367
5	.703	0.000	−.0116	.0405	.0089	.0089	.0466	−.0136	.1007	−.0392	.1789	−.0679	.2852	−.1014	.4126	−.1230
6	.644	0.000	−.0101	.0430	.0096	.0086	.0465	−.0122	.1009	−.0379	.1799	−.0660	.2848	−.0995	.4127	−.1207
7	.646	.117	−.0101	.0424	.0099	.0089	.0472	−.0121	.1008	−.0746	.1774	−.1035	.2799	−.1216	.4046	−.1357
8	.647	.234	−.0535	.0411	.0107	.0100	.0490	−.0515	.0985	−.0904	.1692	−.1122	.2641	−.1266	.3801	−.1382
9	.600	0.000	−.0066	.0453	.0113	.0116	.0487	−.0089	.0960	−.0347	.1766	−.0593	.2807	−.0919	.4091	−.1132
10	.558	.086	−.0082	.0434	.0094	.0065	.0453	−.0142	.1002	−.0506	.1784	−.0821	.2820	−.1092	.4057	−.1306
11	.560	.203	−.0305	.0441	.0112	.0094	.0473	−.0221	.1006	−.0938	.1755	−.1160	.2750	−.1293	.3946	−.1409
12	.562	.320	−.0552	.0436	.0113	.0097	.0477	−.0542	.0966	−.0934	.1656	−.1148	.2579	−.1290	.3691	−.1407
13	.501	0.000	−.0169	.0359	.0031	.0005	.0350	−.0221	.0878	−.0482	.1652	−.0740	.2665	−.1052	.3894	−.1258
14	.502	.141	−.0099	.0409	.0079	.0058	.0422	−.0174	.0955	−.0677	.1732	−.0998	.2724	−.1204	.3937	−.1386
15	.504	.258	−.0490	.0434	.0109	.0078	.0458	−.0385	.0975	−.0944	.1726	−.1156	.2691	−.1300	.3864	−.1415
16	.506	.375	−.0550	.0431	.0113	.0097	.0474	−.0548	.0944	−.0936	.1640	−.1156	.2532	−.1294	.3623	−.1405
17	.442	0.000	−.0151	.0351	.0033	.0011	.0331	−.0216	.0861	−.0480	.1645	−.0740	.2648	−.1061	.3872	−.1250
18	.443	.200	−.0124	.0402	.0068	.0044	.0406	−.0194	.0918	−.0839	.1697	−.1120	.2678	−.1267	.3876	−.1409
19	.445	.317	−.0599	.0417	.0101	.0070	.0442	−.0528	.0932	−.0953	.1684	−.1167	.2632	−.1299	.3783	−.1415
20	.447	.434	−.0558	.0429	.0117	.0097	.0467	−.0563	.0911	−.0953	.1602	−.1164	.2464	−.1292	.3528	−.1406
21	.383	0.000	−.0142	.0351	.0044	.0010	.0352	−.0207	.0846	−.0489	.1641	−.0759	.2644	−.1078	.3853	−.1256
22	.383	.082	−.0155	.0343	.0027	.0007	.0339	−.0217	.0845	−.0509	.1640	−.0785	.2638	−.1075	.3845	−.1321
23	.384	.259	−.0223	.0381	.0057	.0022	.0398	−.0223	.0893	−.0957	.1667	−.1188	.2648	−.1300	.3819	−.1422
24	.386	.376	−.0623	.0409	.0092	.0069	.0435	−.0603	.0906	−.0956	.1660	−.1171	.2600	−.1296	.3724	−.1412
25	.388	.493	−.0577	.0418	.0115	.0087	.0460	−.0576	.0881	−.0968	.1558	−.1174	.2429	−.1299	.3470	−.1418
26	.324	0.000	−.0145	.0360	.0052	.0012	.0366	−.0198	.0842	−.0485	.1632	−.0749	.2635	−.1066	.3834	−.1233
27	.324	.109	−.0147	.0346	.0035	.0008	.0345	−.0210	.0840	−.0514	.1636	−.0802	.2637	−.1089	.3832	−.1321
28	.325	.318	−.0371	.0377	.0057	.0029	.0403	−.0273	.0886	−.0984	.1659	−.1193	.2633	−.1319	.3786	−.1421
29	.327	.435	−.0628	.0398	.0090	.0062	.0434	−.0603	.0893	−.0969	.1629	−.1176	.2565	−.1315	.3669	−.1425
30	.329	.552	−.0574	.0408	.0113	.0092	.0455	−.0555	.0864	−.0965	.1532	−.1171	.2396	−.1306	.3415	−.1409
31	.236	0.000	−.0140	.0350	.0051	.0007	.0378	−.0197	.0844	−.0486	.1603	−.0759	.2628	−.1083	.3830	−.1256
32	.236	.151	−.0143	.0353	.0076	.0010	.0445	−.0198	.1034	−.0540	.1621	−.0823	.2467	−.1090	.3694	−.1299
33	.236	.264	−.0151	.0334	.0030	−.0002	.0404	−.0197	.1017	−.0717	.1656	−.1001	.2473	−.1182	.3649	−.1348
34	.237	.407	−.0605	.0373	.0049	.0026	.0412	−.0471	.0888	−.0997	.1627	−.1198	.2612	−.1330	.3760	−.1430
35	.239	.524	−.0638	.0389	.0087	.0063	.0447	−.0610	.0894	−.0988	.1597	−.1192	.2535	−.1321	.3632	−.1428
36	.241	.640	−.0582	.0394	.0107	.0086	.0459	−.0564	.0856	−.0968	.1489	−.1176	.2356	−.1311	.3363	−.1418
37	.147	0.000	−.0153	.0332	.0011	0.0000	.0430	−.0195	.0956	−.0487	.1619	−.0744	.2431	−.1042	.3661	−.1198
38	.147	.192														
39	.147	.336	−.0180	.0333	−.0038	−.0015	.0435	−.0206	.1027	−.0828	.1546	−.1086	.2416	−.1231	.3632	−.1381
40	.149	.495														
41	.150	.612														
42	.152	.729	−.0551	.0395	.0110	.0086	.0482	−.0523	.0846	−.0915	.1452	−.1118	.2306	−.1242	.3312	−.1317
43	.088	0.000	−.0165	.0330	.0035	−.0004	.0446	−.0199	.0980	−.0496	.1551	−.0772	.2400	−.1090	.3634	−.1255
44	.088	.220	−.0162	.0335	.0030	−.0006	.0462	−.0203	.0955	−.0572	.1520	−.0860	.2431	−.1114	.3635	−.1318
45	.088	.385	−.0192	.0351	−.0016	.0003	.0475	−.0176	.0882	−.0803	.1500	−.1048	.2432	−.1182	.3621	−.1309
46	.090	.554	−.0690	.0374	.0047	.0015	.0455	−.0666	.0886	−.1012	.1582	−.1208	.2532	−.1328	.3700	−.1427
47	.092	.671	−.0567	.0402	.0090	.0059	.0491	−.0539	.0877	−.0963	.1550	−.1164	.2461	−.1287	.3586	−.1382
48	.093	.787	−.0581	.0401	.0113	.0086	.0499	−.0558	.0850	−.0952	.1450	−.1176	.2285	−.1312	.3320	−.1416
49	.059	.703	−.0662	.0390	.0081	.0040	.0486	−.0627	.0882	−.1044	.1538	−.1231	.2443	−.1336	.3559	−.1441
50	.044	0.000	−.1040	−.0818	−.0988	−.0926	−.0731	−.1019	−.0718	−.1246	−.0577	−.1330	−.0118	−.1387	.0509	−.1429
51	.044	.236	−.1098	−.0845	−.0988	−.0940	−.0808	−.1049	−.0716	−.1250	−.0589	−.1287	−.0067	−.1337	.0525	−.1414
52	.044	.412	−.1191	−.0861	−.0988	−.0949	−.0776	−.1120	−.0787	−.1143	−.0574	−.1210	−.0034	−.1292	.0543	−.1387
53	.044	.837	−.0617	.0404	.0128	.0083	.0550	−.0579	.1044	−.0958	.1459	−.1174	.2125	−.1297	.3189	−.1385
54	.029	0.000	−.1128	−.0900	−.1026	−.0982	−.0883	−.1069	−.0901	−.1158	−.0710	−.1211	−.0175	−.1271	.0451	−.1319
55	.029	.236	−.1173	−.0960	−.1066	−.1031	−.0967	−.1144	−.0929	−.1174	−.0706	−.1248	−.0190	−.1322	.0422	−.1418
56	.029	.412	−.1182	−.0940	−.1066	−.1020	−.0942	−.1194	−.0731	−.1142	−.0629	−.1221	−.0112	−.1302	.0541	−.1404
57	.029	.599	−.1145	−.1034	−.1117	−.1140	−.0961	−.1155	−.0889	−.1163	−.0776	−.1224	−.0209	−.1307	.0491	−.1417
58	.015	0.000	−.1142	−.0997	−.1146	−.1056	−.1017	−.1130	−.0799	−.1150	−.0749	−.1232	−.0213	−.1314	.0429	−.1378
59	.015	.236	−.1133	−.1023	−.1163	−.1086	−.0934	−.1144	−.0765	−.1169	−.0764	−.1248	−.0233	−.1328	.0437	−.1431
60	.015	.412	−.1093	−.0992	−.1059	−.1061	−.0936	−.1093	−.0696	−.1153	−.0660	−.1243	−.0127	−.1324	.0581	−.1433
61	.015	.733	−.1098	−.1092	−.1077	−.1103	−.1026	−.1087	−.0871	−.1152	−.0879	−.1217	−.0434	−.1299	.0188	−.1409
62	.329	−.552	−.0516	.0421	.0116	.0092	.0406	−.0545	.0787	−.0955	.1437	−.1159	.2267	−.1288	.3282	−.1315
63	.044	−.837	−.0531	.0423	.0111	.0086	.0476	−.0571	.0900	−.0939	.1369	−.1135	.2006	−.1260	.3001	−.1294

TABLE I.—Continued
(c) Concluded

			α =											
			30.0		35.0		40.0		45.0		50.0		55.0		59.9	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	.5576	−.1228	.7122		.8728	−.1265	1.0382		1.1961	−.1292	1.3297		1.3934	−.1318
2	.822	0.000	.5566	−.1338	.7112		.8763	−.1403	1.0381		1.1967	−.1399	1.3445		1.4450	−.1388
3	.762	0.000	.5537	−.1336	.7053		.8731	−.1404	1.0385		1.1935	−.1446	1.3444		1.4683	−.1393
4	.764	.117	.5282	−.1425	.6727		.8316	−.1464	.9872		1.1330	−.1485	1.2736		1.3940	−.1404
5	.703	0.000	.5521	−.1350	.7027		.8687	−.1420	1.0346		1.1943	−.1460	1.3430		1.4775	−.1386
6	.644	0.000	.5545	−.1367	.7038		.8675	−.1427	1.0315		1.1915	−.1450	1.3403		1.4770	−.1377
7	.646	.117	.5421	−.1373	.6867		.8469	−.1444	1.0054		1.1622	−.1465	1.3062		1.4390	−.1375
8	.647	.234	.5084	−.1395	.6426		.7916	−.1457	.9393		1.0853	−.1474	1.2183		1.3425	−.1378
9	.600	0.000	.5503	−.1308	.7020		.8642	−.1379	1.0254		1.1856	−.1395	1.3342		1.4707	−.1343
10	.558	.086	.5448	−.1352	.6954		.8525	−.1432	1.0106		1.1672	−.1436	1.3117		1.4469	−.1359
11	.560	.203	.5295	−.1371	.6759		.8280	−.1462	.9813		1.1321	−.1456	1.2692		1.4000	−.1364
12	.562	.320	.4940	−.1387	.6282		.7697	−.1460	.9117		1.0529	−.1451	1.1800		1.3015	−.1359
13	.501	0.000	.5284	−.1431	.6773		.8411	−.1452	1.0033		1.1633	−.1426	1.3157		1.4509	−.1356
14	.502	.141	.5303	−.1323	.6767		.8370	−.1445	.9947		1.1499	−.1440	1.2964		1.4303	−.1358
15	.504	.258	.5174	−.1365	.6575		.8111	−.1458	.9627		1.1119	−.1435	1.2511		1.3796	−.1354
16	.506	.375	.4846	−.1384	.6135		.7552	−.1451	.8951		1.0324	−.1438	1.1615		1.2791	−.1357
17	.442	0.000	.5249	−.1410	.6735		.8354	−.1452	1.0011		1.1629	−.1414	1.3147		1.4478	−.1349
18	.443	.200	.5217	−.1331	.6673		.8245	−.1448	.9846		1.1402	−.1420	1.2844		1.4134	−.1348
19	.445	.317	.5073	−.1382	.6462		.7970	−.1457	.9501		1.0996	−.1422	1.2366		1.3611	−.1345
20	.447	.434	.4725	−.1376	.6010		.7417	−.1453	.8829		1.0198	−.1415	1.1453		1.2620	−.1339
21	.383	0.000	.5223	−.1409	.6692		.8318	−.1457	.9951		1.1567	−.1404	1.3100		1.4417	−.1346
22	.383	.082	.5212	−.1390	.6688		.8315	−.1461	.9946		1.1550	−.1415	1.3069		1.4397	−.1348
23	.384	.259	.5141	−.1362	.6557		.8130	−.1451	.9706		1.1234	−.1398	1.2676		1.3949	−.1333
24	.386	.376	.5001	−.1388	.6359		.7874	−.1454	.9380		1.0838	−.1401	1.2217		1.3428	−.1333
25	.388	.493	.4645	−.1393	.5887		.7297	−.1462	.8691		1.0035	−.1396	1.1310		1.2436	−.1329
26	.324	0.000	.5189	−.1360	.6671		.8275	−.1418	.9885		1.1490	−.1366	1.2996		1.4338	−.1322
27	.324	.109	.5184	−.1368	.6663		.8272	−.1446	.9873		1.1468	−.1390	1.2969		1.4298	−.1344
28	.325	.318	.5090	−.1402	.6496		.8045	−.1458	.9574		1.1079	−.1408	1.2503		1.3776	−.1346
29	.327	.435	.4914	−.1427	.6267		.7749	−.1474	.9216		1.0654	−.1412	1.2003		1.3228	−.1349
30	.329	.552	.4558	−.1421	.5808		.7183	−.1467	.8528		.9857	−.1405	1.1109		1.2242	−.1346
31	.236	0.000	.5144	−.1379	.6602		.8189	−.1449	.9795		1.1426	−.1367	1.2896		1.4239	−.1337
32	.236	.151	.5030	−.1350	.6588		.8101	−.1420	.9731		1.1330	−.1360	1.2823		1.4212	−.1327
33	.236	.264	.5000	−.1338	.6549		.8019	−.1406	.9632		1.1212	−.1331	1.2679		1.4061	−.1305
34	.237	.407	.5023	−.1426	.6413		.7892	−.1471	.9388		1.0871	−.1385	1.2249		1.3494	−.1341
35	.239	.524	.4845	−.1437	.6171		.7591	−.1476	.9029		1.0447	−.1385	1.1750		1.2942	−.1342
36	.241	.640	.4485	−.1427	.5691		.7012	−.1468	.8332		.9654	−.1374	1.0856		1.1962	−.1335
37	.147	0.000	.4978	−.1296	.6522		.7997	−.1340	.9645		1.1261	−.1301	1.2844		1.4071	−.1291
38	.147	.192														
39	.147	.336	.4968	−.1382	.6483		.7914	−.1412	.9496		1.1085	−.1336	1.2597		1.3789	−.1325
40	.149	.495														
41	.150	.612														
42	.152	.729	.4429	−.1341	.5604		.6886	−.1352	.8186		.9503	−.1299	1.0718		1.1675	−.1280
43	.088	0.000	.5035	−.1351	.6534		.8022	−.1325	.9658		1.1295	−.1311	1.2712		1.3399	−.1326
44	.088	.220	.4984	−.1348	.6540		.8014	−.1304	.9630		1.1258	−.1300	1.2659		1.3342	−.1317
45	.088	.385	.4942	−.1323	.6476		.7911	−.1288	.9500		1.1094	−.1263	1.2462		1.3121	−.1266
46	.090	.554	.4953	−.1450	.6304		.7758	−.1403	.9239		1.0742	−.1335	1.1970		1.2580	−.1336
47	.092	.671	.4777	−.1416	.6063		.7454	−.1383	.8858		1.0322	−.1324	1.1520		1.2095	−.1317
48	.093	.787	.4421	−.1442	.5612		.6889	−.1394	.8190		.9549	−.1337	1.0648		1.1195	−.1331
49	.059	.703	.4750	−.1474	.6034		.7417	−.1393	.8812		1.0159	−.1334	1.0766		1.0841	−.1336
50	.044	0.000	.1163	−.1432	.2015		.2863	−.1327	.3786		.4565	−.1293	.4801		.4985	−.1306
51	.044	.236	.1148	−.1426	.1961		.2831	−.1308	.3687		.4420	−.1282	.4779		.4964	−.1292
52	.044	.412	.1200	−.1411	.2033		.2861	−.1319	.3799		.4488	−.1286	.4849		.5404	−.1293
53	.044	.837	.4212	−.1423	.5517		.6777	−.1348	.7983		.8833	−.1295	.9026		.9155	−.1296
54	.029	0.000	.1091	−.1338	.1902		.2764	−.1247	.3704		.4427	−.1232	.5009		.5770	−.1238
55	.029	.236	.1147	−.1428	.1884		.2701	−.1308	.3712		.4448	−.1299	.4973		.6045	−.1303
56	.029	.412	.1296	−.1414	.2088		.2972	−.1293	.4029		.4906	−.1285	.5641		.6420	−.1289
57	.029	.599	.1160	−.1432	.1972		.2890	−.1309	.4195		.5262	−.1294	.5895		.7069	−.1300
58	.015	0.000	.1103	−.1403	.1892		.2704	−.1272	.3644		.4408	−.1268	.5071		.6402	−.1275
59	.015	.236	.1116	−.1440	.1916		.2712	−.1283	.3688		.4527	−.1291	.5323		.6582	−.1300
60	.015	.412	.1298	−.1441	.2159		.3027	−.1283	.4099		.5026	−.1291	.5824		.7205	−.1303
61	.015	.733	.0730	−.1423	.1497		.2170	−.1274	.2918		.4660	−.1273	.4091		.6568	−.1284
62	.329	−.552	.4420	−.1376	.5640		.6973	−.1408	.8324		.9652	−.1353	1.0926		1.2018	−.1304
63	.044	−.837	.4026	−.1324	.5325		.6608	−.1310	.7763		.8671	−.1258	.8846		.8945	−.1240

TABLE I.–Continued
(d) M = 3.50

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	−.0015	.0380	.0099	.0089	.0392	−.0060	.0916	−.0231	.1791	−.0414	.2898	−.0561	.4216	−.0712
2	.822	0.000	−.0085	.0366	.0059	.0063	.0370	−.0102	.0928	−.0283	.1777	−.0491	.2891	−.0647	.4215	−.0840
3	.762	0.000	−.0095	.0362	.0060	.0053	.0364	−.0108	.0934	−.0287	.1764	−.0500	.2861	−.0660	.4183	−.0852
4	.764	.117	−.0367	.0353	.0048	.0057	.0390	−.0347	.0935	−.0584	.1726	−.0715	.2771	−.0793	.4031	−.0840
5	.703	0.000	−.0112	.0360	.0063	.0047	.0365	−.0117	.0947	−.0297	.1751	−.0520	.2832	−.0666	.4161	−.0848
6	.644	0.000	−.0094	.0359	.0056	.0043	.0375	−.0112	.0943	−.0285	.1748	−.0500	.2824	−.0671	.4159	−.0832
7	.646	.117	−.0136	.0351	.0071	.0046	.0384	−.0118	.0954	−.0527	.1735	−.0692	.2784	−.0791	.4075	−.0848
8	.647	.234	−.0382	.0350	.0057	.0057	.0401	−.0348	.0930	−.0590	.1659	−.0720	.2645	−.0806	.3855	−.0874
9	.600	0.000	−.0026	.0364	.0057	.0106	.0335	−.0067	.0830	−.0237	.1697	−.0439	.2685	−.0614	.4072	−.0779
10	.558	.086	−.0090	.0342	.0060	.0049	.0377	−.0117	.0938	−.0381	.1736	−.0594	.2777	−.0724	.4070	−.0853
11	.560	.203	−.0387	.0343	.0067	.0057	.0403	−.0255	.0942	−.0613	.1721	−.0745	.2734	−.0824	.3979	−.0886
12	.562	.320	−.0400	.0346	.0075	.0054	.0416	−.0378	.0922	−.0621	.1636	−.0750	.2577	−.0821	.3737	−.0889
13	.501	0.000	−.0166	.0272	.0006	−.0001	.0300	−.0175	.0829	−.0371	.1606	−.0580	.2607	−.0741	.3861	−.0860
14	.502	.141	−.0125	.0310	.0049	.0039	.0358	−.0137	.0901	−.0518	.1693	−.0694	.2690	−.0787	.3933	−.0888
15	.504	.258	−.0413	.0328	.0059	.0055	.0394	−.0367	.0929	−.0625	.1698	−.0752	.2668	−.0827	.3868	−.0894
16	.506	.375	−.0410	.0335	.0078	.0060	.0417	−.0389	.0908	−.0626	.1620	−.0749	.2531	−.0816	.3655	−.0886
17	.442	0.000	−.0174	.0243	.0014	0.0000	.0279	−.0193	.0806	−.0374	.1597	−.0579	.2584	−.0733	.3817	−.0865
18	.443	.200	−.0194	.0294	.0036	.0030	.0352	−.0150	.0879	−.0593	.1662	−.0741	.2631	−.0814	.3842	−.0894
19	.445	.317	−.0416	.0318	.0056	.0051	.0382	−.0405	.0905	−.0634	.1657	−.0759	.2598	−.0825	.3774	−.0898
20	.447	.434	−.0415	.0328	.0086	.0068	.0418	−.0399	.0892	−.0630	.1599	−.0746	.2476	−.0818	.3557	−.0886
21	.383	0.000	−.0185	.0238	.0012	−.0005	.0283	−.0196	.0785	−.0380	.1576	−.0593	.2578	−.0737	.3799	−.0872
22	.383	.082	−.0198	.0238	0.0000	−.0007	.0280	−.0197	.0792	−.0405	.1578	−.0611	.2579	−.0744	.3790	−.0888
23	.384	.259	−.0324	.0287	.0025	.0015	.0335	−.0211	.0857	−.0639	.1620	−.0764	.2593	−.0832	.3787	−.0898
24	.386	.376	−.0435	.0312	.0061	.0052	.0380	−.0417	.0879	−.0640	.1629	−.0757	.2571	−.0825	.3716	−.0891
25	.388	.493	−.0413	.0326	.0080	.0063	.0404	−.0406	.0870	−.0637	.1555	−.0757	.2423	−.0833	.3488	−.0902
26	.324	0.000	−.0169	.0273	.0011	.0017	.0297	−.0154	.0799	−.0342	.1563	−.0527	.2578	−.0653	.3767	−.0777
27	.324	.109	−.0181	.0244	.0007	−.0006	.0297	−.0187	.0796	−.0412	.1569	−.0608	.2583	−.0741	.3765	−.0880
28	.325	.318	−.0424	.0286	.0012	.0017	.0332	−.0289	.0843	−.0636	.1606	−.0770	.2586	−.0843	.3738	−.0914
29	.327	.435	−.0453	.0308	.0041	.0042	.0371	−.0423	.0864	−.0655	.1599	−.0777	.2543	−.0850	.3648	−.0918
30	.329	.552	−.0422	.0323	.0058	.0065	.0392	−.0393	.0846	−.0630	.1530	−.0761	.2399	−.0838	.3418	−.0909
31	.236	0.000	−.0146	.0270	.0015	−.0002	.0307	−.0166	.0822	−.0385	.1557	−.0586	.2565	−.0744	.3755	−.0858
32	.236	.151	−.0171	.0273	.0020	.0011	.0364	−.0171	.0829	−.0408	.1587	−.0602	.2602	−.0728	.3770	−.0875
33	.236	.264	−.0210	.0264	−.0042	.0009	.0390	−.0169	.0801	−.0516	.1598	−.0673	.2581	−.0763	.3692	−.0857
34	.237	.407	−.0481	.0291	.0012	.0010	.0336	−.0410	.0849	−.0662	.1589	−.0785	.2567	−.0851	.3698	−.0920
35	.239	.524	−.0460	.0309	.0042	.0039	.0382	−.0436	.0862	−.0666	.1575	−.0781	.2517	−.0849	.3595	−.0916
36	.241	.640	−.0441	.0320	.0071	.0059	.0396	−.0409	.0844	−.0639	.1497	−.0767	.2363	−.0839	.3352	−.0909
37	.147	0.000	−.0205	.0283	.0017	.0024	.0365	−.0145	.0779	−.0342	.1576	−.0525	.2532	−.0656	.3748	−.0762
38	.147	.192														
39	.147	.336	−.0237	.0272	−.0012	−.0003	.0372	−.0193	.0804	−.0581	.1571	−.0735	.2567	−.0804	.3629	−.0888
40	.149	.495														
41	.150	.612														
42	.152	.729	−.0355	.0331	.0040	.0077	.0396	−.0333	.0817	−.0548	.1460	−.0655	.2307	−.0711	.3324	−.0768
43	.088	0.000	−.0099	.0288	.0014	.0009	.0358	−.0165	.0813	−.0382	.1590	−.0587	.2562	−.0731	.3671	−.0840
44	.088	.220	−.0169	.0292	.0002	.0012	.0351	−.0161	.0793	−.0439	.1601	−.0629	.2603	−.0736	.3623	−.0865
45	.088	.385	−.0242	.0312	−.0076	.0047	.0301	−.0146	.0742	−.0506	.1581	−.0653	.2553	−.0721	.3575	−.0811
46	.090	.554	−.0488	.0308	.0004	.0008	.0344	−.0462	.0828	−.0676	.1564	−.0785	.2506	−.0844	.3652	−.0901
47	.092	.671	−.0371	.0335	−.0019	.0063	.0341	−.0358	.0793	−.0605	.1531	−.0728	.2415	−.0797	.3542	−.0871
48	.093	.787	−.0447	.0329	.0050	.0060	.0399	−.0407	.0810	−.0638	.1460	−.0763	.2295	−.0831	.3314	−.0897
49	.059	.703	−.0490	.0323	.0030	.0025	.0373	−.0459	.0835	−.0702	.1530	−.0807	.2421	−.0867	.3514	−.0933
50	.044	0.000	−.0692	−.0488	−.0647	−.0556	−.0509	−.0657	−.0433	−.0777	−.0112	−.0835	.0234	−.0865	.0563	−.0884
51	.044	.236	−.0693	−.0501	−.0678	−.0564	−.0501	−.0667	−.0487	−.0764	−.0181	−.0808	.0248	−.0840	.0602	−.0868
52	.044	.412	−.0761	−.0515	−.0683	−.0574	−.0546	−.0722	−.0542	−.0722	−.0231	−.0771	.0193	−.0820	.0635	−.0871
53	.044	.837	−.0481	.0337	.0029	.0061	.0442	−.0406	.0808	−.0628	.1478	−.0753	.2283	−.0815	.3231	−.0875
54	.029	0.000	−.0744	−.0509	−.0692	−.0565	−.0612	−.0646	−.0562	−.0680	−.0285	−.0724	.0034	−.0755	.0483	−.0779
55	.029	.236	−.0749	−.0588	−.0715	−.0645	−.0616	−.0750	−.0614	−.0757	−.0307	−.0812	.0044	−.0853	.0473	−.0899
56	.029	.412	−.0698	−.0579	−.0714	−.0641	−.0592	−.0721	−.0593	−.0727	−.0277	−.0784	.0091	−.0833	.0554	−.0883
57	.029	.599	−.0730	−.0642	−.0716	−.0713	−.0647	−.0729	−.0616	−.0743	−.0401	−.0804	.0019	−.0848	.0609	−.0907
58	.015	0.000	−.0725	−.0610	−.0719	−.0658	−.0643	−.0723	−.0610	−.0740	−.0376	−.0794	.0076	−.0838	.0555	−.0866
59	.015	.236	−.0682	−.0640	−.0728	−.0694	−.0670	−.0731	−.0662	−.0761	−.0467	−.0825	.0006	−.0865	.0559	−.0918
60	.015	.412	−.0670	−.0637	−.0683	−.0677	−.0621	−.0710	−.0638	−.0753	−.0437	−.0820	.0135	−.0865	.0664	−.0918
61	.015	.733	−.0655	−.0665	−.0713	−.0684	−.0691	−.0694	−.0719	−.0732	−.0587	−.0787	−.0120	−.0840	.0366	−.0897
62	.329	−.552	−.0337	.0354	.0054	.0088	.0357	−.0346	.0775	−.0578	.1446	−.0694	.2293	−.0760	.3309	−.0798
63	.044	−.837	−.0434	.0373	.0007	.0087	.0424	−.0353	.0724	−.0572	.1357	−.0666	.2171	−.0724	.3083	−.0746

TABLE I.–Continued
(d) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		59.9	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	.5662	−.0704	.7302		.9094	−.0697	1.0825		1.2517	−.0707	1.3748		1.3610	−.0720
2	.822	0.000	.5643	−.0846	.7258		.9045	−.0827	1.0769		1.2480	−.0833	1.4013		1.4539	−.0834
3	.762	0.000	.5616	−.0858	.7212		.8996	−.0846	1.0728		1.2419	−.0856	1.4045		1.5149	−.0847
4	.764	.117	.5394	−.0876	.6896		.8576	−.0895	1.0208		1.1796	−.0899	1.3344		1.4393	−.0865
5	.703	0.000	.5614	−.0862	.7184		.8939	−.0865	1.0663		1.2341	−.0869	1.3974		1.5322	−.0851
6	.644	0.000	.5627	−.0871	.7195		.8903	−.0886	1.0627		1.2307	−.0876	1.3936		1.5335	−.0848
7	.646	.117	.5505	−.0862	.7025		.8707	−.0892	1.0382		1.1998	−.0881	1.3593		1.4944	−.0846
8	.647	.234	.5189	−.0885	.6608		.8163	−.0906	.9716		1.1228	−.0886	1.2715		1.3974	−.0851
9	.600	0.000	.5535	−.0827	.7127		.8838	−.0846	1.0552		1.2232	−.0834	1.3863		1.5254	−.0804
10	.558	.086	.5525	−.0870	.7085		.8710	−.0899	1.0422		1.2032	−.0880	1.3614		1.5002	−.0842
11	.560	.203	.5384	−.0894	.6888		.8458	−.0916	1.0116		1.1680	−.0888	1.3206		1.4538	−.0844
12	.562	.320	.5047	−.0889	.6447		.7901	−.0912	.9428		1.0885	−.0890	1.2298		1.3537	−.0847
13	.501	0.000	.5314	−.0902	.6888		.8535	−.0908	1.0262		1.1919	−.0876	1.3555		1.5001	−.0834
14	.502	.141	.5363	−.0889	.6897		.8507	−.0916	1.0194		1.1803	−.0883	1.3411		1.4801	−.0839
15	.504	.258	.5251	−.0892	.6729		.8281	−.0914	.9887		1.1426	−.0886	1.2962		1.4288	−.0841
16	.506	.375	.4943	−.0890	.6310		.7740	−.0912	.9228		1.0646	−.0882	1.2068		1.3302	−.0842
17	.442	0.000	.5263	−.0896	.6840		.8494	−.0899	1.0246		1.1903	−.0870	1.3508		1.4967	−.0829
18	.443	.200	.5257	−.0890	.6784		.8390	−.0910	1.0093		1.1693	−.0875	1.3247		1.4632	−.0832
19	.445	.317	.5135	−.0896	.6592		.8124	−.0920	.9758		1.1290	−.0878	1.2789		1.4110	−.0832
20	.447	.434	.4812	−.0892	.6162		.7592	−.0906	.9097		1.0506	−.0865	1.1886		1.3112	−.0819
21	.383	0.000	.5210	−.0893	.6784		.8439	−.0907	1.0195		1.1897	−.0870	1.3475		1.4928	−.0829
22	.383	.082	.5200	−.0901	.6771		.8433	−.0916	1.0188		1.1882	−.0876	1.3450		1.4906	−.0830
23	.384	.259	.5158	−.0894	.6672		.8252	−.0916	.9950		1.1575	−.0866	1.3091		1.4451	−.0823
24	.386	.376	.5035	−.0898	.6484		.8013	−.0914	.9642		1.1201	−.0859	1.2654		1.3944	−.0813
25	.388	.493	.4712	−.0906	.6052		.7457	−.0920	.8965		1.0398	−.0868	1.1746		1.2925	−.0821
26	.324	0.000	.5170	−.0792	.6718		.8375	−.0807	1.0115		1.1835	−.0781	1.3374		1.4837	−.0750
27	.324	.109	.5166	−.0893	.6708		.8369	−.0903	1.0107		1.1825	−.0860	1.3357		1.4803	−.0823
28	.325	.318	.5092	−.0921	.6571		.8166	−.0932	.9840		1.1463	−.0885	1.2930		1.4276	−.0841
29	.327	.435	.4946	−.0930	.6359		.7880	−.0939	.9481		1.1033	−.0889	1.2443		1.3724	−.0842
30	.329	.552	.4620	−.0921	.5919		.7335	−.0928	.8812		1.0254	−.0881	1.1549		1.2726	−.0837
31	.236	0.000	.5127	−.0884	.6628		.8239	−.0898	.9934		1.1684	−.0857	1.3252		1.4678	−.0822
32	.236	.151	.5047	−.0887	.6504		.8227	−.0902	.9945		1.1619	−.0852	1.3134		1.4589	−.0812
33	.236	.264	.5017	−.0864	.6401		.8133	−.0874	.9846		1.1486	−.0811	1.2990		1.4427	−.0768
34	.237	.407	.5016	−.0931	.6441		.7997	−.0933	.9600		1.1210	−.0879	1.2650		1.3960	−.0837
35	.239	.524	.4862	−.0932	.6223		.7708	−.0934	.9249		1.0794	−.0876	1.2166		1.3416	−.0835
36	.241	.640	.4524	−.0921	.5777		.7162	−.0924	.8584		1.0010	−.0868	1.1275		1.2421	−.0828
37	.147	0.000	.4948	−.0779	.6297		.8072	−.0758	.9767		1.1397	−.0747	1.3004		1.4454	−.0727
38	.147	.192														
39	.147	.336	.4952	−.0900	.6244		.8030	−.0882	.9665		1.1235	−.0833	1.2774		1.4165	−.0795
40	.149	.495														
41	.150	.612														
42	.152	.729	.4444	−.0779	.5675		.6988	−.0774	.8340		.9742	−.0740	1.1030		1.2153	−.0718
43	.088	0.000	.4993	−.0872	.6293		.8004	−.0844	.9748		1.1338	−.0819	1.2985		1.4010	−.0790
44	.088	.220	.4975	−.0884	.6268		.8029	−.0847	.9731		1.1311	−.0809	1.2925		1.3968	−.0777
45	.088	.385	.4936	−.0821	.6239		.7939	−.0798	.9629		1.1161	−.0750	1.2719		1.3789	−.0713
46	.090	.554	.4938	−.0919	.6302		.7755	−.0893	.9285		1.0827	−.0844	1.2345		1.3290	−.0813
47	.092	.671	.4778	−.0883	.6086		.7479	−.0863	.8936		1.0421	−.0822	1.1872		1.2784	−.0795
48	.093	.787	.4458	−.0914	.5657		.6945	−.0886	.8296		.9660	−.0841	1.1007		1.1860	−.0812
49	.059	.703	.4766	−.0946	.6064		.7433	−.0899	.8852		1.0295	−.0864	1.1555		1.1717	−.0834
50	.044	0.000	.1286	−.0890	.1946		.2909	−.0834	.3974		.4834	−.0799	.5461		.5654	−.0764
51	.044	.236	.1342	−.0868	.1941		.2885	−.0818	.3883		.4785	−.0784	.5408		.5609	−.0751
52	.044	.412	.1346	−.0880	.1975		.2928	−.0834	.3916		.4902	−.0793	.5527		.5801	−.0758
53	.044	.837	.4346	−.0889	.5533		.6690	−.0851	.8119		.9364	−.0812	1.0024		1.0122	−.0781
54	.029	0.000	.1231	−.0779	.1860		.2806	−.0729	.3806		.4752	−.0710	.5449		.5971	−.0670
55	.029	.236	.1276	−.0905	.1889		.2827	−.0861	.3842		.4734	−.0825	.5507		.6031	−.0784
56	.029	.412	.1335	−.0887	.2043		.3111	−.0837	.4151		.5077	−.0808	.5980		.6712	−.0763
57	.029	.599	.1274	−.0912	.1928		.2837	−.0864	.4079		.5234	−.0831	.6393		.7208	−.0792
58	.015	0.000	.1211	−.0877	.1992		.2844	−.0815	.3821		.4696	−.0795	.5516		.6307	−.0746
59	.015	.236	.1241	−.0920	.1919		.2825	−.0877	.3850		.4854	−.0843	.5667		.6630	−.0795
60	.015	.412	.1361	−.0926	.2044		.3108	−.0877	.4163		.5209	−.0842	.6159		.7289	−.0798
61	.015	.733	.0911	−.0901	.1436		.2436	−.0850	.3324		.3953	−.0821	.4923		.6332	−.0783
62	.329	−.552	.4480	−.0816	.5759		.7170	−.0824	.8605		1.0029	−.0792	1.1289		1.2474	−.0758
63	.044	−.837	.4188	−.0760	.5342		.6493	−.0735	.7875		.9140	−.0713	.9787		.9887	−.0685

TABLE I.–Continued
(e) M = 4.60

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	.0210	.0445	.0264	.0318	.0442	.0169	.0916	.0067	.1770	−.0001	.2848	−.0065	.4148	
2	.822	0.000	.0070	.0397	.0126	.0222	.0346	.0069	.0870	−.0050	.1756	−.0155	.2828	−.0225	.4114	
3	.762	0.000	.0058	.0401	.0122	.0210	.0341	.0053	.0878	−.0074	.1756	−.0179	.2835	−.0267	.4135	
4	.764	.117	−.0017	.0395	.0110	.0202	.0363	−.0033	.0892	−.0185	.1732	−.0259	.2760	−.0295	.3984	
5	.703	0.000	.0037	.0401	.0115	.0183	.0347	.0037	.0898	−.0092	.1755	−.0201	.2834	−.0282	.4131	
6	.644	0.000	.0040	.0403	.0102	.0188	.0338	.0040	.0881	−.0084	.1756	−.0201	.2849	−.0277	.4112	
7	.646	.117	−.0043	.0393	.0112	.0181	.0358	.0003	.0907	−.0180	.1740	−.0263	.2802	−.0308	.4051	
8	.647	.234	−.0037	.0406	.0114	.0206	.0368	−.0045	.0882	−.0202	.1698	−.0270	.2691	−.0312	.3847	
9	.600	0.000	.0129	.0397	.0158	.0248	.0332	.0109	.0784	−.0005	.1572	−.0125	.2672	−.0207	.4044	
10	.558	.086	.0036	.0394	.0107	.0181	.0345	.0034	.0893	−.0138	.1735	−.0235	.2813	−.0307	.4077	
11	.560	.203	−.0070	.0402	.0111	.0181	.0371	−.0081	.0917	−.0229	.1718	−.0298	.2768	−.0328	.3993	
12	.562	.320	−.0063	.0405	.0115	.0181	.0394	−.0079	.0911	−.0224	.1668	−.0286	.2643	−.0327	.3778	
13	.501	0.000	−.0020	.0353	.0070	.0131	.0305	−.0019	.0819	−.0157	.1576	−.0254	.2617	−.0315	.3861	
14	.502	.141	−.0047	.0380	.0094	.0156	.0351	−.0001	.0892	−.0214	.1674	−.0290	.2731	−.0332	.3970	
15	.504	.258	−.0078	.0390	.0103	.0172	.0365	−.0086	.0910	−.0227	.1691	−.0295	.2722	−.0329	.3939	
16	.506	.375	−.0065	.0406	.0115	.0185	.0409	−.0085	.0914	−.0225	.1636	−.0281	.2606	−.0320	.3726	
17	.442	0.000	−.0019	.0326	.0064	.0122	.0269	−.0022	.0783	−.0155	.1546	−.0254	.2581	−.0311	.3846	
18	.443	.200	−.0090	.0368	.0086	.0152	.0341	−.0024	.0871	−.0223	.1640	−.0295	.2671	−.0326	.3912	
19	.445	.317	−.0090	.0388	.0104	.0169	.0387	−.0097	.0898	−.0236	.1658	−.0292	.2674	−.0334	.3853	
20	.447	.434	−.0067	.0413	.0137	.0186	.0416	−.0089	.0911	−.0228	.1609	−.0287	.2558	−.0315	.3672	
21	.383	0.000	−.0039	.0307	.0054	.0110	.0274	−.0041	.0761	−.0174	.1523	−.0265	.2560	−.0326	.3811	
22	.383	.082	−.0047	.0317	.0043	.0093	.0266	−.0054	.0781	−.0192	.1533	−.0279	.2555	−.0329	.3812	
23	.384	.259	−.0104	.0362	.0088	.0144	.0363	−.0090	.0852	−.0239	.1616	−.0297	.2627	−.0333	.3845	
24	.386	.376	−.0082	.0399	.0122	.0169	.0387	−.0105	.0897	−.0238	.1627	−.0291	.2616	−.0322	.3800	
25	.388	.493	−.0091	.0411	.0129	.0179	.0430	−.0101	.0888	−.0238	.1590	−.0302	.2507	−.0334	.3603	
26	.324	0.000	−.0038	.0361	.0052	.0230	.0281	.0105	.0762	.0006	.1535	−.0072	.2537	−.0128	.3798	
27	.324	.109	−.0038	.0319	.0049	.0109	.0278	−.0042	.0781	−.0184	.1536	−.0267	.2537	−.0319	.3802	
28	.325	.318	−.0094	.0351	.0057	.0155	.0309	−.0109	.0824	−.0252	.1597	−.0312	.2584	−.0350	.3819	
29	.327	.435	−.0101	.0375	.0067	.0162	.0349	−.0118	.0864	−.0261	.1608	−.0324	.2562	−.0355	.3741	
30	.329	.552	−.0080	.0385	.0081	.0188	.0372	−.0091	.0857	−.0240	.1551	−.0308	.2442	−.0343	.3543	
31	.236	0.000	−.0039	.0333	.0052	.0109	.0301	−.0041	.0793	−.0168	.1573	−.0266	.2531	−.0324	.3776	
32	.236	.151	−.0091	.0330	−.0020	.0148	.0243	−.0010	.0751	−.0167	.1557	−.0289	.2530	−.0337	.3955	
33	.236	.264	−.0089	.0359	−.0006	.0157	.0279	.0012	.0691	−.0175	.1606	−.0281	.2472	−.0299	.3918	
34	.237	.407	−.0106	.0353	.0054	.0139	.0318	−.0126	.0832	−.0262	.1591	−.0318	.2540	−.0356	.3772	
35	.239	.524	−.0101	.0378	.0070	.0160	.0354	−.0126	.0861	−.0263	.1595	−.0322	.2513	−.0354	.3684	
36	.241	.640	−.0083	.0389	.0105	.0179	.0384	−.0108	.0856	−.0247	.1528	−.0308	.2381	−.0344	.3480	
37	.147	0.000	.0011	.0367	.0029	.0206	.0267	.0062	.0714	−.0048	.1565	−.0157	.2394	−.0203	.3832	
38	.147	.192														
39	.147	.336	−.0151	.0344	−.0007	.0135	.0286	−.0049	.0698	−.0223	.1546	−.0320	.2400	−.0337	.3843	
40	.149	.495														
41	.150	.612														
42	.152	.729	.0085	.0425	.0175	.0272	.0389	.0048	.0806	−.0065	.1488	−.0112	.2341	−.0141	.3394	
43	.088	0.000	−.0011	.0364	−.0009	.0141	.0313	−.0016	.0686	−.0157	.1526	−.0283	.2462	−.0331	.3867	
44	.088	.220	−.0049	.0372	.0067	.0147	.0318	−.0006	.0675	−.0169	.1534	−.0282	.2403	−.0314	.3847	
45	.088	.385	−.0046	.0424	.0011	.0245	.0263	.0048	.0581	−.0115	.1491	−.0208	.2379	−.0235	.3830	
46	.090	.554	−.0110	.0359	.0055	.0135	.0320	−.0125	.0811	−.0254	.1544	−.0308	.2502	−.0335	.3656	
47	.092	.671	−.0021	.0376	.0097	.0212	.0313	−.0045	.0744	−.0191	.1468	−.0253	.2411	−.0299	.3565	
48	.093	.787	−.0082	.0390	.0095	.0187	.0371	−.0107	.0816	−.0238	.1476	−.0295	.2335	−.0329	.3365	
49	.059	.703	−.0153	.0370	.0048	.0131	.0337	−.0163	.0830	−.0292	.1537	−.0348	.2453	−.0381	.3550	
50	.044	0.000	−.0245	−.0087	−.0281	−.0165	−.0180	−.0228	−.0151	−.0292	.0163	−.0349	.0661	−.0342	.0985	
51	.044	.236	−.0328	−.0080	−.0287	−.0153	−.0216	−.0223	−.0197	−.0273	.0080	−.0320	.0439	−.0321	.1049	
52	.044	.412	−.0290	−.0097	−.0206	−.0170	−.0203	−.0256	−.0199	−.0280	.0028	−.0334	.0389	−.0335	.0922	
53	.044	.837	−.0113	.0393	.0005	.0206	.0331	−.0081	.0763	−.0227	.1478	−.0315	.2326	−.0332	.3247	
54	.029	0.000	−.0327	−.0023	−.0351	−.0085	−.0220	−.0132	−.0256	−.0163	.0072	−.0211	.0343	−.0202	.0762	
55	.029	.236	−.0291	−.0174	−.0320	−.0243	−.0243	−.0289	−.0254	−.0322	−.0028	−.0372	.0266	−.0374	.0780	
56	.029	.412	−.0306	−.0150	−.0292	−.0224	−.0244	−.0255	−.0279	−.0286	.0008	−.0345	.0262	−.0342	.0882	
57	.029	.599	−.0272	−.0205	−.0362	−.0277	−.0260	−.0304	−.0264	−.0326	−.0035	−.0380	.0172	−.0385	.0734	
58	.015	0.000	−.0320	−.0159	−.0313	−.0223	−.0294	−.0260	−.0270	−.0292	−.0048	−.0346	.0218	−.0341	.0759	
59	.015	.236	−.0293	−.0214	−.0330	−.0272	−.0294	−.0302	−.0284	−.0341	0.0000	−.0394	.0184	−.0400	.0727	
60	.015	.412	−.0305	−.0213	−.0286	−.0273	−.0187	−.0307	−.0275	−.0347	.0002	−.0401	.0244	−.0401	.0847	
61	.015	.733	−.0314	−.0201	−.0327	−.0272	−.0226	−.0283	−.0305	−.0317	−.0049	−.0373	.0158	−.0373	.0639	
62	.329	−.552	.0069	.0437	.0182	.0267	.0394	.0016	.0811	−.0122	.1483	−.0173	.2335	−.0206	.3403	
63	.044	−.837	.0023	.0461	.0085	.0300	.0345	.0046	.0713	−.0086	.1360	−.0161	.2240	−.0174	.3316	

TABLE I. Concluded
(e) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.881	0.000	.5634	−.0089	.7007		.8651	−.0105	1.0436		1.2034	−.0103	1.2210		1.1013	−.0114
2	.822	0.000	.5582	−.0260	.7263		.8601	−.0278	1.0368		1.2113	−.0279	1.3148		1.2593	−.0282
3	.762	0.000	.5577	−.0286	.7250		.8625	−.0307	1.0298		1.2042	−.0309	1.3573		1.3891	−.0309
4	.764	.117	.5360	−.0315	.6963		.8228	−.0329	.9832		1.1471	−.0331	1.2923		1.3230	−.0313
5	.703	0.000	.5564	−.0310	.7173		.8932	−.0327	1.0247		1.1935	−.0322	1.3649		1.4613	−.0317
6	.644	0.000	.5566	−.0308	.7170		.8933	−.0321	1.0492		1.1917	−.0322	1.3652		1.4962	−.0315
7	.646	.117	.5453	−.0332	.7007		.8736	−.0349	1.0241		1.1636	−.0337	1.3297		1.4556	−.0312
8	.647	.234	.5160	−.0327	.6616		.8241	−.0342	.9596		1.0914	−.0329	1.2450		1.3637	−.0315
9	.600	0.000	.5474	−.0246	.7085		.8800	−.0268	1.0678		1.1976	−.0265	1.3542		1.4974	−.0249
10	.558	.086	.5515	−.0327	.7032		.8694	−.0343	1.0510		1.2184	−.0331	1.3450		1.4807	−.0312
11	.560	.203	.5375	−.0348	.6849		.8448	−.0366	1.0247		1.1837	−.0344	1.3055		1.4399	−.0318
12	.562	.320	.5075	−.0343	.6430		.7930	−.0358	.9588		1.1053	−.0341	1.2161		1.3403	−.0319
13	.501	0.000	.5264	−.0335	.6809		.8461	−.0344	1.0225		1.2023	−.0333	1.3734		1.5147	−.0310
14	.502	.141	.5347	−.0351	.6846		.8460	−.0367	1.0190		1.1934	−.0342	1.3582		1.4954	−.0316
15	.504	.258	.5274	−.0349	.6691		.8265	−.0362	.9908		1.1613	−.0341	1.3160		1.4449	−.0316
16	.506	.375	.4976	−.0330	.6312		.7764	−.0347	.9296		1.0862	−.0328	1.2263		1.3452	−.0307
17	.442	0.000	.5253	−.0337	.6791		.8428	−.0330	1.0135		1.1894	−.0328	1.3601		1.5157	−.0305
18	.443	.200	.5272	−.0352	.6766		.8354	−.0361	1.0009		1.1703	−.0338	1.3337		1.4829	−.0310
19	.445	.317	.5160	−.0343	.6608		.8113	−.0352	.9707		1.1323	−.0329	1.2895		1.4323	−.0307
20	.447	.434	.4880	−.0336	.6208		.7609	−.0348	.9070		1.0576	−.0320	1.2012		1.3355	−.0292
21	.383	0.000	.5249	−.0345	.6766		.8427	−.0353	1.0080		1.1802	−.0337	1.3471		1.5022	−.0311
22	.383	.082	.5245	−.0354	.6755		.8424	−.0374	1.0065		1.1791	−.0348	1.3447		1.4995	−.0318
23	.384	.259	.5217	−.0345	.6685		.8285	−.0343	.9869		1.1505	−.0322	1.3084		1.4542	−.0297
24	.386	.376	.5113	−.0336	.6522		.8056	−.0341	.9576		1.1147	−.0311	1.2652		1.4070	−.0287
25	.388	.493	.4813	−.0351	.6113		.7528	−.0344	.8933		1.0386	−.0325	1.1793		1.3084	−.0297
26	.324	0.000	.5245	−.0145	.6765		.8394	−.0149	1.0048		1.1709	−.0140	1.3358		1.4845	−.0120
27	.324	.109	.5247	−.0345	.6760		.8392	−.0349	1.0042		1.1696	−.0329	1.3320		1.4800	−.0304
28	.325	.318	.5198	−.0367	.6646		.8230	−.0364	.9803		1.1370	−.0348	1.2920		1.4291	−.0321
29	.327	.435	.5060	−.0371	.6456		.7971	−.0371	.9460		1.0957	−.0354	1.2446		1.3764	−.0325
30	.329	.552	.4756	−.0363	.6043		.7450	−.0359	.8818		1.0199	−.0344	1.1585		1.2807	−.0315
31	.236	0.000	.5212	−.0347	.6761		.8347	−.0345	.9984		1.1624	−.0330	1.3253		1.4687	−.0303
32	.236	.151	.5148	−.0338	.6687		.8234	−.0338	.9697		1.1487	−.0322	1.3182		1.4607	−.0304
33	.236	.264	.5095	−.0293	.6656		.8196	−.0280	.9644		1.1444	−.0262	1.2953		1.4473	−.0236
34	.237	.407	.5152	−.0370	.6618		.8130	−.0367	.9693		1.1195	−.0350	1.2669		1.3990	−.0321
35	.239	.524	.5012	−.0367	.6421		.7858	−.0363	.9348		1.0797	−.0343	1.2216		1.3482	−.0319
36	.241	.640	.4705	−.0361	.5992		.7321	−.0356	.8709		1.0036	−.0338	1.1352		1.2513	−.0308
37	.147	0.000	.5040	−.0197	.6585		.8165	−.0191	.9696		1.1474	−.0188	1.2964		1.4572	−.0171
38	.147	.192														
39	.147	.336	.5081	−.0330	.6575		.8125	−.0317	.9568		1.1307	−.0304	1.2856		1.4336	−.0280
40	.149	.495														
41	.150	.612														
42	.152	.729	.4618	−.0143	.5883		.7214	−.0143	.8592		.9856	−.0135	1.1144		1.2315	−.0119
43	.088	0.000	.4997	−.0303	.6579		.8152	−.0305	.9606		1.1489	−.0294	1.3005		1.4427	−.0279
44	.088	.220	.5040	−.0298	.6590		.8128	−.0292	.9612		1.1479	−.0276	1.3038		1.4357	−.0257
45	.088	.385	.4985	−.0218	.6502		.8078	−.0199	.9499		1.1357	−.0183	1.2785		1.4156	−.0165
46	.090	.554	.5011	−.0343	.6469		.7961	−.0339	.9516		1.0993	−.0318	1.2420		1.3613	−.0292
47	.092	.671	.4872	−.0308	.6264		.7708	−.0300	.9179		1.0603	−.0282	1.1972		1.3125	−.0260
48	.093	.787	.4577	−.0337	.5858		.7183	−.0332	.8560		.9856	−.0313	1.1118		1.2194	−.0284
49	.059	.703	.4837	−.0387	.6216		.7647	−.0379	.9102		1.0518	−.0359	1.1765		1.2286	−.0334
50	.044	0.000	.1405	−.0302	.2240		.3173	−.0284	.4111		.5114	−.0267	.5911		.6091	−.0245
51	.044	.236	.1449	−.0276	.2245		.3151	−.0252	.4063		.5055	−.0241	.5870		.6046	−.0222
52	.044	.412	.1357	−.0301	.2276		.3209	−.0280	.4139		.5046	−.0262	.5971		.6209	−.0241
53	.044	.837	.4419	−.0313	.5725		.6977	−.0303	.8106		.9359	−.0294	1.0305		1.0400	−.0271
54	.029	0.000	.1173	−.0155	.2115		.3069	−.0137	.4002		.4953	−.0123	.5801		.6230	−.0108
55	.029	.236	.1228	−.0326	.2122		.3069	−.0316	.3984		.4958	−.0299	.5823		.6235	−.0284
56	.029	.412	.1350	−.0307	.2253		.3252	−.0290	.4216		.5238	−.0274	.6191		.6764	−.0257
57	.029	.599	.1234	−.0347	.2148		.3134	−.0328	.4158		.5228	−.0315	.6403		.7104	−.0298
58	.015	0.000	.1188	−.0300	.2109		.3002	−.0282	.3946		.4867	−.0270	.5801		.6376	−.0245
59	.015	.236	.1200	−.0353	.2117		.3011	−.0342	.3951		.4854	−.0328	.5917		.6603	−.0312
60	.015	.412	.1323	−.0362	.2270		.3211	−.0349	.4209		.5188	−.0333	.6331		.7118	−.0312
61	.015	.733	.1018	−.0338	.1742		.2532	−.0317	.3486		.4233	−.0311	.5263		.6339	−.0285
62	.329	−.552	.4609	−.0214	.5877		.7247	−.0213	.8597		.9971	−.0199	1.1349		1.2589	−.0182
63	.044	−.837	.4322	−.0154	.5517		.6754	−.0137	.7877		.9101	−.0135	1.0054		1.0123	−.0121

TABLE II.–PRESSURE COEFFICIENTS FOR MODEL 2
(a) M = 1.60

			α =													
			−4.8		.3		5.3		10.3		15.3		20.3		25.2	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.0313	.1483	.0874	.0785	.1597	.0208	.2663	−.0257	.3840	−.0721	.5208	−.1210	.6706	−.1734
2	.874	0.000	.0280	.1484	.0854	.0809	.1559	.0208	.2631	−.0278	.3853	−.0742	.5191	−.1235	.6710	−.1724
3	.882	.110	.0299	.1579	.0922	.0866	.1646	.0245	.2671	−.0848	.3825	−.3281	.5047	−.4214	.6475	−.4491
4	.811	0.000														
5	.819	.110	.0272	.1516	.0869	.0826	.1585	.0195	.2557	−.0246	.3812	−.0724	.5094	−.2122	.6588	−.3541
6	.827	.221	.0436	.1639	.0959	.0908	.1690	.0377	.2673	−.2209	.3842	−.3557	.5024	−.4174	.6384	−.4540
7	.707	0.000														
8	.707	.049	−.0456	.0701	.0102	.0024	.0773	−.0586	.1658	−.1067	.2805	−.1483	.4153	−.1925	.5685	−.2495
9	.713	.197	.0043	.1203	.0588	.0542	.1248	−.0045	.2132	−.0506	.3243	−.0955	.4518	−.2904	.5998	−.4139
10	.721	.307	.0291	.1530	.0861	.0813	.1576	.0194	.2479	−.0704	.3555	−.3869	.4743	−.4275	.6154	−.4601
11	.728	.418	.0025	.1733	.1011	.0941	.1785	−.0703	.2689	−.2787	.3729	−.3824	.4812	−.4358	.6048	−.4681
12	.619	0.000	−.0299	.0773	.0167	.0097	.0815	−.0423	.1681	−.0898	.2836	−.1371	.4132	−.1936	.5659	−.2523
13	.619	.123	−.0417	.0726	.0086	0.0000	.0774	−.0494	.1642	−.0957	.2820	−.1457	.4112	−.1987	.5651	−.2740
14	.619	.246	−.0836	.0528	−.0132	−.0242	.0587	−.1004	.1512	−.1413	.2725	−.1532	.4049	−.2671	.5604	−.3813
15	.624	.374	−.0197	.1029	.0377	.0288	.1065	−.0380	.1986	−.0485	.3115	−.3824	.4352	−.4491	.5875	−.4727
16	.632	.484	.0175	.1348	.0685	.0616	.1377	.0088	.2267	−.3095	.3329	−.3914	.4495	−.4497	.5916	−.4742
17	.640	.594	−.0608	.1660	.0966	.0889	.1672	−.1349	.2516	−.2790	.3461	−.3609	.4500	−.3968	.5747	−.4475
18	.530	0.000	−.0307	.0741	.0157	.0066	.0792	−.0455	.1670	−.0883	.2784	−.1463	.4036	−.2033	.5443	−.2577
19	.530	.197	−.0364	.0737	.0176	.0104	.0786	−.0540	.1665	−.0969	.2785	−.1459	.4049	−.2130	.5449	−.2995
20	.530	.395	−.0742	.0471	−.0203	−.0318	.0574	−.0892	.1568	−.1241	.2740	−.2278	.4048	−.3983	.5459	−.4515
21	.536	.550	−.0433	.0955	.0295	.0187	.1008	−.0526	.1958	−.2855	.3110	−.4023	.4372	−.4541	.5755	−.4785
22	.544	.661	−.0089	.1268	.0588	.0482	.1303	−.0589	.2219	−.3283	.3296	−.4080	.4487	−.4610	.5765	−.4846
23	.552	.771	−.0999	.1568	.0836	.0716	.1584	−.1520	.2441	−.2880	.3397	−.3723	.4425	−.4128	.5537	−.4358
24	.464	0.000	−.0335	.0728	.0142	.0066	.0798	−.0474	.1656	−.0908	.2750	−.1469	.4006	−.2050	.5341	−.2618
25	.464	.236	−.0380	.0777	.0162	.0069	.0850	−.0520	.1659	−.0946	.2751	−.1460	.3986	−.2195	.5302	−.3089
26	.464	.471	−.0696	.0311	−.0384	−.0566	.0491	−.0898	.1423	−.1072	.2497	−.2904	.3633	−.4267	.4817	−.4628
27	.464	.647	−.1726	−.0255	−.0804	−.0908	−.0154	−.1816	.0716	−.3487	.1733	−.4227	.2814	−.4568	.4006	−.4801
28	.464	.764	−.1626	−.0360	−.0893	−.1006	−.0274	−.1960	.0502	−.3827	.1442	−.4371	.2477	−.4773	.3675	−.4940
29	.464	.882	−.1601	−.0226	−.0683	−.0733	−.0149	−.2242	.0553	−.3558	.1371	−.4222	.2265	−.4470	.3376	−.4724
30	.376	0.000	−.0466	.0625	.0041	−.0060	.0698	−.0588	.1470	−.1009	.2438	−.1525	.3459	−.2091	.4576	−.2670
31	.376	.236	−.0595	.0506	−.0050	−.0135	.0587	−.0706	.1373	−.1056	.2364	−.1488	.3421	−.2158	.4568	−.2979
32	.376	.471	−.0666	.0397	−.0068	−.0112	.0468	−.0793	.1232	−.1181	.2189	−.1987	.3279	−.3613	.4464	−.4358
33	.376	.647	−.0536	.0153	−.0337	−.0438	.0219	−.0623	.1007	−.1631	.1970	−.4158	.3037	−.4640	.4171	−.4843
34	.376	.764	−.0632	.0023	−.0356	−.0441	.0078	−.0794	.0792	−.3324	.1739	−.4238	.2782	−.4649	.3880	−.4810
35	.376	.882	−.1118	−.0126	−.0390	−.0442	−.0100	−.1675	.0468	−.3292	.1303	−.3830	.2266	−.4503	.3289	−.4770
36	.243	0.000	−.0513	.0192	−.0223	−.0281	.0293	−.0591	.1046	−.1040	.1959	−.1576	.3010	−.2169	.4228	−.2683
37	.243	.236	−.0487	.0189	−.0182	−.0223	.0284	−.0550	.1020	−.0896	.1916	−.1254	.2971	−.2083	.4170	−.2832
38	.243	.471	−.0374	.0226	−.0060	−.0078	.0289	−.0449	.0948	−.0864	.1770	−.1285	.2785	−.2739	.3963	−.3814
39	.243	.647	−.0334	.0218	.0017	.0012	.0246	−.0422	.0796	−.1185	.1521	−.3547	.2436	−.3650	.3560	−.3977
40	.243	.764	−.0390	.0208	.0017	.0016	.0205	−.0537	.0660	−.1970	.1334	−.3417	.2187	−.3840	.3266	−.4292
41	.243	.882	−.0788	.0121	.0024	.0054	.0099	−.1286	.0387	−.2593	.0977	−.3432	.1732	−.4043	.2712	−.4394
42	.110	0.000	−.0185	.0080	−.0080	−.0016	.0136	−.0203	.0758	−.0677	.1576	−.1238	.2627	−.1781	.3816	−.2332
43	.110	.236	−.0200	.0084	−.0081	−.0012	.0134	−.0223	.0753	−.0696	.1579	−.1313	.2604	−.1870	.3792	−.2548
44	.110	.471	−.0235	.0089	−.0026	−.0027	.0185	−.0349	.0697	−.0907	.1484	−.1812	.2436	−.2491	.3570	−.3433
45	.110	.647	−.0363	.0165	.0026	.0036	.0214	−.0488	.0566	−.1394	.1269	−.2757	.2166	−.3662	.3233	−.3943
46	.110	.764	−.0490	.0209	.0100	.0076	.0258	−.0702	.0509	−.2180	.1091	−.3410	.1947	−.3617	.2944	−.3971
47	.110	.882	−.0946	.0208	.0152	.0070	.0256	−.1325	.0411	−.2275	.0753	−.2916	.1503	−.3652	.2405	−.4063
48	.066	0.000	−.2871	−.2794	−.2839	−.2810	−.2770	−.2891	−.2500	−.3189	−.2082	−.3557	−.1526	−.3928	−.0911	−.4207
49	.066	.236	−.2985	−.2897	−.2943	−.2927	−.2869	−.2976	−.2607	−.3186	−.2179	−.3613	−.1636	−.4008	−.1030	−.4180
50	.066	.471	−.2838	−.2782	−.2800	−.2799	−.2749	−.2906	−.2561	−.3354	−.2156	−.3903	−.1608	−.4034	−.1018	−.3893
51	.044	0.000	−.3062	−.3012	−.3053	−.3024	−.2993	−.3085	−.2698	−.3355	−.2244	−.3731	−.1691	−.3699	−.1077	−.3877
52	.044	.236	−.3087	−.3013	−.3053	−.3032	−.2987	−.3093	−.2713	−.3320	−.2260	−.3759	−.1709	−.3689	−.1101	−.3901
53	.044	.471	−.2820	−.2706	−.2713	−.2704	−.2666	−.2889	−.2450	−.3334	−.2036	−.3942	−.1432	−.3807	−.0793	−.3875
54	.044	.882	−.1080	−.0117	−.0080	−.0091	−.0065	−.1307	.0115	−.2106	.0421	−.2894	.0945	−.3290	.1519	−.3840
55	.022	0.000	−.2748	−.2687	−.2662	−.2680	−.2685	−.2777	−.2501	−.3006	−.2208	−.3347	−.1669	−.3552	−.1057	−.3820
56	.022	.236	−.2796	−.2771	−.2741	−.2750	−.2762	−.2805	−.2697	−.2999	−.2287	−.3403	−.1728	−.3604	−.1110	−.3871
57	.022	.471	−.2773	−.2641	−.2647	−.2656	−.2602	−.2807	−.2384	−.3100	−.2005	−.3548	−.1385	−.3740	−.0716	−.3865
58	.022	.764	−.3540	−.3204	−.3333	−.3351	−.3153	−.3569	−.2817	−.3539	−.2508	−.3829	−.2070	−.3708	−.1580	−.3933
59	.464	−.471	−.0773	.0349	−.0420	−.0535	.0441	−.0884	.1415	−.1060	.2487	−.2740	.3628	−.4183	.4814	−.4330
60	.110	−.471	−.0239	.0078	−.0055	−.0005	.0113	−.0267	.0627	−.0848	.1437	−.1782	.2412	−.2467	.3530	−.3344

TABLE II.–Continued
(a) Concluded

			α =													
			30.3		35.2		40.3		45.3		50.3		55.3			
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.8322	−.2289	.9966	−.2932	1.1745	−.3552	1.3440	−.4019	1.4720	−.4398	1.5610			
2	.874	0.000	.8322	−.2287	.9916	−.2977	1.1603	−.3589	1.3120	−.4093	1.4332	−.4462	1.5250			
3	.882	.110	.7986	−.4707	.9462	−.4888	1.1027	−.4965	1.2445	−.5035	1.3573	−.5017	1.4405			
4	.811	0.000														
5	.819	.110	.8135	−.4258	.9554	−.4489	1.1134	−.4621	1.2579	−.4748	1.3700	−.4683	1.4569			
6	.827	.221	.7816	−.4782	.9110	−.4935	1.0542	−.5004	1.1845	−.5044	1.2853	−.5004	1.3640			
7	.707	0.000														
8	.707	.049	.7314	−.3065	.8921	−.3697	1.0546	−.4117	1.2053	−.4291	1.3333	−.4367	1.4367			
9	.713	.197	.7513	−.4631	.9012	−.4791	1.0601	−.4863	1.1987	−.4737	1.3111	−.4722	1.4026			
10	.721	.307	.7509	−.4846	.8908	−.4994	1.0362	−.5033	1.1660	−.4985	1.2731	−.4825	1.3594			
11	.728	.418	.7246	−.4887	.8474	−.5022	.9746	−.5038	1.0908	−.4938	1.1844	−.4780	1.2625			
12	.619	0.000	.7244	−.3080	.8802	−.3639	1.0289	−.3978	1.1705	−.4293	1.2896	−.4048	1.3947			
13	.619	.123	.7236	−.3419	.8785	−.3918	1.0258	−.4084	1.1695	−.4386	1.2861	−.4115	1.3908			
14	.619	.246	.7218	−.4370	.8768	−.4599	1.0246	−.4491	1.1621	−.4601	1.2776	−.4408	1.3791			
15	.624	.374	.7328	−.4927	.8783	−.5054	1.0152	−.4975	1.1441	−.4770	1.2490	−.4606	1.3369			
16	.632	.484	.7276	−.4925	.8621	−.5031	.9897	−.4964	1.1077	−.4765	1.2036	−.4608	1.2879			
17	.640	.594	.6940	−.4824	.8129	−.5041	.9257	−.4949	1.0256	−.4685	1.1124	−.4570	1.1854			
18	.530	0.000	.7016	−.3207	.8387	−.3728	.9760	−.4044	1.1059	−.3918	1.2216	−.4118	1.3245			
19	.530	.197	.7024	−.3680	.8379	−.4140	.9728	−.4304	1.1018	−.4086	1.2170	−.4323	1.3184			
20	.530	.395	.7024	−.4807	.8336	−.4904	.9653	−.4814	1.0910	−.4569	1.2003	−.4520	1.2956			
21	.536	.550	.7207	−.4947	.8374	−.5071	.9542	−.4883	1.0681	−.4658	1.1666	−.4546	1.2568			
22	.544	.661	.7127	−.4980	.8209	−.5058	.9283	−.4759	1.0316	−.4625	1.1222	−.4521	1.2056			
23	.552	.771	.6747	−.4616	.7687	−.4901	.8609	−.4715	.9506	−.4586	1.0293	−.4492	1.1049			
24	.464	0.000	.6665	−.3216	.7906	−.3729	.9316	−.4218	1.0625	−.3887	1.1785	−.4202	1.2834			
25	.464	.236	.6563	−.3736	.7824	−.4166	.9237	−.4266	1.0534	−.4239	1.1688	−.4380	1.2713			
26	.464	.471	.5961	−.4803	.7366	−.4850	.8795	−.4598	1.0106	−.4514	1.1225	−.4401	1.2204			
27	.464	.647	.5226	−.4970	.6750	−.5029	.8147	−.4859	.9362	−.4667	1.0435	−.4513	1.1406			
28	.464	.764	.4947	−.5065	.6498	−.5103	.7794	−.4824	.8942	−.4573	.9934	−.4441	1.0858			
29	.464	.882	.4642	−.4963	.6096	−.5074	.7187	−.4612	.8192	−.4425	.9062	−.4360	.9872			
30	.376	0.000	.5988	−.3184	.7411	−.3742	.8753	−.3908	1.0042	−.4155	1.1193	−.4122	1.2249			
31	.376	.236	.5965	−.3577	.7349	−.4065	.8704	−.3957	.9952	−.4333	1.1112	−.4277	1.2146			
32	.376	.471	.5789	−.4656	.7077	−.4773	.8369	−.4511	.9595	−.4496	1.0693	−.4370	1.1711			
33	.376	.647	.5381	−.4981	.6556	−.4981	.7766	−.4771	.8905	−.4553	.9935	−.4408	1.0888			
34	.376	.764	.5054	−.4952	.6161	−.4987	.7321	−.4583	.8427	−.4441	.9414	−.4353	1.0342			
35	.376	.882	.4374	−.4858	.5427	−.4819	.6526	−.4383	.7537	−.4357	.8459	−.4303	.9329			
36	.243	0.000	.5533	−.3241	.6840	−.3797	.8139	−.3726	.9324	−.3906	1.0405	−.4006	1.1392			
37	.243	.236	.5470	−.3482	.6764	−.3936	.8062	−.3907	.9260	−.4084	1.0316	−.4113	1.1303			
38	.243	.471	.5221	−.4308	.6477	−.4374	.7723	−.4369	.8893	−.4289	.9910	−.4217	1.0873			
39	.243	.647	.4736	−.4384	.5916	−.4468	.7104	−.4563	.8177	−.4390	.9133	−.4265	1.0031			
40	.243	.764	.4399	−.4676	.5536	−.4637	.6681	−.4434	.7708	−.4306	.8636	−.4224	.9523			
41	.243	.882	.3765	−.4717	.4820	−.4641	.5890	−.4236	.6853	−.4217	.7723	−.4172	.8561			
42	.110	0.000	.5107	−.2950	.6293	−.3029	.7254	−.3675	.7984	−.3666	.8640	−.3874	.9279			
43	.110	.236	.5065	−.3227	.6253	−.3191	.7196	−.3776	.7923	−.3883	.8570	−.3911	.9206			
44	.110	.471	.4790	−.3999	.5944	−.4042	.6856	−.4091	.7589	−.4089	.8228	−.3949	.8876			
45	.110	.647	.4370	−.4126	.5452	−.4206	.6319	−.4330	.7021	−.4206	.7634	−.4015	.8317			
46	.110	.764	.4033	−.4282	.5080	−.4219	.5910	−.4193	.6602	−.4108	.7206	−.3956	.7924			
47	.110	.882	.3413	−.4386	.4389	−.4227	.5164	−.4039	.5835	−.4015	.6413	−.3916	.7137			
48	.066	0.000	−.0328	−.4109	.0100	−.4138	.0397	−.4172	.0713	−.3958	.1163	−.3692	.2970			
49	.066	.236	−.0456	−.4048	−.0037	−.4054	.0260	−.4120	.0582	−.3941	.1484	−.3704	.2966			
50	.066	.471	−.0436	−.4000	.0014	−.4024	.0364	−.4027	.0859	−.3901	.1821	−.3765	.2894			
51	.044	0.000	−.0474	−.4014	.0009	−.4043	.0468	−.4068	.1058	−.3835	.2161	−.3510	.3614			
52	.044	.236	−.0499	−.4012	−.0006	−.4031	.0467	−.4047	.1178	−.3807	.2250	−.3559	.4263			
53	.044	.471	−.0114	−.4000	.0462	−.4046	.1016	−.3961	.1702	−.3761	.2338	−.3655	.6512			
54	.044	.882	.2038	−.4124	.2435	−.3977	.2840	−.3699	.3411	−.3632	.4247	−.3681	.6123			
55	.022	0.000	−.0433	−.4010	.0109	−.4015	.0705	−.3899	.1562	−.3768	.2785	−.3530	.7226			
56	.022	.236	−.0468	−.4012	.0115	−.4037	.0775	−.3941	.1708	−.3786	.2483	−.3582	.7204			
57	.022	.471	.0001	−.3996	.0654	−.4041	.1348	−.3907	.2288	−.3754	.4205	−.3653	.6990			
58	.022	.764	−.0982	−.4061	−.0185	−.4081	.0663	−.3708	.1583	−.3624	.2762	−.3658	.6485			
59	.464	−.471	.5948	−.4381	.7356	−.4427	.8791	−.4418	1.0071	−.4390	1.1206	−.4366	1.2209			
60	.110	−.471	.4765	−.3927	.5920	−.4142	.6867	−.4102	.7586	−.4169	.8245	−.4014	.8910			

TABLE II.–Continued
(b) M = 2.16

			α =													
			−3.7		1.3		6.3		11.3		16.3		21.3		26.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.0378	.1213	.0922	.0577	.1644	.0091	.2591	−.0270	.3742	−.0605	.5057	−.0938	.6588	−.1289
2	.874	0.000	.0286	.1188	.0843	.0546	.1554	.0070	.2534	−.0312	.3698	−.0659	.5032	−.0984	.6579	−.1338
3	.882	.110	.0302	.1283	.0907	.0596	.1640	.0184	.2589	−.1580	.3716	−.2200	.4945	−.2416	.6392	−.2531
4	.811	0.000														
5	.819	.110	.0271	.1208	.0843	.0559	.1564	.0068	.2499	−.0297	.3644	−.0788	.4958	−.2203	.6419	−.2471
6	.827	.221	.0388	.1342	.0956	.0626	.1713	−.0540	.2622	−.1723	.3701	−.2174	.4924	−.2495	.6304	−.2603
7	.707	0.000														
8	.707	.049	−.0301	.0512	.0201	−.0035	.0859	−.0508	.1705	−.0902	.2756	−.1180	.3988	−.1452	.5487	−.1833
9	.713	.197	.0172	.1067	.0728	.0454	.1419	−.0056	.2294	−.0523	.3325	−.1276	.4521	−.2474	.5946	−.2632
10	.721	.307	.0291	.1257	.0888	.0591	.1622	.0149	.2532	−.0622	.3594	−.2156	.4815	−.2545	.6198	−.2640
11	.728	.418	−.0361	.1424	.1026	.0673	.1797	−.0985	.2684	−.1945	.3699	−.2296	.4848	−.2433	.6172	−.2589
12	.619	0.000	−.0219	.0527	.0207	−.0004	.0876	−.0429	.1716	−.0800	.2743	−.1137	.3937	−.1477	.5427	−.1824
13	.619	.123	−.0370	.0455	.0119	−.0119	.0818	−.0625	.1674	−.0946	.2726	−.1206	.3924	−.1584	.5414	−.2062
14	.619	.246	−.0556	.0275	−.0066	−.0291	.0641	−.0805	.1511	−.1135	.2601	−.1611	.3834	−.2356	.5356	−.2547
15	.624	.374	.0068	.0912	.0581	.0341	.1258	−.0103	.2055	−.0629	.3094	−.2302	.4260	−.2574	.5723	−.2665
16	.632	.484	.0358	.1246	.0866	.0570	.1599	−.0161	.2390	−.2018	.3373	−.2286	.4478	−.2561	.5867	−.2677
17	.640	.594	−.0379	.1488	.1050	.0682	.1848	−.1032	.2660	−.1920	.3574	−.2281	.4591	−.2467	.5818	−.2585
18	.530	0.000	−.0295	.0519	.0170	−.0033	.0835	−.0440	.1642	−.0813	.2696	−.1176	.3878	−.1575	.5267	−.1893
19	.530	.197	−.0339	.0515	.0141	−.0079	.0826	−.0467	.1648	−.0915	.2687	−.1205	.3884	−.1824	.5287	−.2243
20	.530	.395	−.0722	.0203	−.0176	−.0372	.0569	−.1048	.1510	−.1175	.2626	−.2352	.3870	−.2560	.5302	−.2681
21	.536	.550	.0014	.0819	.0481	.0248	.1156	−.0190	.2008	−.1965	.3049	−.2396	.4199	−.2574	.5644	−.2679
22	.544	.661	.0305	.1165	.0800	.0521	.1486	−.0626	.2298	−.2079	.3283	−.2397	.4379	−.2532	.5748	−.2664
23	.552	.771	−.0468	.1474	.1046	.0681	.1789	−.1112	.2545	−.1982	.3443	−.2339	.4429	−.2529	.5659	−.2604
24	.464	0.000	−.0291	.0501	.0165	−.0034	.0812	−.0444	.1612	−.0822	.2655	−.1184	.3861	−.1572	.5248	−.1890
25	.464	.236	−.0251	.0540	.0189	−.0017	.0849	−.0466	.1677	−.0914	.2670	−.1207	.3855	−.1906	.5253	−.2299
26	.464	.471	−.0735	.0249	−.0158	−.0452	.0698	−.0936	.1531	−.1123	.2572	−.2262	.3735	−.2460	.5066	−.2530
27	.464	.647	−.0952	−.0218	−.0538	−.0671	.0080	−.1110	.0867	−.2195	.1845	−.2463	.2916	−.2606	.4143	−.2702
28	.464	.764	−.0741	−.0042	−.0343	−.0523	.0205	−.1295	.0858	−.2353	.1722	−.2539	.2684	−.2664	.3802	−.2736
29	.464	.882	−.0986	.0144	−.0165	−.0325	.0387	−.1606	.1002	−.2278	.1799	−.2494	.2677	−.2633	.3664	−.2683
30	.376	0.000	−.0286	.0535	.0188	−.0041	.0802	−.0475	.1586	−.0867	.2546	−.1199	.3742	−.1605	.5064	−.1909
31	.376	.236	−.0308	.0485	.0138	−.0075	.0747	−.0519	.1526	−.0899	.2498	−.1188	.3683	−.1811	.4940	−.2207
32	.376	.471	−.0515	.0358	.0029	−.0421	.0621	−.0704	.1385	−.0956	.2308	−.2316	.3446	−.2581	.4669	−.2681
33	.376	.647	−.0755	.0095	−.0317	−.0512	.0416	−.0857	.1202	−.1911	.2123	−.2551	.3199	−.2675	.4392	−.2717
34	.376	.764	−.0750	−.0061	−.0350	−.0473	.0227	−.0922	.1066	−.2163	.1971	−.2520	.3045	−.2660	.4232	−.2708
35	.376	.882	−.0615	−.0187	−.0333	−.0371	.0025	−.1385	.0810	−.2300	.1688	−.2419	.2712	−.2488	.3830	−.2661
36	.243	0.000	−.0374	.0333	.0022	−.0147	.0587	−.0593	.1353	−.0907	.2248	−.1203	.3281	−.1576	.4517	−.1909
37	.243	.236	−.0333	.0336	.0028	−.0132	.0592	−.0515	.1348	−.0847	.2248	−.1181	.3275	−.1713	.4510	−.2107
38	.243	.471	−.0261	.0272	.0024	−.0085	.0515	−.0432	.1274	−.0720	.2197	−.1656	.3188	−.2390	.4378	−.2548
39	.243	.647	−.0274	.0207	.0042	−.0087	.0384	−.0467	.1076	−.1454	.1987	−.2425	.2925	−.2553	.4042	−.2575
40	.243	.764	−.0349	.0181	.0030	−.0127	.0312	−.0627	.0936	−.2128	.1782	−.2510	.2718	−.2589	.3803	−.2616
41	.243	.882	−.0667	.0092	−.0054	−.0217	.0190	−.1391	.0699	−.2242	.1463	−.2504	.2359	−.2598	.3366	−.2641
42	.110	0.000	−.0267	.0175	−.0061	−.0172	.0422	−.0434	.1135	−.0693	.2065	−.1073	.3076	−.1467	.4248	−.1842
43	.110	.236	−.0270	.0183	−.0029	−.0121	.0411	−.0429	.1105	−.0773	.2047	−.1039	.3056	−.1557	.4220	−.1990
44	.110	.471	−.0131	.0213	.0111	−.0020	.0454	−.0398	.1069	−.0839	.1937	−.1295	.2911	−.2111	.4010	−.2312
45	.110	.647	−.0222	.0196	.0051	.0009	.0338	−.0480	.0893	−.1257	.1702	−.2324	.2635	−.2380	.3683	−.2472
46	.110	.764	−.0279	.0180	.0068	.0039	.0275	−.0683	.0785	−.1900	.1542	−.2388	.2447	−.2453	.3438	−.2517
47	.110	.882	−.0609	.0179	.0097	.0034	.0170	−.1251	.0559	−.2025	.1248	−.2427	.2079	−.2484	.2993	−.2542
48	.066	0.000	−.1697	−.1518	−.1604	−.1631	−.1418	−.1785	−.1124	−.1955	−.0717	−.2193	−.0204	−.2412	.0438	−.2531
49	.066	.236	−.1798	−.1605	−.1689	−.1738	−.1514	−.1857	−.1207	−.2070	−.0807	−.2232	−.0312	−.2475	.0328	−.2568
50	.066	.471	−.1719	−.1575	−.1647	−.1698	−.1510	−.1850	−.1238	−.2116	−.0845	−.2391	−.0365	−.2392	.0277	−.2464
51	.044	0.000	−.1861	−.1725	−.1797	−.1835	−.1637	−.1917	−.1349	−.2073	−.0903	−.2160	−.0367	−.2268	.0265	−.2426
52	.044	.236	−.1912	−.1749	−.1823	−.1863	−.1670	−.1956	−.1372	−.2109	−.0952	−.2302	−.0399	−.2334	.0238	−.2457
53	.044	.471	−.1753	−.1627	−.1690	−.1701	−.1569	−.1884	−.1283	−.2173	−.0858	−.2351	−.0303	−.2385	.0378	−.2463
54	.044	.882	−.0674	.0149	.0096	−.0035	.0114	−.1251	.0378	−.1951	.1033	−.2336	.1825	−.2424	.2655	−.2465
55	.022	0.000	−.1703	−.1663	−.1692	−.1681	−.1640	−.1758	−.1350	−.1891	−.0908	−.2042	−.0354	−.2211	.0279	−.2383
56	.022	.236	−.1772	−.1779	−.1801	−.1771	−.1723	−.1800	−.1425	−.1902	−.0995	−.2107	−.0445	−.2274	.0186	−.2439
57	.022	.471	−.1775	−.1643	−.1701	−.1703	−.1585	−.1844	−.1278	−.1965	−.0834	−.2223	−.0286	−.2363	.0400	−.2451
58	.022	.764	−.1989	−.1803	−.1883	−.1802	−.1762	−.2007	−.1526	−.2151	−.1140	−.2246	−.0666	−.2346	−.0063	−.2432
59	.464	−.471	−.0856	.0242	−.0257	−.0478	.0629	−.0957	.1449	−.1365	.2518	−.1918	.3751	−.2550	.5079	−.2678
60	.110	−.471	−.0244	.0181	.0016	−.0061	.0374	−.0431	.1007	−.0884	.1869	−.1259	.2867	−.2139	.3990	−.2394

TABLE II.–Continued
(b) Concluded

			α =													
			31.3		36.3		41.3		46.3		51.3		56.3		61.3	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.8249	−.1640	.9954	−.1980	1.1564	−.2210	1.3151	−.2381	1.4731	−.2545	1.6077	−.2508	1.7120	−.2469
2	.874	0.000	.8201	−.1714	.9886	−.2075	1.1526	−.2327	1.3088	−.2505	1.4585	−.2643	1.5849	−.2633	1.6824	−.2598
3	.882	.110	.7904	−.2631	.9479	−.2706	1.1002	−.2763	1.2441	−.2772	1.3845	−.2751	1.5017	−.2704	1.5937	−.2647
4	.811	0.000														
5	.819	.110	.8046	−.2584	.9655	−.2643	1.1202	−.2674	1.2639	−.2656	1.4055	−.2687	1.5221	−.2578	1.6184	−.2487
6	.827	.221	.7805	−.2692	.9277	−.2749	1.0707	−.2785	1.2011	−.2777	1.3274	−.2785	1.4322	−.2642	1.5178	−.2547
7	.707	0.000														
8	.707	.049	.7075	−.2146	.8728	−.2376	1.0443	−.2512	1.2191	−.2585	1.3686	−.2611	1.4982	−.2559	1.6071	−.2452
9	.713	.197	.7441	−.2717	.8986	−.2758	1.0584	−.2778	1.2135	−.2773	1.3575	−.2785	1.4754	−.2611	1.5747	−.2476
10	.721	.307	.7581	−.2724	.9001	−.2782	1.0479	−.2791	1.1910	−.2775	1.3231	−.2799	1.4311	−.2615	1.5232	−.2463
11	.728	.418	.7459	−.2702	.8704	−.2773	1.0013	−.2787	1.1324	−.2778	1.2421	−.2798	1.3368	−.2619	1.4182	−.2442
12	.619	0.000	.7052	−.2119	.8725	−.2365	1.0425	−.2527	1.2074	−.2548	1.3416	−.2577	1.4658	−.2559	1.5684	−.2424
13	.619	.123	.7042	−.2345	.8697	−.2513	1.0400	−.2610	1.2059	−.2512	1.3386	−.2636	1.4614	−.2574	1.5639	−.2432
14	.619	.246	.6994	−.2603	.8662	−.2679	1.0373	−.2705	1.2018	−.2580	1.3328	−.2666	1.4512	−.2576	1.5496	−.2432
15	.624	.374	.7250	−.2742	.8807	−.2794	1.0374	−.2789	1.1887	−.2751	1.3096	−.2750	1.4178	−.2615	1.5074	−.2443
16	.632	.484	.7275	−.2752	.8741	−.2803	1.0187	−.2793	1.1608	−.2766	1.2718	−.2749	1.3699	−.2612	1.4543	−.2431
17	.640	.594	.7065	−.2697	.8376	−.2775	.9673	−.2782	1.0938	−.2757	1.1870	−.2735	1.2719	−.2605	1.3466	−.2414
18	.530	0.000	.6824	−.2170	.8472	−.2407	1.0207	−.2444	1.1613	−.2487	1.2894	−.2578	1.4075	−.2525	1.5038	−.2409
19	.530	.197	.6844	−.2447	.8491	−.2576	1.0218	−.2480	1.1582	−.2654	1.2861	−.2640	1.4022	−.2560	1.4973	−.2424
20	.530	.395	.6877	−.2741	.8517	−.2772	1.0196	−.2698	1.1508	−.2710	1.2721	−.2670	1.3811	−.2593	1.4727	−.2432
21	.536	.550	.7158	−.2748	.8730	−.2788	1.0266	−.2767	1.1442	−.2708	1.2430	−.2666	1.3423	−.2591	1.4281	−.2429
22	.544	.661	.7178	−.2748	.8648	−.2786	1.0062	−.2761	1.1166	−.2692	1.2045	−.2655	1.2938	−.2582	1.3748	−.2420
23	.552	.771	.6932	−.2692	.8224	−.2763	.9476	−.2755	1.0467	−.2672	1.1271	−.2643	1.1991	−.2574	1.2682	−.2406
24	.464	0.000	.6827	−.2178	.8476	−.2412	.9888	−.2437	1.1152	−.2589	1.2480	−.2518	1.3674	−.2485	1.4686	−.2389
25	.464	.236	.6823	−.2482	.8429	−.2593	.9790	−.2609	1.1063	−.2633	1.2386	−.2577	1.3570	−.2507	1.4564	−.2395
26	.464	.471	.6530	−.2554	.7934	−.2565	.9148	−.2558	1.0555	−.2485	1.1908	−.2452	1.3069	−.2397	1.4035	−.2272
27	.464	.647	.5513	−.2735	.6902	−.2761	.8268	−.2751	.9833	−.2671	1.1154	−.2615	1.2262	−.2556	1.3182	−.2403
28	.464	.764	.5086	−.2753	.6465	−.2772	.7899	−.2719	.9490	−.2648	1.0728	−.2607	1.1757	−.2539	1.2624	−.2389
29	.464	.882	.4777	−.2726	.6046	−.2758	.7472	−.2690	.8954	−.2608	.9998	−.2589	1.0896	−.2516	1.1658	−.2376
30	.376	0.000	.6447	−.2211	.7745	−.2429	.9163	−.2595	1.0600	−.2415	1.1949	−.2448	1.3158	−.2425	1.4185	−.2353
31	.376	.236	.6328	−.2436	.7694	−.2564	.9131	−.2662	1.0527	−.2513	1.1859	−.2511	1.3067	−.2428	1.4078	−.2352
32	.376	.471	.6069	−.2724	.7499	−.2749	.8908	−.2690	1.0188	−.2579	1.1472	−.2563	1.2617	−.2457	1.3588	−.2356
33	.376	.647	.5755	−.2738	.7150	−.2753	.8430	−.2687	.9576	−.2601	1.0772	−.2576	1.1833	−.2479	1.2748	−.2355
34	.376	.764	.5574	−.2728	.6923	−.2753	.8069	−.2660	.9153	−.2586	1.0307	−.2566	1.1321	−.2458	1.2196	−.2348
35	.376	.882	.5059	−.2717	.6279	−.2754	.7354	−.2619	.8356	−.2566	.9435	−.2556	1.0377	−.2427	1.1192	−.2337
36	.243	0.000	.5930	−.2200	.7353	−.2433	.8651	−.2387	1.0039	−.2292	1.1364	−.2423	1.2481	−.2354	1.3420	−.2304
37	.243	.236	.5900	−.2372	.7278	−.2531	.8583	−.2281	.9970	−.2392	1.1270	−.2464	1.2391	−.2342	1.3332	−.2292
38	.243	.471	.5690	−.2622	.6987	−.2658	.8269	−.2498	.9619	−.2513	1.0878	−.2512	1.1956	−.2353	1.2869	−.2295
39	.243	.647	.5254	−.2650	.6459	−.2652	.7690	−.2586	.8971	−.2538	1.0151	−.2513	1.1166	−.2360	1.2005	−.2293
40	.243	.764	.4966	−.2670	.6122	−.2672	.7320	−.2575	.8544	−.2525	.9695	−.2509	1.0675	−.2346	1.1491	−.2291
41	.243	.882	.4428	−.2700	.5500	−.2675	.6631	−.2555	.7769	−.2513	.8838	−.2500	.9753	−.2322	1.0522	−.2285
42	.110	0.000	.5550	−.2155	.6840	−.2390	.8199	−.2074	.9458	−.2334	1.0260	−.2376	1.0855	−.2276	1.1430	−.2244
43	.110	.236	.5517	−.2307	.6797	−.2255	.8143	−.2232	.9410	−.2383	1.0196	−.2408	1.0778	−.2268	1.1352	−.2227
44	.110	.471	.5270	−.2405	.6511	−.2376	.7798	−.2360	.9054	−.2326	.9830	−.2316	1.0416	−.2159	1.1003	−.2113
45	.110	.647	.4866	−.2558	.6053	−.2539	.7276	−.2505	.8504	−.2460	.9236	−.2454	.9862	−.2268	1.0389	−.2201
46	.110	.764	.4568	−.2569	.5713	−.2556	.6892	−.2486	.8085	−.2438	.8801	−.2447	.9367	−.2246	.9968	−.2181
47	.110	.882	.4046	−.2582	.5114	−.2557	.6213	−.2456	.7337	−.2419	.8016	−.2435	.8571	−.2227	.9172	−.2167
48	.066	0.000	.1142	−.2556	.1831	−.2464	.2463	−.2451	.2888	−.2317	.3265	−.2282	.3579	−.2237	.5139	−.2181
49	.066	.236	.1023	−.2549	.1699	−.2561	.2324	−.2443	.2751	−.2348	.3143	−.2333	.3662	−.2237	.5155	−.2164
50	.066	.471	.0968	−.2508	.1652	−.2524	.2311	−.2420	.2805	−.2372	.3323	−.2377	.4229	−.2233	.5100	−.2144
51	.044	0.000	.0969	−.2489	.1663	−.2450	.2336	−.2426	.2882	−.2298	.3534	−.2224	.4511	−.2206	.6001	−.2126
52	.044	.236	.0937	−.2505	.1623	−.2510	.2302	−.2425	.2872	−.2323	.3588	−.2291	.4625	−.2203	.6603	−.2104
53	.044	.471	.1125	−.2509	.1887	−.2524	.2680	−.2412	.3361	−.2340	.4086	−.2355	.4702	−.2197	.8904	−.2077
54	.044	.882	.3530	−.2507	.4244	−.2499	.4831	−.2349	.5172	−.2314	.5645	−.2340	.6471	−.2162	.8154	−.2044
55	.022	0.000	.0981	−.2486	.1680	−.2459	.2386	−.2415	.3055	−.2285	.3928	−.2197	.5159	−.2166	.9337	−.2062
56	.022	.236	.0894	−.2505	.1599	−.2511	.2344	−.2422	.3086	−.2310	.4038	−.2271	.5058	−.2165	.9286	−.2030
57	.022	.471	.1175	−.2500	.1968	−.2513	.2827	−.2389	.3631	−.2312	.4519	−.2331	.6240	−.2155	.9030	−.1992
58	.022	.764	.0532	−.2487	.1171	−.2491	.2062	−.2352	.3087	−.2287	.4051	−.2326	.5161	−.2140	.8549	−.1967
59	.464	−.471	.6519	−.2714	.7963	−.2735	.9156	−.2722	1.0560	−.2644	1.1910	−.2597	1.3075	−.2497	1.4045	−.2390
60	.110	−.471	.5241	−.2524	.6492	−.2399	.7814	−.2477	.9047	−.2429	.9845	−.2346	1.0456	−.2267	1.1021	−.2247

TABLE II.—Continued
(c) M = 2.86

			α =													
			−4.7		.3		5.3		10.3		15.3		20.3		25.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.0045	.1144	.0464	.0492	.1089	.0022	.1965	−.0284	.3019	−.0507	.4292	−.0738	.5780	−.0940
2	.874	0.000	.0011	.1152	.0443	.0486	.1068	.0009	.1939	−.0299	.3023	−.0516	.4307	−.0748	.5787	−.0957
3	.882	.110	−.0009	.1256	.0508	.0555	.1169	−.0018	.2038	−.0788	.3086	−.1152	.4304	−.1285	.5699	−.1449
4	.811	0.000	.0003	.1136	.0439	.0479	.1054	.0006	.1912	−.0312	.3004	−.0527	.4293	−.0721	.5750	−.0922
5	.819	.110	.0005	.1178	.0467	.0504	.1094	.0002	.1947	−.0208	.3016	−.1146	.4278	−.1343	.5703	−.1490
6	.827	.221	−.0064	.1334	.0565	.0605	.1241	−.0091	.2102	−.0877	.3139	−.1257	.4340	−.1364	.5682	−.1516
7	.707	0.000														
8	.707	.049	−.0407	.0534	−.0014	−.0002	.0487	−.0404	.1192	−.0694	.2134	−.0865	.3282	−.1068	.4619	−.1262
9	.713	.197	−.0049	.1101	.0420	.0443	.1028	−.0051	.1840	−.0260	.2880	−.1297	.4091	−.1388	.5392	−.1540
10	.721	.307	.0008	.1252	.0524	.0549	.1169	.0011	.2005	−.0983	.3058	−.1304	.4290	−.1394	.5622	−.1535
11	.728	.418	−.0227	.1442	.0646	.0676	.1349	−.0265	.2190	−.1001	.3209	−.1317	.4376	−.1395	.5618	−.1537
12	.619	0.000	−.0392	.0507	−.0025	−.0013	.0463	−.0382	.1176	−.0642	.2133	−.0800	.3294	−.1035	.4627	−.1195
13	.619	.123	−.0497	.0423	−.0109	−.0102	.0385	−.0491	.1111	−.0766	.2091	−.0879	.3267	−.1179	.4609	−.1387
14	.619	.246	−.0625	.0262	−.0251	−.0247	.0236	−.0622	.0962	−.0881	.1931	−.1362	.3124	−.1457	.4490	−.1541
15	.624	.374	−.0045	.1089	.0431	.0450	.1024	−.0027	.1763	−.1038	.2683	−.1366	.3798	−.1408	.5075	−.1548
16	.632	.484	−.0089	.1303	.0566	.0588	.1229	−.0127	.2042	−.1047	.3039	−.1363	.4161	−.1423	.5360	−.1553
17	.640	.594	−.0309	.1516	.0707	.0728	.1433	−.0346	.2254	−.1049	.3244	−.1347	.4347	−.1420	.5486	−.1548
18	.530	0.000	−.0386	.0486	−.0017	−.0034	.0484	−.0402	.1202	−.0668	.2130	−.0874	.3293	−.1092	.4620	−.1266
19	.530	.197	−.0514	.0483	−.0109	−.0127	.0477	−.0524	.1200	−.0775	.2121	−.0894	.3296	−.1313	.4634	−.1469
20	.530	.395	−.0673	.0209	−.0294	−.0310	.0221	−.0687	.1002	−.0961	.2005	−.1343	.3244		.4620	−.1559
21	.536	.550	−.0006	.1060	.0443	.0454	.1008	.0021	.1673	−.1091	.2566	−.1416	.3717	−.1471	.5024	−.1571
22	.544	.661	−.0228	.1325	.0602	.0615	.1264	−.0283	.2008	−.1124	.2908	−.1400	.4009	−.1463	.5245	−.1567
23	.552	.771	−.0375	.1556	.0748	.0762	.1486	−.0406	.2263	−.1105	.3173	−.1393	.4193	−.1462	.5309	−.1563
24	.464	0.000	−.0380	.0498	−.0012	−.0028	.0508	−.0388	.1190	−.0644	.2103	−.0873	.3277	−.1044	.4622	−.1273
25	.464	.236	−.0508	.0513	−.0043	−.0060	.0519	−.0512	.1227	−.0768	.2143	−.0918	.3291	−.1344	.4641	−.1485
26	.464	.471	−.0657	.0161	−.0325	−.0367	.0217	−.0697	.1020	−.1087	.1956	−.1339	.3161	−.1363	.4508	−.1488
27	.464	.647	−.0600	.0047	−.0299	−.0317	.0072	−.0598	.0610	−.1256	.1412	−.1439	.2465	−.1487	.3663	−.1574
28	.464	.764	−.0679	.0302	−.0140	−.0158	.0321	−.0749	.0831	−.1338	.1512	−.1492	.2432	−.1490	.3480	−.1585
29	.464	.882	−.0748	.0462	−.0041	−.0057	.0474	−.0790	.1023	−.1325	.1684	−.1477	.2535	−.1466	.3497	−.1573
30	.376	0.000	−.0387	.0512	−.0003	−.0022	.0540	−.0390	.1226	−.0668	.2079	−.0891	.3211	−.1129	.4556	−.1290
31	.376	.236	−.0411	.0491	−.0016	−.0037	.0524	−.0425	.1206	−.0776	.2095	−.0895	.3226	−.1295	.4528	−.1451
32	.376	.471	−.0680	.0400	−.0212	−.0243	.0428	−.0703	.1098	−.0991	.1958	−.1386	.3021	−.1489	.4264	−.1564
33	.376	.647	−.0747	.0104	−.0363	−.0379	.0142	−.0734	.0856	−.1166	.1691	−.1454	.2767	−.1507	.3965	−.1573
34	.376	.764	−.0540	.0032	−.0339	−.0349	.0069	−.0524	.0731	−.1266	.1585	−.1481	.2612	−.1497	.3809	−.1577
35	.376	.882	−.0601	.0055	−.0170	−.0175	.0084	−.0671	.0638	−.1383	.1444	−.1502	.2430	−.1501	.3577	−.1574
36	.243	0.000	−.0392	.0450	−.0016	−.0042	.0502	−.0395	.1157	−.0686	.2031	−.0899	.3075	−.1098	.4315	−.1281
37	.243	.236	−.0418	.0419	−.0045	−.0068	.0468	−.0416	.1115	−.0675	.1964	−.0905	.3025	−.1209	.4293	−.1405
38	.243	.471	−.0440	.0357	−.0078	−.0100	.0401	−.0459	.1037	−.0750	.1863	−.1307	.2901	−.1444	.4154	−.1538
39	.243	.647	−.0465	.0273	−.0163	−.0200	.0319	−.0491	.0957	−.0904	.1764	−.1342	.2760	−.1458	.3921	−.1568
40	.243	.764	−.0565	.0188	−.0231	−.0249	.0233	−.0569	.0854	−.1151	.1647	−.1465	.2592	−.1472	.3707	−.1576
41	.243	.882	−.0611	.0024	−.0220	−.0227	.0067	−.0642	.0659	−.1438	.1391	−.1534	.2288	−.1482	.3339	−.1580
42	.110	0.000	−.0432	.0334	−.0093	−.0108	.0385	−.0439	.1033	−.0702	.1843	−.0912	.2884	−.1107	.4072	−.1261
43	.110	.236	−.0269	.0343	.0029	−.0094	.0543	−.0373	.1263	−.0600	.2160	−.0849	.3286	−.1135	.4592	−.1352
44	.110	.471	−.0283	.0267	−.0036	−.0075	.0349	−.0318	.0986	−.0633	.1764	−.1102	.2748	−.1339	.3888	−.1464
45	.110	.647	−.0336	.0227	−.0025	−.0035	.0279	−.0354	.0873	−.0929	.1624	−.1393	.2587	−.1456	.3689	−.1545
46	.110	.764	−.0434	.0177	−.0027	−.0032	.0216	−.0470	.0754	−.1251	.1469	−.1489	.2400	−.1474	.3465	−.1553
47	.110	.882	−.0724	.0111	−.0056	−.0067	.0139	−.0777	.0586	−.1391	.1230	−.1512	.2091	−.1482	.3085	−.1554
48	.066	0.000	−.1194	−.0848	−.1010	−.1011	−.0805	−.1196	−.0519	−.1265	−.0178	−.1334	.0252	−.1465	.0811	−.1513
49	.066	.236	−.1205	−.0926	−.1084	−.1089	−.0886	−.1201	−.0597	−.1342	−.0251	−.1410	.0205	−.1523	.0734	−.1562
50	.066	.471	−.1163	−.0954	−.1069	−.1076	−.0907	−.1177	−.0630	−.1383	−.0289	−.1513	.0154	−.1532	.0686	−.1550
51	.044	0.000	−.1243	−.1032	−.1168	−.1174	−.0986	−.1219	−.0729	−.1235	−.0427	−.1310	−.0004	−.1458	.0590	−.1512
52	.044	.236	−.1283	−.1054	−.1182	−.1186	−.1013	−.1276	−.0755	−.1269	−.0442	−.1371	−.0009	−.1481	.0552	−.1530
53	.044	.471	−.1204	−.1030	−.1114	−.1122	−.0984	−.1215	−.0731	−.1376	−.0404	−.1498	.0046	−.1528	.0627	−.1547
54	.044	.882	−.0787	.0038	−.0048	−.0054	.0062	−.0845	.0483	−.1364	.1100	−.1487	.1906	−.1476	.2829	−.1538
55	.022	0.000	−.1161	−.1055	−.1150	−.1156	−.1012	−.1151	−.0769	−.1220	−.0456	−.1311	−.0002	−.1446	.0604	−.1499
56	.022	.236	−.1208	−.1122	−.1216	−.1223	−.1080	−.1190	−.0838	−.1213	−.0526	−.1334	−.0082	−.1469	.0498	−.1521
57	.022	.471	−.1217	−.1073	−.1140	−.1147	−.1028	−.1215	−.0778	−.1280	−.0440	−.1444	.0036	−.1518	.0644	−.1543
58	.022	.764	−.1206	−.1130	−.1172	−.1175	−.1089	−.1183	−.0890	−.1358	−.0602	−.1480	−.0199	−.1510	.0327	−.1534
59	.464	−.471	−.0696	.0186	−.0351	−.0361	.0217	−.0708	.1021	−.1136	.1967	−.1415	.3190	−.1441	.4529	−.1565
60	.110	−.471	−.0318	.0274	−.0071	−.0075	.0327	−.0325	.0963	−.0630	.1751	−.1118	.2739	−.1423	.3891	−.1544

TABLE II.—Continued
(c) Concluded

			α =													
			30 3		35 3		40 3		45 3		50 3		55 3		60.3	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.7335	−.1135	.9024		1.0749	−.1370	1.2452		1.4032	−.1424	1.5479		1.6751	−.1467
2	.874	0.000	.7354	−.1164	.9048		1.0755	−.1439	1.2466		1.4054	−.1526	1.5455		1.6626	−.1529
3	.882	.110	.7182	−.1511	.8751		1.0355	−.1565	1.1929		1.3398	−.1593	1.4697		1.5767	−.1546
4	.811	0.000	.7327	−.1079	.8979		1.0687	−.1325	1.2405		1.3943	−.1340	1.5310		1.6428	−.1233
5	.819	.110	.7239	−.1530	.8837		1.0504	−.1547	1.2162		1.3650	−.1566	1.4975		1.6071	−.1514
6	.827	.221	.7118	−.1554	.8595		1.0131	−.1583	1.1639		1.2976	−.1599	1.4168		1.5150	−.1530
7	.707	0.000														
8	.707	.049	.6149	−.1384	.7771		.9472	−.1470	1.1220		1.3021	−.1521	1.4629		1.5874	−.1474
9	.713	.197	.6775	−.1572	.8278		.9844	−.1595	1.1441		1.3072	−.1598	1.4549		1.5683	−.1512
10	.721	.307	.7031	−.1574	.8499		.9919	−.1602	1.1351		1.2843	−.1605	1.4200		1.5239	−.1512
11	.728	.418	.6943	−.1570	.8356		.9671	−.1597	1.0905		1.2213	−.1603	1.3393		1.4294	−.1508
12	.619	0.000	.6134	−.1302	.7760		.9475	−.1425	1.1278		1.3030	−.1438	1.4461		1.5626	−.1392
13	.619	.123	.6123	−.1483	.7749		.9467	−.1553	1.1273		1.3012	−.1558	1.4432		1.5592	−.1501
14	.619	.246	.6039	−.1572	.7684		.9428	−.1595	1.1247		1.2962	−.1585	1.4371		1.5486	−.1508
15	.624	.374	.6504	−.1578	.8027		.9630	−.1601	1.1300		1.2884	−.1594	1.4179		1.5168	−.1512
16	.632	.484	.6690	−.1579	.8096		.9588	−.1603	1.1127		1.2582	−.1596	1.3780		1.4695	−.1511
17	.640	.594	.6671	−.1576	.7925		.9238	−.1600	1.0589		1.1884	−.1594	1.2928		1.3732	−.1506
18	.530	0.000	.6123	−.1401	.7761		.9486	−.1534	1.1270		1.2845	−.1550	1.4075		1.5211	−.1519
19	.530	.197	.6138	−.1530	.7768		.9494	−.1573	1.1271		1.2837	−.1573	1.4053		1.5157	−.1525
20	.530	.395	.6140	−.1587	.7782		.9511		1.1260		1.2777		1.3925		1.4950	
21	.536	.550	.6450	−.1591	.7982		.9593	−.1609	1.1197		1.2583	−.1595	1.3590		1.4504	−.1513
22	.544	.661	.6577	−.1588	.7991		.9496	−.1606	1.0992		1.2292	−.1590	1.3190		1.4022	−.1509
23	.552	.771	.6501	−.1588	.7754		.9073	−.1608	1.0419		1.1565	−.1590	1.2343		1.3061	−.1506
24	.464	0.000	.6139	−.1407	.7771		.9484	−.1465	1.1201		1.2411	−.1419	1.3712		1.4886	−.1355
25	.464	.236	.6157	−.1538	.7782		.9480	−.1566	1.1152		1.2294	−.1558	1.3604		1.4781	−.1506
26	.464	.471	.5986	−.1503	.7552		.9100	−.1517	1.0524		1.1661	−.1508	1.3083		1.4256	−.1457
27	.464	.647	.5006	−.1591	.6469		.7961	−.1604	.9450		1.0813	−.1588	1.2302		1.3439	−.1505
28	.464	.764	.4681	−.1598	.6033		.7462	−.1611	.8972		1.0444	−.1592	1.1884		1.2928	−.1499
29	.464	.882	.4583	−.1589	.5774		.7025	−.1600	.8459		.9922	−.1583	1.1185		1.2062	−.1491
30	.376	0.000	.6052	−.1426	.7618		.9109	−.1544	1.0418		1.1838	−.1551	1.3238		1.4452	−.1503
31	.376	.236	.5977	−.1523	.7496		.8999	−.1572	1.0364		1.1773	−.1561	1.3161		1.4364	−.1502
32	.376	.471	.5645	−.1586	.7141		.8648	−.1602	1.0084		1.1457	−.1579	1.2771		1.3904	−.1500
33	.376	.647	.5292	−.1590	.6721		.8193	−.1602	.9617		1.0874	−.1582	1.2055		1.3108	−.1493
34	.376	.764	.5137	−.1595	.6550		.7995	−.1607	.9339		1.0482	−.1583	1.1587		1.2587	−.1484
35	.376	.882	.4834	−.1592	.6148		.7448	−.1603	.8672		.9693	−.1579	1.0726		1.1633	−.1481
36	.243	0.000	.5657	−.1432	.7092		.8576	−.1534	1.0037		1.1458	−.1532	1.2767		1.3907	−.1493
37	.243	.236	.5650	−.1498	.7091		.8549	−.1559	.9967		1.1379	−.1536	1.2690		1.3818	−.1493
38	.243	.471	.5510	−.1564	.6932		.8313	−.1578	.9649		1.1019	−.1545	1.2280		1.3368	−.1494
39	.243	.647	.5183	−.1590	.6526		.7809	−.1602	.9050		1.0368	−.1569	1.1560		1.2543	−.1516
40	.243	.764	.4938	−.1594	.6243		.7470	−.1605	.8666		.9940	−.1571	1.1095		1.2043	−.1518
41	.243	.882	.4418	−.1595	.5684		.6839	−.1606	.7964		.9153	−.1567	1.0232		1.1116	−.1516
42	.110	0.000	.5389	−.1422	.6817		.8251	−.1383	.9652		1.0991	−.1502	1.1839		1.2363	−.1512
43	.110	.236	.5509	−.1478	.6917		.8329	−.1445	.9739		1.1057	−.1502	1.1919		1.2449	−.1512
44	.110	.471	.5114	−.1487	.6470		.7829	−.1465	.9203		1.0509	−.1442	1.1364		1.1894	−.1451
45	.110	.647	.4857	−.1575	.6113		.7409	−.1569	.8718		.9962	−.1515	1.0800		1.1296	−.1509
46	.110	.764	.4616	−.1574	.5823		.7056	−.1569	.8319		.9530	−.1501	1.0348		1.0839	−.1499
47	.110	.882	.4156	−.1574	.5298		.6443	−.1566	.7625		.8754	−.1493	.9543		1.0033	−.1491
48	.066	0.000	.1500	−.1529	.2327		.3148	−.1516	.3923		.4440	−.1454	.4710		.5213	−.1431
49	.066	.236	.1370	−.1570	.2175		.2993	−.1544	.3763		.4270	−.1491	.4557		.5281	−.1474
50	.066	.471	.1284	−.1568	.2096		.2916	−.1544	.3713		.4286	−.1492	.4763		.5875	−.1482
51	.044	0.000	.1291	−.1544	.2106		.2931	−.1541	.3725		.4344	−.1493	.4988		.6172	−.1459
52	.044	.236	.1266	−.1557	.2066		.2886	−.1544	.3684		.4320	−.1489	.5037		.6271	−.1454
53	.044	.471	.1339	−.1566	.2207		.3096	−.1541	.4005		.4785	−.1481	.5593		.6348	−.1451
54	.044	.882	.3841	−.1559	.4865		.5765	−.1530	.6408		.6765	−.1454	.7189		.7985	−.1435
55	.022	0 000	.1320	−.1544	.2119		.2925	−.1525	.3741		.4479	−.1477	.5395		.6812	−.1446
56	.022	.236	.1208	−.1554	.1999		.2812	−.1539	.3658		.4463	−.1473	.5496		.6811	−.1434
57	.022	.471	.1371	−.1566	.2225		.3134	−.1537	.4098		.5002	−.1465	.6014		.7817	−.1422
58	.022	.764	.0959	−.1554	.1726		.2432	−.1533	.3309		.4432	−.1446	.5500		.6937	−.1412
59	.464	−.471	.6006	−.1583	.7571		.9129	−.1592	1.0558		1.1684	−.1574	1.3105		1.4296	−.1508
60	.110	−.471	.5159	−.1571	.6516		.7884	−.1566	.9248		1.0554	−.1511	1.1408		1.1954	−.1496

TABLE II.–Continued
(d) M = 3.50

			α =													
			−4.9		.2		5.2		10.2		15.2		20.2		25.1	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.0003	.0963	.0392	.0391	.0979	−.0023	.1780	−.0272	.2792	−.0477	.4031	−.0590	.5515	−.0679
2	.874	0.000	−.0063	.0942	.0338	.0361	.0928	−.0053	.1750	−.0297	.2788	−.0498	.4033	−.0628	.5531	−.0735
3	.882	.110	−.0072	.1047	.0404	.0430	.1026	−.0061	.1844	−.0462	.2855	−.0748	.4053	−.0856	.5477	−.0922
4	.811	0.000	−.0072	.0920	.0327	.0357	.0912	−.0045	.1730	−.0280	.2769	−.0462	.4010	−.0573	.5496	−.0652
5	.819	.110	−.0069	.0962	.0357	.0378	.0945	−.0063	.1756	−.0458	.2785	−.0771	.4006	−.0871	.5459	−.0928
6	.827	.221	−.0090	.1117	.0450	.0481	.1090	−.0077	.1910	−.0525	.2909	−.0810	.4082	−.0905	.5456	−.0958
7	.707	0.000														
8	.707	.049	−.0336	.0414	−.0031	−.0021	.0422	−.0362	.1068	−.0576	.1925	−.0711	.2999	−.0803	.4296	−.0866
9	.713	.197	−.0122	.0905	.0308	.0332	.0884	−.0118	.1675	−.0518	.2679	−.0821	.3874	−.0911	.5216	−.0962
10	.721	.307	−.0091	.1039	.0398	.0425	.1010	−.0086	.1819	−.0555	.2833	−.0837	.4025	−.0928	.5383	−.0975
11	.728	.418	−.0130	.1227	.0522	.0560	.1188	−.0117	.2009	−.0601	.2998	−.0865	.4132	−.0939	.5421	−.0977
12	.619	0.000	−.0326	.0371	−.0044	−.0033	.0377	−.0335	.1033	−.0507	.1902	−.0633	.3000	−.0715	.4281	−.0773
13	.619	.123	−.0427	.0289	−.0133	−.0128	.0302	−.0444	.0971	−.0636	.1854	−.0772	.2959	−.0897	.4252	−.0944
14	.619	.246	−.0503	.0167	−.0241	−.0237	.0185	−.0522	.0835	−.0693	.1694	−.0877	.2800	−.0939	.4103	−.0971
15	.624	.374	−.0140	.0941	.0330	.0361	.0912	−.0131	.1682	−.0616	.2589	−.0869	.3644	−.0941	.4842	−.0977
16	.632	.484	−.0118	.1105	.0437	.0473	.1071	−.0106	.1884	−.0622	.2852	−.0875	.3990	−.0947	.5209	−.0983
17	.640	.594	−.0151	.1309	.0587	.0618	.1269	−.0154	.2087	−.0662	.3040	−.0893	.4143	−.0954	.5343	−.0986
18	.530	0.000	−.0417	.0328	−.0119	−.0117	.0345	−.0429	.1020	−.0585	.1892	−.0746	.3014	−.0834	.4327	−.0905
19	.530	.197	−.0445	.0305	−.0163	−.0175	.0324	−.0291	.1011	−.0661	.1872	−.0847	.3013	−.0904	.4328	−.0933
20	.530	.395	−.0536		−.0268		.0173		.0850		.1765		.2931		.4273	
21	.536	.550	−.0134	.0971	.0372	.0391	.0951	−.0146	.1673	−.0677	.2481	−.0903	.3517	−.0966	.4755	−.0996
22	.544	.661	−.0137	.1157	.0480	.0513	.1122	−.0127	.1916	−.0680	.2816	−.0905	.3865	−.0967	.5032	−.0995
23	.552	.771	−.0200	.1369	.0616	.0660	.1321	−.0191	.2133	−.0726	.3035	−.0928	.4082	−.0977	.5166	−.0998
24	.464	0.000	−.0415	.0351	−.0095	−.0076	.0358	−.0411	.1014	−.0569	.1883	−.0739	.3007	−.0836	.4340	−.0903
25	.464	.236	−.0481	.0348	−.0166	−.0160	.0354	−.0490	.1024	−.0722	.1895	−.0902	.3004	−.0961	.4350	−.0991
26	.464	.471	−.0469	.0119	−.0243	−.0268	.0187	−.0542	.0846	−.0688	.1743	−.0829	.2886	−.0870	.4221	−.0895
27	.464	.647	−.0537	.0150	−.0206	−.0209	.0166	−.0554	.0628	−.0812	.1283	−.0947	.2227	−.0990	.3388	−.1012
28	.464	.764	−.0523	.0320	−.0107	−.0109	.0331	−.0533	.0865	−.0830	.1482	−.0960	.2299	−.0999	.3306	−.1018
29	.464	.882	−.0543	.0428	−.0041	−.0034	.0434	−.0548	.1007	−.0832	.1659	−.0955	.2442	−.0991	.3381	−.1009
30	.376	0.000	−.0409	.0372	−.0073	−.0078	.0384	−.0418	.1028	−.0585	.1850	−.0734	.2959	−.0833	.4302	−.0911
31	.376	.236	−.0491	.0359	−.0105	−.0105	.0378	−.0499	.1038	−.0707	.1896	−.0870	.2968	−.0952	.4300	−.0986
32	.376	.471	−.0536	.0265	−.0267	−.0270	.0273	−.0549	.0944	−.0777	.1768	−.0930	.2806	−.0982	.4062	−.1007
33	.376	.647	−.0547	.0048	−.0305	−.0319	.0075	−.0572	.0664	−.0800	.1434	−.0944	.2491	−.0989	.3731	−.1010
34	.376	.764	−.0518	.0065	−.0229	−.0242	.0085	−.0536	.0609	−.0804	.1385	−.0954	.2369	−.0993	.3546	−.1014
35	.376	.882	−.0488	.0154	−.0127	−.0134	.0170	−.0491	.0646	−.0856	.1304	−.0965	.2229	−.1004	.3357	−.1016
36	.243	0.000	−.0397	.0355	−.0083	−.0087	.0355	−.0401	.1003	−.0592	.1878	−.0751	.2896	−.0833	.4161	−.0910
37	.243	.236	−.0452	.0336	−.0093	−.0097	.0340	−.0456	.0975	−.0568	.1815	−.0780	.2857	−.0922	.4115	−.0968
38	.243	.471	−.0489	.0279	−.0161	−.0155	.0284	−.0502	.0885	−.0732	.1690	−.0896	.2709	−.0962	.3941	−.0985
39	.243	.647	−.0486	.0200	−.0254	−.0255	.0203	−.0502	.0811	−.0762	.1596	−.0955	.2558	−.1003	.3705	−.1020
40	.243	.764	−.0474	.0094	−.0267	−.0269	.0101	−.0486	.0744	−.0800	.1521	−.0986	.2452	−.1017	.3540	−.1024
41	.243	.882	−.0490	−.0038	−.0224	−.0237	−.0020	−.0499	.0551	−.0889	.1291	−.1010	.2172	−.1024	.3239	−.1030
42	.110	0.000	−.0378	.0290	−.0110	−.0121	.0292	−.0407	.0896	−.0601	.1711	−.0760	.2753	−.0842	.3928	−.0915
43	.110	.236	−.0374	.0290	−.0066	−.0121	.0383	−.0390	.1069	−.0564	.1992	−.0754	.3158	−.0893	.4491	−.0963
44	.110	.471	−.0427	.0246	−.0083	−.0104	.0292	−.0485	.0869	−.0651	.1644	−.0818	.2625	−.0869	.3780	−.0892
45	.110	.647	−.0479	.0181	−.0137	−.0139	.0194	−.0491	.0772	−.0744	.1538	−.0944	.2501	−.0991	.3626	−.1013
46	.110	.764	−.0473	.0124	−.0177	−.0177	.0138	−.0480	.0672	−.0829	.1404	−.0991	.2334	−.1004	.3419	−.1013
47	.110	.882	−.0567	.0055	−.0172	−.0175	.0071	−.0572	.0539	−.0902	.1211	−.1001	.2060	−.1007	.3078	−.1015
48	.066	0.000	−.0809	−.0549	−.0676	−.0684	−.0516	−.0833	−.0278	−.0886	.0054	−.0944	.0457	−.0960	.0950	−.0969
49	.066	.236	−.0892	−.0642	−.0777	−.0777	−.0615	−.0914	−.0378	−.0949	−.0038	−.0999	.0402	−.1020	.0905	−.1029
50	.066	.471	−.0745	−.0676	−.0743	−.0791	−.0620	−.0828	−.0390	−.0916	−.0068	−.0978	.0362	−.1008	.0883	−.1018
51	.044	0.000	−.0814	−.0720	−.0805	−.0826	−.0687	−.0854	−.0488	−.0894	−.0195	−.0960	.0182	−.0996	.0718	−.1012
52	.044	.236	−.0810	−.0741	−.0799	−.0843	−.0690	−.0884	−.0504	−.0905	−.0217	−.0967	.0184	−.1004	.0680	−.1018
53	.044	.471	−.0830	−.0739	−.0805	−.0824	−.0711	−.0854	−.0502	−.0897	−.0190	−.0967	.0222	−.1008	.0750	−.1019
54	.044	.882	−.0627	.0018	−.0166	−.0165	.0041	−.0633	.0450	−.0909	.1076	−.0996	.1900	−.1002	.2870	−.1013
55	.022	0.000	−.0770	−.0733	−.0777	−.0820	−.0677	−.0827	−.0507	−.0882	−.0232	−.0953	.0167	−.0985	.0729	−.0999
56	.022	.236	−.0819	−.0787	−.0839	−.0866	−.0753	−.0844	−.0584	−.0884	−.0309	−.0954	.0085	−.0992	.0611	−.1010
57	.022	.471	−.0791	−.0772	−.0792	−.0839	−.0731	−.0829	−.0547	−.0888	−.0246	−.0963	.0178	−.1005	.0732	−.1018
58	.022	.764	−.0820	−.0797	−.0800	−.0835	−.0756	−.0842	−.0599	−.0936	−.0330	−.1002	.0032	−.1008	.0510	−.1016
59	.464	−.471	−.0531	.0118	−.0292	−.0300	.0143	−.0572	.0819	−.0756	.1742	−.0914	.2913	−.0965	.4265	−.0992
60	.110	−.471	−.0486	.0231	−.0126	−.0136	.0262	−.0522	.0838	−.0724	.1626	−.0915	.2618	−.0975	.3800	−.0997

TABLE II.—Continued
(d) Concluded

			α =													
			30.1		35.2		40.2		45.2		50.2		55.2		60.2	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.7169	−.0813	.8905		1.0687	−.0832	1.2465		1.4146	−.0841	1.5727		1.7036	−.0840
2	.874	0.000	.7204	−.0853	.8944		1.0717	−.0937	1.2524		1.4188	−.0961	1.5720		1.6975	−.0936
3	.882	.110	.7049	−.0977	.8698		1.0349	−.1005	1.2030		1.3565	−.1015	1.4993		1.6133	−.0965
4	.811	0.000	.7146	−.0769	.8894		1.0646	−.0821	1.2491		1.4162	−.0740	1.5571		1.6793	−.0688
5	.819	.110	.7064	−.0979	.8774		1.0467	−.1002	1.2261		1.3877	−.1000	1.5257		1.6438	−.0952
6	.827	.221	.6962	−.1000	.8562		1.0119	−.1022	1.1770		1.3231	−.1024	1.4484		1.5528	−.0972
7	.707	0.000														
8	.707	.049	.5836	−.0912	.7567		.9326	−.0941	1.1164		1.3054	−.0947	1.4793		1.6220	−.0915
9	.713	.197	.6680	−.1004	.8237		.9805	−.1023	1.1519		1.3208	−.1021	1.4782		1.6065	−.0973
10	.721	.307	.6891	−.1012	.8474		.9981	−.1031	1.1529		1.3038	−.1029	1.4480		1.5639	−.0977
11	.728	.418	.6825	−.1012	.8321		.9769	−.1029	1.1182		1.2461	−.1029	1.3720		1.4718	−.0981
12	.619	0.000	.5811	−.0825	.7514		.9294	−.0856	1.1188		1.3115	−.0868	1.4735		1.6019	−.0813
13	.619	.123	.5796	−.0977	.7510		.9297	−.0996	1.1194		1.3117	−.1005	1.4721		1.5988	−.0956
14	.619	.246	.5675	−.1006	.7424		.9242	−.1022	1.1162		1.3083	−.1021	1.4670		1.5892	−.0967
15	.624	.374	.6273	−.1009	.7869		.9528	−.1026	1.1307		1.3072	−.1024	1.4495		1.5593	−.0974
16	.632	.484	.6550	−.1015	.8024		.9547	−.1029	1.1190		1.2827	−.1027	1.4137		1.5134	−.0976
17	.640	.594	.6621	−.1015	.7936		.9278	−.1029	1.0739		1.2185	−.1027	1.3318		1.4182	−.0978
18	.530	0.000	.5831	−.0972	.7507		.9286	−.0997	1.1178		1.3056	−.1013	1.4432		1.5605	−.0975
19	.530	.197	.5845	−.0960	.7530		.9310	−.0966	1.1198		1.3076	−.0969	1.4427		1.5561	−.0939
20	.530	.395	.5826		.7540		.9328		1.1212		1.3056		1.4328		1.5382	
21	.536	.550	.6202	−.1025	.7837		.9484	−.1032	1.1201		1.2934	−.1032	1.4054		1.4941	−.0980
22	.544	.661	.6385	−.1021	.7910		.9454	−.1029	1.1056		1.2652	−.1027	1.3691		1.4485	−.0978
23	.552	.771	.6377	−.1024	.7727		.9116	−.1030	1.0544		1.1945	−.1030	1.2858		1.3546	−.0978
24	.464	0.000	.5846	−.0969	.7533		.9276	−.0991	1.1126		1.2897	−.1004	1.4005		1.5228	−.0971
25	.464	.236	.5856	−.1017	.7546		.9289	−.1020	1.1118		1.2824	−.1020	1.3898		1.5127	−.0980
26	.464	.471	.5704	−.0927	.7340		.9018	−.0924	1.0667		1.2100	−.0919	1.3260		1.4559	−.0889
27	.464	.647	.4721	−.1035	.6235		.7820	−.1036	.9437		1.1015	−.1034	1.2422		1.3743	−.0984
28	.464	.764	.4478	−.1038	.5841		.7311	−.1040	.8890		1.0516	−.1037	1.2013		1.3258	−.0982
29	.464	.882	.4447	−.1028	.5675		.6967	−.1028	.8359		.9946	−.1026	1.1390		1.2446	−.0974
30	.376	0.000	.5800	−.0982	.7418		.9067	−.1007	1.0603		1.1953	−.1008	1.3471		1.4742	−.0973
31	.376	.236	.5785	−.1014	.7367		.8957	−.1019	1.0510		1.1915	−.1013	1.3420		1.4671	−.0977
32	.376	.471	.5454	−.1029	.6960		.8529	−.1029	1.0100		1.1596	−.1025	1.3035		1.4227	−.0980
33	.376	.647	.5053	−.1028	.6501		.8034	−.1030	.9569		1.1059	−.1029	1.2356		1.3455	−.0981
34	.376	.764	.4860	−.1034	.6307		.7830	−.1034	.9347		1.0742	−.1030	1.1917		1.2953	−.0979
35	.376	.882	.4615	−.1032	.5982		.7393	−.1030	.8755		1.0007	−.1029	1.1071		1.2010	−.0978
36	.243	0.000	.5562	−.0979	.7016		.8468	−.0999	.9937		1.1528	−.0993	1.3037		1.4254	−.0967
37	.243	.236	.5523	−.1004	.7004		.8454	−.1009	.9913		1.1464	−.0994	1.2965		1.4178	−.0966
38	.243	.471	.5319	−.1010	.6807		.8254	−.1009	.9655		1.1119	−.0996	1.2555		1.3725	−.0963
39	.243	.647	.5010	−.1057	.6417		.7804	−.1050	.9135		1.0479	−.1034	1.1822		1.2924	−.0997
40	.243	.764	.4838	−.1059	.6186		.7503	−.1054	.8783		1.0075	−.1037	1.1362		1.2429	−.0998
41	.243	.882	.4466	−.1061	.5657		.6894	−.1053	.8109		.9314	−.1034	1.0502		1.1498	−.0999
42	.110	0.00:	.5253	−.1001	.6734		.8187	−.0990	.9674		1.1152	−.0994	1.2433		1.3038	−.0983
43	.110	.236	.5546	−.1017	.6869		.8315	−.1016	.9788		1.1259	−.0995	1.2543		1.3155	−.0982
44	.110	.471	.5080	−.0933	.6440		.7829	−.0924	.9233		1.0649	−.0892	1.1922		1.2533	−.0881
45	.110	.647	.4866	−.1051	.6156		.7465	−.1043	.8797		1.0153	−.1003	1.1369		1.1961	−.0984
46	.110	.764	.4634	−.1047	.5904		.7144	−.1038	.8417		.9721	−.0998	1.0907		1.1490	−.0976
47	.110	.882	.4205	−.1047	.5410		.6563	−.1038	.7748		.8967	−.0991	1.0085		1.0658	−.0973
48	.066	0.000	.1611	−.0968	.2453		.3329	−.0971	.4205		.4999	−.0935	.5414		.5728	−.0912
49	.066	.236	.1502	−.1032	.2315		.3173	−.1028	.4044		.4834	−.0991	.5246		.5598	−.0974
50	.066	.471	.1461	−.1049	.2244		.3090	−.1038	.3967		.4793	−.0993	.5326		.6017	−.0977
51	.044	0.000	.1384	−.1022	.2218		.3085	−.1021	.3946		.4782	−.0997	.5439		.6257	−.0976
52	.044	.236	.1366	−.1030	.2197		.3053	−.1025	.3910		.4755	−.0992	.5449		.6416	−.0974
53	.044	.471	.1426	−.1044	.2313		.3206	−.1037	.4152		.5122	−.0987	.5984		.6894	−.0971
54	.044	.882	.3966	−.1034	.5078		.6052	−.1031	.6953		.7487	−.0965	.7818		.8331	−.0960
55	.022	0.000	.1425	−.1023	.2249		.3087	−.1019	.3957		.4828	−.0988	.5690		.6808	−.0962
56	.022	.236	.1305	−.1026	.2128		.2960	−.1022	.3845		.4755	−.0984	.5717		.6927	−.0965
57	.022	.471	.1445	−.1040	.2310		.3207	−.1037	.4204		.5231	−.0974	.6269		.7392	−.0966
58	.022	.764	.1138	−.1035	.1921		.2718	−.1033	.3536		.4543	−.0963	.5759		.7008	−.0959
59	.464	−.471	.5757	−.1018	.7385		.9058	−.1025	1.0698		1.2134	−.1022	1.3302		1.4607	−.0977
60	.110	−.471	.5115	−.1032	.6493		.7871	−.1022	.9283		1.0717	−.0998	1.1991		1.2621	−.0978

TABLE II.—Continued
(e) M = 4.60

			α =													
			−4.2		.8		5.8		10.8		15.8		20.8		25.8	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.0216	.0806	.0451	.0419	.0996	.0132	.1819	−.0012	.2876	−.0149	.4166	−.0200	.5615	
2	.874	0.000	.0048	.0767	.0336	.0312	.0920	.0011	.1768	−.0153	.2831	−.0288	.4149	−.0343	.5636	
3	.882	.110	.0061	.0874	.0408	.0367	.1025	.0013	.1868	−.0185	.2907	−.0337	.4171	−.0395	.5580	
4	.811	0.000	.0020	.0745	.0320	.0292	.0909	−.0001	.1756	−.0145	.2811	−.0256	.4121	−.0286	.5613	
5	.819	.110	.0034	.0792	.0352	.0304	.0946	−.0018	.1786	−.0205	.2828	−.0346	.4116	−.0396	.5565	
6	.827	.221	.0053	.0954	.0459	.0398	.1102	−.0003	.1942	−.0220	.2962	−.0369	.4201	−.0422	.5576	
7	.707	0.000														
8	.707	.049	−.0104	.0335	.0059	.0067	.0462	−.0123	.1096	−.0227	.1932	−.0312	.2998	−.0344	.4339	
9	.713	.197	−.0013	.0739	.0302	.0264	.0887	−.0060	.1704	−.0245	.2720	−.0374	.3961	−.0422	.5388	
10	.721	.307	.0017	.0873	.0395	.0336	.1021	−.0041	.1847	−.0252	.2862	−.0388	.4097	−.0437	.5527	
11	.728	.418	.0059	.1064	.0536	.0460	.1211	−.0008	.2046	−.0250	.3039	−.0396	.4229	−.0442	.5580	
12	.619	0.000	−.0037	.0347	.0135	.0086	.0488	−.0072	.1071	−.0147	.1901	−.0215	.2959	−.0243	.4313	
13	.619	.123	−.0203	.0209	−.0039	−.0058	.0352	−.0234	.0971	−.0329	.1824	−.0400	.2898	−.0430	.4273	
14	.619	.246	−.0240	.0131	−.0104	−.0114	.0261	−.0268	.0864	−.0348	.1677	−.0412	.2738	−.0443	.4118	
15	.624	.374	−.0018	.0793	.0342	.0291	.0939	−.0066	.1726	−.0268	.2685	−.0391	.3806	−.0430	.5071	
16	.632	.484	.0020	.0937	.0445	.0377	.1085	−.0040	.1899	−.0264	.2891	−.0399	.4077	−.0443	.5442	
17	.640	.594	.0066	.1141	.0594	.0505	.1286	−.0010	.2116	−.0260	.3085	−.0402	.4240	−.0448	.5552	
18	.530	0.000	−.0220	.0158	−.0083	−.0068	.0290	−.0247	.0936	−.0344	.1839	−.0414	.2949	−.0446	.4353	
19	.530	.197	−.0229	.0147	−.0096	−.0041	.0276	−.0205	.0921	−.0293	.1816	−.0362	.2940	−.0388	.4353	
20	.530	.395	−.0269		−.0143		.0225		.0858		.1727		.2841		.4273	
21	.536	.550	−.0013	.0835	.0384	.0308	.0987	−.0085	.1759	−.0300	.2653	−.0421	.3657	−.0459	.4894	
22	.544	.661	.0022	.0990	.0490	.0403	.1145	−.0051	.1960	−.0285	.2915	−.0414	.4024	−.0458	.5249	
23	.552	.771	.0054	.1194	.0632	.0526	.1348	−.0024	.2182	−.0287	.3122	−.0422	.4220	−.0460	.5427	
24	.464	0.000	−.0234	.0167	−.0098	−.0079	.0295	−.0251	.0946	−.0341	.1829	−.0408	.2954	−.0438	.4359	
25	.464	.236	−.0248	.0152	−.0114	−.0100	.0287	−.0275	.0958	−.0368	.1828	−.0435	.2941	−.0464	.4357	
26	.464	.471	−.0099	.0107	.0003	−.0040	.0316	−.0177	.0884	−.0233	.1742	−.0293	.2849	−.0312	.4234	
27	.464	.647	−.0248	.0162	−.0081	−.0084	.0284	−.0285	.0788	−.0389	.1393	−.0456	.2218	−.0478	.3385	
28	.464	.764	−.0228	.0274	−.0013	−.0031	.0405	−.0268	.0970	−.0385	.1634	−.0456	.2400	−.0483	.3385	
29	.464	.882	−.0196	.0353	.0034	.0024	.0484	−.0235	.1074	−.0365	.1769	−.0441	.2566	−.0469	.3497	
30	.376	0.000	−.0247	.0195	−.0082	−.0096	.0338	−.0278	.0979	−.0363	.1835	−.0428	.2940	−.0455	.4308	
31	.376	.236	−.0265	.0181	−.0122	−.0123	.0324	−.0293	.0987	−.0383	.1838	−.0446	.2930	−.0471	.4319	
32	.376	.471	−.0288	.0091	−.0156	−.0158	.0231	−.0315	.0909	−.0395	.1745	−.0452	.2780	−.0474	.4090	
33	.376	.647	−.0291	.0043	−.0166	−.0169	.0161	−.0326	.0696	−.0403	.1425	−.0456	.2410	−.0478	.3707	
34	.376	.764	−.0264	.0093	−.0112	−.0118	.0212	−.0298	.0702	−.0397	.1390	−.0458	.2331	−.0480	.3516	
35	.376	.882	−.0250	.0141	−.0065	−.0078	.0271	−.0291	.0789	−.0400	.1404	−.0459	.2217	−.0484	.3342	
36	.243	0.000	−.0258	.0194	−.0076	−.0098	.0343	−.0284	.0995	−.0365	.1838	−.0426	.2909	−.0454	.4234	
37	.243	.236	−.0268	.0189	−.0085	−.0107	.0336	−.0296	.0986	−.0388	.1842	−.0448	.2912	−.0471	.4185	
38	.243	.471	−.0257	.0138	−.0137	−.0121	.0259	−.0285	.0888	−.0373	.1713	−.0433	.2742	−.0454	.3972	
39	.243	.647	−.0278	.0032	−.0169	−.0163	.0145	−.0317	.0771	−.0379	.1567	−.0467	.2512	−.0487	.3697	
40	.243	.764	−.0285	−.0003	−.0171	−.0168	.0107	−.0319	.0707	−.0387	.1497	−.0473	.2439	−.0497	.3582	
41	.243	.882	−.0254	−.0023	−.0136	−.0149	.0082	−.0302	.0590	−.0394	.1322	−.0480	.2174	−.0499	.3285	
42	.110	0.000	−.0243	.0161	−.0090	−.0101	.0288	−.0287	.0935	−.0346	.1822	−.0434	.2857	−.0462	.4080	
43	.110	.236	−.0268	.0156	−.0084	−.0097	.0326	−.0302	.1030	−.0371	.2024	−.0460	.3233	−.0482	.4543	
44	.110	.471	−.0076	.0157	.0047	−.0005	.0351	−.0165	.0897	−.0211	.1707	−.0293	.2719	−.0308	.3911	
45	.110	.647	−.0295	.0068	−.0164	−.0167	.0182	−.0327	.0789	−.0386	.1592	−.0474	.2574	−.0494	.3738	
46	.110	.764	−.0279	.0026	−.0161	−.0170	.0141	−.0316	.0719	−.0385	.1489	−.0470	.2428	−.0490	.3550	
47	.110	.882	−.0271	−.0037	−.0149	−.0162	.0071	−.0321	.0601	−.0402	.1322	−.0473	.2180	−.0488	.3211	
48	.066	0.000	−.0345	−.0273	−.0287	−.0319	−.0181	−.0371	.0026	−.0368	.0354	−.0421	.0754	−.0427	.1205	
49	.066	.236	−.0422	−.0397	−.0385	−.0426	−.0306	−.0447	−.0119	−.0432	.0199	−.0488	.0632	−.0495	.1143	
50	.066	.471	−.0418	−.0413	−.0394	−.0437	−.0329	−.0447	−.0162	−.0424	.0148	−.0488	.0567	−.0501	.1102	
51	.044	0.000	−.0441	−.0433	−.0418	−.0453	−.0353	−.0450	−.0210	−.0438	.0064	−.0501	.0425	−.0510	.0911	
52	.044	.236	−.0432	−.0447	−.0419	−.0462	−.0365	−.0448	−.0233	−.0433	.0029	−.0495	.0411	−.0503	.0892	
53	.044	.471	−.0439	−.0451	−.0424	−.0461	−.0372	−.0454	−.0239	−.0433	.0030	−.0495	.0421	−.0507	.0939	
54	.044	.882	−.0303	−.0055	−.0177	−.0180	.0043	−.0345	.0527	−.0405	.1202	−.0468	.2066	−.0482	.3114	
55	.022	0.000	−.0419	−.0428	−.0403	−.0443	−.0346	−.0437	−.0209	−.0430	.0042	−.0493	.0399	−.0500	.0923	
56	.022	.236	−.0430	−.0459	−.0418	−.0458	−.0383	−.0442	−.0274	−.0432	−.0051	−.0491	.0302	−.0500	.0800	
57	.022	.471	−.0428	−.0460	−.0412	−.0458	−.0381	−.0447	−.0260	−.0433	−.0023	−.0495	.0359	−.0504	.0899	
58	.022	.764	−.0429	−.0455	−.0413	−.0455	−.0382	−.0448	−.0273	−.0433	−.0050	−.0490	.0293	−.0499	.0770	
59	.464	−.471	−.0262	.0067	−.0158	−.0135	.0187	−.0292	.0826	−.0367	.1723	−.0427	.2839	−.0452	.4230	
60	.110	−.471	−.0236	.0117	−.0104	−.0093	.0229	−.0280	.0824	−.0348	.1654	−.0439	.2683	−.0461	.3914	

TABLE II.—Concluded
(e) Concluded

			α =													
			30.8		35.8		40.8		45.8		50.8		55.8		60.8	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.937	0.000	.7173	−.0241	.8875		1.0680	−.0259	1.2557		1.4352	−.0271	1.5898		1.6998	−.0267
2	.874	0.000	.7205	−.0387	.8940		1.0713	−.0407	1.2566		1.4318	−.0419	1.5909		1.7302	−.0415
3	.882	.110	.7058	−.0438	.8689		1.0357	−.0457	1.2095		1.3700	−.0468	1.5177		1.6479	−.0449
4	.811	0.000	.7177	−.0294	.8901		1.0659	−.0306	1.2467		1.4184	−.0262	1.5690		1.7081	−.0210
5	.819	.110	.7088	−.0437	.8771		1.0475	−.0453	1.2244		1.3891	−.0457	1.5368		1.6745	−.0432
6	.827	.221	.7008	−.0461	.8582		1.0156	−.0475	1.1799		1.3306	−.0482	1.4644		1.5893	−.0458
7	.707	0.000														
8	.707	.049	.5818	−.0367	.7457		.9269	−.0377	1.1030		1.2897	−.0382	1.4722		1.6317	−.0369
9	.713	.197	.6841	−.0460	.8327		.9920	−.0473	1.1457		1.3105	−.0477	1.4782		1.6232	−.0456
10	.721	.307	.7004	−.0475	.8545		1.0136	−.0485	1.1532		1.2987	−.0490	1.4513		1.5846	−.0468
11	.728	.418	.6964	−.0473	.8401		.9898	−.0483	1.1216		1.2491	−.0488	1.3810		1.4966	−.0468
12	.619	0.000	.5834	−.0257	.7524		.9310	−.0271	1.1172		1.3024	−.0264	1.4730		1.6122	−.0236
13	.619	.123	.5800	−.0456	.7508		.9304	−.0464	1.1163		1.3017	−.0466	1.4722		1.6102	−.0441
14	.619	.246	.5662	−.0469	.7406		.9233	−.0482	1.1124		1.2992	−.0479	1.4685		1.6033	−.0454
15	.624	.374	.6416	−.0463	.7943		.9604	−.0477	1.1315		1.3015	−.0474	1.4582		1.5771	−.0454
16	.632	.484	.6771	−.0475	.8162		.9663	−.0484	1.1223		1.2810	−.0483	1.4256		1.5346	−.0463
17	.640	.594	.6843	−.0477	.8136		.9436	−.0486	1.0787		1.2210	−.0483	1.3482		1.4424	−.0464
18	.530	0.000	.5934	−.0468	.7652		.9406	−.0482	1.1222		1.3015	−.0507	1.4557		1.5744	−.0463
19	.530	.197	.5943	−.0407	.7662		.9421	−.0415	1.1242		1.3021	−.0435	1.4572		1.5731	−.0399
20	.530	.395	.5891		.7646		.9435		1.1262		1.3019		1.4515		1.5586	
21	.536	.550	.6316	−.0488	.7942		.9615	−.0490	1.1315		1.2937	−.0488	1.4267		1.5171	−.0469
22	.544	.661	.6546	−.0483	.8050		.9613	−.0487	1.1185		1.2700	−.0484	1.3916		1.4729	−.0464
23	.552	.771	.6591	−.0485	.7912		.9303	−.0490	1.0691		1.2057	−.0488	1.3114		1.3806	−.0466
24	.464	0.000	.5954	−.0457	.7685		.9447	−.0469	1.1262		1.2952	−.0492	1.4153		1.5409	−.0454
25	.464	.236	.5963	−.0482	.7697		.9453	−.0489	1.1259		1.2900	−.0508	1.4049		1.5315	−.0465
26	.464	.471	.5806	−.0327	.7489		.9190	−.0334	1.0857		1.2279	−.0349	1.3340		1.4702	−.0312
27	.464	.647	.4786	−.0493	.6338		.7945	−.0501	.9592		1.1102	−.0518	1.2441		1.3935	−.0473
28	.464	.764	.4596	−.0495	.5976		.7451	−.0504	.9024		1.0544	−.0522	1.2002		1.3458	−.0473
29	.464	.882	.4599	−.0482	.5846		.7162	−.0488	.8529		.9941	−.0506	1.1395		1.2689	−.0459
30	.376	0.000	.5878	−.0476	.7568		.9284	−.0485	1.0965		1.2212	−.0506	1.3557		1.4938	−.0466
31	.376	.236	.5886	−.0487	.7559		.9217	−.0494	1.0856		1.2160	−.0512	1.3528		1.4896	−.0468
32	.376	.471	.5573	−.0488	.7145		.8739	−.0499	1.0384		1.1792	−.0514	1.3177		1.4488	−.0468
33	.376	.647	.5113	−.0490	.6614		.8166	−.0498	.9782		1.1206	−.0516	1.2532		1.3731	−.0468
34	.376	.764	.4894	−.0493	.6383		.7937	−.0502	.9556		1.0923	−.0516	1.2138		1.3247	−.0467
35	.376	.882	.4667	−.0492	.6078		.7539	−.0498	.9018		1.0248	−.0516	1.1317		1.2333	−.0465
36	.243	0.000	.5697	−.0471	.7233		.8737	−.0481	1.0238		1.1742	−.0504	1.3182		1.4483	−.0463
37	.243	.236	.5625	−.0483	.7186		.8724	−.0487	1.0229		1.1704	−.0504	1.3133		1.4435	−.0462
38	.243	.471	.5375	−.0470	.6919		.8492	−.0470	1.0011		1.1395	−.0489	1.2755		1.4010	−.0448
39	.243	.647	.5054	−.0501	.6539		.8070	−.0511	.9528		1.0776	−.0503	1.2052		1.3207	−.0479
40	.243	.764	.4911	−.0506	.6355		.7830	−.0512	.9212		1.0386	−.0505	1.1599		1.2720	−.0484
41	.243	.882	.4611	−.0506	.5880		.7280	−.0513	.8553		.9639	−.0503	1.0757		1.1802	−.0481
42	.110	0.000	.5405	−.0468	.6859		.8365	−.0494	.9914		1.1418	−.0489	1.2694		1.3406	−.0473
43	.110	.236	.5722	−.0485	.7020		.8499	−.0498	1.0028		1.1510	−.0489	1.2781		1.3506	−.0471
44	.110	.471	.5236	−.0317	.6642		.8073	−.0325	.9501		1.0932	−.0318	1.2170		1.2896	−.0300
45	.110	.647	.5042	−.0504	.6389		.7764	−.0511	.9110		1.0452	−.0497	1.1648		1.2362	−.0476
46	.110	.764	.4836	−.0494	.6160		.7474	−.0500	.8739		1.0017	−.0489	1.1175		1.1875	−.0466
47	.110	.882	.4441	−.0496	.5681		.6914	−.0499	.8086		.9266	−.0488	1.0354		1.1029	−.0464
48	.066	0.000	.1840	−.0424	.2652		.3575	−.0421	.4557		.5423	−.0399	.5928		.6214	−.0379
49	.066	.236	.1734	−.0501	.2506		.3411	−.0500	.4378		.5233	−.0486	.5737		.6053	−.0462
50	.066	.471	.1719	−.0504	.2458		.3350	−.0508	.4304		.5187	−.0493	.5784		.6346	−.0472
51	.044	0.000	.1566	−.0511	.2373		.3282	−.0510	.4236		.5139	−.0497	.5823		.6562	−.0475
52	.044	.236	.1542	−.0509	.2357		.3250	−.0511	.4197		.5098	−.0495	.5813		.6645	−.0473
53	.044	.471	.1617	−.0508	.2473		.3397	−.0513	.4401		.5425	−.0498	.6303		.7198	−.0472
54	.044	.882	.4239	−.0489	.5350		.6383	−.0491	.7362		.8014	−.0478	.8264		.8643	−.0451
55	.022	0.000	.1600	−.0499	.2400		.3275	−.0504	.4235		.5165	−.0484	.6005		.6985	−.0464
56	.022	.236	.1472	−.0504	.2277		.3140	−.0506	.4106		.5071	−.0487	.5995		.7083	−.0465
57	.022	.471	.1607	−.0508	.2449		.3362	−.0515	.4418		.5500	−.0492	.6515		.7578	−.0464
58	.022	.764	.1395	−.0498	.2163		.3021	−.0502	.3937		.4960	−.0486	.6090		.7275	−.0456
59	.464	−.471	.5816	−.0470	.7524		.9232	−.0479	1.0896		1.2340	−.0495	1.3359		1.4747	−.0452
60	.110	−.471	.5254	−.0470	.6684		.8117	−.0480	.9546		1.1000	−.0470	1.2244		1.2970	−.0453

TABLE III.–PRESSURE COEFFICIENTS FOR MODEL 3
(a) M = 1.60

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	.3831	.9513	.7305	.7072	.9666	.3548	1.1162	.1095		−.1032	1.3242	−.2549	1.3962	−.3805
2	.971	.236	.3848	.9435	.7260	.7042	.9584	.3585	1.1085	.1142		−.0996	1.3194	−.2519	1.3921	−.3798
3	.971	.471	.3844	.9094	.7030	.6832	.9243	.3597	1.0748	.1208		−.0897	1.2917	−.2389	1.3676	−.3646
4	.971	.764	.3666	.7625	.5908	.5759	.7784	.3456	.9219	.1319		−.0669	1.1439	−.2105	1.2299	−.3323
5	.941	0.000	.3802	.8106	.6590	.6454	.8210	.3533	.9396	.1363		−.0555	1.1347	−.1937	1.2135	−.3108
6	.941	.236	.3786	.7981	.6496	.6350	.8093	.3542	.9287	.1378		−.0541	1.1248	−.1917	1.2047	−.3086
7	.941	.471	.3752	.7541	.6107	.5974	.7652	.3512	.8854	.1373		−.0506	1.0850	−.1863	1.1677	−.3029
8	.941	.647	.3378	.6480	.5213	.5059	.6607	.3184	.7744	.1298		−.0517	.9687	−.1841	1.0530	−.2979
9	.941	.882	−.1258	.0332	−.0763	−.0768	.0488	−.1344	.2080	−.2085		−.2858	.5998	−.3516	.6981	−.4089
10	.912	0.000	.3669	.6899	.5867	.5757	.6977	.3390	.7857	.1316		−.0483	.9359	−.1786	1.0041	−.2897
11	.912	.236	.3644	.6759	.5713	.5604	.6827	.3364	.7732	.1321		−.0487	.9268	−.1778	.9962	−.2883
12	.912	.471	.3385	.6122	.5087	.4980	.6218	.3173	.7129	.1268		−.0506	.8728	−.1770	.9440	−.2866
13	.912	.764	−.1674	−.0310	−.0948	−.0983	−.0256	−.1759	.0419	−.2342		−.2956	.3062	−.3530	.6047	−.4089
14	.854	0.000	−.1146	−.0011	−.0447	−.0485	.0039	−.1275	.0660	−.2330		−.3239	.2700	−.3878	.4255	−.4386
15	.854	.236														
16	.854	.471	−.2009	−.1054	−.1454	−.1502	−.0998	−.2099	−.0457	−.2711		−.3391	.1863	−.3850	.3201	−.4302
17	.854	.647	−.1975	−.0806	−.1507	−.1243	−.1159	−.2031	−.0082	−.2597		−.3239	.2957	−.3683	.4484	−.4205
18	.854	.764	−.0733	.1835	.0675	.0426	.1778	−.0662	.2129	−.1455		−.2591	.3353	−.3308	.4620	−.3693
19	.854	.882	.0282	.1242	.0971	.0932	.1259	.0180	.1767	−.0746		−.1811	.3099	−.2681	.4178	−.3490
20	.736	0.000	−.1649	−.0571	−.1167	−.1210	−.0510	−.1732	.0352	−.2518		−.3318	.3729	−.3711	.5595	−.4168
21	.736	.236	−.1855	−.0656	−.1348	−.1380	−.0618	−.1928	.0481	−.2585		−.3219	.3816	−.3690	.5536	−.4168
22	.736	.471	−.1532	−.0297	−.1049	−.1123	−.0235	−.1645	.0868	−.2346		−.2725	.3733	−.3334	.5242	−.3942
23	.736	.647	−.0417	.0399	.0074	−.0080	.0443	−.0483	.1130	−.1093		−.2009	.3369	−.2459	.4802	−.3139
24	.736	.764	−.0245	.0372	.0099	.0111	.0373	−.0398	.0946	−.1175		−.2085	.3108	−.2828	.4469	−.3544
25	.736	.882	−.0176	.0284	.0252	.0218	.0270	−.0331	.0728	−.1422		−.2599	.2574	−.3443	.3816	−.4072
26	.588	0.000	−.1590	−.0369	−.1052	−.1115	−.0296	−.1676	.0852	−.2237		−.2964	.3404	−.3522	.4632	−.3975
27	.588	.236	−.1577	−.0396	−.1126	−.1167	−.0353	−.1708	.0763	−.2287		−.2941	.3360	−.3333	.4578	−.3719
28	.588	.471	−.0813	−.0103	−.0441	−.0490	−.0064	−.0935	.0661	−.1642		−.2374	.3142	−.2853	.4331	−.3413
29	.588	.647	−.0532	.0057	−.0193	−.0223	.0067	−.0648	.0637	−.1429		−.2304	.2801	−.3034	.3927	−.3787
30	.588	.764	−.0483	.0101	−.0106	−.0130	.0116	−.0617	.0594	−.1516		−.2572	.2532	−.3436	.3610	−.4169
31	.588	.882	−.0522	.0077	.0001	−.0013	.0071	−.0702	.0409	−.1951		−.3020	.2032	−.3689	.3000	−.4233
32	.412	0.000	−.0339	.0253	−.0055	−.0176	.0308	−.0472	.0846	−.0855		−.1295	.2765	−.1576	.3976	−.2187
33	.412	.236	−.0506	.0060	−.0244	−.0343	.0121	−.0625	.0832	−.1020		−.1663	.2712	−.2086	.3946	−.2678
34	.412	.471	−.0949	−.0019	−.0446	−.0550	.0045	−.1063	.0728	−.1624		−.2368	.2547	−.3016	.3731	−.3705
35	.412	.647	−.0920	−.0109	−.0502	−.0558	−.0058	−.1014	.0543	−.1653		−.2692	.2255	−.3485	.3357	−.4202
36	.412	.764	−.0850	−.0170	−.0441	−.0486	−.0133	−.0955	.0419	−.1931		−.3163	.2010	−.3899	.3058	−.4397
37	.412	.882	−.0928	−.0214	−.0346	−.0389	−.0203	−.1111	.0194	−.2318		−.3332	.1557	−.3932	.2534	−.4379
38	.264	0.000	−.0031	.0234	.0076	.0015	.0309	−.0102	.0743	−.0429		−.1057	.2518	−.1511	.3773	−.2199
39	.264	.236	−.0094	.0223	.0079	.0006	.0288	−.0179	.0733	−.0569		−.1223	.2471	−.1685	.3706	−.2334
40	.264	.471	−.0228	.0174	.0027	−.0067	.0238	−.0334	.0659	−.0799		−.1579	.2294	−.2148	.3473	−.2932
41	.264	.647	−.0489	.0054	−.0095	−.0175	.0107	−.0617	.0509	−.1437		−.2738	.1995	−.3626	.3092	−.4357
42	.264	.764	−.0745	.0004	−.0124	−.0206	.0055	−.0901	.0397	−.2160		−.3405	.1795	−.4045	.2840	−.4487
43	.264	.882	−.1228	−.0007	−.0105	−.0216	.0027	−.1420	.0193	−.2524		−.3473	.1367	−.3997	.2330	−.4450
44	.146	0.000	−.0008	.0161	.0061	.0020	.0213	−.0058	.0643	−.0376		−.1009	.2337	−.1522	.3596	−.2338
45	.146	.236	−.0031	.0137	.0081	.0032	.0195	−.0080	.0656	−.0447		−.1143	.2302	−.1749	.3545	−.2495
46	.146	.471	−.0072	.0156	.0130	.0079	.0213	−.0123	.0595	−.0647		−.1584	.2153	−.2417	.3341	−.3181
47	.146	.647														
48	.146	.764	−.0625	.0223	.0147	.0083	.0274	−.0798	.0445	−.2218		−.3303	.1651	−.3882	.2716	−.4202
49	.146	.882	−.1208	.0168	.0079	−.0002	.0217	−.1394	.0299	−.2403		−.3170	.1228	−.3676	.2201	−.4098
50	.088	0.000	−.2741	−.2799	−.2687	−.2707	−.2776	−.2745	−.2559	−.2901		−.3250	−.1695	−.3607	−.1109	−.4039
51	.088	.236	−.2840	−.2841	−.2862	−.2862	−.2822	−.2797	−.2648	−.2973		−.3366	−.1750	−.3737	−.1163	−.4180
52	.088	.471	−.2844	−.2682	−.2654	−.2640	−.2677	−.2811	−.2547	−.3293		−.3814	−.1730	−.4257	−.1126	−.4433
53	.088	.764	−.0699	.0026	.0001	−.0033	.0067	−.0855	.0306	−.2309		−.3399	.1353	−.3967	.2087	−.4251
54	.059	0.000	−.2835	−.2925	−.2823	−.2820	−.2910	−.2819	−.2521	−.2998		−.3345	−.1784	−.3712	−.1193	−.4124
55	.059	.236	−.2920	−.2942	−.2950	−.2952	−.2920	−.2919	−.2689	−.3102		−.3483	−.1809	−.3847	−.1212	−.4240
56	.059	.471	−.2827	−.2571	−.2529	−.2532	−.2561	−.2828	−.2411	−.3279		−.3885	−.1534	−.4238	−.0831	−.4276
57	.059	.647	−.3128	−.2618	−.2942	−.2942	−.2564	−.3155	−.2330	−.3523		−.4012	−.1345	−.4102	−.0573	−.4231
58	.059	.882	−.1144	−.0162	−.0142	−.0147	−.0124	−.1283	.0023	−.2221		−.2991	.0730	−.3497	.1206	−.3836
59	.029	0.000	−.2745	−.2686	−.2624	−.2638	−.2653	−.2739	−.2212	−.2926		−.3221	−.1816	−.3494	−.1202	−.3818
60	.029	.236	−.2649	−.2567	−.2511	−.2522	−.2542	−.2656	−.2451	−.2911		−.3240	−.1814	−.3543	−.1192	−.3942
61	.029	.471	−.2725	−.2493	−.2492	−.2487	−.2466	−.2733	−.2347	−.3074		−.3508	−.1480	−.3919	−.0716	−.4179
62	.029	.764	−.3500	−.3147	−.3217	−.3241	−.3118	−.3489	−.2825	−.3631		−.3774	−.2089	−.3886	−.0993	−.3917
63	.854	−.471	−.1913	−.1030	−.1384	−.1465	−.0942	−.2037	−.0412	−.2666		−.3360	.1859	−.3834	.3145	−.4257
64	.146	−.471	−.0037	.0109	.0126	.0065	.0187	−.0098	.0551	−.0621		−.1561	.2157	−.2342	.3296	−.3121

TABLE III.–Continued
(a) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	1.4591	−.4635	1.5149	−.4987	1.5511	−.5125	1.5782	−.5018	1.5814	−.4776	1.5732		1.5374	
2	.971	.236	1.4562	−.4669	1.5109	−.5056	1.5508	−.5195	1.5760	−.5058	1.5781	−.4779	1.5694		1.5337	
3	.971	.471	1.4345	−.4585	1.4920	−.5039	1.5332	−.5198	1.5601	−.5057	1.5644	−.4767	1.5573		1.5217	
4	.971	.764	1.3031	−.4298	1.3736	−.4927	1.4298	−.5157	1.4693	−.5046	1.4897	−.4737	1.4895		1.4653	
5	.941	0.000	1.2937	−.4093	1.3820	−.4835	1.4566	−.5136	1.5216	−.5040	1.5635	−.4776	1.5874		1.5826	
6	.941	.236	1.2856	−.4071	1.3734	−.4821	1.4510	−.5142	1.5150	−.5034	1.5568	−.4770	1.5818		1.5768	
7	.941	.471	1.2518	−.3999	1.3401	−.4748	1.4196	−.5103	1.4866	−.5033	1.5321	−.4769	1.5589		1.5548	
8	.941	.647	1.1415	−.3938	1.2388	−.4683	1.3298	−.5100	1.4071	−.5030	1.4633	−.4755	1.4997		1.5063	
9	.941	.882	.8088	−.4585	.9245	−.4942	1.0277	−.5107	1.1233	−.5028	1.2018	−.4725	1.2570		1.2862	
10	.912	0.000	1.0923	−.3827	1.2096	−.4579	1.3205	−.5067	1.4237	−.5022	1.5004	−.4773	1.5559		1.5792	
11	.912	.236	1.0846	−.3815	1.1989	−.4565	1.3118	−.5060	1.4154	−.5021	1.4924	−.4773	1.5486		1.5714	
12	.912	.471	1.0339	−.3790	1.1508	−.4521	1.2659	−.5035	1.3711	−.5018	1.4542	−.4769	1.5126		1.5377	
13	.912	.764	.7623	−.4575	.9375	−.4916	1.0748	−.5086	1.1614	−.5023	1.2430	−.4755	1.3119		1.3599	
14	.854	0.000	.8786	−.4764	.9739	−.4819	1.1014	−.4960	1.2401	−.4965	1.3542	−.4760	1.4454		1.5084	
15	.854	.236														
16	.854	.471	.8395	−.4695	.9264	−.4856	1.0528	−.4995	1.1891	−.5009	1.3029	−.4786	1.3924		1.4541	
17	.854	.647	.7419	−.4627	.8790	−.4883	.9960	−.5036	1.1161	−.5016	1.2223	−.4779	1.3044		1.3660	
18	.854	.764	.6895	−.4229	.8187	−.4664	.9424	−.5030	1.0597	−.5014	1.1618	−.4772	1.2419		1.3022	
19	.854	.882	.6054	−.4157	.7306	−.4628	.8463	−.4903	.9549	−.4949	1.0506	−.4752	1.1250		1.1825	
20	.736	0.000	.6972	−.4583	.8425	−.4834	.9816	−.5009	1.1207	−.5021	1.2408	−.4798	1.3438		1.4264	
21	.736	.236	.6880	−.4578	.8333	−.4839	.9714	−.5010	1.1094	−.5023	1.2293	−.4802	1.3313		1.4129	
22	.736	.471	.6550	−.4536	.7962	−.4816	.9316	−.5012	1.0658	−.5022	1.1820	−.4798	1.2814		1.3598	
23	.736	.647	.6062	−.3675	.7392	−.4203	.8643	−.4767	.9904	−.4958	1.1022	−.4779	1.1970		1.2730	
24	.736	.764	.5641	−.4142	.6929	−.4604	.8152	−.4847	.9359	−.4896	1.0435	−.4752	1.1351		1.2083	
25	.736	.882	.4967	−.4494	.6133	−.4813	.7272	−.4998	.8378	−.4862	.9362	−.4737	1.0212		1.0911	
26	.588	0.000	.5995	−.4402	.7434	−.4739	.8833	−.5002	1.0228	−.5030	1.1435	−.4777	1.2531		1.3444	
27	.588	.236	.5918	−.4246	.7344	−.4746	.8736	−.4997	1.0124	−.5021	1.1331	−.4764	1.2409		1.3316	
28	.588	.471	.5632	−.3983	.6988	−.4440	.8356	−.4739	.9690	−.4953	1.0867	−.4717	1.1899		1.2792	
29	.588	.647	.5153	−.4343	.6454	−.4748	.7721	−.4948	.8975	−.4735	1.0084	−.4628	1.1069		1.1913	
30	.588	.764	.4799	−.4614	.6031	−.4892	.7270	−.5026	.8472	−.4685	.9537	−.4602	1.0475		1.1306	
31	.588	.882	.4116	−.4599	.5273	−.4865	.6423	−.5025	.7550	−.4707	.8516	−.4599	.9390		1.0170	
32	.412	0.000	.5335	−.2854	.6734	−.3696	.8135	−.4512	.9467	−.4605	1.0639	−.4453	1.1686		1.2639	
33	.412	.236	.5280	−.3244	.6669	−.3989	.8059	−.4514	.9380	−.4569	1.0538	−.4435	1.1588		1.2543	
34	.412	.471	.5014	−.4271	.6359	−.4671	.7695	−.4895	.8975	−.4570	1.0093	−.4413	1.1097		1.2022	
35	.412	.647	.4642	−.4670	.5882	−.4926	.7120	−.5026	.8332	−.4598	.9374	−.4442	1.0312		1.1175	
36	.412	.764	.4215	−.4711	.5421	−.4919	.6641	−.5025	.7806	−.4606	.8809	−.4420	.9722		1.0567	
37	.412	.882	.3594	−.4698	.4720	−.4922	.5843	−.5022	.6926	−.4604	.7867	−.4408	.8705		.9498	
38	.264	0.000	.5086	−.2902	.6458	−.3536	.7771	−.3728	.8926	−.3260	.9922	−.4041	1.0860		1.1796	
39	.264	.236	.5013	−.3016	.6375	−.3612	.7684	−.3966	.8834	−.3613	.9828	−.4119	1.0749		1.1686	
40	.264	.471	.4743	−.3627	.6058	−.4266	.7332	−.4767	.8442	−.4276	.9390	−.4237	1.0284		1.1222	
41	.264	.647	.4267	−.4716	.5506	−.4909	.6706	−.4965	.7752	−.4475	.8660	−.4305	.9515		1.0387	
42	.264	.764	.3948	−.4730	.5140	−.4895	.6301	−.4970	.7310	−.4480	.8192	−.4278	.9009		.9858	
43	.264	.882	.3346	−.4717	.4456	−.4900	.5538	−.4980	.6469	−.4476	.7285	−.4252	.8045		.8866	
44	.146	0.000	.4859	−.3129	.6095	−.3756	.7038	−.3989	.7815	−.3490	.8491	−.3959	.9139		.9964	
45	.146	.236	.4785	−.3256	.5998	−.3849	.6951	−.4120	.7734	−.3987	.8402	−.4025	.9054		.9882	
46	.146	.471	.4538	−.3786	.5735	−.4230	.6654	−.4370	.7413	−.4362	.8082	−.4131	.8729		.9600	
47	.146	.647														
48	.146	.764	.3787	−.4443	.4887	−.4678	.5739	−.4835	.6439	−.4388	.7076	−.4152	.7740		.8761	
49	.146	.882	.3190	−.4477	.4211	−.4715	.5016	−.4856	.5688	−.4367	.6298	−.4120	.6966		.7972	
50	.088	0.000	−.0558	−.4427	−.0091	−.4653	.0235	−.4599	.0588	−.4566	.1130	−.4098	.2789		.4677	
51	.088	.236	−.0621	−.4554	−.0155	−.4561	.0168	−.4521	.0524	−.4464	.1526	−.4100	.2833		.4762	
52	.088	.471	−.0560	−.4324	−.0057	−.4382	.0331	−.4429	.0891	−.4369	.1778	−.4104	.2715		.4933	
53	.088	.764	.2790	−.4301	.3401	−.4372	.3925	−.4584	.4416	−.4310	.4995	−.4085	.6276		.7906	
54	.059	0.000	−.0596	−.4342	−.0029	−.4470	.0458	−.4529	.1081	−.4396	.2157	−.3867	.3450		.8144	
55	.059	.236	−.0617	−.4354	−.0045	−.4492	.0478	−.4498	.1226	−.4357	.2186	−.3913	.3831		.8229	
56	.059	.471	−.0165	−.4351	.0493	−.4396	.1047	−.4406	.1700	−.4251	.2323	−.3983	.6231		.8014	
57	.059	.647	.0131	−.4204	.0820	−.4282	.1465	−.4371	.2291	−.4256	.3485	−.4032	.6134		.7608	
58	.059	.882	.1765	−.3903	.2293	−.4215	.2794	−.4502	.3400	−.4252	.4231	−.4008	.5921		.7073	
59	.029	0.000	−.0560	−.4099	.0089	−.4185	.0715	−.4435	.1574	−.4132	.2727	−.3670	.7091		.7539	
60	.029	.236	−.0538	−.4165	.0145	−.4308	.0849	−.4436	.1729	−.4182	.2374	−.3754	.7059		.7501	
61	.029	.471	.0013	−.4268	.0775	−.4363	.1438	−.4394	.2318	−.4189	.4233	−.3899	.6848		.7357	
62	.029	.764	−.0102	−.4022	.0737	−.4166	.0806	−.4267	.1386	−.4209	.2870	−.3986	.6319		.6964	
63	.854	−.471	.8460	−.4618	.9251	−.4746	1.0504	−.4875	1.1836	−.4895	1.2991	−.4710	1.3911		1.4542	
64	.146	−.471	.4509	−.3721	.5721	−.4156	.6652	−.4431	.7405	−.4332	.8092	−.4116	.8743		.9618	

TABLE III.—Continued
(b) M = 2.16

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	.2538	.6192	.4142	.4208	.6251	.2561	.9594	.1278	1.2175	.0305	1.3714	−.0581	1.4707	−.1461
2	.971	.236	.2544	.6196	.4142	.4211	.6231	.2600	.9555	.1272	1.2099	.0300	1.3647	−.0581	1.4659	−.1470
3	.971	.471	.2560	.6213	.4157	.4199	.6238	.2595	.9397	.1268	1.1779	.0294	1.3336	−.0558	1.4396	−.1410
4	.971	.764	.2519	.6099	.4086	.4153	.6156	.2562	.8484	.1264	1.0349	.0235	1.1801	−.0532	1.2941	−.1279
5	.941	0.000	.2471	.6114	.4080	.4167	.6177	.2510	.9134	.1211	1.0746	.0172	1.1981	−.0568	1.2907	−.1273
6	.941	.236	.2477	.6124	.4075	.4162	.6159	.2522	.9055	.1208	1.0641	.0179	1.1880	−.0571	1.2816	−.1268
7	.941	.471	.2496	.6121	.4085	.4148	.6143	.2536	.8724	.1204	1.0235	.0170	1.1463	−.0581	1.2433	−.1254
8	.941	.647	.2444	.5904	.3999	.4057	.5964	.2481	.7870	.1172	.9196	.0129	1.0354	−.0625	1.1322	−.1261
9	.941	.882	−.0618	.0578	−.0116	−.0103	.0588	−.0586	.1753	−.1099	.3173	−.1531	.4949	−.1879	.7043	−.2157
10	.912	0.000	.2424	.6035	.4007	.4101	.6069	.2467	.8557	.1164	.9477	.0095	1.0355	−.0639	1.1081	−.1275
11	.912	.236	.2426	.6037	.4012	.4090	.6060	.2473	.8413	.1162	.9354	.0103	1.0239	−.0649	1.0984	−.1270
12	.912	.471	.2411	.5909	.3972	.4036	.5936	.2462	.7814	.1142	.8754	.0081	.9653	−.0676	1.0434	−.1289
13	.912	.764	−.0933	.0179	−.0459	−.0438	.0182	−.0907	.1212	−.1348	.2368	−.1723	.3133	−.2038	.3847	−.2284
14	.854	0.000	−.0641	.1283	.0180	.0246	.1299	−.0608	.2219	−.1270	.2757	−.1748	.3612	−.2104	.4839	−.2359
15	.854	.236														
16	.854	.471	−.0837	.0561	−.0159	−.0115	.0578	−.0806	.1172	−.1380	.1679	−.1820	.2421	−.2164	.3604	−.2402
17	.854	.647	−.0975	.0044	−.0541	−.0523	.0062	−.0949	.0975	−.1385	.1730	−.1773	.2304	−.2090	.4597	−.2331
18	.854	.764	−.0716	.0632	−.0120	−.0100	.0650	−.0689	.1799	−.1212	.3031	−.1661	.4157	−.2022	.4979	−.2285
19	.854	.882	.0110	.0839	.0248	.0254	.0886	.0091	.1851	−.0537	.2842	−.1134	.3747	−.1624	.4601	−.2006
20	.736	0.000	−.0736	.1045	.0077	.0149	.1052	−.0689	.1551	−.1355	.2258	−.1858	.3253	−.2192	.4758	−.2435
21	.736	.236	−.0841	.0570	−.0167	−.0110	.0580	−.0804	.1169	−.1398	.2034	−.1866	.3330	−.2177	.5015	−.2410
22	.736	.471	−.0914	.0331	−.0359	−.0322	.0341	−.0876	.1226	−.1369	.2292	−.1808	.3650	−.2117	.5044	−.2352
23	.736	.647	−.1002	.0530	−.0331	−.0274	.0553	−.0966	.1498	−.1471	.2337	−.1951	.3385	−.2129	.4703	−.2257
24	.736	.764	−.0055	.0606	.0224	.0174	.0646	−.0028	.1325	−.0660	.2130	−.1209	.3135	−.1680	.4426	−.2052
25	.736	.882	−.0149	.0523	.0301	.0271	.0567	−.0128	.1108	−.0864	.1757	−.1609	.2710	−.2054	.3920	−.2300
26	.588	0.000	−.0995	−.0105	−.0554	−.0514	−.0104	−.0961	.0657	−.1410	.1869	−.1727	.3267	−.2057	.4598	−.2315
27	.588	.236	−.0880	.0234	−.0353	−.0304	.0227	−.0842	.0909	−.1330	.1877	−.1720	.3137	−.2060	.4539	−.2316
28	.588	.471	−.0738	.0500	−.0201	−.0145	.0499	−.0701	.1131	−.1017	.1896	−.1407	.2899	−.1856	.4291	−.2205
29	.588	.647	−.0294	.0540	.0149	.0135	.0558	−.0276	.1092	−.0841	.1805	−.1396	.2690	−.1825	.3915	−.2177
30	.588	.764	−.0307	.0475	.0116	.0123	.0506	−.0284	.1007	−.0891	.1704	−.1518	.2548	−.2018	.3653	−.2331
31	.588	.882	−.0357	.0381	.0159	.0143	.0402	−.0319	.0788	−.1193	.1423	−.1834	.2225	−.2153	.3217	−.2357
32	.412	0.000	−.0748	.0121	−.0362	−.0331	.0102	−.0734	.0873	−.1176	.1756	−.1605	.2827	−.1875	.4024	−.2105
33	.412	.236	−.0799	.0091	−.0394	−.0355	.0067	−.0784	.0815	−.1143	.1719	−.1507	.2810	−.1845	.3995	−.2129
34	.412	.471	−.0465	.0140	−.0095	−.0084	.0119	−.0448	.0689	−.0932	.1588	−.1413	.2674	−.1818	.3820	−.2165
35	.412	.647	−.0390	.0298	.0065	.0072	.0261	−.0380	.0641	−.0962	.1374	−.1560	.2408	−.2068	.3507	−.2370
36	.412	.764	−.0403	.0312	.0080	.0095	.0273	−.0382	.0577	−.1114	.1209	−.1792	.2199	−.2227	.3268	−.2432
37	.412	.882	−.0567	.0281	.0100	.0108	.0229	−.0514	.0460	−.1411	.0961	−.1925	.1852	−.2230	.2838	−.2423
38	.264	0.000	−.0485	.0206	−.0272	−.0234	.0180	−.0496	.0776	−.0803	.1568	−.1086	.2573	−.1421	.3787	−.1800
39	.264	.236	−.0443	.0197	−.0230	−.0249	.0163	−.0450	.0763	−.0866	.1544	−.1279	.2531	−.1613	.3740	−.1903
40	.264	.471	−.0513	.0136	−.0210	−.0200	.0101	−.0517	.0691	−.0941	.1449	−.1442	.2393	−.1917	.3561	−.2252
41	.264	.647	−.0441	.0067	−.0136	−.0141	.0022	−.0423	.0531	−.1051	.1265	−.1704	.2148	−.2199	.3243	−.2452
42	.264	.764	−.0462	.0046	−.0043	−.0056	.0012	−.0423	.0425	−.1281	.1143	−.1953	.1994	−.2297	.3043	−.2462
43	.264	.882	−.0704	.0010	.0068	.0043	.0002	−.0637	.0248	−.1502	.0894	−.1982	.1679	−.2290	.2652	−.2459
44	.146	0.000	−.0231	.0131	−.0195	−.0264	.0109	−.0310	.0655	−.0505	.1446	−.0841	.2423	−.1292	.3580	−.1719
45	.146	.236	−.0286	.0170	−.0083	−.0106	.0141	−.0321	.0651	−.0641	.1430	−.0992	.2390	−.1413	.3539	−.1791
46	.146	.471	−.0466	.0146	−.0140	−.0131	.0115	−.0467	.0588	−.0963	.1334	−.1449	.2274	−.1922	.3385	−.2267
47	.146	.647														
48	.146	.764	−.0543	.0039	−.0108	−.0101	.0035	−.0497	.0399	−.1410	.1040	−.2022	.1901	−.2320	.2925	−.2411
49	.146	.882	−.0808	−.0029	−.0029	−.0009	−.0017	−.0745	.0236	−.1557	.0797	−.2019	.1593	−.2316	.2555	−.2423
50	.088	0.000	−.1395	−.1590	−.1431	−.1512	−.1603	−.1387	−.1399	−.1641	−.0977	−.1900	−.0461	−.2152	.0165	−.2353
51	.088	.236	−.1778	−.1692	−.1769	−.1811	−.1706	−.1805	−.1448	−.1879	−.1018	−.2069	−.0496	−.2279	.0111	−.2488
52	.088	.471	−.1897	−.1637	−.1652	−.1675	−.1645	−.1893	−.1431	−.2049	−.1023	−.2098	−.0505	−.2487	.0108	−.2461
53	.088	.764	−.0614	.0045	−.0103	−.0078	.0048	−.0570	.0332	−.1497	.0899	−.2064	.1722	−.2309	.2682	−.2419
54	.059	0.000	−.1564	−.1669	−.1636	−.1668	−.1666	−.1579	−.1486	−.1703	−.1069	−.1941	−.0556	−.2189	.0064	−.2370
55	.059	.236	−.1833	−.1714	−.1874	−.1908	−.1708	−.1861	−.1513	−.1968	−.1092	−.2127	−.0568	−.2339	.0049	−.2444
56	.059	.471	−.1860	−.1624	−.1661	−.1683	−.1628	−.1830	−.1401	−.1871	−.0979	−.2040	−.0430	−.2339	.0230	−.2415
57	.059	.647	−.1870	−.1667	−.1838	−.1825	−.1670	−.1782	−.1394	−.1854	−.0942	−.2026	−.0352	−.2330	.0379	−.2397
58	.059	.882	−.0928	.0070	−.0098	−.0052	.0061	−.0878	.0175	−.1627	.0627	−.1994	.1352	−.2277	.2176	−.2424
59	.029	0.000	−.1713	−.1502	−.1618	−.1540	−.1499	−.1721	−.1509	−.1804	−.1112	−.1929	−.0597	−.2077	.0029	−.2215
60	.029	.236	−.1733	−.1517	−.1686	−.1694	−.1509	−.1742	−.1527	−.1786	−.1129	−.1922	−.0604	−.2142	.0020	−.2332
61	.029	.471	−.1767	−.1594	−.1674	−.1693	−.1598	−.1741	−.1416	−.1845	−.0991	−.2045	−.0429	−.2299	.0251	−.2413
62	.029	.764	−.1786	−.1841	−.1978	−.1963	−.1848	−.1749	−.1629	−.1807	−.1235	−.1994	−.0747	−.2263	−.0191	−.2363
63	.854	−.471	−.0704	.0617	−.0049	−.0066	.0680	−.0755	.1258	−.1327	.1738	−.1742	.2455	−.2069	.3635	−.2287
64	.146	−.471	−.0434	.0127	−.0113	−.0124	.0143	−.0447	.0613	−.0930	.1346	−.1387	.2282	−.1820	.3410	−.2167

TABLE III.—Continued
(b) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	1.5440	−.2140	1.6019	−.2501	1.6505	−.2681	1.6879	−.2681	1.7071	−.2667	1.7073	−.2646	1.6897	−.2634
2	.971	.236	1.5398	−.2166	1.5991	−.2567	1.6491	−.2780	1.6865	−.2779	1.7050	−.2749	1.7041	−.2715	1.6913	−.2702
3	.971	.471	1.5161	−.2104	1.5800	−.2534	1.6367	−.2768	1.6746	−.2776	1.6949	−.2747	1.6926	−.2714	1.6846	−.2702
4	.971	.764	1.3811	−.1946	1.4575	−.2428	1.5305	−.2721	1.5853	−.2765	1.6207	−.2744	1.6293	−.2711	1.6334	−.2692
5	.941	0.000	1.3688	−.1893	1.4449	−.2362	1.5261	−.2676	1.6020	−.2748	1.6626	−.2740	1.7028	−.2711	1.7192	−.2702
6	.941	.236	1.3606	−.1879	1.4373	−.2353	1.5200	−.2673	1.5964	−.2749	1.6571	−.2741	1.6963	−.2711	1.7171	−.2699
7	.941	.471	1.3249	−.1854	1.4038	−.2315	1.4912	−.2639	1.5697	−.2727	1.6327	−.2725	1.6724	−.2698	1.6993	−.2694
8	.941	.647	1.2143	−.1832	1.2982	−.2292	1.3935	−.2627	1.4842	−.2734	1.5586	−.2735	1.6102	−.2707	1.6486	−.2695
9	.941	.882	.8416	−.2413	.9551	−.2594	1.0741	−.2738	1.1847	−.2746	1.2850	−.2738	1.3604	−.2705	1.4173	−.2689
10	.912	0.000	1.1725	−.1825	1.2500	−.2263	1.3598	−.2600	1.4727	−.2729	1.5725	−.2737	1.6499	−.2707	1.7013	−.2704
11	.912	.236	1.1646	−.1815	1.2413	−.2250	1.3520	−.2581	1.4640	−.2701	1.5638	−.2712	1.6403	−.2688	1.6952	−.2680
12	.912	.471	1.1121	−.1820	1.1926	−.2244	1.3043	−.2573	1.4202	−.2716	1.5243	−.2728	1.6032	−.2701	1.6620	−.2700
13	.912	.764	.6616	−.2493	.8792	−.2637	1.0419	−.2749	1.2086	−.2749	1.3059	−.2739	1.3956	−.2707	1.4720	−.2697
14	.854	0.000	.6418	−.2540	.9981	−.2649	1.1094	−.2690	1.2521	−.2693	1.3922	−.2696	1.5099	−.2674	1.6057	−.2667
15	.854	.236														
16	.854	.471	.5507	−.2579	.9610	−.2694	1.0681	−.2739	1.2009	−.2734	1.3401	−.2731	1.4573	−.2702	1.5510	−.2696
17	.854	.647	.6374	−.2526	.8662	−.2652	1.0258	−.2729	1.1457	−.2738	1.2658	−.2735	1.3738	−.2706	1.4636	−.2701
18	.854	.764	.5947	−.2494	.8218	−.2634	.9637	−.2727	1.0925	−.2739	1.2124	−.2738	1.3159	−.2707	1.4014	−.2700
19	.854	.882	.5553	−.2293	.7419	−.2493	.8786	−.2646	.9995	−.2719	1.1131	−.2727	1.2072	−.2699	1.2879	−.2694
20	.736	0.000	.6825	−.2600	.8373	−.2658	.9892	−.2713	1.1314	−.2736	1.2744	−.2740	1.4017	−.2711	1.5077	−.2707
21	.736	.236	.6772	−.2578	.8269	−.2654	.9788	−.2714	1.1211	−.2736	1.2628	−.2743	1.3892	−.2713	1.4952	−.2707
22	.736	.471	.6481	−.2544	.7949	−.2650	.9421	−.2709	1.0816	−.2735	1.2183	−.2739	1.3409	−.2708	1.4439	−.2705
23	.736	.647	.6036	−.2433	.7443	−.2584	.8842	−.2701	1.0159	−.2729	1.1448	−.2735	1.2585	−.2707	1.3584	−.2703
24	.736	.764	.5723	−.2336	.7039	−.2524	.8398	−.2657	.9680	−.2721	1.0921	−.2730	1.2019	−.2702	1.2976	−.2701
25	.736	.882	.5136	−.2480	.6395	−.2607	.7618	−.2704	.8837	−.2732	.9968	−.2735	1.1004	−.2707	1.1891	−.2702
26	.588	0.000	.6003	−.2511	.7495	−.2632	.8948	−.2714	1.0381	−.2739	1.1814	−.2747	1.3138	−.2716	1.4220	−.2709
27	.588	.236	.5957	−.2510	.7425	−.2627	.8868	−.2705	1.0282	−.2735	1.1708	−.2741	1.3020	−.2711	1.4105	−.2707
28	.588	.471	.5698	−.2441	.7124	−.2620	.8514	−.2705	.9900	−.2730	1.1273	−.2736	1.2540	−.2708	1.3610	−.2700
29	.588	.647	.5285	−.2442	.6647	−.2595	.7973	−.2691	.9262	−.2727	1.0571	−.2733	1.1749	−.2704	1.2770	−.2703
30	.588	.764	.4975	−.2527	.6291	−.2642	.7565	−.2731	.8824	−.2736	1.0081	−.2740	1.1219	−.2710	1.2207	−.2705
31	.588	.882	.4419	−.2527	.5646	−.2634	.6843	−.2724	.8006	−.2732	.9185	−.2736	1.0244	−.2707	1.1166	−.2704
32	.412	0.000	.5436	−.2379	.6820	−.2561	.8286	−.2680	.9717	−.2715	1.1158	−.2726	1.2438	−.2702	1.3498	−.2696
33	.412	.236	.5363	−.2419	.6755	−.2526	.8225	−.2618	.9634	−.2647	1.1056	−.2660	1.2334	−.2643	1.3393	−.2637
34	.412	.471	.5156	−.2422	.6504	−.2546	.7910	−.2655	.9257	−.2684	1.0641	−.2695	1.1885	−.2671	1.2903	−.2668
35	.412	.647	.4831	−.2534	.6150	−.2580	.7444	−.2679	.8685	−.2728	.9989	−.2738	1.1158	−.2713	1.2120	−.2707
36	.412	.764	.4514	−.2516	.5744	−.2574	.6994	−.2675	.8220	−.2730	.9470	−.2740	1.0606	−.2716	1.1536	−.2708
37	.412	.882	.4022	−.2510	.5158	−.2570	.6315	−.2674	.7446	−.2730	.8629	−.2738	.9686	−.2712	1.0551	−.2709
38	.264	0.000	.5189	−.2119	.6543	−.2447	.7961	−.2613	.9393	−.2651	1.0758	−.2666	1.1892	−.2646	1.2799	−.2645
39	.264	.236	.5116	−.2142	.6466	−.2451	.7875	−.2619	.9308	−.2663	1.0662	−.2676	1.1781	−.2656	1.2687	−.2660
40	.264	.471	.4881	−.2437	.6186	−.2517	.7551	−.2625	.8942	−.2666	1.0252	−.2680	1.1342	−.2663	1.2226	−.2661
41	.264	.647	.4488	−.2492	.5710	−.2565	.7000	−.2672	.8325	−.2731	.9559	−.2744	1.0596	−.2722	1.1438	−.2720
42	.264	.764	.4234	−.2492	.5410	−.2564	.6653	−.2667	.7947	−.2729	.9126	−.2738	1.0127	−.2716	1.0939	−.2719
43	.264	.882	.3751	−.2490	.4849	−.2566	.6005	−.2670	.7213	−.2732	.8305	−.2742	.9247	−.2718	1.0003	−.2715
44	.146	0.000	.4922	−.2115	.6292	−.2372	.7688	−.2551	.8916	−.2650	.9853	−.2692	1.0594	−.2669	1.1193	−.2670
45	.146	.236	.4850	−.2132	.6215	−.2421	.7614	−.2607	.8831	−.2676	.9767	−.2705	1.0499	−.2684	1.1096	−.2677
46	.146	.471	.4641	−.2465	.5970	−.2552	.7333	−.2649	.8515	−.2688	.9447	−.2716	1.0167	−.2698	1.0769	−.2689
47	.146	.647														
48	.146	.764	.4079	−.2474	.5275	−.2543	.6500	−.2634	.7580	−.2657	.8460	−.2687	.9147	−.2672	.9741	−.2667
49	.146	.882	.3610	−.2490	.4734	−.2567	.5860	−.2654	.6886	−.2682	.7728	−.2727	.8385	−.2704	.8962	−.2689
50	.088	0.000	.0822	−.2433	.1492	−.2614	.2119	−.2596	.2614	−.2667	.3037	−.2710	.3513	−.2680	.4797	−.2656
51	.088	.236	.0760	−.2515	.1429	−.2558	.2056	−.2590	.2543	−.2669	.2980	−.2699	.3634	−.2668	.4853	−.2642
52	.088	.471	.0764	−.2484	.1459	−.2561	.2120	−.2596	.2693	−.2670	.3317	−.2703	.4192	−.2678	.4765	−.2663
53	.088	.764	.3600	−.2486	.4501	−.2562	.5294	−.2632	.6036	−.2669	.6606	−.2724	.7162	−.2694	.8101	−.2672
54	.059	0.000	.0730	−.2357	.1439	−.2516	.2163	−.2561	.2816	−.2631	.3492	−.2684	.4465	−.2651	.5183	−.2623
55	.059	.236	.0703	−.2468	.1422	−.2543	.2139	−.2592	.2811	−.2667	.3571	−.2701	.4561	−.2663	.5109	−.2642
56	.059	.471	.0982	−.2455	.1773	−.2539	.2578	−.2544	.3299	−.2616	.4073	−.2652	.4651	−.2630	.7303	−.2620
57	.059	.647	.1215	−.2470	.2040	−.2558	.2864	−.2582	.3673	−.2631	.4549	−.2678	.5621	−.2661	.6964	−.2649
58	.059	.882	.2838	−.2483	.3587	−.2564	.4264	−.2603	.4953	−.2665	.5592	−.2708	.6343	−.2681	.7615	−.2653
59	.029	0.000	.0705	−.2255	.1441	−.2406	.2225	−.2499	.2978	−.2589	.3856	−.2658	.5044	−.2620	.9085	−.2614
60	.029	.236	.0695	−.2419	.1446	−.2479	.2241	−.2556	.3062	−.2635	.4011	−.2672	.4984	−.2638	.8922	−.2632
61	.029	.471	.1048	−.2420	.1877	−.2537	.2748	−.2525	.3540	−.2599	.4490	−.2648	.6064	−.2628	.8724	−.2627
62	.029	.764	.0747	−.2447	.1702	−.2531	.2649	−.2552	.2920	−.2606	.3871	−.2665	.4936	−.2640	.7694	−.2633
63	.854	−.471	.5532	−.2448	.9604	−.2547	1.0610	−.2587	1.1974	−.2578	1.3372	−.2582	1.4562	−.2561	1.5513	−.2555
64	.146	−.471	.4674	−.2379	.5982	−.2473	.7311	−.2566	.8532	−.2595	.9465	−.2622	1.0184	−.2613	1.0794	−.2608

TABLE III.–Continued
(c) M = 2.86

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	.1862	.4770	.3071	.3164	.4570	.1859	.6506	.0880	.8998	.0157	1.2622	−.0230	1.4312	−.0470
2	.971	.236	.1875	.4810	.3099	.3199	.4609	.1881	.6539	.0889	.9016	.0162	1.2569	−.0245	1.4254	−.0485
3	.971	.471	.1874	.4805	.3101	.3204	.4612	.1891	.6532	.0888	.9000	.0163	1.2275	−.0268	1.3936	−.0487
4	.971	.764	.1866	.4773	.3086	.3192	.4591	.1884	.6498	.0883	.8844	.0157	1.1086	−.0319	1.2533	−.0543
5	.941	0.000	.1817	.4751	.3045	.3134	.4555	.1820	.6479	.0816	.8956	.0076	1.1622	−.0399	1.2835	−.0589
6	.941	.236	.1819	.4763	.3049	.3148	.4554	.1824	.6474	.0821	.8931	.0080	1.1502	−.0405	1.2717	−.0598
7	.941	.471	.1818	.4758	.3048	.3152	.4552	.1835	.6453	.0822	.8869	.0083	1.1092	−.0415	1.2287	−.0616
8	.941	.647	.1800	.4692	.3017	.3111	.4511	.1813	.6383	.0802	.8567	.0067	1.0181	−.0439	1.1279	−.0663
9	.941	.882	−.0362	.0615	−.0010	−.0007	.0566	−.0395	.1416	−.0717	.2559	−.0965	.4104	−.1141	.5702	−.1259
10	.912	0.000	.1780	.4680	.3007	.3083	.4505	.1780	.6401	.0780	.8802	.0041	1.0604	−.0471	1.1362	−.0693
11	.912	.236	.1780	.4697	.3010	.3094	.4504	.1785	.6393	.0783	.8758	.0043	1.0478	−.0477	1.1260	−.0699
12	.912	.471	.1767	.4661	.2991	.3074	.4478	.1775	.6342	.0769	.8566	.0036	.9893	−.0488	1.0717	−.0726
13	.912	.764	−.0520	.0553	−.0077	−.0073	.0506	−.0535	.1216	−.0876	.2085	−.1099	.3441	−.1246	.4562	−.1355
14	.854	0.000	−.0410	.0978	.0144	.0169	.0890	−.0413	.1929	−.0820	.3287	−.1092	.4060	−.1248	.4955	−.1355
15	.854	.236	−.0378	.0990	.0160	.0168	.0912	−.0413	.1946	−.0824	.3257	−.1093	.3946	−.1253	.4801	−.1362
16	.854	.471	−.0465	.0805	.0034	.0067	.0714	−.0465	.1571	−.0838	.2382	−.1101	.2952	−.1250	.3712	−.1359
17	.854	.647	−.0610	.0412	−.0191	−.0196	.0372	−.0634	.1049	−.0945	.1912	−.1150	.3005	−.1285	.3790	−.1387
18	.854	.764	−.0426	.0506	−.0060	−.0093	.0480	−.0457	.1334	−.0810	.2469	−.1055	.3775	−.1221	.4979	−.1338
19	.854	.882	−.0343	.0568	.0094	.0070	.0547	−.0365	.1289	−.0764	.2305	−.0931	.3569	−.1104	.4653	−.1255
20	.736	0.000	−.0507	.0891	.0058	.0079	.0835	−.0511	.1855	−.0914	.2951	−.1166	.3441	−.1319	.4419	−.1407
21	.736	.236	−.0527	.0802	.0012	.0033	.0730	−.0531	.1584	−.0920	.2394	−.1166	.3150	−.1316	.4403	−.1404
22	.736	.471	−.0562	.0421	−.0184	−.0191	.0376	−.0587	.1128	−.0913	.2147	−.1137	.3225	−.1290	.4559	−.1380
23	.736	.647	−.0511	.0420	−.0105	−.0136	.0402	−.0527	.1187	−.0877	.2189	−.1113	.3201	−.1265	.4320	−.1366
24	.736	.764	−.0463	.0462	−.0022	−.0050	.0452	−.0491	.1143	−.0879	.2041	−.1027	.2973	−.1145	.4083	−.1277
25	.736	.882	−.0153	.0436	.0109	.0069	.0438	−.0164	.1011	−.0636	.1807	−.1017	.2654	−.1243	.3667	−.1348
26	.588	0.000	−.0559	.0628	−.0053	−.0040	.0607	−.0560	.1200	−.0927	.1668	−.1142	.2676	−.1290	.4062	−.1348
27	.588	.236	−.0557	.0476	−.0136	−.0135	.0452	−.0566	.1202	−.0907	.1999	−.1128	.2778	−.1282	.4002	−.1343
28	.588	.471	−.0463	.0441	−.0064	−.0112	.0453	−.0531	.1203	−.0875	.2080	−.1108	.2832	−.1279	.3906	−.1342
29	.588	.647	−.0560	.0422	−.0060	−.0087	.0434	−.0583	.1082	−.0827	.1852	−.0864	.2711	−.1114	.3739	−.1273
30	.588	.764	−.0203	.0393	.0030	−.0018	.0406	−.0202	.0993	−.0634	.1780	−.0974	.2591	−.1227	.3581	−.1358
31	.588	.882	−.0269	.0307	.0094	.0052	.0335	−.0271	.0815	−.0805	.1539	−.1141	.2294	−.1296	.3248	−.1382
32	.412	0.000	−.0568	.0176	−.0250	−.0270	.0191	−.0569	.0807	−.0838	.1591	−.1062	.2552	−.1226	.3740	−.1322
33	.412	.236	−.0544	.0275	−.0155	−.0187	.0329	−.0539	.0868	−.0833	.1539	−.1057	.2522	−.1218	.3726	−.1314
34	.412	.471	−.0375	.0370	−.0033	−.0111	.0421	−.0486	.0986	−.0771	.1530	−.1024	.2414	−.1164	.3607	−.1308
35	.412	.647	−.0276	.0351	.0004	−.0052	.0381	−.0245	.0950	−.0645	.1553	−.0979	.2290	−.1214	.3394	−.1345
36	.412	.764	−.0277	.0309	.0064	.0026	.0358	−.0284	.0840	−.0716	.1493	−.1081	.2160	−.1273	.3201	−.1374
37	.412	.882	−.0361	.0235	.0102	.0043	.0292	−.0348	.0707	−.0890	.1326	−.1174	.1930	−.1302	.2857	−.1375
38	.264	0.000	−.0482	.0175	−.0177	−.0226	.0199	−.0495	.0789	−.0782	.1487	−.1035	.2393	−.1210	.3602	−.1321
39	.264	.236	−.0497	.0171	−.0183	−.0217	.0207	−.0497	.0761	−.0798	.1479	−.1043	.2377	−.1222	.3582	−.1320
40	.264	.471	−.0383	.0220	−.0096	−.0148	.0291	−.0412	.0739	−.0695	.1404	−.0952	.2290	−.1173	.3462	−.1316
41	.264	.647	−.0310	.0256	.0051	−.0021	.0320	−.0303	.0743	−.0708	.1300	−.1060	.2134	−.1259	.3239	−.1348
42	.264	.764	−.0301	.0239	.0066	.0021	.0303	−.0310	.0737	−.0802	.1226	−.1160	.1998	−.1278	.3068	−.1342
43	.264	.882	−.0469	.0182	.0103	.0045	.0258	−.0417	.0628	−.0942	.1070	−.1196	.1740	−.1280	.2737	−.1346
44	.146	0.000	−.0502	.0139	−.0235	−.0275	.0167	−.0528	.0725	−.0762	.1401	−.0918	.2281	−.1117	.3481	−.1294
45	.146	.236	−.0459	.0145	−.0213	−.0260	.0180	−.0493	.0730	−.0748	.1402	−.0996	.2272	−.1134	.3464	−.1282
46	.146	.471	−.0340	.0127	−.0071	−.0177	.0186	−.0369	.0682	−.0657	.1350	−.0971	.2205	−.1186	.3334	−.1297
47	.146	.647	−.0316	.0153	.0034	−.0013	.0237	−.0312	.0633	−.0733	.1247	−.1102	.2050	−.1262	.3137	−.1336
48	.146	.764	−.0316	.0153	.0034	−.0013	.0237	−.0312	.0633	−.0733	.1247	−.1102	.2050	−.1262	.3137	−.1336
49	.146	.882	−.0566	.0125	.0097	.0045	.0215	−.0485	.0524	−.0972	.0961	−.1172	.1681	−.1269	.2677	−.1339
50	.088	0.000	−.1002	−.0964	−.1042	−.1066	−.0949	−.1035	−.0743	−.1078	−.0420	−.1204	.0092	−.1308	.0743	−.1322
51	.088	.236	−.1168	−.1005	−.1066	−.1090	−.0991	−.1139	−.0780	−.1234	−.0457	−.1242	.0060	−.1299	.0702	−.1316
52	.088	.471	−.1180	−.1003	−.1035	−.1042	−.0971	−.1177	−.0772	−.1180	−.0447	−.1202	.0059	−.1262	.0696	−.1318
53	.088	.764	−.0380	.0093	.0040	−.0015	.0186	−.0364	.0518	−.0909	.1053	−.1170	.1803	−.1263	.2818	−.1333
54	.059	0.000	−.1062	−.1049	−.1044	−.1054	−.1039	−.1070	−.0839	−.1096	−.0510	−.1187	−.0001	−.1242	.0634	−.1284
55	.059	.236	−.1162	−.1087	−.1122	−.1085	−.1075	−.1146	−.0863	−.1137	−.0529	−.1203	−.0017	−.1277	.0617	−.1325
56	.059	.471	−.1103	−.1037	−.1075	−.1098	−.1019	−.1111	−.0793	−.1105	−.0450	−.1180	.0076	−.1258	.0745	−.1323
57	.059	.647	−.1084	−.1054	−.1089	−.1109	−.1029	−.1113	−.0803	−.1086	−.0437	−.1168	.0115	−.1241	.0823	−.1333
58	.059	.882	−.0613	.0059	.0076	−.0005	.0149	−.0551	.0394	−.1024	.0857	−.1164	.1554	−.1263	.2473	−.1349
59	.029	0.000	−.0891	−.1078	−.0919	−.1019	−.1002	−.1032	−.0847	−.1065	−.0540	−.1150	−.0050	−.1211	.0577	−.1307
60	.029	.236	−.1044	−.1101	−.1030	−.1024	−.1081	−.1051	−.0885	−.1114	−.0558	−.1207	−.0059	−.1276	.0563	−.1321
61	.029	.471	−.1026	−.1061	−.1064	−.1075	−.1032	−.1041	−.0813	−.1094	−.0466	−.1177	.0057	−.1265	.0730	−.1330
62	.029	.764	−.1061	−.1128	−.1082	−.1093	−.1082	−.1073	−.0944	−.1093	−.0637	−.1148	−.0153	−.1244	.0466	−.1326
63	.854	−.471	−.0422	.0775	.0045	.0060	.0742	−.0451	.1642	−.0807	.2529	−.1066	.3040	−.1206	.3754	−.1301
64	.146	−.471	−.0359	.0141	−.0146	−.0133	.0149	−.0337	.0647	−.0650	.1299	−.0958	.2141	−.1155	.3264	−.1261

TABLE III.—Continued
(c) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	1.5445	−.0861	1.6174	−.1180	1.6766	−.1347	1.7260		1.7568	−.1426	1.7616		1.7441	−.1422
2	.971	.236	1.5404	−.0892	1.6163	−.1232	1.6765	−.1415	1.7265		1.7556	−.1497	1.7644		1.7485	−.1489
3	.971	.471	1.5126	−.0871	1.5943	−.1214	1.6609	−.1414	1.7139		1.7452	−.1507	1.7574		1.7466	−.1500
4	.971	.764	1.3722	−.0836	1.4686	−.1150	1.5530	−.1360	1.6226		1.6728	−.1497	1.6998		1.7032	−.1488
5	.941	0.000	1.3825	−.0854	1.4602	−.1137	1.5376	−.1351	1.6179		1.6883	−.1499	1.7371		1.7565	−.1497
6	.941	.236	1.3718	−.0860	1.4519	−.1141	1.5289	−.1351	1.6101		1.6819	−.1502	1.7330		1.7559	−.1495
7	.941	.471	1.3305	−.0860	1.4140	−.1124	1.4965	−.1330	1.5809		1.6562	−.1491	1.7117		1.7421	−.1489
8	.941	.647	1.2268	−.0880	1.3136	−.1126	1.4033	−.1326	1.4939		1.5815	−.1491	1.6503		1.6960	−.1488
9	.941	.882	.7598	−.1342	.9211	−.1415	1.0467	−.1476	1.1757		1.2986	−.1509	1.3996		1.4710	−.1496
10	.912	0.000	1.2101	−.0900	1.2752	−.1127	1.3536	−.1319	1.4627		1.5735	−.1495	1.6644		1.7234	−.1490
11	.912	.236	1.2002	−.0905	1.2672	−.1132	1.3437	−.1326	1.4531		1.5642	−.1495	1.6578		1.7190	−.1495
12	.912	.471	1.1483	−.0922	1.2193	−.1132	1.2990	−.1311	1.4081		1.5225	−.1488	1.6217		1.6907	−.1487
13	.912	.764	.5431	−.1422	.7116	−.1470	.9412	−.1506	1.1479		1.2981	−.1514	1.4129		1.5043	−.1501
14	.854	0.000	.6204	−.1424	.7878	−.1480	1.0371	−.1518	1.2134		1.3718	−.1519	1.5102		1.6146	−.1506
15	.854	.236	.5990	−.1427	.7606	−.1479	1.0173	−.1513	1.2052		1.3640	−.1515	1.5025		1.6091	−.1501
16	.854	.471	.4910	−.1426	.6861	−.1475	.9823	−.1499	1.1651		1.3210	−.1506	1.4585		1.5680	−.1497
17	.854	.647	.5580	−.1450	.7423	−.1490	.9493	−.1500	1.1340		1.2633	−.1513	1.3843		1.4848	−.1504
18	.854	.764	.6016	−.1415	.7154	−.1466	.9118	−.1489	1.0750		1.2104	−.1510	1.3309		1.4287	−.1501
19	.854	.882	.5631	−.1363	.6718	−.1435	.8400	−.1479	.9907		1.1195	−.1503	1.2331		1.3253	−.1497
20	.736	0.000	.5742	−.1462	.7636	−.1483	.9459	−.1484	1.1087		1.2591	−.1509	1.3979		1.5160	−.1501
21	.736	.236	.5943	−.1461	.7618	−.1481	.9400	−.1482	1.1008		1.2503	−.1509	1.3883		1.5065	−.1500
22	.736	.471	.5927	−.1445	.7413	−.1467	.9134	−.1477	1.0673		1.2118	−.1504	1.3464		1.4614	−.1497
23	.736	.647	.5594	−.1436	.7026	−.1466	.8653	−.1480	1.0094		1.1453	−.1508	1.2733		1.3820	−.1501
24	.736	.764	.5326	−.1391	.6733	−.1453	.8271	−.1472	.9674		1.0980	−.1502	1.2220		1.3268	−.1495
25	.736	.882	.4839	−.1409	.6153	−.1457	.7604	−.1477	.8899		1.0120	−.1503	1.1268		1.2262	−.1496
26	.588	0.000	.5516	−.1419	.7164	−.1457	.8774	−.1478	1.0284		1.1777	−.1512	1.3187		1.4439	−.1502
27	.588	.236	.5484	−.1413	.7133	−.1450	.8700	−.1470	1.0214		1.1699	−.1501	1.3102		1.4355	−.1492
28	.588	.471	.5301	−.1408	.6922	−.1451	.8432	−.1472	.9892		1.1335	−.1502	1.2691		1.3919	−.1490
29	.588	.647	.4995	−.1392	.6500	−.1443	.7958	−.1465	.9320		1.0678	−.1498	1.1978		1.3114	−.1488
30	.588	.764	.4773	−.1427	.6202	−.1464	.7606	−.1481	.8924		1.0242	−.1511	1.1492		1.2596	−.1499
31	.588	.882	.4355	−.1437	.5641	−.1470	.6943	−.1480	.8184		.9419	−.1510	1.0588		1.1615	−.1499
32	.412	0.000	.5178	−.1410	.6737	−.1457	.8202	−.1482	.9715		1.1232	−.1518	1.2674		1.3952	−.1516
33	.412	.236	.5147	−.1400	.6689	−.1447	.8153	−.1468	.9655		1.1164	−.1504	1.2582		1.3864	−.1499
34	.412	.471	.4985	−.1403	.6476	−.1451	.7905	−.1476	.9347		1.0809	−.1509	1.2185		1.3421	−.1506
35	.412	.647	.4704	−.1409	.6132	−.1444	.7494	−.1468	.8841		1.0212	−.1502	1.1510		1.2652	−.1495
36	.412	.764	.4453	−.1429	.5817	−.1450	.7120	−.1467	.8435		.9756	−.1503	1.1000		1.2106	−.1491
37	.412	.882	.4010	−.1430	.5295	−.1451	.6510	−.1470	.7733		.8966	−.1501	1.0130		1.1158	−.1492
38	.264	0.000	.5013	−.1410	.6523	−.1455	.7989	−.1480	.9499		1.1013	−.1517	1.2376		1.3494	−.1507
39	.264	.236	.4973	−.1407	.6455	−.1451	.7915	−.1479	.9428		1.0934	−.1510	1.2290		1.3408	−.1509
40	.264	.471	.4799	−.1406	.6259	−.1452	.7669	−.1479	.9121		1.0581	−.1512	1.1899		1.2990	−.1510
41	.264	.647	.4502	−.1401	.5896	−.1441	.7222	−.1465	.8591		.9967	−.1503	1.1199		1.2205	−.1493
42	.264	.764	.4292	−.1404	.5630	−.1436	.6900	−.1462	.8224		.9553	−.1498	1.0744		1.1718	−.1487
43	.264	.882	.3891	−.1409	.5126	−.1442	.6309	−.1465	.7539		.8782	−.1502	.9891		1.0813	−.1489
44	.146	0.000	.4867	−.1404	.6363	−.1453	.7808	−.1480	.9234		1.0536	−.1511	1.1487		1.2172	−.1493
45	.146	.236	.4832	−.1386	.6325	−.1435	.7759	−.1467	.9180		1.0477	−.1496	1.1430		1.2111	−.1483
46	.146	.471	.4675	−.1393	.6115	−.1446	.7502	−.1472	.8908		1.0185	−.1508	1.1116		1.1775	−.1500
47	.146	.647	.4399	−.1395	.5762	−.1438	.7086	−.1464	.8404		.9634	−.1501	1.0536		1.1186	−.1485
48	.146	.764	.4399	−.1395	.5762	−.1438	.7086	−.1464	.8404		.9634	−.1501	1.0536		1.1186	−.1485
49	.146	.882	.3793	−.1395	.4998	−.1438	.6189	−.1465	.7405		.8538	−.1500	.9381		1.0001	−.1483
50	.088	0.000	.1474	−.1399	.2237	−.1445	.2966	−.1475	.3679		.4271	−.1497	.4755		.5334	−.1462
51	.088	.236	.1426	−.1398	.2183	−.1441	.2904	−.1466	.3616		.4208	−.1500	.4696		.5509	−.1469
52	.088	.471	.1418	−.1405	.2187	−.1452	.2955	−.1479	.3726		.4431	−.1512	.5115		.6001	−.1487
53	.088	.764	.3939	−.1393	.4986	−.1438	.5977	−.1466	.7026		.7742	−.1501	.8293		.8880	−.1478
54	.059	0.000	.1357	−.1365	.2128	−.1409	.2906	−.1432	.3713		.4477	−.1457	.5238		.6316	−.1425
55	.059	.236	.1338	−.1407	.2105	−.1448	.2883	−.1471	.3700		.4489	−.1507	.5336		.6393	−.1474
56	.059	.471	.1514	−.1405	.2372	−.1444	.3233	−.1478	.4119		.5001	−.1512	.5845		.6505	−.1479
57	.059	.647	.1645	−.1410	.2582	−.1455	.3482	−.1485	.4419		.5333	−.1517	.6253		.7416	−.1486
58	.059	.882	.3445	−.1409	.4266	−.1469	.5126	−.1501	.6023		.6683	−.1505	.7292		.8087	−.1478
59	.029	0.000	.1293	−.1396	.2067	−.1443	.2867	−.1470	.3725		.4608	−.1497	.5578		.6854	−.1458
60	.029	.236	.1280	−.1393	.2054	−.1442	.2871	−.1469	.3767		.4720	−.1505	.5747		.6905	−.1469
61	.029	.471	.1504	−.1406	.2383	−.1437	.3267	−.1477	.4202		.5196	−.1513	.6209		.7980	−.1476
62	.029	.764	.1146	−.1403	.2084	−.1449	.3052	−.1481	.3755		.4744	−.1511	.5730		.6973	−.1472
63	.854	−.471	.4890	−.1363	.6813	−.1408	.9587	−.1432	1.1494		1.3099	−.1442	1.4474		1.5536	−.1433
64	.146	−.471	.4599	−.1341	.6030	−.1383	.7411	−.1412	.8801		1.0099	−.1443	1.1028		1.1670	−.1437

TABLE III.—Continued
(d) M = 3.50

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	.1577	.4074	.2634	.2690	.4029	.1605	.5753	.0793	.7824	.0206	1.0472	−.0157	1.3893	−.0201
2	.971	.236	.1567	.4108	.2643	.2718	.4047	.1608	.5786	.0788	.7867	.0187	1.0492	−.0188	1.3829	−.0229
3	.971	.471	.1567	.4107	.2642	.2722	.4038	.1604	.5783	.0793	.7866	.0192	1.0474	−.0192	1.3523	−.0251
4	.971	.764	.1553	.4084	.2627	.2705	.4004	.1586	.5751	.0790	.7812	.0189	1.0197	−.0192	1.2260	−.0318
5	.941	0.000	.1500	.4049	.2579	.2659	.3984	.1549	.5713	.0711	.7783	.0093	1.0409	−.0292	1.2718	−.0389
6	.941	.236	.1500	.4052	.2583	.2669	.3984	.1547	.5712	.0707	.7780	.0093	1.0387	−.0295	1.2605	−.0394
7	.941	.471	.1505	.4058	.2583	.2678	.3976	.1543	.5709	.0716	.7777	.0096	1.0296	−.0285	1.2207	−.0408
8	.941	.647	.1480	.4005	.2554	.2638	.3927	.1515	.5644	.0696	.7673	.0086	.9857	−.0299	1.1252	−.0439
9	.941	.882	−.0217	.0584	.0073	.0089	.0587	−.0229	.1318	−.0458	.2277	−.0635	.3508	−.0758	.5232	−.0812
10	.912	0.000	.1469	.3996	.2536	.2619	.3924	.1507	.5636	.0671	.7687	.0046	1.0217	−.0338	1.1536	−.0471
11	.912	.236	.1464	.3997	.2539	.2623	.3924	.1510	.5635	.0668	.7685	.0049	1.0174	−.0345	1.1425	−.0478
12	.912	.471	.1453	.3971	.2524	.2611	.3894	.1490	.5601	.0666	.7636	.0048	.9876	−.0330	1.0878	−.0478
13	.912	.764	−.0299	.0542	.0032	.0046	.0551	−.0304	.1256	−.0549	.2074	−.0722	.3043	−.0822	.4539	−.0863
14	.854	0.000	−.0253	.0760	.0134	.0164	.0749	−.0243	.1633	−.0528	.2821	−.0727	.4314	−.0833	.5061	−.0877
15	.854	.236	−.0254	.0766	.0141	.0160	.0755	−.0248	.1646	−.0533	.2834	−.0727	.4240	−.0832	.4925	−.0872
16	.854	.471	−.0272	.0667	.0061	.0104	.0645	−.0271	.1459	−.0534	.2446	−.0725	.3259	−.0820	.3848	−.0864
17	.854	.647	−.0394	.0409	−.0087	−.0070	.0420	−.0403	.1103	−.0620	.1889	−.0778	.2852	−.0859	.3990	−.0895
18	.854	.764	−.0313	.0431	−.0046	−.0045	.0443	−.0323	.1170	−.0550	.2134	−.0720	.3356	−.0822	.4644	−.0863
19	.854	.882	−.0235	.0400	.0046	.0027	.0423	−.0248	.1095	−.0498	.1995	−.0680	.3122	−.0782	.4457	−.0840
20	.736	0.000	−.0370	.0669	.0026	.0054	.0660	−.0362	.1567	−.0625	.2729	−.0796	.3846	−.0871	.4404	−.0904
21	.736	.236	−.0381	.0634	.0003	.0034	.0616	−.0362	.1472	−.0621	.2449	−.0783	.3312	−.0858	.4184	−.0885
22	.736	.471	−.0408	.0404	−.0115	−.0091	.0396	−.0411	.1093	−.0629	.1944	−.0784	.3064	−.0854	.4185	−.0885
23	.736	.647	−.0358	.0339	−.0096	−.0100	.0349	−.0358	.1046	−.0590	.1925	−.0755	.3002	−.0843	.4026	−.0876
24	.736	.764	−.0327	.0342	−.0032	−.0046	.0361	−.0333	.1012	−.0572	.1833	−.0748	.2835	−.0829	.3836	−.0865
25	.736	.882	−.0192	.0308	.0033	.0010	.0341	−.0235	.0912	−.0456	.1672	−.0693	.2589	−.0826	.3501	−.0867
26	.588	0.000	−.0405	.0567	−.0031	−.0006	.0566	−.0398	.1351	−.0649	.2037	−.0796	.2537	−.0837	.3679	−.0871
27	.588	.236	−.0396	.0465	−.0076	−.0048	.0451	−.0393	.1159	−.0630	.1992	−.0783	.2807	−.0827	.3719	−.0862
28	.588	.471	−.0356	.0354	−.0076	−.0087	.0364	−.0372	.1056	−.0613	.1907	−.0775	.2840	−.0827	.3718	−.0861
29	.588	.647	−.0363	.0317	−.0058	−.0062	.0335	−.0361	.0955	−.0611	.1734	−.0766	.2667	−.0822	.3582	−.0855
30	.588	.764	−.0306	.0292	−.0029	−.0041	.0316	−.0354	.0885	−.0475	.1637	−.0692	.2549	−.0827	.3457	−.0877
31	.588	.882	−.0226	.0232	.0012	−.0006	.0264	−.0214	.0755	−.0551	.1440	−.0766	.2289	−.0857	.3137	−.0889
32	.412	0.000	−.0384	.0325	−.0134	−.0100	.0325	−.0382	.0851	−.0598	.1504	−.0769	.2373	−.0823	.3495	−.0866
33	.412	.236	−.0366	.0335	−.0114	−.0090	.0338	−.0364	.0944	−.0581	.1560	−.0753	.2347	−.0806	.3483	−.0850
34	.412	.471	−.0356	.0317	−.0077	−.0065	.0329	−.0353	.0930	−.0592	.1637	−.0751	.2316	−.0820	.3393	−.0864
35	.412	.647	−.0250	.0280	−.0057	−.0049	.0304	−.0342	.0860	−.0455	.1577	−.0678	.2304	−.0798	.3243	−.0842
36	.412	.764	−.0212	.0241	−.0024	−.0026	.0272	−.0205	.0770	−.0492	.1433	−.0735	.2231	−.0835	.3090	−.0862
37	.412	.882	−.0274	.0181	.0016	.0001	.0218	−.0251	.0655	−.0595	.1272	−.0787	.2037	−.0858	.2815	−.0875
38	.264	0.000	−.0366	.0217	−.0148	−.0135	.0213	−.0367	.0739	−.0578	.1431	−.0732	.2271	−.0817	.3398	−.0863
39	.264	.236	−.0368	.0243	−.0122	−.0108	.0254	−.0363	.0754	−.0574	.1420	−.0724	.2260	−.0812	.3382	−.0859
40	.264	.471	−.0360	.0269	−.0090	−.0069	.0285	−.0351	.0795	−.0570	.1392	−.0688	.2202	−.0806	.3287	−.0856
41	.264	.647	−.0228	.0238	−.0045	−.0049	.0262	−.0216	.0765	−.0487	.1368	−.0721	.2077	−.0819	.3093	−.0850
42	.264	.764	−.0210	.0206	.0001	−.0010	.0239	−.0217	.0714	−.0530	.1323	−.0764	.1981	−.0843	.2938	−.0858
43	.264	.882	−.0320	.0154	.0042	.0023	.0195	−.0276	.0589	−.0631	.1213	−.0800	.1782	−.0858	.2654	−.0864
44	.146	0.000	−.0411	.0169	−.0185	−.0167	.0160	−.0411	.0671	−.0601	.1349	−.0726	.2182	−.0819	.3312	−.0863
45	.146	.236	−.0372	.0184	−.0161	−.0143	.0195	−.0380	.0678	−.0582	.1349	−.0705	.2179	−.0803	.3296	−.0849
46	.146	.471	−.0318	.0209	−.0135	−.0106	.0226	−.0321	.0676	−.0503	.1303	−.0684	.2113	−.0792	.3189	−.0845
47	.146	.647	−.0221	.0208	−.0041	−.0074	.0235	−.0216	.0679	−.0501	.1241	−.0741	.1994	−.0815	.3006	−.0846
48	.146	.764	−.0221	.0208	−.0041	−.0074	.0235	−.0216	.0679	−.0501	.1241	−.0741	.1994	−.0815	.3006	−.0846
49	.146	.882	−.0372	.0124	.0034	.0029	.0172	−.0327	.0575	−.0653	.1061	−.0790	.1682	−.0840	.2603	−.0855
50	.088	0.000	−.0701	−.0603	−.0706	−.0695	−.0620	−.0728	−.0449	−.0732	−.0162	−.0734	.0252	−.0812	.0926	−.0853
51	.088	236	−.0701	−.0629	−.0701	−.0706	−.0634	−.0727	−.0483	−.0742	−.0199	−.0736	.0216	−.0811	.0883	−.0847
52	.088	.471	−.0746	−.0621	−.0643	−.0632	−.0610	−.0745	−.0482	−.0757	−.0202	−.0750	.0218	−.0825	.0871	−.0857
53	.088	.764	−.0264	.0131	−.0010	−.0038	.0160	−.0240	.0570	−.0598	.1089	−.0769	.1781	−.0827	.2734	−.0848
54	.059	0.000	−.0641	−.0665	−.0641	−.0661	−.0660	−.0675	−.0532	−.0682	−.0254	−.0686	.0160	−.0769	.0816	−.0801
55	.059	.236	−.0711	−.0716	−.0697	−.0712	−.0712	−.0739	−.0577	−.0729	−.0292	−.0731	.0141	−.0819	.0792	−.0848
56	.059	.471	−.0704	−.0675	−.0692	−.0695	−.0665	−.0738	−.0530	−.0717	−.0229	−.0729	.0212	−.0823	.0887	−.0850
57	.059	.647	−.0749	−.0650	−.0740	−.0714	−.0650	−.0781	−.0514	−.0732	−.0220	−.0729	.0231	−.0826	.0947	−.0848
58	.059	.882	−.0393	.0075	.0003	−.0018	.0102	−.0376	.0473	−.0689	.0945	−.0780	.1566	−.0843	.2443	−.0862
59	.029	0.000	−.0651	−.0730	−.0645	−.0673	−.0709	−.0694	−.0591	−.0709	−.0311	−.0718	.0115	−.0804	.0754	−.0828
60	.029	.236	−.0672	−.0740	−.0659	−.0682	−.0722	−.0702	−.0603	−.0726	−.0324	−.0727	.0105	−.0820	.0741	−.0845
61	.029	.471	−.0657	−.0701	−.0680	−.0697	−.0684	−.0697	−.0554	−.0716	−.0257	−.0726	.0196	−.0825	.0863	−.0849
62	.029	.764	−.0720	−.0705	−.0725	−.0721	−.0682	−.0761	−.0586	−.0737	−.0372	−.0719	.0021	−.0822	.0650	−.0842
63	.854	−.471	−.0207	.0660	.0081	.0118	.0675	−.0232	.1496	−.0485	.2522	−.0656	.3408	−.0748	.3942	−.0782
64	.146	−.471	−.0259	.0229	−.0129	−.0078	.0207	−.0284	.0640	−.0455	.1278	−.0626	.2063	−.0724	.3144	−.0764

TABLE III.–Continued
(d) Concluded

			α = 30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	1.5408	−.0355	1.6426	−.0555	1.7213	−.0711	1.7911		1.8231	−.0786	1.8355		1.8285	−.0798
2	.971	.236	1.5374	−.0391	1.6397	−.0616	1.7219	−.0795	1.7918		1.8260	−.0877	1.8401		1.8308	−.0895
3	.971	.471	1.5073	−.0396	1.6148	−.0617	1.7025	−.0801	1.7773		1.8156	−.0891	1.8363		1.8272	−.0904
4	.971	.764	1.3679	−.0419	1.4807	−.0587	1.5854	−.0761	1.6779		1.7352	−.0868	1.7768		1.7865	−.0892
5	.941	0.000	1.3887	−.0459	1.4852	−.0608	1.5739	−.0772	1.6673		1.7410	−.0880	1.7989		1.8322	−.0903
6	.941	.236	1.3797	−.0462	1.4757	−.0610	1.5665	−.0772	1.6609		1.7360	−.0881	1.7957		1.8295	−.0900
7	.941	.471	1.3394	−.0478	1.4385	−.0608	1.5329	−.0759	1.6311		1.7099	−.0871	1.7753		1.8126	−.0897
8	.941	.647	1.2360	−.0510	1.3335	−.0626	1.4332	−.0757	1.5375		1.6279	−.0874	1.7087		1.7617	−.0891
9	.941	.882	.6970	−.0853	8815	−.0880	1.0390	−.0902	1.1879		1.3230	−.0921	1.4417		1.5262	−.0918
10	.912	0.000	1.2309	−.0530	1.3057	−.0638	1.3852	−.0766	1.4950		1.6103	−.0877	1.7108		1.7868	−.0903
11	.912	.236	1.2225	−.0539	1.2975	−.0648	1.3785	−.0770	1.4862		1.6024	−.0883	1.7055		1.7805	−.0901
12	.912	.471	1.1700	−.0549	1.2490	−.0648	1.3328	−.0762	1.4396		1.5587	−.0871	1.6693		1.7477	−.0895
13	.912	.764	.5746	−.0894	6973	−.0914	.8816	−.0928	1.1248		1.3085	−.0932	1.4463		1.5511	−.0926
14	.854	0.000	.6181	−.0903	7731	−.0926	.9835	−.0944	1.2042		1.3856	−.0941	1.5366		1.6607	−.0936
15	.854	.236	.5994	−.0896	.7497	−.0919	.9573	−.0937	1.1942		1.3786	−.0937	1.5313		1.6556	−.0927
16	.854	.471	.4877	−.0892	.6509	−.0913	.8823	−.0927	1.1508		1.3323	−.0923	1.4849		1.6098	−.0920
17	.854	.647	.4929	−.0922	.6755	−.0938	.9141	−.0934	1.1401		1.2897	−.0935	1.4166		1.5292	−.0932
18	.854	.764	.5873	−.0896	.7085	−.0914	.8737	−.0916	1.0772		1.2339	−.0929	1.3654		1.4741	−.0922
19	.854	.882	.5588	−.0879	.6725	−.0903	.8163	−.0914	.9979		1.1457	−.0923	1.2692		1.3714	−.0924
20	.736	0.000	.5528	−.0914	.7143	−.0918	.9153	−.0919	1.1087		1.2801	−.0931	1.4275		1.5601	−.0929
21	.736	.236	.5575	−.0894	.7222	−.0900	.9132	−.0904	•1.1025		1.2721	−.0919	1.4188		1.5499	−.0908
22	.736	.471	.5596	−.0898	.7116	−.0906	.8928	−.0910	1.0738		1.2368	−.0926	1.3786		1.5050	−.0921
23	.736	.647	.5333	−.0894	.6794	−.0906	.8510	−.0908	1.0218		1.1737	−.0927	1.3070		1.4249	−.0922
24	.736	.764	.5102	−.0892	.6534	−.0901	.8201	−.0907	.9815		1.1278	−.0920	1.2563		1.3708	−.0921
25	.736	.882	.4668	−.0892	.6023	−.0902	.7554	−.0904	.9096		1.0432	−.0921	1.1626		1.2700	−.0915
26	.588	0.000	.5164	−.0890	.6887	−.0906	.8666	−.0914	1.0344		1.1999	−.0934	1.3494		1.4850	−.0927
27	.588	.236	.5133	−.0881	.6870	−.0896	.8617	−.0904	1.0286		1.1930	−.0924	1.3412		1.4761	−.0917
28	.588	.471	.5019	−.0881	.6684	−.0898	.8367	−.0904	.9998		1.1589	−.0919	1.3020		1.4314	−.0912
29	.588	.647	.4811	−.0878	.6322	−.0892	.7924	−.0897	.9465		1.0973	−.0915	1.2307		1.3522	−.0910
30	.588	.764	.4636	−.0894	.6053	−.0910	.7592	−.0915	.9087		1.0546	−.0930	1.1831		1.3001	−.0925
31	.588	.882	.4267	−.0894	.5567	−.0907	.6971	−.0912	.8371		.9743	−.0927	1.0934		1.2023	−.0920
32	.412	0.000	.4959	−.0896	.6545	−.0916	.8198	−.0932	.9749		1.1386	−.0915	1.2926		1.4295	−.0939
33	.412	.236	.4938	−.0881	.6501	−.0898	.8143	−.0916	.9698		1.1322	−.0896	1.2850		1.4215	−.0925
34	.412	.471	.4785	−.0888	.6305	−.0908	.7902	−.0924	.9418		1.0989	−.0907	1.2459		1.3778	−.0935
35	.412	.647	.4538	−.0871	.5973	−.0890	.7519	−.0900	.8955		1.0434	−.0912	1.1806		1.3039	−.0913
36	.412	.764	.4313	−.0875	.5694	−.0888	.7165	−.0902	.8558		.9982	−.0908	1.1302		1.2496	−.0913
37	.412	.882	.3917	−.0883	.5217	−.0896	.6588	−.0905	.7881		.9214	−.0920	1.0440		1.1556	−.0917
38	.264	0.000	.4847	−.0890	.6395	−.0910	.7960	−.0929	.9490		1.1113	−.0912	1.2672		1.3927	−.0934
39	.264	.236	.4819	−.0886	.6349	−.0906	.7893	−.0924	.9432		1.1045	−.0909	1.2590		1.3839	−.0931
40	.264	.471	.4672	−.0885	.6154	−.0907	.7662	−.0925	.9155		1.0708	−.0910	1.2203		1.3417	−.0930
41	.264	.647	.4404	−.0869	.5808	−.0888	.7238	−.0900	.8649		1.0113	−.0915	1.1517		1.2657	−.0915
42	.264	.764	.4208	−.0869	.5561	−.0884	.6934	−.0895	.8302		.9714	−.0908	1.1065		1.2166	−.0909
43	.264	.882	.3846	−.0873	.5100	−.0890	.6375	−.0898	.7652		.8967	−.0916	1.0224		1.1255	−.0911
44	.146	0.000	.4740	−.0889	.6261	−.0910	.7801	−.0928	.9256		1.0743	−.0911	1.2021		1.2811	−.0930
45	.146	.236	.4717	−.0877	.6234	−.0899	.7761	−.0915	.9214		1.0694	−.0898	1.1967		1.2751	−.0918
46	.146	.471	.4568	−.0875	.6049	−.0894	.7523	−.0914	.8959		1.0402	−.0896	1.1648		1.2423	−.0922
47	.146	.647	.4319	−.0867	.5721	−.0884	.7121	−.0896	.8483		.9848	−.0910	1.1066		1.1814	−.0911
48	.146	.764	.4319	−.0867	.5721	−.0884	.7121	−.0896	.8483		.9848	−.0910	1.1066		1.1814	−.0911
49	.146	.882	.3778	−.0871	.5038	−.0888	.6275	−.0897	.7524		.8768	−.0913	.9895		1.0591	−.0912
50	.088	0.000	.1705	−.0875	.2518	−.0895	.3277	−.0911	.4045		.4786	−.0891	.5418		.5851	−.0912
51	.088	.236	.1659	−.0872	.2465	−.0890	.3217	−.0905	.3983		.4720	−.0890	.5351		.5802	−.0913
52	.088	.471	.1646	−.0886	.2464	−.0902	.3245	−.0919	.4057		.4873	−.0903	.5647		.6333	−.0927
53	.088	.764	.3934	−.0869	.5167	−.0886	.6207	−.0896	.7383		.8288	−.0912	.8991		.9443	−.0909
54	.059	0.000	.1580	−.0835	.2385	−.0847	.3161	−.0860	.3988		.4846	−.0843	.5695		.6474	−.0868
55	.059	.236	.1557	−.0879	.2366	−.0897	.3134	−.0915	.3964		.4836	−.0901	.5731		.6627	−.0924
56	.059	.471	.1697	−.0883	.2562	−.0904	.3418	−.0920	.4314		.5291	−.0903	.6271		.7090	−.0930
57	.059	.647	.1805	−.0884	.2731	−.0904	.3644	−.0919	.4582		.5589	−.0907	.6596		.7534	−.0927
58	.059	.882	.3511	−.0872	.4573	−.0881	.5409	−.0888	.6453		.7217	−.0889	.7892		.8466	−.0886
59	.029	0.000	.1506	−.0874	.2301	−.0891	.3061	−.0911	.3920		.4865	−.0898	.5859		.6906	−.0918
60	.029	.236	.1491	−.0878	.2289	−.0898	.3049	−.0918	.3937		.4928	−.0904	.6000		.7068	−.0921
61	.029	.471	.1670	−.0882	.2528	−.0903	.3379	−.0920	.4319		.5375	−.0904	.6475		.7524	−.0920
62	.029	.764	.1395	−.0879	.2193	−.0901	.3139	−.0915	.3949		.5006	−.0898	.6116		.7134	−.0913
63	.854	−.471	.4897	−.0807	.6467	−.0824	.8780	−.0832	1.1305		1.3177	−.0832	1.4701		1.5965	−.0828
64	.146	−.471	.4497	−.0795	.5962	−.0811	.7423	−.0823	.8850		1.0289	−.0807	1.1530		1.2306	−.0832

TABLE III.—Continued
(e) M = 4.60

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	.1407	.3781	.2316	.2446	.3643	.1469	.5258	.0822	.7151	.0403	.9423	.0154	1.2835	.0016
2	.971	.236	.1356	.3811	.2303	.2452	.3646	.1446	.5263	.0775	.7175	.0333	.9477	.0072	1.2851	−.0080
3	.971	.471	.1350	.3814	.2296	.2457	.3638	.1443	.5250	.0774	.7167	.0322	.9472	.0060	1.2713	−.0099
4	.971	.764	.1334	.3803	.2279	.2445	.3611	.1427	.5210	.0773	.7119	.0322	.9389	.0064	1.1949	−.0096
5	.941	0.000	.1270	.3751	.2242	.2382	.3581	.1358	.5201	.0667	.7105	.0219	.9367	−.0041	1.2471	−.0182
6	.941	.236	.1263	.3750	.2233	.2388	.3578	.1352	.5187	.0653	.7092	.0212	.9360	−.0047	1.2402	−.0191
7	.941	.471	.1260	.3760	.2227	.2394	.3573	.1362	.5178	.0670	.7079	.0222	.9348	−.0037	1.2127	−.0178
8	.941	.647	.1235	.3709	.2196	.2362	.3526	.1333	.5113	.0649	.6990	.0208	.9202	−.0046	1.1378	−.0189
9	.941	.882	.0029	.0692	.0205	.0308	.0623	.0068	.1250	−.0120	.2112	−.0235	.3228	−.0299	.4767	−.0338
10	.912	0.000	.1231	.3692	.2198	.2333	.3527	.1312	.5131	.0612	.7018	.0169	.9233	−.0087	1.1910	−.0220
11	.912	.236	.1220	.3692	.2189	.2334	.3524	.1310	.5114	.0603	.7003	.0154	.9225	−.0101	1.1805	−.0231
12	.912	.471	.1205	.3676	.2165	.2324	.3499	.1302	.5075	.0608	.6950	.0168	.9153	−.0084	1.1302	−.0222
13	.912	.764	−.0024	.0646	.0157	.0259	.0577	−.0004	.1207	−.0185	.2043	−.0276	.2985	−.0331	.4318	−.0368
14	.854	0.000	−.0022	.0754	.0190	.0304	.0669	.0017	.1411	−.0180	.2460	−.0295	.3831	−.0354	.5313	−.0385
15	.854	.236	−.0020	.0763	.0205	.0294	.0687	.0006	.1420	−.0189	.2468	−.0296	.3840	−.0346	.5213	−.0381
16	.854	.471	−.0021	.0680	.0131	.0289	.0573	.0025	.1275	−.0169	.2255	−.0272	.3367	−.0331	.4158	−.0362
17	.854	.647	−.0119	.0503	.0033	.0142	.0427	−.0102	.1053	−.0247	.1865	−.0328	.2769	−.0364	.3986	−.0386
18	.854	.764	−.0104	.0507	.0038	.0135	.0434	−.0084	.1062	−.0226	.1903	−.0303	.2993	−.0340	.4451	−.0373
19	.854	.882	−.0055	.0427	.0078	.0136	.0362	−.0040	.0933	−.0191	.1739	−.0279	.2792	−.0329	.4210	−.0359
20	.736	0.000	−.0137	.0632	.0050	.0165	.0544	−.0109	.1313	−.0264	.2373	−.0341	.3687	−.0379	.4622	−.0386
21	.736	.236	−.0142	.0608	.0032	.0157	.0509	−.0108	.1257	−.0258	.2262	−.0334	.3343	−.0373	.4218	−.0384
22	.736	.471	−.0156	.0480	−.0021	.0097	.0387	−.0140	.1027	−.0269	.1841	−.0336	.2811	−.0375	.4053	−.0381
23	.736	.647	−.0130	.0410	−.0018	.0079	.0329	−.0117	.0924	−.0250	.1720	−.0325	.2700	−.0365	.3908	−.0376
24	.736	.764	−.0109	.0383	.0017	.0082	.0314	−.0104	.0877	−.0240	.1645	−.0314	.2591	−.0351	.3758	−.0372
25	.736	.882	−.0056	.0333	.0059	.0095	.0289	−.0075	.0787	−.0200	.1517	−.0287	.2425	−.0342	.3507	−.0361
26	.588	0.000	−.0172	.0561	.0001	.0113	.0475	−.0149	.1214	−.0287	.2137	−.0353	.2840	−.0384	.3502	−.0388
27	.588	.236	−.0159	.0519	−.0010	.0106	.0423	−.0140	.1095	−.0274	.1917	−.0335	.2804	−.0366	.3636	−.0380
28	.588	.471	−.0138	.0422	−.0015	.0071	.0341	−.0128	.0940	−.0260	.1729	−.0326	.2649	−.0356	.3653	−.0370
29	.588	.647	−.0126	.0357	−.0002	.0068	.0293	−.0119	.0834	−.0253	.1568	−.0312	.2461	−.0348	.3515	−.0366
30	.588	.764	−.0139	.0328	.0009	.0064	.0272	−.0125	.0780	−.0257	.1493	−.0325	.2366	−.0369	.3401	−.0385
31	.588	.882	−.0068	.0281	.0033	.0074	.0244	−.0047	.0692	−.0231	.1346	−.0324	.2162	−.0361	.3127	−.0385
32	.412	0.000	−.0160	.0470	−.0052	.0111	.0346	−.0118	.0941	−.0254	.1561	−.0327	.2315	−.0326	.3323	−.0387
33	.412	.236	−.0138	.0439	−.0032	.0111	.0310	−.0104	.0890	−.0231	.1609	−.0305	.2352	−.0305	.3328	−.0369
34	.412	.471	−.0138	.0372	−.0022	.0085	.0261	−.0121	.0802	−.0250	.1554	−.0320	.2409	−.0326	.3292	−.0374
35	.412	.647	−.0135	.0307	−.0020	.0087	.0240	−.0107	.0738	−.0245	.1465	−.0307	.2325	−.0345	.3223	−.0364
36	.412	.764	−.0074	.0274	.0003	.0088	.0219	−.0078	.0678	−.0215	.1349	−.0302	.2197	−.0343	.3110	−.0360
37	.412	.882	−.0094	.0231	.0017	.0088	.0192	−.0073	.0593	−.0234	.1224	−.0317	.1992	−.0354	.2873	−.0363
38	.264	0.000	−.0151	.0361	−.0047	.0080	.0262	−.0132	.0749	−.0267	.1386	−.0312	.2242	−.0333	.3268	−.0393
39	.264	.236	−.0147	.0354	−.0042	.0077	.0255	−.0120	.0765	−.0270	.1405	−.0312	.2245	−.0336	.3254	−.0381
40	.264	.471	−.0143	.0320	−.0025	.0080	.0233	−.0121	.0734	−.0278	.1415	−.0308	.2224	−.0337	.3175	−.0375
41	.264	.647	−.0094	.0272	−.0009	.0092	.0210	−.0111	.0680	−.0225	.1371	−.0298	.2151	−.0338	.3025	−.0361
42	.264	.764	−.0051	.0250	.0020	.0099	.0203	−.0042	.0615	−.0210	.1315	−.0299	.2088	−.0339	.2908	−.0352
43	.264	.882	−.0121	.0209	.0017	.0099	.0173	−.0076	.0547	−.0246	.1156	−.0317	.1950	−.0350	.2678	−.0361
44	.146	0.000	−.0172	.0300	−.0061	.0030	.0213	−.0160	.0664	−.0289	.1301	−.0314	.2169	−.0338	.3205	−.0370
45	.146	.236	−.0141	.0313	−.0025	.0045	.0248	−.0149	.0696	−.0278	.1320	−.0302	.2177	−.0321	.3192	−.0365
46	.146	.471	−.0140	.0300	−.0061	.0085	.0189	−.0084	.0668	−.0227	.1328	−.0287	.2132	−.0289	.3105	−.0352
47	.146	.647	−.0069	.0254	−.0015	.0073	.0197	−.0065	.0656	−.0202	.1307	−.0291	.2039	−.0332	.2962	−.0353
48	.146	.764	−.0069	.0254	−.0015	.0073	.0197	−.0065	.0656	−.0202	.1307	−.0291	.2039	−.0332	.2962	−.0353
49	.146	.882	−.0152	.0193	.0006	.0091	.0159	−.0096	.0527	−.0256	.1170	−.0316	.1812	−.0343	.2608	−.0361
50	.088	0.000	−.0280	−.0213	−.0288	−.0289	−.0253	−.0306	−.0141	−.0321	.0093	−.0314	.0518	−.0337	.1050	−.0365
51	.088	.236	−.0281	−.0229	−.0285	−.0302	−.0256	−.0312	−.0156	−.0321	.0058	−.0318	.0474	−.0332	.1003	−.0357
52	.088	.471	−.0297	−.0218	−.0275	−.0281	−.0258	−.0322	−.0159	−.0355	.0049	−.0337	.0459	−.0347	.0998	−.0377
53	.088	.764	−.0083	.0174	−.0029	.0029	.0128	−.0060	.0540	−.0225	.1173	−.0308	.1857	−.0337	.2723	−.0352
54	.059	0.000	−.0216	−.0216	−.0230	−.0275	−.0238	−.0256	−.0171	−.0257	.0012	−.0262	.0414	−.0267	.0944	−.0289
55	.059	.236	−.0294	−.0290	−.0306	−.0354	−.0316	−.0327	−.0254	−.0344	−.0067	−.0347	.0354	−.0354	.0912	−.0383
56	.059	.471	−.0297	−.0263	−.0295	−.0340	−.0295	−.0329	−.0214	−.0340	−.0009	−.0348	.0426	−.0358	.0976	−.0383
57	.059	.647	−.0306	−.0250	−.0305	−.0326	−.0279	−.0340	−.0189	−.0353	.0012	−.0352	.0471	−.0359	.1024	−.0385
58	.059	.882	−.0075	.0137	.0014	.0056	.0103	−.0068	.0453	−.0181	.1048	−.0216	.1690	−.0251	.2476	−.0281
59	.029	0.000	−.0269	−.0281	−.0279	−.0335	−.0299	−.0312	−.0262	−.0328	−.0109	−.0331	.0340	−.0345	.0867	−.0376
60	.029	.236	−.0280	−.0285	−.0288	−.0347	−.0316	−.0318	−.0281	−.0336	−.0133	−.0338	.0319	−.0348	.0854	−.0383
61	.029	.471	−.0286	−.0274	−.0297	−.0339	−.0302	−.0325	−.0244	−.0333	−.0077	−.0333	.0401	−.0343	.0966	−.0381
62	.029	.764	−.0307	−.0272	−.0320	−.0334	−.0304	−.0342	−.0251	−.0343	−.0101	−.0334	.0294	−.0342	.0770	−.0381
63	.854	−.471	.0091	.0676	.0206	.0347	.0606	.0107	.1309	−.0070	.2317	−.0159	.3471	−.0208	.4274	−.0234
64	.146	−.471	−.0010	.0325	.0037	.0160	.0233	.0013	.0643	−.0108	.1281	−.0149	.2083	−.0158	.3054	−.0223

TABLE III.–Concluded
(e) Concluded

			α = 30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.971	0.000	1.5138	.0032	1.6260		1.7095	−.0101	1.7694		1.8216	−.0195	1.8521		1.8661	−.0203
2	.971	.236	1.5106	−.0051	1.6241		1.7109	−.0224	1.7720		1.8273	−.0325	1.8579		1.8721	−.0336
3	.971	.471	1.4818	−.0072	1.5990		1.6908	−.0235	1.7559		1.8166	−.0343	1.8518		1.8750	−.0360
4	.971	.764	1.3514	−.0102	1.4684		1.5703	−.0224	1.6512		1.7346	−.0320	1.7964		1.8383	−.0336
5	.941	0.000	1.3841	−.0166	1.4786		1.5676	−.0260	1.6450		1.7325	−.0351	1.8061		1.8596	−.0365
6	.941	.236	1.3741	−.0168	1.4695		1.5605	−.0259	1.6378		1.7281	−.0346	1.8020		1.8571	−.0359
7	.941	.471	1.3361	−.0174	1.4329		1.5277	−.0260	1.6082		1.7021	−.0339	1.7802		1.8455	−.0355
8	.941	.647	1.2378	−.0196	1.3320		1.4267	−.0258	1.5117		1.6165	−.0343	1.7117		1.7945	−.0346
9	.941	.882	.6530	−.0363	.8237		.9927	−.0368	1.1396		1.2953	−.0391	1.4390		1.5532	−.0380
10	.912	0.000	1.2455	−.0217	1.3118		1.3871	−.0281	1.4697		1.5901	−.0354	1.7061		1.8008	−.0365
11	.912	.236	1.2360	−.0226	1.3033		1.3813	−.0281	1.4606		1.5823	−.0359	1.6992		1.7947	−.0363
12	.912	.471	1.1861	−.0233	1.2563		1.3373	−.0286	1.4160		1.5376	−.0350	1.6606		1.7667	−.0362
13	.912	.764	.5825	−.0379	.7141		.8810	−.0390	1.0654		1.2597	−.0395	1.4296		1.5647	−.0386
14	.854	0.000	.6240	−.0400	.7575		.9455	−.0406	1.1467		1.3437	−.0412	1.5155		1.6563	−.0404
15	.854	.236	.6082	−.0390	.7355		.9216	−.0397	1.1334		1.3350	−.0397	1.5091		1.6513	−.0392
16	.854	.471	.4956	−.0372	.6268		.8350	−.0386	1.0764		1.2867	−.0386	1.4641		1.6083	−.0378
17	.854	.647	.5141	−.0403	.6308		.8358	−.0406	1.0709		1.2596	−.0409	1.4027		1.5353	−.0399
18	.854	.764	.5651	−.0384	.6852		.8310	−.0387	1.0242		1.2032	−.0393	1.3549		1.4839	−.0385
19	.854	.882	.5487	−.0371	.6624		.7928	−.0385	.9573		1.1221	−.0389	1.2645		1.3848	−.0386
20	.736	0.000	.5477	−.0397	.6853		.8775	−.0397	1.0728		1.2529	−.0400	1.4115		1.5528	−.0399
21	.736	.236	.5375	−.0396	.6906		.8778	−.0391	1.0688		1.2458	−.0396	1.4035		1.5429	−.0390
22	.736	.471	.5304	−.0388	.6822		.8641	−.0391	1.0442		1.2125	−.0394	1.3656		1.5021	−.0392
23	.736	.647	.5106	−.0385	.6551		.8307	−.0385	.9971		1.1542	−.0394	1.2993		1.4288	−.0386
24	.736	.764	.4916	−.0379	.6344		.8053	−.0383	.9616		1.1110	−.0384	1.2516		1.3771	−.0384
25	.736	.882	.4546	−.0371	.5880		.7464	−.0369	.8944		1.0334	−.0382	1.1625		1.2798	−.0372
26	.588	0.000	.4910	−.0397	.6672		.8495	−.0398	1.0233		1.1870	−.0406	1.3400		1.4810	−.0403
27	.588	.236	.4933	−.0382	.6683		.8468	−.0388	1.0190		1.1805	−.0392	1.3325		1.4719	−.0388
28	.588	.471	.4902	−.0377	.6543		.8262	−.0376	.9923		1.1480	−.0385	1.2965		1.4312	−.0357
29	.588	.647	.4752	−.0364	.6237		.7865	−.0372	.9433		1.0890	−.0380	1.2296		1.3573	−.0372
30	.588	.764	.4607	−.0392	.6008		.7562	−.0390	.9077		1.0489	−.0405	1.1848		1.3078	−.0384
31	.588	.882	.4284	−.0383	.5588		.6984	−.0389	.8403		.9727	−.0398	1.0985		1.2133	−.0393
32	.412	0.000	.4798	−.0405	.6457		.8157	−.0375	.9847		1.1404	−.0411	1.2908		1.4304	−.0387
33	.412	.236	.4783	−.0381	.6428		.8108	−.0355	.9804		1.1348	−.0389	1.2847		1.4238	−.0355
34	.412	.471	.4661	−.0394	.6265		.7898	−.0362	.9545		1.1036	−.0398	1.2491		1.3833	−.0357
35	.412	.647	.4468	−.0372	.5983		.7552	−.0374	.9104		1.0498	−.0384	1.1880		1.3160	−.0379
36	.412	.764	.4280	−.0367	.5723		.7236	−.0368	.8727		1.0065	−.0376	1.1394		1.2628	−.0354
37	.412	.882	.3933	−.0376	.5277		.6696	−.0377	.8081		.9329	−.0388	1.0564		1.1712	−.0372
38	.264	0.000	.4714	−.0396	.6361		.7988	−.0367	.9638		1.1236	−.0400	1.2719		1.4030	−.0369
39	.264	.236	.4692	−.0395	.6323		.7945	−.0361	.9593		1.1169	−.0394	1.2644		1.3954	−.0362
40	.264	.471	.4572	−.0394	.6154		.7730	−.0360	.9338		1.0852	−.0400	1.2281		1.3556	−.0362
41	.264	.647	.4336	−.0372	.5845		.7357	−.0375	.8850		1.0273	−.0381	1.1622		1.2845	−.0378
42	.264	.764	.4162	−.0365	.5620		.7081	−.0371	.8518		.9888	−.0372	1.1188		1.2369	−.0359
43	.264	.882	.3835	−.0374	.5190		.6547	−.0376	.7887		.9163	−.0386	1.0369		1.1471	−.0371
44	.146	0.000	.4636	−.0397	.6233		.7815	−.0360	.9397		1.0896	−.0401	1.2172		1.3063	−.0368
45	.146	.236	.4619	−.0382	.6213		.7790	−.0344	.9364		1.0854	−.0385	1.2123		1.3012	−.0355
46	.146	.471	.4497	−.0373	.6048		.7599	−.0350	.9124		1.0568	−.0376	1.1821		1.2716	−.0359
47	.146	.647	.4276	−.0368	.5760		.7243	−.0376	.8669		1.0049	−.0378	1.1243		1.2131	−.0377
48	.146	.764	.4276	−.0368	.5760		.7243	−.0376	.8669		1.0049	−.0378	1.1243		1.2131	−.0377
49	.146	.882	.3791	−.0374	.5124		.6463	−.0380	.7752		.8999	−.0382	1.0084		1.0919	−.0378
50	.088	0.000	.1904	−.0385	.2776		.3612	−.0344	.4452		.5227	−.0380	.5877		.6319	−.0348
51	.088	.236	.1857	−.0384	.2724		.3551	−.0337	.4383		.5151	−.0381	.5799		.6259	−.0340
52	.088	.471	.1853	−.0402	.2727		.3574	−.0359	.4450		.5276	−.0400	.6028		.6662	−.0374
53	.088	.764	.3933	−.0371	.5248		.6504	−.0369	.7648		.8662	−.0379	.9387		.9880	−.0369
54	.059	0.000	.1774	−.0318	.2617		.3443	−.0267	.4304		.5157	−.0311	.5988		.6731	−.0290
55	.059	.236	.1743	−.0403	.2590		.3409	−.0359	.4273		.5137	−.0396	.5997		.6818	−.0369
56	.059	.471	.1862	−.0404	.2765		.3631	−.0357	.4561		.5531	−.0400	.6487		.7354	−.0374
57	.059	.647	.1944	−.0404	.2908		.3822	−.0357	.4808		.5811	−.0398	.6768		.7659	−.0374
58	.059	.882	.3571	−.0276	.4723		.5807	−.0297	.6815		.7656	−.0291	.8273		.8805	−.0293
59	.029	0.000	.1684	−.0392	.2511		.3286	−.0340	.4168		.5101	−.0387	.6048		.6991	−.0365
60	.029	.236	.1664	−.0403	.2491		.3261	−.0349	.4165		.5140	−.0392	.6146		.7157	−.0364
61	.029	.471	.1815	−.0397	.2691		.3507	−.0353	.4491		.5540	−.0394	.6584		.7606	−.0368
62	.029	.764	.1589	−.0394	.2443		.3275	−.0344	.4255		.5288	−.0388	.6313		.7322	−.0355
63	.854	−.471	.5015	−.0241	.6246		.8284	−.0247	1.0578		1.2705	−.0254	1.4511		1.5969	−.0244
64	.146	−.471	.4440	−.0244	.5963		.7479	−.0217	.8986		1.0429	−.0247	1.1686		1.2595	−.0215

TABLE IV.–PRESSURE COEFFICIENTS FOR MODEL 4
(a) M = 1.60

			α =													
			−4.8		.2		5.3		10.3		15.3		20.3		25.2	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.0095	.0938	.0514	.0419	.1082	.0028	.1862	−.0413	.2867	−.0887	.4062	−.1372	.5446	−.1896
2	.828	0.000	.0081	.0993	.0496	.0453	.1079	.0056	.1913	−.0386	.2942	−.0778	.4111	−.1338	.5528	−.1860
3	.742	0.000	.0079	.0992	.0492	.0468	.1057	.0037	.1854	−.0391	.2936	−.0817	.4103	−.1354	.5503	−.1857
4	.747	.081	.0089	.1017	.0517	.0482	.1073	.0056	.1858	−.0375	.2924	−.1406	.4051	−.2849	.5412	−.3634
5	.752	.162	.0072	.1067	.0566	.0519	.1122	−.0241	.1850	−.2350	.2823	−.3119	.3836	−.3721	.5090	−.4178
6	.646	0.000	−.0251	.0627	.0159	.0111	.0677	−.0323	.1388	−.0741	.2402	−.1278	.3611	−.1800	.4943	−.2291
7	.650	.092	.0001	.0893	.0420	.0374	.0955	−.0079	.1666	−.0475	.2733	−.1270	.3880	−.2512	.5226	−.3329
8	.655	.174	.0108	.1012	.0519	.0476	.1064	.0073	.1747	−.1158	.2811	−.3313	.3913	−.3788	.5194	−.4210
9	.660	.254	−.0588	.1107	.0597	.0547	.1154	−.1223	.1768	−.2393	.2740	−.3268	.3738	−.3836	.4922	−.4257
10	.583	0.000	−.0278	.0605	.0109	.0065	.0663	−.0361	.1369	−.0781	.2344	−.1210	.3555	−.1802	.4947	−.2290
11	.583	.054	−.0333	.0567	.0066	.0019	.0637	−.0436	.1341	−.0832	.2318	−.1224	.3526	−.1890	.4929	−.2463
12	.500	0.000	−.0224	.0608	.0108	.0065	.0645	−.0330	.1384	−.0740	.2351	−.1264	.3486	−.1851	.4845	−.2403
13	.500	.050	−.0225	.0607	.0094	.0047	.0639	−.0323	.1386	−.0746	.2356	−.1268	.3490	−.1893	.4838	−.2495
14	.500	.101	−.0286	.0582	.0043	−.0016	.0621	−.0392	.1373	−.0806	.2348	−.1310	.3484	−.2085	.4834	−.2796
15	.500	.153	−.0414	.0526	−.0015	−.0069	.0566	−.0541	.1338	−.0838	.2328	−.1492	.3471	−.2640	.4818	−.3401
16	.504	.239	−.0236	.0753	.0216	.0159	.0783	−.0350	.1496	−.1146	.2514	−.3380	.3596	−.3946	.4938	−.4320
17	.509	.319	.0008	.0900	.0354	.0301	.0911	−.0274	.1579	−.2564	.2546	−.3335	.3557	−.3885	.4825	−.4289
18	.514	.400	−.1065	.1002	.0469	.0401	.1011	−.1389	.1598	−.2663	.2435	−.3340	.3341	−.3899	.4468	−.4366
19	.375	0.000	−.0261	.0593	.0134	.0069	.0644	−.0352	.1364	−.0735	.2339	−.1333	.3489	−.1888	.4777	−.2468
20	.375	.085	−.0256	.0592	.0143	.0084	.0639	−.0349	.1363	−.0742	.2348	−.1359	.3490	−.1970	.4775	−.2593
21	.375	.171	−.0286	.0602	.0066	.0042	.0622	−.0368	.1362	−.0775	.2355	−.1517	.3490	−.2422	.4776	−.3133
22	.375	.259	−.0416	.0531	−.0029	−.0075	.0563	−.0542	.1346	−.0846	.2344	−.2421	.3479	−.3498	.4752	−.4051
23	.375	.292	−.0609	.0405	−.0094	−.0269	.0504	−.0705	.1306	−.1099	.2314	−.3210	.3451	−.4006	.4724	−.4391
24	.379	.364	−.0196	.0686	.0199	.0052	.0758	−.0221	.1466	−.2870	.2475	−.3536	.3527	−.4052	.4805	−.4400
25	.384	.444	−.0777	.0834	.0335	.0222	.0887	−.1455	.1574	−.2759	.2497	−.3547	.3471	−.4070	.4670	−.4450
26	.389	.525	−.1099	.0952	.0438	.0341	.0989	−.1424	.1562	−.2474	.2390	−.3125	.3228	−.3692	.4297	−.4210
27	.250	0.000	−.0247	.0616	.0145	.0066	.0686	−.0324	.1396	−.0699	.2362	−.1287	.3458	−.1911	.4795	−.2517
28	.250	.120	−.0274	.0620	.0162	.0065	.0701	−.0340	.1400	−.0711	.2374	−.1307	.3460	−.2042	.4793	−.2707
29	.250	.241	−.0312	.0617	.0177	.0035	.0720	−.0373	.1410	−.0725	.2384	−.1729	.3476	−.2806	.4779	−.3476
30	.250	.365	−.0391	.0611	−.0041	−.0137	.0653	−.0453	.1453	−.1420	.2404	−.3331	.3489	−.4011	.4765	−.4388
31	.250	.412	−.0545	.0529	−.0112	−.0221	.0588	−.0529	.1418	−.2565	.2384	−.3585	.3481	−.4012	.4745	−.4375
32	.254	.489	−.0373	.0722	.0149	.0045	.0795	−.0851	.1505	−.2924	.2491	−.3587	.3505	−.3993	.4767	−.4352
33	.259	.569	−.1124	.0839	.0284	.0171	.0899	−.1721	.1574	−.2902	.2494	−.3849	.3442	−.4129	.4618	−.4426
34	.264	.650	−.1172	.0945	.0411	.0263	.0993	−.1507	.1569	−.2557	.2371	−.3156	.3191	−.3717	.4239	−.4188
35	.125	0.000	−.0262	.0616	.0162	.0062	.0706	−.0321	.1419	−.0779	.2365	−.1335	.3510	−.1944	.4842	−.2490
36	.125	.155	−.0234	.0673	.0217	.0112	.0767	−.0284	.1455	−.0657	.2400	−.1323	.3542	−.2084	.4893	−.2722
37	.125	.312	−.0317	.0607	.0138	.0036	.0727	−.0362	.1484	−.0705	.2397	−.1955	.3507	−.3071	.4873	−.3688
38	.125	.471	−.0423	.0573	−.0029	−.0153	.0735	−.0395	.1500	−.2358	.2434	−.3595	.3496	−.4016	.4831	−.4433
39	.125	.532	−.0541	.0483	−.0135	−.0270	.0621	−.0503	.1452	−.3095	.2393	−.3528	.3485	−.3989	.4793	−.4399
40	.129	.614	−.0851	.0688	.0121	.0004	.0821	−.1524	.1576	−.3016	.2558	−.3486	.3529	−.3997	.4806	−.4429
41	.134	.694	−.1349	.0779	.0235	.0126	.0914	−.1797	.1610	−.2975	.2512	−.3442	.3432	−.4041	.4620	−.4524
42	.139	.775	−.1359	.0899	.0367	.0245	.1021	−.1696	.1635	−.2670	.2379	−.3255	.3155	−.3761	.4204	−.4255
43	.085	.658	−.0961	.0625	.0042	−.0056	.0766	−.1616	.1583	−.3025	.2485	−.3578	.3447	−.4122	.4556	−.4473
44	.072	.756	−.1419	.0727	.0207	.0093	.0884	−.1843	.1631	−.2991	.2477	−.3515	.3324	−.4207	.4223	−.4557
45	.060	.854	−.1710	.0850	.0372	.0285	.1007	−.1974	.1615	−.2779	.2354	−.3360	.3018	−.3837	.3653	−.4291
46	.063	0.000	−.2973	−.2572	−.2751	−.2806	−.2493	−.3011	−.2154	−.3289	−.1663	−.3715	−.1071	−.4009	−.0417	−.4292
47	.063	.173	−.3043	−.2684	−.2884	−.2927	−.2615	−.3081	−.2233	−.3364	−.1757	−.3772	−.1187	−.4125	−.0546	−.4421
48	.063	.347	−.3154	−.2675	−.2934	−.2989	−.2635	−.3209	−.2276	−.3474	−.1727	−.4083	−.1178	−.4524	−.0555	−.4582
49	.063	.525	−.3236	−.2716	−.2847	−.2903	−.2616	−.3282	−.2179	−.4161	−.1722	−.4079	−.1094	−.4324	−.0499	−.4488
50	.063	.592	−.3150	−.2568	−.2798	−.2850	−.2422	−.3255	−.1917	−.4006	−.1380	−.4171	−.0757	−.4374	−.0088	−.4482
51	.042	0.000	−.3177	−.2775	−.2970	−.3015	−.2689	−.3209	−.2267	−.3457	−.1800	−.3387	−.1212	−.3853	−.0547	−.4081
52	.042	.178	−.3174	−.2797	−.2996	−.3031	−.2711	−.3210	−.2293	−.3476	−.1797	−.3410	−.1220	−.3942	−.0567	−.4212
53	.042	.359	−.3252	−.2764	−.3042	−.3069	−.2723	−.3268	−.2342	−.3546	−.1782	−.3774	−.1208	−.4269	−.0581	−.4482
54	.042	.542	−.3197	−.2623	−.2709	−.2759	−.2510	−.3284	−.2041	−.3943	−.1527	−.4102	−.0891	−.4324	−.0229	−.4508
55	.042	.612	−.3252	−.2617	−.2813	−.2854	−.2459	−.3348	−.1963	−.3955	−.1377	−.4006	−.0699	−.4273	−.0018	−.4489
56	.021	0.000	−.2881	−.2702	−.2816	−.2869	−.2635	−.2901	−.1968	−.3094	−.1805	−.3294	−.1218	−.3635	−.0551	−.3929
57	.021	.184	−.2968	−.2795	−.2944	−.2963	−.2713	−.2990	−.2272	−.3155	−.1806	−.3316	−.1223	−.3732	−.0561	−.4067
58	.021	.370	−.3091	−.2785	−.2986	−.2999	−.2728	−.3121	−.2335	−.3321	−.1798	−.3705	−.1184	−.4237	−.0541	−.4531
59	.021	.560	−.3139	−.2590	−.2490	−.2567	−.2478	−.3159	−.2003	−.3726	−.1443	−.4005	−.0798	−.4297	−.0116	−.4500
60	.021	.632	−.3318	−.2578	−.2795	−.2839	−.2434	−.3440	−.1983	−.3662	−.1386	−.3968	−.0703	−.4174	−.0017	−.4474
61	.125	−.532	−.0494	.0448	−.0110	−.0294	.0603	−.0486	.1391	−.3016	.2379	−.3498	.3450	−.3926	.4701	−.4306
62	.375	−.292	−.0579	.0414	−.0068	−.0194	.0530	−.0720	.1339	−.1095	.2320	−.3125	.3440	−.3920	.4725	−.4293

TABLE IV.—Continued
(a) Concluded

			α =													
			30.2		35.3		40.3		45.3		50.3		55.3		60.3	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.6905	−.2733	.8527	−.3391	1.0119	−.3902	1.1791	−.4571	1.3338	−.4694	1.4647		1.5434	
2	.828	0.000	.6981	−.2728	.8580	−.3395	1.0216	−.3921	1.1831	−.4499	1.3310	−.4732	1.4497		1.5180	
3	.742	0.000	.6963	−.2697	.8532	−.3400	1.0138	−.3927	1.1730	−.4400	1.3088	−.4635	1.4168		1.4946	
4	.747	.081	.6817	−.4011	.8340	−.4294	.9875	−.4441	1.1414	−.4556	1.2740	−.4895	1.3790		1.4557	
5	.752	.162	.6386	−.4435	.7776	−.4646	.9176	−.4759	1.0600	−.4659	1.1780	−.4952	1.2817		1.3465	
6	.646	0.000	.6423	−.3047	.7991	−.3696	.9603	−.4164	1.1225	−.4464	1.2599	−.4551	1.3803		1.4664	
7	.650	.092	.6611	−.3851	.8136	−.4196	.9665	−.4412	1.1287	−.4555	1.2600	−.4740	1.3683		1.4400	
8	.655	.174	.6508	−.4503	.7944	−.4726	.9390	−.4860	1.0895	−.4708	1.2172	−.4818	1.3210		1.3853	
9	.660	.254	.6098	−.4504	.7396	−.4697	.8721	−.4840	1.0036	−.4736	1.1175	−.4804	1.2152		1.2755	
10	.583	0.000	.6408	−.3034	.7965	−.3671	.9582	−.4149	1.1180	−.4416	1.2496	−.4491	1.3666		1.4510	
11	.583	.054	.6393	−.3200	.7950	−.3775	.9566	−.4179	1.1158	−.4447	1.2472	−.4542	1.3630		1.4456	
12	.500	0.000	.6311	−.3132	.7909	−.3690	.9517	−.4179	1.1071	−.4365	1.2323	−.4424	1.3424		1.4246	
13	.500	.050	.6312	−.3221	.7900	−.3749	.9518	−.4198	1.1043	−.4386	1.2305	−.4442	1.3405		1.4226	
14	.500	.101	.6295	−.3487	.7881	−.3936	.9507	−.4277	1.1011	−.4452	1.2254	−.4482	1.3336		1.4159	
15	.500	.153	.6264	−.3935	.7850	−.4230	.9448	−.4437	1.0957	−.4540	1.2174	−.4538	1.3233		1.4035	
16	.504	.239	.6292	−.4579	.7826	−.4774	.9330	−.4871	1.0820	−.4764	1.1949	−.4613	1.2936		1.3585	
17	.509	.319	.6114	−.4528	.7567	−.4721	.8969	−.4853	1.0361	−.4797	1.1439	−.4599	1.2379		1.2990	
18	.514	.400	.5649	−.4614	.6947	−.4767	.8225	−.4850	.9441	−.4787	1.0439	−.4574	1.1309		1.1889	
19	.375	0.000	.6261	−.3242	.7870	−.3742	.9443	−.4183	1.0801	−.4212	1.1926	−.4158	1.2955		1.3794	
20	.375	.085	.6252	−.3345	.7865	−.3836	.9446	−.4231	1.0794	−.4266	1.1902	−.4236	1.2932		1.3771	
21	.375	.171	.6239	−.3744	.7843	−.4123	.9397	−.4384	1.0737	−.4417	1.1834	−.4346	1.2845		1.3668	
22	.375	.259	.6198	−.4338	.7795	−.4541	.9303	−.4652	1.0611	−.4609	1.1687	−.4437	1.2654		1.3456	
23	.375	.292	.6165	−.4575	.7722	−.4748	.9230	−.4821	1.0517	−.4714	1.1571	−.4465	1.2491		1.3280	
24	.379	.364	.6158	−.4610	.7665	−.4782	.9084	−.4890	1.0362	−.4816	1.1360	−.4487	1.2205		1.2858	
25	.384	.444	.5948	−.4609	.7377	−.4773	.8713	−.4874	.9901	−.4800	1.0860	−.4472	1.1685		1.2284	
26	.389	.525	.5459	−.4584	.6728	−.4772	.7956	−.4862	.9027	−.4775	.9871	−.4446	1.0658		1.1255	
27	.250	0.000	.6301	−.3238	.7889	−.3759	.9240	−.4010	1.0368	−.3295	1.1328	−.3862	1.2254		1.3109	
28	.250	.120	.6302	−.3385	.7886	−.3876	.9228	−.4093	1.0335	−.3241	1.1303	−.3828	1.2213		1.3061	
29	.250	.241	.6284	−.3938	.7851	−.4246	.9181	−.4287	1.0272	−.3563	1.1221	−.4009	1.2118		1.2964	
30	.250	.365	.6253	−.4558	.7771	−.4693	.9059	−.4577	1.0114	−.3903	1.1026	−.4168	1.1893		1.2712	
31	.250	.412	.6204	−.4605	.7712	−.4777	.8955	−.4660	.9974	−.4074	1.0848	−.4247	1.1689		1.2485	
32	.254	.489	.6142	−.4587	.7569	−.4763	.8759	−.4738	.9760	−.4283	1.0604	−.4308	1.1398		1.2021	
33	.259	.569	.5911	−.4666	.7254	−.4814	.8389	−.4718	.9325	−.4203	1.0116	−.4235	1.0888		1.1558	
34	.264	.650	.5403	−.4572	.6609	−.4796	.7640	−.4725	.8497	−.4114	.9183	−.4164	.9903		1.0557	
35	.125	0.000	.6344	−.3215	.7588	−.3727	.8406	−.2874	.9094	−.3347	.9727	−.3772	1.0442		1.1293	
36	.125	.155	.6374	−.3395	.7597	−.3865	.8416	−.3032	.9095	−.3464	.9720	−.3745	1.0442		1.1293	
37	.125	.312	.6335	−.4054	.7543	−.4293	.8350	−.3632	.9033	−.3713	.9651	−.3778	1.0383		1.1231	
38	.125	.471	.6265	−.4645	.7425	−.4463	.8189	−.4117	.8860	−.3890	.9471	−.3867	1.0204		1.1055	
39	.125	.532	.6178	−.4622	.7303	−.4482	.8043	−.4233	.8685	−.3967	.9278	−.3929	1.0001		1.0858	
40	.129	.614	.6131	−.4631	.7230	−.4493	.7916	−.4319	.8554	−.3922	.9095	−.3965	.9827		1.0690	
41	.134	.694	.5885	−.4654	.6927	−.4481	.7586	−.4161	.8201	−.3745	.8734	−.3854	.9457		1.0320	
42	.139	.775	.5331	−.4592	.6286	−.4512	.6886	−.4090	.7455	−.3648	.7962	−.3749	.8669		.9463	
43	.085	.658	.5618	−.4577	.6231	−.4370	.6559	−.4020	.6888	−.3817	.7246	−.3812	.8108		.9325	
44	.072	.756	.4953	−.4590	.5299	−.4314	.5527	−.3758	.5872	−.3664	.6379	−.3625	.7947		.9100	
45	.060	.854	.4135	−.4535	.4416	−.4193	.4700	−.3545	.5138	−.3539	.5846	−.3439	.7472		.8397	
46	.063	0.000	.0146	−.4567	.0425	−.4313	.0661	−.3867	.0963	−.4023	.1573	−.3756	.3576		.5525	
47	.063	.173	−.0008	−.4664	.0254	−.4297	.0480	−.3903	.0784	−.4024	.1467	−.3742	.3532		.5522	
48	.063	.347	−.0039	−.4597	.0221	−.4286	.0454	−.3988	.0772	−.3960	.1947	−.3751	.3731		.5752	
49	.063	.525	−.0018	−.4541	.0249	−.4244	.0518	−.3931	.1088	−.3862	.2076	−.3745	.3817		.6392	
50	.063	.592	.0459	−.4533	.0792	−.4255	.1109	−.3882	.1594	−.3805	.2352	−.3731	.5021		.8483	
51	.042	0.000	.0019	−.4315	.0386	−.4282	.0808	−.3886	.1409	−.3747	.2491	−.3587	.6541		.8541	
52	.042	.178	−.0005	−.4420	.0376	−.4283	.0803	−.3904	.1430	−.3808	.2525	−.3548	.6655		.8558	
53	.042	.359	−.0032	−.4566	.0356	−.4291	.0809	−.3959	.1626	−.3806	.2456	−.3544	.7249		.8569	
54	.042	.542	.0365	−.4543	.0833	−.4253	.1372	−.3867	.2068	−.3692	.2893	−.3526	.7745		.8487	
55	.042	.612	.0612	−.4533	.1126	−.4250	.1732	−.3792	.2662	−.3629	.4152	−.3524	.7479		.8320	
56	.021	0.000	.0042	−.4264	.0507	−.4284	.1089	−.3703	.1939	−.3389	.3133	−.3417	.7366		.7806	
57	.021	.184	.0030	−.4378	.0507	−.4288	.1094	−.3724	.1968	−.3564	.3144	−.3358	.7381		.7796	
58	.021	.370	.0055	−.4609	.0569	−.4293	.1227	−.3807	.2145	−.3646	.3351	−.3331	.7371		.7822	
59	.021	.560	.0557	−.4541	.1162	−.4244	.1900	−.3780	.3094	−.3581	.5460	−.3349	.7176		.7776	
60	.021	.632	.0676	−.4522	.1317	−.4205	.2113	−.3709	.3268	−.3529	.5135	−.3368	.7056		.7714	
61	.125	−.532	.6110	−.4471	.7267	−.4429	.8017	−.4192	.8644	−.4036	.9249	−.3870	.9981		1.0827	
62	.375	−.292	.6159	−.4431	.7690	−.4605	.9192	−.4699	1.0451	−.4502	1.1513	−.4274	1.2454		1.3250	

TABLE IV.—Continued
(b) M = 2.16

			α =													
			−3.7		1.3		6.3		11.3		16.3		21.3		26.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.0199	.0869	.0583	.0373	.1168	.0002	.1950	−.0333	.2968	−.0712	.4180	−.1078	.5563	−.1558
2	.828	0.000	.0115	.0872	.0536	.0372	.1119	−.0031	.1943	−.0359	.2997	−.0734	.4202	−.1094	.5599	−.1579
3	.742	0.000	.0093	.0846	.0521	.0349	.1078	−.0037	.1897	−.0374	.2951	−.0719	.4153	−.1135	.5542	−.1578
4	.747	.081	.0097	.0865	.0542	.0363	.1096	−.0030	.1899	−.0414	.2937	−.1615	.4104	−.2221	.5469	−.2418
5	.752	.162	.0276	.0928	.0588	.0392	.1160	−.0759	.1900	−.1765	.2868	−.2169	.3952	−.2428	.5210	−.2561
6	.646	0.000	−.0159	.0532	.0234	.0083	.0770	−.0288	.1497	−.0670	.2482	−.1084	.3689	−.1406	.4999	−.1848
7	.650	.092	.0027	.0786	.0464	.0290	.1028	−.0107	.1811	−.0445	.2810	−.1361	.4026	−.2083	.5319	−.2359
8	.655	.174	.0105	.0870	.0538	.0357	.1107	.0016	.1874	−.1765	.2847	−.2212	.4040	−.2452	.5318	−.2590
9	.660	.254	−.0261	.0959	.0621	.0399	.1179	−.1019	.1894	−.1847	.2792	−.2239	.3891	−.2472	.5082	−.2598
10	.583	0.000	−.0222	.0478	.0174	.0022	.0721	−.0354	.1476	−.0679	.2430	−.1058	.3629	−.1433	.5018	−.1851
11	.583	.054	−.0262	.0450	.0139	−.0013	.0694	−.0407	.1444	−.0708	.2402	−.1093	.3602	−.1542	.4997	−.1964
12	.500	0.000	−.0216	.0458	.0139	.0004	.0706	−.0333	.1448	−.0672	.2402	−.1081	.3559	−.1502	.4899	−.1884
13	.500	.050	−.0238	.0450	.0115	−.0014	.0703	−.0342	.1443	−.0682	.2401	−.1098	.3557	−.1569	.4901	−.1948
14	.500	.101	−.0292	.0418	.0059	−.0060	.0680	−.0418	.1424	−.0703	.2393	−.1199	.3548	−.1778	.4895	−.2145
15	.500	.153	−.0434	.0368	.0005	−.0113	.0631	−.0562	.1379	−.0725	.2358	−.1565	.3522	−.2155	.4871	−.2404
16	.504	.239	−.0123	.0628	.0275	.0122	.0871	−.0202	.1584	−.1751	.2542	−.2316	.3677	−.2510	.4990	−.2630
17	.509	.319	.0029	.0782	.0438	.0260	.1018	−.0866	.1692	−.1928	.2602	−.2311	.3695	−.2517	.4940	−.2625
18	.514	.400	−.0639	.0918	.0567	.0344	.1137	−.1075	.1750	−.1770	.2560	−.2130	.3574	−.2404	.4697	−.2588
19	.375	0.000	−.0192	.0459	.0160	.0015	.0677	−.0325	.1411	−.0711	.2372	−.1119	.3526	−.1532	.4838	−.1951
20	.375	.085	−.0199	.0476	.0175	.0009	.0674	−.0324	.1417	−.0718	.2373	−.1150	.3520	−.1620	.4833	−.2040
21	.375	.171	−.0237	.0494	.0167	−.0103	.0687	−.0349	.1416	−.0734	.2380	−.1427	.3517	−.2000	.4833	−.2305
22	.375	.259	−.0405	.0353	−.0030	−.0174	.0587	−.0520	.1394	−.1076	.2365	−.2172	.3500	−.2474	.4815	−.2586
23	.375	.292	−.0585	.0245	−.0104	−.0235	.0533	−.0632	.1350	−.1698	.2336	−.2342	.3470	−.2526	.4790	−.2629
24	.379	.364	−.0239	.0585	.0213	.0046	.0810	−.0592	.1555	−.2011	.2500	−.2348	.3582	−.2533	.4856	−.2638
25	.384	.444	−.0290	.0732	.0366	.0174	.0953	−.1273	.1646	−.2035	.2553	−.2394	.3573	−.2563	.4784	−.2652
26	.389	.525	−.0714	.0870	.0501	.0273	.1071	−.1149	.1678	−.1854	.2509	−.2167	.3423	−.2382	.4525	−.2564
27	.250	0.000	−.0167	.0495	.0193	.0008	.0699	−.0334	.1386	−.0717	.2333	−.1160	.3479	−.1533	.4812	−.1958
28	.250	.120	−.0184	.0489	.0187	.0020	.0697	−.0342	.1373	−.0709	.2329	−.1193	.3493	−.1349	.4824	−.1517
29	.250	.241	−.0234	.0482	.0170	−.0023	.0704	−.0377	.1393	−.0790	.2333	−.1722	.3507	−.2184	.4833	−.2387
30	.250	.365	−.0356	.0454	.0025	−.0231	.0677	−.0422	.1403	−.1874	.2347	−.2362	.3528	−.2535	.4842	−.2639
31	.250	.412	−.0540	.0323	−.0083	−.0304	.0571	−.0605	.1375	−.2061	.2326	−.2359	.3512	−.2533	.4823	−.2639
32	.254	.489	−.0343	.0569	.0193	−.0021	.0789	−.1223	.1557	−.2067	.2448	−.2344	.3568	−.2530	.4816	−.2638
33	.259	.569	−.0569	.0694	.0333	.0109	.0906	−.1339	.1649	−.2002	.2483	−.2276	.3530	−.2524	.4714	−.2647
34	.264	.650	−.0822	.0830	.0474	.0219	.1026	−.1265	.1683	−.1942	.2433	−.2217	.3364	−.2434	.4422	−.2580
35	.125	0.000	−.0196	.0468	.0153	−.0008	.0683	−.0374	.1377	−.0734	.2329	−.1159	.3439	−.1539	.4732	−.1974
36	.125	.155	−.0175	.0514	.0192	.0037	.0724	−.0331	.1444	−.0681	.2357	−.1232	.3455	−.1708	.4753	−.2120
37	.125	.312	−.0251	.0466	.0152	.0001	.0697	−.0375	.1406	−.0900	.2363	−.1930	.3456	−.2316	.4734	−.2475
38	.125	.471	−.0381	.0454	.0085	−.0235	.0702	−.0635	.1389	−.2087	.2371	−.2345	.3472	−.2514	.4736	−.2595
39	.125	.532	−.0525	.0334	−.0094	−.0354	.0605	−.1040	.1364	−.2075	.2357	−.2354	.3464	−.2518	.4721	−.2590
40	.129	.614	−.0490	.0566	.0157	−.0080	.0815	−.1322	.1524	−.2077	.2455	−.2391	.3517	−.2548	.4731	−.2629
41	.134	.694	−.0738	.0674	.0279	.0055	.0913	−.1411	.1587	−.1973	.2459	−.2243	.3469	−.2480	.4615	−.2622
42	.139	.775	−.0954	.0801	.0406	.0154	.1006	−.1393	.1619	−.1951	.2379	−.2236	.3285	−.2461	.4320	−.2603
43	.085	.658	−.0527	.0524	.0116	−.0127	.0785	−.1328	.1500	−.2111	.2386	−.2421	.3462	−.2545	.4630	−.2610
44	.072	.756	−.0791	.0646	.0249	.0011	.0878	−.1459	.1575	−.1988	.2392	−.2261	.3388	−.2476	.4475	−.2611
45	.060	.854	−.1028	.0767	.0375	.0090	.0968	−.1450	.1581	−.1970	.2327	−.2257	.3207	−.2494	.4179	−.2614
46	.063	0.000	−.1717	−.1381	−.1531	−.1599	−.1296	−.1800	−.1027	−.2048	−.0603	−.2333	−.0018	−.2497	.0676	−.2613
47	.063	.173	−.1795	−.1480	−.1619	−.1713	−.1396	−.1855	−.1140	−.2080	−.0691	−.2388	−.0116	−.2555	.0561	−.2653
48	.063	.347	−.1824	−.1506	−.1667	−.1747	−.1408	−.1949	−.1158	−.2279	−.0708	−.2439	−.0115	−.2530	.0564	−.2609
49	.063	.525	−.1931	−.1571	−.1730	−.1749	−.1476	−.2168	−.1128	−.2384	−.0674	−.2414	−.0081	−.2509	.0600	−.2585
50	.063	.592	−.1928	−.1525	−.1670	−.1734	−.1412	−.2183	−.1053	−.2392	−.0532	−.2426	.0109	−.2505	.0845	−.2585
51	.042	0.000	−.1891	−.1591	−.1719	−.1810	−.1519	−.1966	−.1183	−.2157	−.0739	−.2226	−.0162	−.2406	.0524	−.2527
52	.042	.178	−.1911	−.1618	−.1750	−.1832	−.1538	−.1973	−.1260	−.2179	−.0749	−.2296	−.0165	−.2468	.0513	−.2566
53	.042	.359	−.1943	−.1623	−.1792	−.1849	−.1552	−.2042	−.1248	−.2343	−.0761	−.2410	−.0169	−.2518	.0510	−.2598
54	.042	.542	−.1978	−.1597	−.1634	−.1689	−.1487	−.2214	−.1107	−.2393	−.0636	−.2402	−.0025	−.2506	.0692	−.2580
55	.042	.612	−.2023	−.1626	−.1613	−.1707	−.1503	−.2197	−.1092	−.2374	−.0560	−.2435	.0092	−.2505	.0858	−.2583
56	.021	0.000	−.1850	−.1658	−.1772	−.1832	−.1573	−.1853	−.1227	−.1954	−.0765	−.2134	−.0185	−.2330	.0505	−.2493
57	.021	.184	−.1915	−.1669	−.1804	−.1874	−.1581	−.1880	−.1275	−.1954	−.0775	−.2190	−.0188	−.2403	.0502	−.2547
58	.021	.370	−.1848	−.1679	−.1828	−.1875	−.1586	−.1875	−.1261	−.2172	−.0781	−.2411	−.0187	−.2521	.0496	−.2603
59	.021	.560	−.1821	−.1580	−.1591	−.1651	−.1484	−.2003	−.1101	−.2353	−.0619	−.2395	.0001	−.2496	.0742	−.2576
60	.021	.632	−.1942	−.1598	−.1601	−.1686	−.1541	−.2029	−.1101	−.2311	−.0563	−.2420	.0085	−.2495	.0852	−.2570
61	.125	−.532	−.0425	.0332	.0011	−.0325	.0659	−.1001	.1421	−.1972	.2388	−.2222	.3486	−.2380	.4746	−.2444
62	.375	−.292	−.0455	.0285	.0015	−.0206	.0639	−.0598	.1396	−.1556	.2361	−.2185	.3520	−.2372	.4817	−.2471

TABLE IV.–Continued
(b) Concluded

			α =													
			31.3		36.3		41.3		46.3		51.3		56.3		61.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.7116	−.1936	.8674	−.2235	1.0354	−.2465	1.1868	−.2478	1.3429	−.2504	1.4836	−.2517	1.6172	−.2401
2	.828	0.000	.7146	−.1998	.8789	−.2286	1.0464	−.2569	1.1975	−.2616	1.3488	−.2665	1.4869	−.2717	1.6109	−.2509
3	.742	0.000	.7090	−.2005	.8667	−.2312	1.0361	−.2544	1.1899	−.2598	1.3387	−.2682	1.4712	−.2697	1.5918	−.2490
4	.747	.081	.6958	−.2529	.8499	−.2560	1.0139	−.2719	1.1632	−.2696	1.3065	−.2764	1.4336	−.2708	1.5500	−.2494
5	.752	.162	.6588	−.2646	.8006	−.2675	.9531	−.2771	1.0906	−.2738	1.2193	−.2806	1.3351	−.2746	1.4415	−.2497
6	.646	0.000	.6492	−.2173	.8068	−.2448	.9690	−.2572	1.1360	−.2649	1.2938	−.2665	1.4361	−.2555	1.5549	−.2438
7	.650	.092	.6757	−.2496	.8296	−.2515	.9890	−.2655	1.1399	−.2703	1.2887	−.2725	1.4221	−.2603	1.5380	−.2452
8	.655	.174	.6717	−.2675	.8192	−.2702	.9685	−.2781	1.1085	−.2755	1.2513	−.2798	1.3734	−.2637	1.4822	−.2434
9	.660	.254	.6378	−.2675	.7750	−.2699	.9109	−.2779	1.0408	−.2751	1.1681	−.2800	1.2717	−.2641	1.3705	−.2427
10	.583	0.000	.6511	−.2178	.8092	−.2437	.9717	−.2574	1.1342	−.2639	1.2909	−.2624	1.4303	−.2555	1.5442	−.2431
11	.583	.054	.6491	−.2256	.8070	−.2460	.9706	−.2590	1.1327	−.2646	1.2885	−.2626	1.4276	−.2558	1.5395	−.2433
12	.500	0.000	.6423	−.2221	.8004	−.2440	.9600	−.2580	1.1256	−.2636	1.2841	−.2582	1.4180	−.2505	1.5216	−.2408
13	.500	.050	.6418	−.2261	.7999	−.2454	.9588	−.2596	1.1252	−.2649	1.2839	−.2572	1.4160	−.2502	1.5185	−.2406
14	.500	.101	.6409	−.2376	.7980	−.2513	.9559	−.2630	1.1233	−.2659	1.2797	−.2580	1.4106	−.2510	1.5125	−.2405
15	.500	.153	.6386	−.2524	.7948	−.2594	.9529	−.2678	1.1175	−.2679	1.2732	−.2602	1.4002	−.2516	1.5006	−.2404
16	.504	.239	.6454	−.2708	.7953	−.2747	.9517	−.2797	1.1000	−.2731	1.2455	−.2708	1.3626	−.2547	1.4620	−.2401
17	.509	.319	.6328	−.2697	.7737	−.2739	.9218	−.2791	1.0636	−.2733	1.2020	−.2713	1.3088	−.2539	1.4044	−.2393
18	.514	.400	.5930	−.2683	.7215	−.2738	.8579	−.2790	.9876	−.2734	1.1133	−.2690	1.2052	−.2520	1.2929	−.2382
19	.375	0.000	.6328	−.2274	.7929	−.2482	.9554	−.2599	1.1190	−.2540	1.2671	−.2555	1.3861	−.2477	1.4814	−.2369
20	.375	.085	.6322	−.2329	.7922	−.2504	.9551	−.2626	1.1184	−.2571	1.2662	−.2550	1.3840	−.2480	1.4788	−.2366
21	.375	.171	.6324	−.2472	.7907	−.2566	.9526	−.2667	1.1148	−.2615	1.2600	−.2549	1.3776	−.2486	1.4692	−.2370
22	.375	.259	.6296	−.2645	.7865	−.2683	.9458	−.2734	1.1051	−.2662	1.2466	−.2574	1.3599	−.2503	1.4482	−.2372
23	.375	.292	.6272	−.2681	.7826	−.2722	.9392	−.2743	1.0977	−.2659	1.2358	−.2584	1.3451	−.2502	1.4318	−.2369
24	.379	.364	.6285	−.2711	.7772	−.2756	.9326	−.2781	1.0789	−.2713	1.2126	−.2599	1.3081	−.2495	1.3954	−.2367
25	.384	.444	.6140	−.2714	.7553	−.2749	.9022	−.2777	1.0403	−.2703	1.1664	−.2570	1.2545	−.2478	1.3382	−.2362
26	.389	.525	.5753	−.2653	.7033	−.2716	.8391	−.2761	.9638	−.2695	1.0770	−.2517	1.1581	−.2450	1.2311	−.2354
27	.250	0.000	.6289	−.2272	.7882	−.2468	.9497	−.2450	1.1091	−.2422	1.2366	−.2477	1.3370	−.2442	1.4218	−.2322
28	.250	.120	.6296	−.1670	.7889	−.1775	.9477	−.1861	1.1067	−.2374	1.2342	−.2426	1.3332	−.2433	1.4186	−.2319
29	.250	.241	.6290	−.2491	.7869	−.2560	.9441	−.2456	1.1014	−.2415	1.2274	−.2453	1.3240	−.2440	1.4076	−.2319
30	.250	.365	.6280	−.2693	.7830	−.2719	.9357	−.2593	1.0879	−.2511	1.2109	−.2464	1.3021	−.2433	1.3808	−.2317
31	.250	.412	.6248	−.2698	.7773	−.2724	.9280	−.2632	1.0770	−.2546	1.1953	−.2474	1.2826	−.2433	1.3577	−.2318
32	.254	.489	.6190	−.2709	.7660	−.2735	.9163	−.2687	1.0519	−.2591	1.1653	−.2474	1.2393	−.2425	1.3181	−.2317
33	.259	.569	.6009	−.2714	.7405	−.2731	.8844	−.2666	1.0126	−.2565	1.1210	−.2453	1.1904	−.2413	1.2639	−.2309
34	.264	.650	.5606	−.2664	.6875	−.2708	.8202	−.2646	.9363	−.2541	1.0369	−.2422	1.1024	−.2399	1.1640	−.2302
35	.125	0.000	.6209	−.2285	.7777	−.2488	.9413	−.2377	1.0713	−.2394	1.1372	−.2340	1.1926	−.2378	1.2521	−.2288
36	.125	.155	.6234	−.2361	.7808	−.2507	.9454	−.2431	1.0718	−.2335	1.1373	−.2331	1.1914	−.2386	1.2512	−.2288
37	.125	.312	.6194	−.2562	.7755	−.2616	.9388	−.2513	1.0642	−.2316	1.1291	−.2350	1.1832	−.2388	1.2437	−.2287
38	.125	.471	.6169	−.2641	.7694	−.2654	.9252	−.2560	1.0459	−.2327	1.1093	−.2366	1.1619	−.2386	1.2224	−.2280
39	.125	.532	.6140	−.2634	.7633	−.2648	.9123	−.2560	1.0292	−.2345	1.0897	−.2364	1.1402	−.2377	1.1992	−.2273
40	.129	.614	.6091	−.2676	.7540	−.2675	.9052	−.2575	1.0091	−.2363	1.0722	−.2353	1.1127	−.2381	1.1692	−.2268
41	.134	.694	.5913	−.2679	.7281	−.2658	.8701	−.2535	.9717	−.2301	1.0331	−.2335	1.0739	−.2371	1.1298	−.2260
42	.139	.775	.5498	−.2687	.6738	−.2661	.8016	−.2510	.8960	−.2255	.9545	−.2322	.9959	−.2365	1.0484	−.2250
43	.085	.658	.5944	−.2647	.7271	−.2637	.8470	−.2483	.9069	−.2302	.9191	−.2297	.9388	−.2368	1.0074	−.2249
44	.072	.756	.5686	−.2636	.6854	−.2606	.7740	−.2410	.8006	−.2191	.8087	−.2255	.8437	−.2343	.9914	−.2208
45	.060	.854	.5233	−.2636	.6209	−.2571	.6846	−.2337	.7031	−.2084	.7239	−.2216	.7848	−.2312	.9399	−.2163
46	.063	0.000	.1475	−.2658	.2292	−.2565	.2951	−.2392	.3210	−.2319	.3398	−.2285	.3832	−.2351	.5719	−.2232
47	.063	.173	.1347	−.2663	.2157	−.2562	.2787	−.2427	.3037	−.2305	.3219	−.2275	.3672	−.2359	.5698	−.2232
48	.063	.347	.1343	−.2634	.2141	−.2548	.2748	−.2459	.3001	−.2298	.3191	−.2281	.3922	−.2360	.5888	−.2228
49	.063	.525	.1366	−.2623	.2139	−.2561	.2730	−.2453	.3010	−.2267	.3290	−.2279	.4392	−.2350	.6065	−.2219
50	.063	.592	.1693	−.2621	.2539	−.2572	.3222	−.2439	.3567	−.2242	.3870	−.2269	.4615	−.2348	.7160	−.2210
51	.042	0.000	.1319	−.2597	.2141	−.2550	.2831	−.2340	.3223	−.2234	.3699	−.2222	.4785	−.2315	.9094	−.2179
52	.042	.178	.1306	−.2610	.2127	−.2546	.2808	−.2371	.3213	−.2209	.3704	−.2219	.4820	−.2326	.9139	−.2181
53	.042	.359	.1291	−.2626	.2099	−.2543	.2767	−.2410	.3195	−.2220	.3751	−.2237	.4829	−.2337	.9521	−.2181
54	.042	.542	.1515	−.2615	.2375	−.2545	.3124	−.2402	.3665	−.2190	.4312	−.2243	.5020	−.2330	.9849	−.2172
55	.042	.612	.1722	−.2618	.2619	−.2551	.3405	−.2385	.3990	−.2163	.4738	−.2242	.6171	−.2327	.9580	−.2164
56	.021	0.000	.1298	−.2583	.2140	−.2546	.2859	−.2229	.3388	−.2141	.4139	−.2145	.5422	−.2258	.9402	−.2125
57	.021	.184	.1291	−.2610	.2126	−.2547	.2841	−.2269	.3387	−.2114	.4145	−.2147	.5433	−.2286	.9405	−.2128
58	.021	.370	.1280	−.2632	.2105	−.2546	.2833	−.2327	.3448	−.2136	.4304	−.2180	.5510	−.2309	.9412	−.2131
59	.021	.560	.1585	−.2611	.2490	−.2527	.3330	−.2345	.4038	−.2138	.4959	−.2206	.7224	−.2312	.9253	−.2124
60	.021	.632	.1715	−.2606	.2624	−.2531	.3490	−.2334	.4225	−.2112	.5245	−.2209	.7031	−.2306	.9140	−.2119
61	.125	−.532	.6142	−.2478	.7614	−.2484	.9072	−.2465	1.0275	−.2365	1.0874	−.2348	1.1388	−.2271	1.1977	−.2175
62	.375	−.292	.6253	−.2513	.7814	−.2557	.9396	−.2575	1.0944	−.2480	1.2327	−.2465	1.3413	−.2340	1.4289	−.2240

TABLE IV.–Continued
(c) M = 2.86

			α =													
			−4.7		.3		5.3		10.3		15.3		20.3		25.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.0025	.0784	.0322	.0298	.0797	−.0022	.1538	−.0257	.2438	−.0507	.3585	−.0733	.4942	−.0985
2	.828	0.000	.0007	.0825	.0315	.0305	.0804	−.0026	.1557	−.0272	.2491	−.0501	.3653	−.0738	.5028	−.1012
3	.742	0.000	−.0002	.0818	.0314	.0292	.0795	−.0045	.1525	−.0290	.2478	−.0518	.3634	−.0750	.4980	−.1025
4	.747	.081	.0011	.0840	.0331	.0312	.0815	−.0031	.1540	−.0275	.2475	−.1073	.3601	−.1334	.4920	−.1448
5	.752	.162	−.0497	.0907	.0374	.0357	.0882	−.0516	.1580	−.1017	.2466	−.1266	.3520	−.1406	.4754	−.1486
6	.646	0.000	−.0186	.0556	.0110	.0089	.0550	−.0221	.1192	−.0485	.2078	−.0723	.3173	−.0954	.4444	−.1173
7	.650	.092	−.0056	.0786	.0293	.0266	.0764	−.0101	.1475	−.0333	.2420	−.0953	.3558	−.1302	.4850	−.1448
8	.655	.174	.0055	.0860	.0347	.0320	.0834	.0022	.1533	−.1069	.2457	−.1309	.3570	−.1440	.4831	−.1515
9	.660	.254	−.0511	.0955	.0407	.0379	.0921	−.0529	.1591	−.1038	.2464	−.1281	.3504	−.1427	.4669	−.1512
10	.583	0.000	−.0243	.0487	.0059	.0036	.0478	−.0280	.1142	−.0520	.2041	−.0738	.3147	−.0970	.4419	−.1179
11	.583	.054	−.0270	.0461	.0031	.0008	.0454	−.0304	.1113	−.0542	.2011	−.0763	.3114	−.1048	.4388	−.1253
12	.500	0.000	−.0264	.0458	.0034	.0012	.0447	−.0299	.1122	−.0528	.2010	−.0766	.3122	−.1000	.4392	−.1197
13	.500	.050	−.0286	.0460	.0022	0.0000	.0443	−.0320	.1117	−.0541	.2008	−.0780	.3124	−.1039	.4397	−.1237
14	.500	.101	−.0324	.0432	−.0014	−.0036	.0414	−.0354	.1102	−.0556	.1996	−.0844	.3114	−.1164	.4389	−.1352
15	.500	.153	−.0378	.0368	−.0067	−.0087	.0363	−.0407	.1057	−.0582	.1952	−.1095	.3072	−.1364	.4355	−.1476
16	.504	.239	−.0082	.0686	.0222	.0193	.0684	−.0108	.1328	−.1118	.2198	−.1369	.3287	−.1473	.4532	−.1536
17	.509	.319	−.0321	.0848	.0342	.0310	.0837	−.0460	.1473	−.1110	.2322	−.1372	.3370	−.1475	.4559	−.1535
18	.514	.400	−.0551	.0955	.0420	.0384	.0942	−.0599	.1564	−.1075	.2370	−.1283	.3344	−.1437	.4428	−.1522
19	.375	0.000	−.0237	.0477	.0051	.0025	.0494	−.0268	.1112	−.0519	.1979	−.0783	.3095	−.1026	.4379	−.1236
20	.375	.085	−.0252	.0487	.0055	.0029	.0511	−.0285	.1103	−.0539	.1979	−.0810	.3100	−.1089	.4384	−.1295
21	.375	.171	−.0354	.0486	.0004	−.0027	.0503	−.0397	.1083	−.0567	.1967	−.1022	.3105	−.1297	.4396	−.1428
22	.375	.259	−.0482	.0401	−.0117	−.0145	.0421	−.0498	.1068	−.0959	.1954	−.1333	.3096	−.1466	.4390	−.1523
23	.375	.292	−.0564	.0276	−.0193	−.0211	.0299	−.0560	.1015	−.1106	.1902	−.1342	.3050	−.1464	.4343	−.1519
24	.379	.364	−.0201	.0639	.0171	.0138	.0649	−.0234	.1291	−.1142	.2134	−.1365	.3243	−.1484	.4490	−.1538
25	.384	.444	−.0440	.0799	.0319	.0283	.0817	−.0536	.1420	−.1131	.2235	−.1303	.3309	−.1466	.4504	−.1530
26	.389	.525	−.0583	.0937	.0428	.0388	.0953	−.0624	.1517	−.1122	.2267	−.1329	.3255	−.1427	.4351	−.1499
27	.250	0.000	−.0226	.0496	.0065	.0035	.0533	−.0249	.1133	−.0533	.1948	−.0804	.3057	−.1041	.4392	−.1253
28	.250	.120	−.0229	.0500	.0065	.0041	.0531	−.0247	.1145	−.0519	.1960	−.0846	.3051	−.1121	.4386	−.1314
29	.250	.241	−.0286	.0488	.0059	.0026	.0520	−.0310	.1148	−.0609	.1977	−.1175	.3068	−.1391	.4392	−.1480
30	.250	.365	−.0486	.0452	−.0139	−.0165	.0482	−.0504	.1094	−.1156	.1978	−.1361	.3086	−.1475	.4412	−.1525
31	.250	.412	−.0570	.0343	−.0204	−.0230	.0377	−.0580	.1055	−.1162	.1954	−.1352	.3070	−.1455	.4399	−.1501
32	.254	.489	−.0380	.0611	.0136	.0098	.0646	−.0467	.1290	−.1162	.2136	−.1348	.3196	−.1471	.4466	−.1521
33	.259	.569	−.0617	.0768	.0282	.0245	.0795	−.0699	.1411	−.1179	.2223	−.1381	.3236	−.1476	.4439	−.1522
34	.264	.650	−.0638	.0915	.0409	.0369	.0939	−.0678	.1505	−.1179	.2241	−.1371	.3168	−.1458	.4265	−.1505
35	.125	0.000	−.0230	.0478	.0064	.0034	.0527	−.0251	.1170	−.0521	.1983	−.0820	.3064	−.1026	.4358	−.1221
36	.125	.155	−.0221	.0501	.0085	.0057	.0552	−.0242	.1199	−.0503	.2029	−.0877	.3130	−.1131	.4400	−.1302
37	.125	.312	−.0284	.0491	.0067	.0037	.0534	−.0297	.1193	−.0747	.2025	−.1226	.3100	−.1378	.4384	−.1449
38	.125	.471	−.0463	.0471	−.0137	−.0175	.0509	−.0486	.1175	−.1128	.2015	−.1328	.3104	−.1408	.4393	−.1461
39	.125	.532	−.0583	.0367	−.0226	−.0255	.0404	−.0591	.1121	−.1143	.1988	−.1335	.3087	−.1406	.4364	−.1455
40	.129	.614	−.0531	.0625	.0111	.0068	.0658	−.0644	.1313	−.1187	.2141	−.1359	.3188	−.1435	.4415	−.1490
41	.134	.694	−.0709	.0750	.0251	.0205	.0782	−.0776	.1406	−.1211	.2203	−.1388	.3199	−.1450	.4357	−.1511
42	.139	.775	−.0733	.0882	.0378	.0329	.0907	−.0773	.1483	−.1212	.2206	−.1384	.3111	−.1456	.4157	−.1505
43	.085	.658	−.0561	.0588	.0072	.0026	.0637	−.0686	.1310	−.1209	.2135	−.1363	.3182	−.1437	.4391	−.1497
44	.072	.756	−.0753	.0738	.0222	.0181	.0774	−.0818	.1418	−.1222	.2200	−.1383	.3188	−.1436	.4330	−.1498
45	.060	.854	−.0796	.0855	.0344	.0297	.0886	−.0839	.1488	−.1231	.2196	−.1384	.3082	−.1448	.4122	−.1510
46	.063	0.000	−.1064	−.0735	−.0925	−.0915	−.0724	−.1053	−.0446	−.1203	−.0130	−.1366	.0325	−.1441	.0927	−.1488
47	.063	.173	−.1108	−.0799	−.0987	−.0977	−.0783	−.1105	−.0525	−.1228	−.0189	−.1389	.0270	−.1458	.0824	−.1493
48	.063	.347	−.1161	−.0802	−.1022	−.1011	−.0794	−.1157	−.0546	−.1351	−.0234	−.1371	.0251	−.1417	.0837	−.1457
49	.063	.525	−.1216	−.0861	−.1046	−.1020	−.0859	−.1202	−.0609	−.1316	−.0281	−.1350	.0227	−.1401	.0868	−.1450
50	.063	.592	−.1238	−.0858	−.0990	−.0973	−.0851	−.1218	−.0593	−.1315	−.0224	−.1338	.0326	−.1389	.1017	−.1436
51	.042	0.000	−.1175	−.0890	−.1044	−.1036	−.0880	−.1172	−.0646	−.1279	−.0337	−.1348	.0150	−.1411	.0755	−.1452
52	.042	.178	−.1187	−.0910	−.1075	−.1064	−.0902	−.1183	−.0667	−.1294	−.0360	−.1360	.0100	−.1419	.0730	−.1461
53	.042	.359	−.1226	−.0911	−.1111	−.1089	−.0920	−.1216	−.0688	−.1329	−.0391	−.1366	.0096	−.1420	.0731	−.1462
54	.042	.542	−.1245	−.0939	−.0966	−.0952	−.0931	−.1222	−.0658	−.1319	−.0297	−.1352	.0222	−.1407	.0868	−.1453
55	.042	.612	−.1261	−.0991	−.0960	−.0953	−.0980	−.1233	−.0692	−.1318	−.0301	−.1355	.0268	−.1411	.0974	−.1455
56	.021	0.000	−.1159	−.0956	−.1086	−.1080	−.0949	−.1154	−.0723	−.1194	−.0393	−.1301	.0104	−.1382	.0721	−.1443
57	.021	.184	−.1145	−.0972	−.1117	−.1111	−.0965	−.1134	−.0731	−.1196	−.0416	−.1325	.0062	−.1407	.0701	−.1459
58	.021	.370	−.1111	−.0990	−.1105	−.1091	−.0982	−.1113	−.0748	−.1298	−.0420	−.1360	.0065	−.1421	.0694	−.1466
59	.021	.560	−.1132	−.0969	−.0956	−.0958	−.0955	−.1129	−.0670	−.1300	−.0306	−.1350	.0218	−.1410	.0871	−.1454
60	.021	.632	−.1181	−.1030	−.0951	−.0953	−.1019	−.1167	−.0734	−.1293	−.0329	−.1345	.0252	−.1405	.0959	−.1448
61	.125	−.532	−.0532	.0336	−.0195	−.0258	.0427	−.0586	.1106	−.1076	.1950	−.1269	.3028	−.1336	.4296	−.1381
62	.375	−.292	−.0503	.0261	−.0147	−.0204	.0323	−.0540	.1018	−.1041	.1884	−.1270	.3011	−.1379	.4282	−.1431

TABLE IV.–Continued
(c) Concluded

			α =													
			30.3		35.3		40.3		45.3		50.3		55.3		60.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.6447	−.1167	.8064	−.1300	.9693	−.1369	1.1333		1.2936	−.1385	1.4395		1.5758	−.1368
2	.828	0.000	.6534	−.1254	.8153	−.1381	.9807	−.1404	1.1439		1.3042	−.1499	1.4507		1.5822	−.1459
3	.742	0.000	.6486	−.1260	.8083	−.1398	.9717	−.1475	1.1401		1.3009	−.1534	1.4460		1.5725	−.1466
4	.747	.081	.6393	−.1496	.7943	−.1534	.9548	−.1545	1.1187		1.2726	−.1578	1.4122		1.5343	−.1488
5	.752	.162	.6134	−.1528	.7565	−.1557	.9055	−.1563	1.0564		1.1961	−.1585	1.3239		1.4367	−.1486
6	.646	0.000	.5897	−.1373	.7474	−.1476	.9123	−.1531	1.0803		1.2439	−.1535	1.4037		1.5407	−.1460
7	.650	.092	.6280	−.1507	.7794	−.1535	.9363	−.1540	1.0932		1.2461	−.1571	1.3965		1.5273	−.1477
8	.655	.174	.6238	−.1551	.7728	−.1573	.9270	−.1575	1.0750		1.2165	−.1591	1.3580		1.4803	−.1475
9	.660	.254	.5981	−.1553	.7370	−.1576	.8797	−.1578	1.0176		1.1436	−.1594	1.2706		1.3800	−.1479
10	.583	0.000	.5862	−.1356	.7440	−.1470	.9093	−.1526	1.0773		1.2448	−.1523	1.4034		1.5376	−.1455
11	.583	.054	.5827	−.1393	.7413	−.1474	.9070	−.1525	1.0748		1.2429	−.1528	1.4013		1.5361	−.1456
12	.500	0.000	.5809	−.1388	.7396	−.1476	.9050	−.1523	1.0749		1.2426	−.1517	1.3985		1.5301	−.1448
13	.500	.050	.5818	−.1407	.7401	−.1480	.9058	−.1524	1.0747		1.2420	−.1517	1.3983		1.5285	−.1445
14	.500	.101	.5810	−.1468	.7395	−.1506	.9041	−.1535	1.0729		1.2397	−.1529	1.3952		1.5238	−.1449
15	.500	.153	.5780	−.1527	.7366	−.1541	.9010	−.1553	1.0698		1.2354	−.1544	1.3891		1.5142	−.1449
16	.504	.239	.5922	−.1569	.7416	−.1588	.8972	−.1585	1.0577		1.2142	−.1575	1.3601		1.4770	−.1461
17	.509	.319	.5885	−.1564	.7295	−.1583	.8762	−.1582	1.0274		1.1753	−.1567	1.3127		1.4237	−.1455
18	.514	.400	.5641	−.1559	.6929	−.1579	.8241	−.1580	.9629		1.0968	−.1560	1.2219		1.3223	−.1445
19	.375	0.000	.5821	−.1403	.7394	−.1487	.9024	−.1516	1.0714		1.2391	−.1512	1.3904		1.5094	−.1432
20	.375	.085	.5821	−.1431	.7401	−.1497	.9021	−.1527	1.0707		1.2377	−.1516	1.3890		1.5066	−.1429
21	.375	.171	.5832	−.1503	.7405	−.1530	.9020	−.1547	1.0685		1.2341	−.1522	1.3839		1.4992	−.1435
22	.375	.259	.5819	−.1562	.7381	−.1574	.8989	−.1576	1.0621		1.2255	−.1532	1.3709		1.4814	−.1438
23	.375	.292	.5785	−.1560	.7344	−.1575	.8953	−.1576	1.0580		1.2177	−.1534	1.3605		1.4671	−.1440
24	.379	.364	.5867	−.1566	.7336	−.1587	.8843	−.1584	1.0392		1.1917	−.1540	1.3298		1.4301	−.1434
25	.384	.444	.5808	−.1565	.7201	−.1587	.8628	−.1585	1.0090		1.1537	−.1532	1.2831		1.3780	−.1434
26	.389	.525	.5530	−.1539	.6805	−.1568	.8093	−.1568	.9427		1.0749	−.1503	1.1926		1.2787	−.1413
27	.250	0.000	.5823	−.1424	.7400	−.1502	.9026	−.1512	1.0692		1.2385	−.1489	1.3727		1.4699	−.1417
28	.250	.120	.5822	−.1446	.7395	−.1505	.9012	−.1518	1.0685		1.2370	−.1487	1.3697		1.4663	−.1413
29	.250	.241	.5824	−.1530	.7387	−.1553	.8992	−.1557	1.0645		1.2314	−.1499	1.3624		1.4570	−.1421
30	.250	.365	.5849	−.1564	.7396	−.1581	.8980	−.1579	1.0583		1.2196	−.1502	1.3456		1.4335	−.1417
31	.250	.412	.5838	−.1539	.7387	−.1555	.8950	−.1552	1.0525		1.2094	−.1468	1.3312		1.4130	−.1385
32	.254	.489	.5852	−.1554	.7308	−.1580	.8776	−.1571	1.0296		1.1782	−.1497	1.2953		1.3745	−.1417
33	.259	.569	.5765	−.1554	.7136	−.1580	.8538	−.1570	.9966		1.1367	−.1494	1.2486		1.3237	−.1420
34	.264	.650	.5469	−.1539	.6718	−.1568	.7999	−.1556	.9284		1.0566	−.1474	1.1589		1.2280	−.1398
35	.125	0.000	.5840	−.1372	.7434	−.1441	.9070	−.1404	1.0747		1.2300	−.1388	1.2934		1.3368	−.1366
36	.125	.155	.5868	−.1410	.7462	−.1460	.9102	−.1421	1.0769		1.2300	−.1392	1.2927		1.3355	−.1369
37	.125	.312	.5849	−.1490	.7428	−.1503	.9054	−.1470	1.0697		1.2223	−.1412	1.2858		1.3279	−.1377
38	.125	.471	.5826	−.1491	.7384	−.1502	.8966	−.1489	1.0556		1.2033	−.1420	1.2648		1.3042	−.1378
39	.125	.532	.5799	−.1488	.7346	−.1497	.8889	−.1487	1.0439		1.1871	−.1418	1.2449		1.2805	−.1374
40	.129	.614	.5792	−.1515	.7247	−.1534	.8707	−.1517	1.0187		1.1557	−.1415	1.2150		1.2524	−.1380
41	.134	.694	.5662	−.1537	.7044	−.1556	.8425	−.1538	.9830		1.1145	−.1439	1.1732		1.2112	−.1402
42	.139	.775	.5342	−.1536	.6610	−.1552	.7855	−.1531	.9133		1.0346	−.1434	1.0902		1.1268	−.1398
43	.085	.658	.5734	−.1517	.7178	−.1526	.8593	−.1503	.9981		1.0838	−.1399	1.0770		1.0777	−.1360
44	.072	.756	.5593	−.1518	.6952	−.1533	.8256	−.1485	.9417		.9821	−.1403	.9637		.9846	−.1373
45	.060	.854	.5271	−.1522	.6495	−.1533	.7666	−.1456	.8553		.8727	−.1389	.8701		.9232	−.1353
46	.063	0.000	.1720	−.1503	.2648	−.1485	.3600	−.1457	.4450		.4891	−.1395	.4925		.5414	−.1362
47	.063	.173	.1588	−.1491	.2498	−.1478	.3436	−.1451	.4274		.4689	−.1390	.4714		.5250	−.1360
48	.063	.347	.1577	−.1471	.2486	−.1467	.3414	−.1439	.4243		.4644	−.1382	.4684		.5530	−.1355
49	.063	.525	.1601	−.1469	.2502	−.1470	.3410	−.1438	.4231		.4621	−.1378	.4754		.5948	−.1353
50	.063	.592	.1837	−.1450	.2796	−.1454	.3789	−.1416	.4702		.5171	−.1347	.5349		.6147	−.1326
51	.042	0.000	.1530	−.1471	.2450	−.1466	.3398	−.1416	.4272		.4778	−.1357	.5140		.6356	−.1337
52	.042	.178	.1515	−.1472	.2427	−.1468	.3375	−.1426	.4246		.4760	−.1367	.5144		.6397	−.1343
53	.042	.359	.1505	−.1476	.2410	−.1471	.3341	−.1437	.4207		.4722	−.1378	.5169		.6401	−.1349
54	.042	.542	.1647	−.1469	.2596	−.1467	.3575	−.1428	.4525		.5142	−.1368	.5737		.6573	−.1339
55	.042	.612	.1811	−.1470	.2800	−.1473	.3821	−.1433	.4807		.5459	−.1370	.6130		.7722	−.1342
56	.021	0.000	.1491	−.1474	.2404	−.1473	.3360	−.1406	.4258		.4857	−.1340	.5523		.6999	−.1334
57	.021	.184	.1481	−.1480	.2393	−.1474	.3344	−.1418	.4242		.4848	−.1351	.5532		.7015	−.1337
58	.021	.370	.1471	−.1476	.2379	−.1470	.3320	−.1424	.4231		.4869	−.1362	.5673		.7136	−.1337
59	.021	.560	.1676	−.1466	.2641	−.1464	.3653	−.1420	.4666		.5419	−.1362	.6317		.8818	−.1329
60	.021	.632	.1793	−.1466	.2785	−.1464	.3809	−.1415	.4830		.5605	−.1360	.6610		.8595	−.1326
61	.125	−.532	.5722	−.1418	.7252	−.1417	.8780	−.1415	1.0359		1.1776	−.1382	1.2342		1.2716	−.1326
62	.375	−.292	.5690	−.1478	.7244	−.1488	.8850	−.1485	1.0493		1.2092	−.1452	1.3505		1.4585	−.1374

TABLE IV.—Continued
(d) M = 3.50

			α =													
			−4.9		.2		5.1		10.2		15.2		20.1		25.2	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.0006	.0716	.0253	.0297	.0725	.0013	.1414	−.0155	.2331	−.0334	.3461	−.0480	.4838	−.0636
2	.828	0.000	−.0040	.0719	.0219	.0270	.0712	−.0010	.1423	−.0192	.2372	−.0375	.3498	−.0539	.4890	−.0733
3	.742	0.000	−.0042	.0704	.0219	.0252	.0705	−.0023	.1412	−.0210	.2358	−.0385	.3456	−.0553	.4833	−.0752
4	.747	.081	−.0025	.0720	.0230	.0269	.0719	−.0013	.1420	−.0365	.2352	−.0737	.3437	−.0878	.4781	−.0941
5	.752	.162	−.0250	.0790	.0259	.0314	.0792	−.0202	.1473	−.0578	.2359	−.0797	.3390	−.0894	.4648	−.0947
6	.646	0.000	−.0182	.0492	.0052	.0091	.0493	−.0164	.1098	−.0346	.1939	−.0546	.2975	−.0708	.4251	−.0865
7	.650	.092	−.0067	.0667	.0193	.0226	.0665	−.0047	.1359	−.0224	.2297	−.0733	.3386	−.0903	.4698	−.0962
8	.655	.174	−.0226	.0735	.0243	.0272	.0737	−.0170	.1421	−.0634	.2335	−.0851	.3403	−.0935	.4683	−.0975
9	.660	.254	−.0322	.0826	.0297	.0331	.0828	−.0272	.1491	−.0656	.2364	−.0851	.3366	−.0932	.4568	−.0975
10	.583	0.000	−.0239	.0407	−.0010	.0037	.0400	−.0213	.1030	−.0384	.1877	−.0574	.2933	−.0723	.4195	−.0872
11	.583	.054	−.0253	.0387	−.0023	.0016	.0384	−.0227	.1009	−.0399	.1850	−.0605	.2898	−.0779	.4153	−.0906
12	.500	0.000	−.0265	.0363	−.0028	.0017	.0349	−.0238	.0997	−.0398	.1849	−.0590	.2909	−.0741	.4147	−.0873
13	.500	.050	−.0277	.0365	−.0037	.0010	.0354	−.0254	.0995	−.0409	.1846	−.0607	.2912	−.0769	.4148	−.0891
14	.500	.101	−.0299	.0346	−.0057	−.0016	.0336	−.0277	.0984	−.0422	.1831	−.0688	.2896	−.0851	.4133	−.0940
15	.500	.153	−.0343	.0300	−.0098	−.0062	.0287	−.0320	.0945	−.0441	.1786	−.0817	.2848	−.0929	.4089	−.0986
16	.504	.239	−.0133	.0643	.0168	.0196	.0638	−.0022	.1273	−.0675	.2110	−.0882	.3136	−.0952	.4328	−.0989
17	.509	.319	−.0361	.0752	.0245	.0280	.0753	−.0312	.1413	−.0689	.2256	−.0872	.3260	−.0942	.4406	−.0984
18	.514	.400	−.0358	.0849	.0319	.0347	.0850	−.0314	.1500	−.0696	.2312	−.0877	.3267	−.0944	.4340	−.0982
19	.375	0.000	−.0261	.0395	−.0016	.0021	.0393	−.0237	.0966	−.0404	.1817	−.0604	.2877	−.0749	.4148	−.0886
20	.375	.085	−.0287	.0407	−.0015	.0019	.0412	−.0262	.0964	−.0420	.1805	−.0638	.2875	−.0798	.4146	−.0913
21	.375	.171	−.0319	.0393	−.0080	−.0039	.0398	−.0304	.0962	−.0426	.1809	−.0784	.2872	−.0901	.4151	−.0970
22	.375	.259	−.0369	.0299	−.0140	−.0097	.0300	−.0345	.0922	−.0713	.1790	−.0877	.2862	−.0943	.4141	−.0992
23	.375	.292	−.0411	.0212	−.0220	−.0137	.0191	−.0375	.0853	−.0692	.1735	−.0870	.2812	−.0934	.4095	−.0982
24	.379	.364	−.0353	.0597	.0145	.0177	.0592	−.0333	.1228	−.0719	.2043	−.0898	.3071	−.0957	.4284	−.0983
25	.384	.444	−.0394	.0752	.0246	.0285	.0753	−.0344	.1372	−.0732	.2170	−.0893	.3165	−.0951	.4327	−.0982
26	.389	.525	−.0386	.0868	.0332	.0365	.0871	−.0336	.1482	−.0716	.2234	−.0874	.3155	−.0931	.4225	−.0964
27	.250	0.000	−.0240	.0417	−.0001	.0025	.0414	−.0222	.1015	−.0426	.1794	−.0625	.2857	−.0767	.4156	−.0901
28	.250	.120	−.0286	.0427	0.0000	.0036	.0415	−.0249	.1025	−.0435	.1811	−.0666	.2853	−.0818	.4149	−.0926
29	.250	.241	−.0335	.0418	−.0037	−.0001	.0404	−.0306	.1021	−.0570	.1803	−.0855	.2873	−.0927	.4160	−.0984
30	.250	.365	−.0383	.0357	−.0155	−.0121	.0349	−.0351	.0979	−.0746	.1818	−.0910	.2875	−.0952	.4176	−.0995
31	.250	.412	−.0404	.0257	−.0208	−.0170	.0253	−.0379	.0901	−.0748	.1787	−.0886	.2851	−.0922	.4166	−.0967
32	.254	.489	−.0440	.0570	.0127	.0160	.0566	−.0400	.1183	−.0766	.2026	−.0908	.3034	−.0947	.4280	−.0976
33	.259	.569	−.0445	.0728	.0247	.0277	.0726	−.0395	.1324	−.0768	.2129	−.0907	.3099	−.0946	.4293	−.0976
34	.264	.650	−.0435	.0867	.0342	.0372	.0865	−.0380	.1435	−.0764	.2178	−.0904	.3076	−.0941	.4166	−.0963
35	.125	0.000	−.0230	.0418	−.0022	.0037	.0387	−.0200	.1011	−.0405	.1839	−.0582	.2860	−.0690	.4154	−.0815
36	.125	.155	−.0245	.0437	−.0002	.0050	.0411	−.0220	.1035	−.0413	.1862	−.0637	.2914	−.0755	.4221	−.0857
37	.125	.312	−.0323	.0426	−.0024	.0033	.0402	−.0299	.1026	−.0628	.1856	−.0800	.2901	−.0838	.4197	−.0898
38	.125	.471	−.0447	.0392	−.0201	−.0114	.0357	−.0401	.1012	−.0676	.1832	−.0817	.2888	−.0843	.4190	−.0899
39	.125	.532	−.0488	.0276	−.0275	−.0178	.0239	−.0436	.0936	−.0698	.1805	−.0822	.2868	−.0840	.4170	−.0895
40	.129	.614	−.0471	.0570	.0114	.0146	.0561	−.0422	.1186	−.0767	.2023	−.0881	.3010	−.0914	.4246	−.0943
41	.134	.694	−.0502	.0713	.0232	.0260	.0702	−.0446	.1301	−.0799	.2105	−.0913	.3044	−.0944	.4225	−.0971
42	.139	.775	−.0507	.0850	.0331	.0363	.0839	−.0448	.1403	−.0801	.2140	−.0910	.2997	−.0937	.4077	−.0967
43	.085	.658	−.0481	.0543	.0107	.0113	.0544	−.0448	.1164	−.0789	.1989	−.0898	.2995	−.0929	.4225	−.0950
44	.072	.756	−.0551	.0701	.0222	.0245	.0693	−.0485	.1286	−.0815	.2077	−.0908	.3034	−.0936	.4201	−.0974
45	.060	.854	−.0586	.0833	.0325	.0347	.0821	−.0521	.1375	−.0831	.2102	−.0916	.2980	−.0944	.4044	−.0982
46	.063	0.000	−.0762	−.0445	−.0664	−.0572	−.0494	−.0708	−.0243	−.0795	.0088	−.0861	.0504	−.0871	.1029	−.0922
47	.063	.173	−.0761	−.0501	−.0705	−.0627	−.0551	−.0745	−.0327	−.0817	−.0010	−.0877	.0450	−.0876	.0973	−.0917
48	.063	.347	−.0795	−.0506	−.0734	−.0641	−.0564	−.0757	−.0328	−.0834	−.0048	−.0860	.0410	−.0857	.0969	−.0903
49	.063	.525	−.0818	−.0551	−.0754	−.0667	−.0610	−.0774	−.0373	−.0834	−.0127	−.0856	.0335	−.0855	.0926	−.0903
50	.063	.592	−.0802	−.0562	−.0720	−.0658	−.0602	−.0764	−.0361	−.0817	−.0085	−.0838	.0398	−.0837	.1033	−.0881
51	.042	0.000	−.0794	−.0569	−.0737	−.0667	−.0614	−.0776	−.0408	−.0829	−.0140	−.0868	.0278	−.0863	.0839	−.0906
52	.042	.178	−.0806	−.0588	−.0761	−.0690	−.0636	−.0782	−.0445	−.0845	−.0169	−.0868	.0248	−.0863	.0786	−.0907
53	.042	.359	−.0787	−.0592	−.0770	−.0704	−.0647	−.0763	−.0453	−.0830	−.0211	−.0862	.0220	−.0861	.0788	−.0909
54	.042	.542	−.0779	−.0620	−.0698	−.0648	−.0653	−.0743	−.0462	−.0817	−.0177	−.0853	.0298	−.0855	.0900	−.0902
55	.042	.612	−.0771	−.0668	−.0694	−.0660	−.0691	−.0743	−.0500	−.0818	−.0202	−.0855	.0302	−.0857	.0956	−.0905
56	.021	0.000	−.0750	−.0622	−.0745	−.0702	−.0661	−.0743	−.0486	−.0795	−.0227	−.0845	.0213	−.0848	.0790	−.0897
57	.021	.184	−.0760	−.0637	−.0764	−.0724	−.0673	−.0744	−.0503	−.0807	−.0240	−.0853	.0174	−.0857	.0742	−.0907
58	.021	.370	−.0752	−.0649	−.0741	−.0709	−.0683	−.0737	−.0512	−.0818	−.0258	−.0858	.0171	−.0860	.0743	−.0905
59	.021	.560	−.0755	−.0656	−.0685	−.0655	−.0676	−.0730	−.0495	−.0815	−.0195	−.0854	.0281	−.0856	.0888	−.0903
60	.021	.632	−.0750	−.0695	−.0678	−.0658	−.0709	−.0728	−.0548	−.0811	−.0244	−.0851	.0267	−.0853	.0933	−.0898
61	.125	−.532	−.0385	.0276	−.0204	−.0135	.0272	−.0382	.0936	−.0613	.1805	−.0728	.2841	−.0748	.4121	−.0801
62	.375	−.292	−.0301	.0234	−.0139	−.0100	.0244	−.0317	.0897	−.0596	.1740	−.0764	.2801	−.0825	.4070	−.0875

TABLE IV.—Continued
(d) Concluded

			α =													
			30.1		35.2		40.2		45.2		50.2		55.1		60.1	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.6372	−.0707	.8057		.9757	−.0759	1.1500		1.3173	−.0783	1.4779		1.6158	−.0782
2	.828	0.000	.6448	−.0822	.8144		.9864	−.0888	1.1604		1.3270	−.0913	1.4874		1.6229	−.0895
3	.742	0.000	.6388	−.0863	.8074		.9776	−.0940	1.1552		1.3196	−.0967	1.4776		1.6117	−.0914
4	.747	.081	.6294	−.0969	.7935		.9601	−.0982	1.1327		1.2932	−.0997	1.4449		1.5742	−.0933
5	.752	.162	.6061	−.0975	.7586		.9140	−.0991	1.0729		1.2200	−.1000	1.3587		1.4772	−.0925
6	.646	0.000	.5723	−.0919	.7369		.9077	−.0969	1.0895		1.2601	−.0983	1.4242		1.5744	−.0917
7	.650	.092	.6174	−.0986	.7790		.9402	−.0989	1.1107		1.2696	−.0998	1.4213		1.5626	−.0926
8	.655	.174	.6129	−.0997	.7712		.9308	−.1008	1.0966		1.2452	−.1008	1.3859		1.5175	−.0925
9	.660	.254	.5914	−.0998	.7372		.8870	−.1013	1.0411		1.1779	−.1010	1.3030		1.4199	−.0930
10	.583	0.000	.5669	−.0917	.7303		.9024	−.0964	1.0833		1.2622	−.0978	1.4261		1.5750	−.0917
11	.583	.054	.5630	−.0938	.7264		.8992	−.0971	1.0807		1.2602	−.0983	1.4237		1.5723	−.0917
12	.500	0.000	.5607	−.0929	.7219		.8954	−.0959	1.0778		1.2604	−.0962	1.4221		1.5664	−.0910
13	.500	.050	.5610	−.0938	.7224		.8961	−.0962	1.0784		1.2604	−.0967	1.4218		1.5656	−.0909
14	.500	.101	.5600	−.0961	.7215		.8955	−.0975	1.0774		1.2584	−.0975	1.4199		1.5617	−.0916
15	.500	.153	.5556	−.0990	.7179		.8923	−.0997	1.0747		1.2541	−.0989	1.4137		1.5526	−.0918
16	.504	.239	.5738	−.1008	.7290		.8952	−.1020	1.0675		1.2366	−.1006	1.3863		1.5177	−.0924
17	.509	.319	.5747	−.1004	.7213		.8788	−.1014	1.0409		1.2008	−.0995	1.3415		1.4649	−.0918
18	.514	.400	.5570	−.1003	.6897		.8344	−.1013	.9800		1.1263	−.0995	1.2519		1.3639	−.0915
19	.375	0.000	.5582	−.0937	.7205		.8897	−.0964	1.0662		1.2480	−.0954	1.4117		1.5448	−.0900
20	.375	.085	.5582	−.0950	.7202		.8899	−.0972	1.0662		1.2473	−.0960	1.4103		1.5427	−.0901
21	.375	.171	.5591	−.0978	.7207		.8902	−.0989	1.0657		1.2450	−.0968	1.4060		1.5369	−.0905
22	.375	.259	.5574	−.0997	.7193		.8877	−.1003	1.0620		1.2383	−.0977	1.3945		1.5216	−.0910
23	.375	.292	.5534	−.0984	.7154		.8840	−.0990	1.0571		1.2324	−.0972	1.3856		1.5078	−.0906
24	.379	.364	.5654	−.1003	.7198		.8804	−.1012	1.0437		1.2092	−.0984	1.3543		1.4726	−.0911
25	.384	.444	.5631	−.1002	.7102		.8631	−.1011	1.0179		1.1743	−.0984	1.3096		1.4217	−.0910
26	.389	.525	.5417	−.0985	.6747		.8163	−.0992	.9565		1.0996	−.0960	1.2204		1.3227	−.0887
27	.250	0.000	.5606	−.0948	.7185		.8843	−.0973	1.0577		1.2332	−.0953	1.3996		1.5129	−.0898
28	.250	.120	.5605	−.0957	.7178		.8828	−.0982	1.0563		1.2312	−.0956	1.3977		1.5104	−.0898
29	.250	.241	.5610	−.0989	.7177		.8814	−.0995	1.0531		1.2264	−.0960	1.3912		1.5014	−.0902
30	.250	.365	.5634	−.0998	.7190		.8817	−.1000	1.0494		1.2182	−.0961	1.3758		1.4793	−.0904
31	.250	.412	.5627	−.0968	.7176		.8794	−.0970	1.0448		1.2109	−.0927	1.3630		1.4616	−.0865
32	.254	.489	.5660	−.0994	.7137		.8680	−.1000	1.0248		1.1818	−.0962	1.3269		1.4229	−.0898
33	.259	.569	.5603	−.0994	.7005		.8472	−.1000	.9953		1.1442	−.0960	1.2805		1.3717	−.0899
34	.264	.650	.5362	−.0980	.6637		.7986	−.0983	.9326		1.0690	−.0942	1.1910		1.2744	−.0876
35	.125	0.000	.5623	−.0865	.7229		.8851	−.0883	1.0532		1.2217	−.0867	1.3657		1.4062	−.0835
36	.125	.155	.5656	−.0887	.7262		.8883	−.0897	1.0573		1.2248	−.0872	1.3650		1.4052	−.0840
37	.125	.312	.5640	−.0915	.7246		.8844	−.0912	1.0514		1.2177	−.0876	1.3561		1.3968	−.0843
38	.125	.471	.5641	−.0913	.7222		.8783	−.0910	1.0406		1.2014	−.0875	1.3348		1.3729	−.0843
39	.125	.532	.5616	−.0908	.7178		.8730	−.0907	1.0309		1.1865	−.0871	1.3162		1.3498	−.0836
40	.129	.614	.5631	−.0962	.7114		.8592	−.0955	1.0088		1.1555	−.0902	1.2809		1.3183	−.0851
41	.134	.694	.5540	−.0991	.6944		.8345	−.0983	.9762		1.1151	−.0932	1.2361		1.2742	−.0883
42	.139	.775	.5273	−.0988	.6549		.7820	−.0981	.9116		1.0383	−.0929	1.1513		1.1864	−.0882
43	.085	.658	.5597	−.0956	.7070		.8523	−.0960	.9961		1.1270	−.0908	1.1808		1.1597	−.0836
44	.072	.756	.5496	−.0974	.6885		.8244	−.0967	.9568		1.0580	−.0918	1.0654		1.0468	−.0874
45	.060	.854	.5224	−.0982	.6480		.7711	−.0970	.8888		.9588	−.0919	.9521		.9609	−.0874
46	.063	0.000	.1749	−.0927	.2670		.3645	−.0909	.4633		.5483	−.0885	.5732		.5822	−.0845
47	.063	.173	.1633	−.0925	.2525		.3485	−.0913	.4456		.5291	−.0877	.5511		.5599	−.0844
48	.063	.347	.1627	−.0914	.2513		.3472	−.0908	.4436		.5252	−.0870	.5466		.5578	−.0837
49	.063	.525	.1657	−.0915	.2533		.3484	−.0907	.4438		.5226	−.0865	.5448		.5891	−.0831
50	.063	.592	.1832	−.0892	.2778		.3809	−.0883	.4843		.5716	−.0834	.6019		.6383	−.0797
51	.042	0.000	.1546	−.0912	.2454		.3429	−.0895	.4412		.5275	−.0870	.5666		.6300	−.0831
52	.042	.178	.1534	−.0915	.2441		.3409	−.0905	.4390		.5254	−.0870	.5651		.6325	−.0836
53	.042	.359	.1520	−.0919	.2425		.3390	−.0910	.4358		.5208	−.0868	.5619		.6477	−.0837
54	.042	.542	.1646	−.0914	.2570		.3571	−.0903	.4606		.5534	−.0858	.6073		.6966	−.0826
55	.042	.612	.1770	−.0916	.2747		.3792	−.0908	.4881		.5833	−.0861	.6409		.7495	−.0829
56	.021	0.000	.1505	−.0908	.2408		.3376	−.0888	.4364		.5266	−.0865	.5806		.6869	−.0831
57	.021	.184	.1496	−.0918	.2399		.3363	−.0901	.4351		.5251	−.0864	.5800		.6893	−.0830
58	.021	.370	.1482	−.0915	.2386		.3342	−.0905	.4331		.5237	−.0859	.5843		.7063	−.0829
59	.021	.560	.1648	−.0914	.2589		.3606	−.0903	.4696		.5690	−.0856	.6423		.7714	−.0823
60	.021	.632	.1750	−.0911	.2723		.3768	−.0900	.4880		.5864	−.0854	.6640		.8124	−.0821
61	.125	−.532	.5538	−.0810	.7086		.8622	−.0810	1.0179		1.1733	−.0788	1.3032		1.3373	−.0756
62	.375	−.292	.5487	−.0880	.7069		.8732	−.0881	1.0439		1.2198	−.0862	1.3724		1.4955	−.0814

TABLE IV.–Continued
(e) M = 4.60

			α =													
			−4.2		.8		5.8		10.8		15.8		20.8		25.8	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.0280	.0697	.0372	.0408	.0788	.0125	.1483	−.0061	.2487	−.0154	.3669	−.0177	.4993	
2	.828	0.000	.0123	.0668	.0250	.0324	.0723	.0017	.1469	−.0155	.2476	−.0262	.3699	−.0309	.5057	
3	.742	0.000	.0079	.0652	.0233	.0284	.0721	−.0014	.1470	−.0177	.2440	−.0286	.3678	−.0344	.5038	
4	.747	.081	.0074	.0668	.0240	.0300	.0729	−.0041	.1472	−.0296	.2440	−.0393	.3648	−.0424	.4975	
5	.752	.162	.0082	.0741	.0293	.0345	.0816	−.0056	.1540	−.0309	.2465	−.0399	.3611	−.0428	.4857	
6	.646	0.000	−.0029	.0473	.0093	.0160	.0539	−.0165	.1170	−.0279	.2003	−.0381	.3097	−.0424	.4395	
7	.650	.092	.0033	.0623	.0208	.0250	.0684	−.0072	.1416	−.0335	.2375	−.0421	.3581	−.0450	.4910	
8	.655	.174	.0024	.0689	.0263	.0280	.0768	−.0096	.1489	−.0346	.2421	−.0424	.3599	−.0450	.4898	
9	.660	.254	.0021	.0785	.0323	.0336	.0867	−.0112	.1572	−.0359	.2460	−.0433	.3586	−.0458	.4802	
10	.583	0.000	−.0066	.0392	.0032	.0111	.0443	−.0193	.1077	−.0303	.1913	−.0393	.2998	−.0431	.4312	
11	.583	.054	−.0076	.0378	.0026	.0094	.0431	−.0202	.1063	−.0311	.1887	−.0414	.2965	−.0447	.4274	
12	.500	0.000	−.0090	.0344	−.0003	.0075	.0384	−.0210	.1009	−.0306	.1873	−.0390	.2942	−.0428	.4264	
13	.500	.050	−.0099	.0339	−.0008	.0064	.0383	−.0220	.1009	−.0311	.1872	−.0401	.2940	−.0434	.4264	
14	.500	.101	−.0114	.0328	−.0019	.0051	.0382	−.0236	.1005	−.0360	.1855	−.0431	.2928	−.0456	.4256	
15	.500	.153	−.0135	.0300	−.0043	.0013	.0357	−.0248	.0976	−.0381	.1813	−.0446	.2877	−.0469	.4207	
16	.504	.239	−.0025	.0627	.0194	.0227	.0692	−.0143	.1358	−.0373	.2221	−.0442	.3290	−.0464	.4555	
17	.509	.319	−.0011	.0717	.0272	.0289	.0791	−.0141	.1482	−.0370	.2361	−.0437	.3453	−.0458	.4681	
18	.514	.400	−.0026	.0816	.0349	.0343	.0899	−.0155	.1573	−.0386	.2417	−.0441	.3469	−.0459	.4640	
19	.375	0.000	−.0115	.0342	−.0017	.0052	.0380	−.0224	.0967	−.0316	.1844	−.0391	.2913	−.0426	.4249	
20	.375	.085	−.0132	.0354	−.0024	.0031	.0404	−.0250	.0976	−.0333	.1836	−.0413	.2904	−.0442	.4251	
21	.375	.171	−.0138	.0337	−.0045	.0023	.0382	−.0256	.0981	−.0373	.1846	−.0439	.2908	−.0465	.4252	
22	.375	.259	−.0153	.0278	−.0074	−.0014	.0327	−.0270	.0952	−.0381	.1819	−.0443	.2889	−.0465	.4239	
23	.375	.292	−.0143	.0225	−.0106	−.0007	.0260	−.0258	.0875	−.0368	.1766	−.0430	.2830	−.0449	.4183	
24	.379	.364	−.0062	.0625	.0206	.0228	.0694	−.0175	.1326	−.0392	.2145	−.0443	.3189	−.0458	.4459	
25	.384	.444	−.0030	.0737	.0283	.0304	.0808	−.0165	.1480	−.0388	.2310	−.0439	.3328	−.0457	.4534	
26	.389	.525	−.0015	.0848	.0374	.0372	.0924	−.0158	.1590	−.0373	.2399	−.0416	.3360	−.0435	.4470	
27	.250	0.000	−.0124	.0355	−.0008	.0040	.0411	−.0229	.1027	−.0320	.1830	−.0400	.2909	−.0437	.4222	
28	.250	.120	−.0118	.0366	−.0001	.0047	.0419	−.0247	.1030	−.0340	.1824	−.0425	.2905	−.0456	.4213	
29	.250	.241	−.0154	.0353	−.0057	.0002	.0406	−.0276	.1027	−.0387	.1820	−.0448	.2898	−.0470	.4234	
30	.250	.365	−.0187	.0285	−.0090	−.0045	.0351	−.0302	.1003	−.0402	.1846	−.0457	.2929	−.0476	.4254	
31	.250	.412	−.0155	.0253	−.0077	−.0039	.0316	−.0267	.0945	−.0364	.1817	−.0417	.2904	−.0437	.4239	
32	.254	.489	−.0075	.0623	.0216	.0232	.0679	−.0195	.1298	−.0398	.2122	−.0437	.3165	−.0455	.4416	
33	.259	.569	−.0062	.0747	.0298	.0306	.0815	−.0193	.1461	−.0401	.2265	−.0439	.3264	−.0455	.4460	
34	.264	.650	−.0063	.0862	.0391	.0371	.0938	−.0201	.1587	−.0401	.2347	−.0433	.3273	−.0445	.4369	
35	.125	0.000	−.0047	.0351	.0016	.0111	.0375	−.0093	.1011	−.0220	.1862	−.0290	.2926	−.0322	.4216	
36	.125	.155	−.0075	.0367	.0018	.0110	.0402	−.0134	.1046	−.0265	.1900	−.0330	.2987	−.0348	.4274	
37	.125	.312	−.0103	.0361	−.0018	.0060	.0393	−.0161	.1046	−.0296	.1874	−.0347	.2984	−.0363	.4257	
38	.125	.471	−.0126	.0288	−.0074	.0030	.0318	−.0176	.1007	−.0302	.1868	−.0346	.2964	−.0361	.4258	
39	.125	.532	−.0134	.0231	−.0095	.0004	.0252	−.0178	.0936	−.0297	.1848	−.0343	.2945	−.0355	.4243	
40	.129	.614	−.0060	.0624	.0242	.0246	.0672	−.0184	.1285	−.0365	.2117	−.0396	.3174	−.0410	.4388	
41	.134	.694	−.0091	.0738	.0306	.0298	.0800	−.0219	.1424	−.0406	.2225	−.0438	.3237	−.0454	.4395	
42	.139	.775	−.0090	.0854	.0396	.0362	.0924	−.0226	.1539	−.0407	.2283	−.0435	.3219	−.0451	.4280	
43	.085	.658	−.0102	.0564	.0221	.0199	.0638	−.0279	.1241	−.0389	.2078	−.0429	.3130	−.0448	.4355	
44	.072	.756	−.0103	.0708	.0314	.0291	.0792	−.0283	.1397	−.0391	.2191	−.0430	.3200	−.0450	.4359	
45	.060	.854	−.0125	.0824	.0407	.0354	.0915	−.0306	.1503	−.0406	.2245	−.0443	.3176	−.0463	.4241	
46	.063	0.000	−.0309	−.0166	−.0290	−.0230	−.0192	−.0310	.0012	−.0357	.0356	−.0383	.0771	−.0391	.1271	
47	.063	.173	−.0318	−.0203	−.0315	−.0264	−.0244	−.0316	−.0077	−.0349	.0234	−.0375	.0658	−.0384	.1203	
48	.063	.347	−.0316	−.0218	−.0318	−.0270	−.0251	−.0303	−.0075	−.0333	.0220	−.0360	.0609	−.0372	.1155	
49	.063	.525	−.0325	−.0238	−.0332	−.0291	−.0268	−.0308	−.0100	−.0335	.0146	−.0361	.0515	−.0377	.1079	
50	.063	.592	−.0296	−.0221	−.0309	−.0273	−.0247	−.0276	−.0060	−.0301	.0195	−.0326	.0592	−.0341	.1188	
51	.042	0.000	−.0320	−.0237	−.0321	−.0282	−.0268	−.0309	−.0123	−.0342	.0139	−.0368	.0479	−.0378	.0998	
52	.042	.178	−.0315	−.0251	−.0329	−.0296	−.0284	−.0308	−.0160	−.0341	.0088	−.0367	.0450	−.0378	.0961	
53	.042	.359	−.0322	−.0261	−.0336	−.0301	−.0292	−.0306	−.0163	−.0341	.0050	−.0372	.0400	−.0384	.0943	
54	.042	.542	−.0311	−.0267	−.0316	−.0290	−.0297	−.0298	−.0173	−.0335	.0036	−.0364	.0429	−.0378	.1020	
55	.042	.612	−.0311	−.0291	−.0323	−.0304	−.0317	−.0305	−.0205	−.0341	.0014	−.0370	.0422	−.0382	.1049	
56	.021	0.000	−.0309	−.0262	−.0315	−.0296	−.0288	−.0302	−.0178	−.0336	.0040	−.0363	.0379	−.0373	.0923	
57	.021	.184	−.0315	−.0274	−.0327	−.0308	−.0302	−.0306	−.0200	−.0344	.0013	−.0371	.0357	−.0382	.0883	
58	.021	.370	−.0311	−.0280	−.0316	−.0296	−.0305	−.0305	−.0204	−.0341	−.0012	−.0371	.0343	−.0382	.0890	
59	.021	.560	−.0304	−.0283	−.0307	−.0290	−.0308	−.0301	−.0207	−.0338	.0002	−.0368	.0401	−.0379	.0996	
60	.021	.632	−.0302	−.0287	−.0307	−.0290	−.0320	−.0299	−.0239	−.0336	−.0040	−.0366	.0364	−.0379	.1002	
61	.125	−.532	.0040	.0277	.0092	.0103	.0372	−.0063	.0977	−.0171	.1897	−.0215	.2975	−.0215	.4247	
62	.375	−.292	.0040	.0290	.0099	.0094	.0396	−.0128	.0970	−.0233	.1830	−.0292	.2857	−.0298	.4167	

TABLE IV.–Concluded
(e) Concluded

			α =													
			30.8		35.8		40.8		45.8		50.8		55.8		60.8	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.914	0.000	.6495	−.0216	.8123		.9819	−.0203	1.1698		1.3233	−.0219	1.4531		1.5886	−.0235
2	.828	0.000	.6579	−.0366	.8188		.9924	−.0390	1.1753		1.3519	−.0395	1.4964		1.6187	−.0388
3	.742	0.000	.6528	−.0406	.8151		.9839	−.0435	1.1614		1.3318	−.0434	1.4952		1.6411	−.0420
4	.747	.081	.6425	−.0463	.8003		.9659	−.0487	1.1378		1.3047	−.0468	1.4630		1.6040	−.0440
5	.752	.162	.6211	−.0462	.7677		.9227	−.0486	1.0802		1.2364	−.0460	1.3810		1.5087	−.0429
6	.646	0.000	.5856	−.0459	.7440		.9118	−.0480	1.0847		1.2577	−.0466	1.4236		1.5868	−.0432
7	.650	.092	.6357	−.0483	.7908		.9515	−.0508	1.1132		1.2737	−.0479	1.4251		1.5778	−.0441
8	.655	.174	.6310	−.0484	.7834		.9406	−.0509	1.0999		1.2540	−.0480	1.3930		1.5375	−.0435
9	.660	.254	.6119	−.0488	.7533		.8976	−.0513	1.0452		1.1900	−.0485	1.3156		1.4456	−.0443
10	.583	0.000	.5802	−.0465	.7375		.9087	−.0487	1.0792		1.2538	−.0471	1.4254		1.5806	−.0429
11	.583	.054	.5762	−.0475	.7339		.9056	−.0494	1.0761		1.2512	−.0476	1.4238		1.5789	−.0431
12	.500	0.000	.5777	−.0457	.7386		.9063	−.0478	1.0837		1.2534	−.0461	1.4198		1.5701	−.0415
13	.500	.050	.5781	−.0465	.7396		.9074	−.0482	1.0853		1.2542	−.0464	1.4201		1.5696	−.0417
14	.500	.101	.5771	−.0478	.7391		.9067	−.0492	1.0843		1.2529	−.0472	1.4180		1.5662	−.0424
15	.500	.153	.5723	−.0489	.7351		.9038	−.0504	1.0810		1.2494	−.0481	1.4137		1.5596	−.0427
16	.504	.239	.5966	−.0497	.7489		.9085	−.0519	1.0755		1.2358	−.0490	1.3891		1.5251	−.0433
17	.509	.319	.6019	−.0491	.7445		.8940	−.0510	1.0501		1.2024	−.0479	1.3500		1.4767	−.0423
18	.514	.400	.5875	−.0490	.7165		.8514	−.0510	.9920		1.1293	−.0479	1.2656		1.3791	−.0422
19	.375	0.000	.5786	−.0453	.7447		.9097	−.0476	1.0846		1.2506	−.0456	1.4135		1.5541	−.0409
20	.375	.085	.5790	−.0469	.7450		.9102	−.0487	1.0852		1.2500	−.0466	1.4125		1.5531	−.0417
21	.375	.171	.5798	−.0481	.7454		.9110	−.0497	1.0854		1.2487	−.0471	1.4097		1.5484	−.0420
22	.375	.259	.5785	−.0481	.7435		.9089	−.0497	1.0824		1.2427	−.0471	1.4007		1.5350	−.0421
23	.375	.292	.5738	−.0463	.7390		.9050	−.0478	1.0781		1.2370	−.0455	1.3918		1.5231	−.0408
24	.379	.364	.5899	−.0489	.7453		.9021	−.0507	1.0662		1.2180	−.0476	1.3636		1.4870	−.0421
25	.384	.444	.5897	−.0488	.7377		.8862	−.0507	1.0415		1.1850	−.0476	1.3223		1.4376	−.0421
26	.389	.525	.5700	−.0463	.7052		.8406	−.0477	.9810		1.1113	−.0448	1.2383		1.3417	−.0390
27	.250	0.000	.5766	−.0461	.7406		.9086	−.0482	1.0854		1.2498	−.0459	1.4054		1.5300	−.0414
28	.250	.120	.5761	−.0476	.7401		.9076	−.0492	1.0839		1.2481	−.0466	1.4040		1.5281	−.0418
29	.250	.241	.5772	−.0483	.7404		.9069	−.0496	1.0817		1.2440	−.0469	1.3982		1.5210	−.0421
30	.250	.365	.5800	−.0487	.7426		.9070	−.0499	1.0796		1.2378	−.0471	1.3866		1.5030	−.0422
31	.250	.412	.5795	−.0446	.7422		.9059	−.0452	1.0767		1.2317	−.0422	1.3765		1.4868	−.0369
32	.254	.489	.5873	−.0482	.7397		.8945	−.0493	1.0565		1.2056	−.0464	1.3404		1.4446	−.0412
33	.259	.569	.5849	−.0481	.7286		.8752	−.0493	1.0290		1.1688	−.0465	1.2969		1.3956	−.0414
34	.264	.650	.5640	−.0472	.6941		.8273	−.0477	.9680		1.0929	−.0444	1.2122		1.3021	−.0388
35	.125	0.000	.5726	−.0342	.7374		.9032	−.0338	1.0741		1.2425	−.0337	1.3870		1.4358	−.0311
36	.125	.155	.5767	−.0361	.7410		.9072	−.0354	1.0786		1.2462	−.0349	1.3888		1.4379	−.0319
37	.125	.312	.5757	−.0372	.7398		.9048	−.0363	1.0747		1.2403	−.0356	1.3814		1.4311	−.0324
38	.125	.471	.5777	−.0368	.7388		.9018	−.0360	1.0674		1.2262	−.0354	1.3618		1.4091	−.0322
39	.125	.532	.5762	−.0362	.7360		.8978	−.0343	1.0597		1.2138	−.0341	1.3439		1.3873	−.0312
40	.129	.614	.5814	−.0438	.7315		.8848	−.0437	1.0397		1.1859	−.0408	1.3089		1.3529	−.0358
41	.134	.694	.5752	−.0482	.7175		.8632	−.0485	1.0087		1.1465	−.0458	1.2651		1.3099	−.0408
42	.139	.775	.5520	−.0477	.6815		.8138	−.0478	.9448		1.0695	−.0453	1.1794		1.2247	−.0407
43	.085	.658	.5784	−.0465	.7279		.8798	−.0460	1.0268		1.1612	−.0423	1.2359		1.2074	−.0403
44	.072	.756	.5713	−.0463	.7123		.8545	−.0466	.9895		1.1034	−.0441	1.1306		1.0908	−.0401
45	.060	.854	.5476	−.0476	.6758		.8041	−.0476	.9240		1.0152	−.0452	1.0132		.9976	−.0407
46	.063	0.000	.1943	−.0391	.2839		.3853	−.0377	.4936		.5909	−.0367	.6338		.6283	−.0332
47	.063	.173	.1835	−.0387	.2688		.3678	−.0374	.4747		.5703	−.0364	.6105		.6042	−.0329
48	.063	.347	.1823	−.0380	.2676		.3670	−.0365	.4738		.5673	−.0360	.6055		.6021	−.0324
49	.063	.525	.1809	−.0382	.2698		.3691	−.0370	.4747		.5664	−.0361	.6039		.6163	−.0322
50	.063	.592	.1974	−.0345	.2926		.3988	−.0333	.5126		.6124	−.0320	.6569		.6741	−.0276
51	.042	0.000	.1694	−.0378	.2587		.3588	−.0364	.4656		.5642	−.0355	.6140		.6555	−.0317
52	.042	.178	.1655	−.0383	.2573		.3569	−.0368	.4634		.5619	−.0361	.6123		.6575	−.0324
53	.042	.359	.1659	−.0390	.2564		.3553	−.0375	.4610		.5585	−.0367	.6087		.6641	−.0329
54	.042	.542	.1776	−.0382	.2697		.3714	−.0367	.4827		.5881	−.0359	.6497		.7222	−.0321
55	.042	.612	.1864	−.0387	.2846		.3921	−.0374	.5075		.6171	−.0365	.6807		.7607	−.0326
56	.021	0.000	.1639	−.0376	.2532		.3510	−.0359	.4573		.5594	−.0351	.6197		.7006	−.0318
57	.021	.184	.1609	−.0384	.2523		.3498	−.0367	.4562		.5583	−.0360	.6190		.7024	−.0325
58	.021	.370	.1615	−.0388	.2513		.3482	−.0371	.4548		.5574	−.0364	.6217		.7189	−.0326
59	.021	.560	.1758	−.0386	.2684		.3713	−.0372	.4868		.5991	−.0363	.6757		.7817	−.0325
60	.021	.632	.1828	−.0383	.2803		.3879	−.0369	.5049		.6184	−.0361	.6965		.8162	−.0323
61	.125	−.532	.5705	−.0215	.7272		.8826	−.0173	1.0395		1.1951	−.0190	1.3259		1.3669	−.0183
62	.375	−.292	.5671	−.0311	.7308		.8926	−.0317	1.0608		1.2210	−.0293	1.3715		1.5024	−.0266

TABLE V.–PRESSURE COEFFICIENTS FOR MODEL 5
(a) M = 1.60

			α =													
			−4.7		.3		5.3		10.2		15.3		20.3		25.2	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	.0910	.2774	.1850	.1748	.2948	.0809	.4249	−.0022	.5796	−.0590	.7541	−.1087	.9441	−.1461
2	.896	0.000	.0931	.2782	.1859	.1760	.2957	.0823	.4260	−.0016	.5793	−.0616	.7557	−.1089	.9297	−.1503
3	.844	0.000	.0936	.2805	.1849	.1752	.2955	.0835	.4271	.0012	.5812	−.0607	.7432	−.1154	.8881	−.1543
4	.838	.115	.0994	.2940	.1950	.1840	.3099	.0853	.4424	−.0020	.5951	−.0498	.7511	−.0534	.8869	−.4532
5	.857	.182	.1166	.3266	.2204	.2064	.3435	.1033	.4781	−.1254	.6275	−.3541	.7819	−.4278	.9168	−.4808
6	.781	0.000	−.0477	.1157	.0291	.0192	.1223	−.0660	.2325	−.1324	.3615	−.1857	.4869	−.2308	.6617	−.2702
7	.719	0.000	−.0504	.1085	.0228	.0115	.1139	−.0704	.2256	−.1315	.3582	−.1844	.5072	−.2324	.6855	−.2771
8	.719	.105	−.1291	.0216	−.0617	−.0742	.0330	−.1477	.1532	−.2013	.2993	−.2504	.4629	−.2847	.6617	−.3154
9	.733	.223	.0979	.2640	.1799	.1694	.2741	.0817	.3698	−.0027	.4773	−.0695	.6040	−.0752	.7599	−.4844
10	.751	.289	.1117	.3187	.2156	.2016	.3308	.0939	.4555	.0238	.5679	−.2016	.6837	−.4373	.8208	−.4909
11	.770	.356	.1320	.3614	.2481	.2300	.3760	.1222	.5097	−.2378	.6360	−.3842	.7455	−.4413	.8615	−.4808
12	.625	0.000	−.0536	.0995	.0211	.0080	.1086	−.0728	.2187	−.1317	.3565	−.1876	.5126	−.2347	.6900	−.2841
13	.625	.131	−.0628	.0977	.0162	.0015	.1084	−.0839	.2216	−.1487	.3584	−.2351	.5171	−.2760	.6961	−.3061
14	.625	.218	−.1213	.0360	−.0698	−.0737	.0320	−.1686	.1746	−.2278	.3195	−.2647	.5071	−.3048	.6913	−.3105
15	.625	.306	−.2267	−.0503	−.1145	−.1317	−.0229	−.2419	.1188	−.2884	.2872	−.3028	.4646	−.3796	.6727	−.4902
16	.639	.410	.0863	.2285	.1629	.1533	.2359	.0693	.3273	−.0341	.4497	−.2100	.5905	−.3928	.7553	−.4980
17	.658	.477	.1159	.3121	.2240	.2087	.3217	.0943	.4199	−.0417	.5349	−.3053	.6639	−.4459	.8083	−.4892
18	.676	.543	.1368	.3758	.2643	.2436	.3891	.1030	.4952	−.3034	.6028	−.4115	.7163	−.4530	.8399	−.4840
19	.500	0.000	−.0712	.0975	.0161	.0051	.1023	−.0724	.2044	−.1359	.3393	−.1963	.4994	−.2476	.6737	−.2995
20	.500	.222	−.0651	.0946	.0174	−.0008	.1103	−.0787	.2230	−.1469	.3607	−.2125	.5158	−.2580	.6814	−.3223
21	.500	.370	−.1028	.0946	.0141	−.0351	.1196	−.1295	.2290	−.2211	.3676	−.2866	.5238	−.3959	.6864	−.4705
22	.500	.518	−.2505	−.0663	−.1419	−.1532	−.0400	−.2658	.1252	−.2997	.3028	−.3437	.5013	−.4270	.6870	−.4876
23	.514	.660	.0706	.2071	.1452	.1350	.2143	.0563	.3101	−.0492	.4417	−.3388	.5979	−.4658	.7534	−.5067
24	.533	.727	.1198	.2954	.2149	.2008	.3034	.1014	.4057	−.2121	.5263	−.4145	.6620	−.4753	.8032	−.5100
25	.551	.793	.0852	.3695	.2727	.2492	.3810	−.0654	.4836	−.3230	.5940	−.4183	.7106	−.4767	.8310	−.5084
26	.375	0.000	−.0605	.0968	.0195	.0019	.1140	−.0745	.2256	−.1369	.3592	−.1980	.5070	−.2488	.6146	−.2971
27	.375	.250	−.0635	.0967	.0188	.0001	.1141	−.0796	.2284	−.1462	.3602	−.2112	.4979	−.2543	.5981	−.3336
28	.375	.417	−.0774	.0959	.0126	−.0052	.1137	−.0960	.2255	−.1734	.3505	−.2625	.4649	−.3793	.5668	−.4421
29	.375	.583	−.1713	.0522	−.0198	−.0528	.0716	−.2043	.1745	−.2888	.2871	−.3186	.4017	−.4038	.5219	−.4620
30	.375	.750	−.2503	−.0797	−.1625	−.1803	−.0621	−.2568	.0784	−.2759	.2318	−.3876	.3474	−.4721	.4852	−.5113
31	.375	.833	−.1459	−.0998	−.1438	−.1479	−.0836	−.1501	.0541	−.2168	.1874	−.4075	.3292	−.5039	.4911	−.5227
32	.375	.917	−.0833	−.0762	−.0668	−.0644	−.0807	−.1032	.0076	−.2824	.1468	−.4686	.2877	−.5180	.4205	−.5183
33	.250	0.000	−.0575	.0996	.0198	.0042	.1121	−.0734	.2225	−.1364	.3295	−.1999	.4145	−.2505	.5307	−.3003
34	.250	.250	−.0696	.0840	.0106	−.0051	.0985	−.0846	.1996	−.1456	.3081	−.1999	.4123	−.2469	.5318	−.3151
35	.250	.417	−.0982	.0515	−.0197	−.0361	.0666	−.1145	.1686	−.1769	.2822	−.2510	.4045	−.3249	.5258	−.4081
36	.250	.583	−.0778	.0306	−.0345	−.0483	.0434	−.0923	.1463	−.1576	.2651	−.2394	.3941	−.3611	.5098	−.4392
37	.250	.750	−.1043	.0262	−.0306	−.0608	.0325	−.1369	.1135	−.2465	.2240	−.2772	.3435	−.3799	.4508	−.4865
38	.250	.833	−.1747	.0190	−.0592	−.0806	.0370	−.1966	.0942	−.2639	.1969	−.4028	.3104	−.4931	.4164	−.5130
39	.250	.917	−.1762	−.0174	−.0838	−.1078	−.0112	−.1906	.0692	−.3171	.1514	−.5178	.2558	−.5316	.3528	−.5139
40	.156	0.000	−.0690	.0739	.0049	−.0074	.0835	−.0848	.1719	−.1425	.2626	−.2017	.3739	−.2510	.5150	−.2936
41	.156	.250	−.0840	.0568	−.0166	−.0297	.0681	−.1001	.1669	−.1560	.2696	−.2084	.3770	−.2525	.5085	−.3149
42	.156	.417	−.0661	.0400	−.0246	−.0322	.0517	−.0789	.1531	−.1332	.2656	−.1921	.3700	−.2183	.4949	−.3704
43	.156	.583	−.0603	.0309	−.0089	−.0178	.0462	−.0698	.1361	−.1418	.2472	−.2106	.3538	−.3625	.4680	−.4130
44	.156	.750	−.0685	.0274	−.0029	−.0113	.0388	−.0792	.1033	−.1610	.2016	−.2895	.3051	−.4151	.4056	−.4659
45	.156	.833	−.0814	.0189	−.0077	−.0163	.0294	−.0998	.0831	−.2259	.1741	−.4268	.2754	−.4969	.3728	−.4972
46	.156	.917	−.1480	.0116	−.0196	−.0325	.0194	−.1849	.0523	−.3543	.1296	−.4991	.2241	−.5188	.3110	−.4931
47	.094	0.000	−.3332	−.2694	−.2964	−.3049	−.2605	−.3389	−.2166	−.3736	−.1681	−.4050	−.1075	−.3955	−.0522	−.3895
48	.094	.250	−.3303	−.2785	−.3096	−.3157	−.2711	−.3369	−.2240	−.3602	−.1732	−.3899	−.1161	−.3960	−.0574	−.3878
49	.094	.417	−.3210	−.2805	−.3002	−.3086	−.2716	−.3252	−.2231	−.3497	−.1705	−.3825	−.1182	−.4025	−.0618	−.4481
50	.094	.583	−.3200	−.2790	−.2897	−.2943	−.2674	−.3271	−.2292	−.3503	−.1795	−.3729	−.1287	−.4520	−.0765	−.4717
51	.094	.917	−.1309	−.0037	−.0052	.0057	.0045	−.1925	.0428	−.3736	.1122	−.4740	.1866	−.4904	.2613	−.4825
52	.063	0.000	−.3468	−.2836	−.3112	−.3189	−.2747	−.3539	−.2292	−.3768	−.1767	−.3772	−.1133	−.3636	−.0557	−.3857
53	.063	.250	−.3375	−.2880	−.3166	−.3225	−.2800	−.3439	−.2331	−.3660	−.1813	−.3839	−.1205	−.3617	−.0591	−.3879
54	.063	.417	−.3332	−.2874	−.3079	−.3144	−.2800	−.3385	−.2342	−.3600	−.1826	−.3862	−.1273	−.4091	−.0670	−.4293
55	.063	.583	−.3131	−.2748	−.2910	−.2957	−.2662	−.3186	−.2282	−.3445	−.1753	−.3944	−.1198	−.4559	−.0610	−.4754
56	.031	0.000	−.3195	−.2864	−.3042	−.3090	−.2798	−.3231	−.2383	−.3399	−.1833	−.3337	−.1191	−.3132	−.0593	−.3844
57	.031	.250	−.3269	−.2927	−.3127	−.3160	−.2849	−.3294	−.2398	−.3363	−.1874	−.3455	−.1242	−.3121	−.0624	−.3911
58	.031	.417	−.3185	−.2850	−.3031	−.3075	−.2781	−.3207	−.2373	−.3287	−.1865	−.3595	−.1275	−.3652	−.0645	−.4076
59	.031	.583	−.2957	−.2577	−.2745	−.2785	−.2501	−.3002	−.2138	−.3164	−.1594	−.3633	−.0986	−.4330	−.0326	−.4636
60	.031	.750	−.3092	−.2467	−.2661	−.2671	−.2354	−.3225	−.1892	−.3682	−.1294	−.4020	−.0692	−.4581	−.0023	−.4671
61	.375	−.583	−.1672	.0474	−.0180	−.0417	.0615	−.2032	.1750	−.2858	.2868	−.3217	.4031	−.4108	.5229	−.4721
62	.156	−.583	−.0581	.0313	−.0098	−.0156	.0431	−.0604	.1302	−.1352	.2479	−.2090	.3520	−.3651	.4645	−.4166

TABLE V.–Continued
(a) Concluded

			α =													
			30.2		35.2		40.2		45.2		50.3		55.3		60.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	1.1277	−.1826	1.3189	−.2315	1.4632	−.3110	1.5490	−.3987	1.5830	−.4514	1.5808		1.5460	
2	.896	0.000	1.0810	−.1932	1.2516	−.2420	1.3910	−.3049	1.4914	−.3964	1.5535	−.4311	1.5799		1.5784	
3	.844	0.000	1.0247	−.1987	1.1913	−.2448	1.3313	−.3015	1.4411	−.3903	1.5168	−.4232	1.5594		1.5799	
4	.838	.115	1.0161	−.5037	1.1757	−.5128	1.3068	−.5110	1.4087	−.4714	1.4771	−.4639	1.5172		1.5341	
5	.857	.182	1.0343	−.5029	1.1734	−.5179	1.2818	−.5168	1.3668	−.4737	1.4141	−.4651	1.4409		1.4418	
6	.781	0.000	.8610	−.3112	1.0476	−.3511	1.2195	−.4030	1.3560	−.4447	1.4489	−.4711	1.5218		1.5609	
7	.719	0.000	.8690	−.3191	1.0309	−.3649	1.1856	−.4089	1.3124	−.4570	1.4053	−.4579	1.4848		1.5358	
8	.719	.105	.8601	−.3419	1.0261	−.4272	1.1831	−.4645	1.3120	−.4584	1.4040	−.4615	1.4832		1.5312	
9	.733	.223	.9205	−.5181	1.0797	−.5230	1.2125	−.5060	1.3240	−.4749	1.4030	−.4652	1.4628		1.5003	
10	.751	.289	.9664	−.5086	1.1050	−.5213	1.2222	−.5037	1.3174	−.4754	1.3826	−.4654	1.4294		1.4570	
11	.770	.356	.9862	−.5056	1.0982	−.5175	1.1912	−.5013	1.2648	−.4748	1.3108	−.4658	1.3416		1.3545	
12	.625	0.000	.8511	−.3294	.9865	−.3782	1.1283	−.4111	1.2491	−.4455	1.3418	−.4470	1.4291		1.4909	
13	.625	.131	.8515	−.3380	.9895	−.4183	1.1293	−.4402	1.2507	−.4604	1.3423	−.4616	1.4283		1.4877	
14	.625	.218	.8551	−.4866	.9913	−.5068	1.1308	−.4833	1.2508	−.4755	1.3403	−.4656	1.4231		1.4784	
15	.625	.306	.8507	−.5156	.9913	−.5203	1.1321	−.4934	1.2504	−.4761	1.3391	−.4662	1.4177		1.4686	
16	.639	.410	.9086	−.5175	1.0366	−.5211	1.1538	−.4911	1.2534	−.4786	1.3283	−.4670	1.3885		1.4308	
17	.658	.477	.9469	−.5159	1.0592	−.5207	1.1596	−.4898	1.2444	−.4777	1.3053	−.4667	1.3537		1.3856	
18	.676	.543	.9582	−.5101	1.0454	−.5193	1.1233	−.4865	1.1873	−.4767	1.2296	−.4665	1.2656		1.2852	
19	.500	0.000	.8051	−.3336	.9377	−.3656	1.0624	−.4137	1.1722	−.4419	1.2692	−.4570	1.3516		1.4275	
20	.500	.222	.8066	−.3854	.9394	−.4644	1.0626	−.4675	1.1708	−.4761	1.2664	−.4634	1.3490		1.4230	
21	.500	.370	.8089	−.5107	.9393	−.5005	1.0584	−.4819	1.1660	−.4796	1.2579	−.4666	1.3383		1.4077	
22	.500	.518	.8072	−.5142	.9340	−.4959	1.0505	−.4834	1.1547	−.4792	1.2404	−.4672	1.3168		1.3804	
23	.514	.660	.8511	−.5138	.9360	−.5131	1.0361	−.4805	1.1261	−.4775	1.1982	−.4659	1.2623		1.3115	
24	.533	.727	.8917	−.5179	.9620	−.5123	1.0444	−.4790	1.1185	−.4774	1.1785	−.4659	1.2296		1.2711	
25	.551	.793	.9024	−.5153	.9523	−.5088	1.0129	−.4771	1.0679	−.4770	1.1098	−.4655	1.1462		1.1779	
26	.375	0.000	.7357	−.3361	.8671	−.3840	.9824	−.4152	1.0860	−.4545	1.1788	−.4515	1.2639		1.3467	
27	.375	.250	.7279	−.3753	.8603	−.4511	.9757	−.4539	1.0803	−.4611	1.1728	−.4579	1.2587		1.3381	
28	.375	.417	.7119	−.5110	.8472	−.4970	.9613	−.4747	1.0643	−.4741	1.1557	−.4642	1.2420		1.3191	
29	.375	.583	.6843	−.4990	.8173	−.4887	.9248	−.4731	1.0242	−.4682	1.1138	−.4581	1.1942		1.2718	
30	.375	.750	.6402	−.5187	.7447	−.4948	.8398	−.4769	.9284	−.4715	1.0073	−.4636	1.0835		1.1518	
31	.375	.833	.6184	−.5200	.7115	−.4839	.8017	−.4669	.8870	−.4709	.9610	−.4636	1.0357		1.1019	
32	.375	.917	.5462	−.5122	.6337	−.4610	.7201	−.4602	.7979	−.4676	.8679	−.4611	.9355		.9954	
33	.250	0.000	.6771	−.3405	.7924	−.3827	.8906	−.4084	.9799	−.4185	1.0638	−.4437	1.1466		1.2314	
34	.250	.250	.6717	−.3698	.7857	−.4266	.8841	−.4281	.9733	−.4405	1.0561	−.4504	1.1407		1.2247	
35	.250	.417	.6580	−.4796	.7720	−.4763	.8693	−.4564	.9581	−.4672	1.0384	−.4596	1.1247		1.2063	
36	.250	.583	.6305	−.5046	.7420	−.4797	.8364	−.4670	.9213	−.4687	.9998	−.4627	1.0862		1.1669	
37	.250	.750	.5592	−.5029	.6631	−.4767	.7503	−.4651	.8296	−.4651	.9018	−.4616	.9834		1.0591	
38	.250	.833	.5218	−.5039	.6232	−.4619	.7089	−.4546	.7852	−.4637	.8548	−.4604	.9350		1.0087	
39	.250	.917	.4508	−.5007	.5458	−.4549	.6258	−.4492	.6986	−.4628	.7637	−.4599	.8395		.9088	
40	.156	0.000	.6302	−.3462	.7058	−.3729	.7736	−.3949	.8354	−.3841	.8939	−.4371	.9643		1.0459	
41	.156	.250	.6232	−.3813	.7005	−.3840	.7683	−.4171	.8302	−.4359	.8889	−.4450	.9622		1.0449	
42	.156	.417	.6090	−.4464	.6881	−.4353	.7561	−.4489	.8175	−.4607	.8759	−.4546	.9516		1.0357	
43	.156	.583	.5795	−.4840	.6619	−.4460	.7255	−.4568	.7867	−.4578	.8475	−.4539	.9201		1.0124	
44	.156	.750	.5113	−.4848	.5885	−.4725	.6483	−.4574	.7057	−.4625	.7632	−.4587	.8456		.9428	
45	.156	.833	.4768	−.4831	.5526	−.4505	.6117	−.4421	.6679	−.4595	.7253	−.4565	.8164		.9142	
46	.156	.917	.4086	−.4767	.4808	−.4363	.5358	−.4370	.5910	−.4574	.6459	−.4548	.7391		.8281	
47	.094	0.000	−.0147	−.4588	.0167	−.4465	.0456	−.4447	.0829	−.4632	.1900	−.4299	.3711		.5612	
48	.094	.250	−.0186	−.4553	.0089	−.4573	.0381	−.4413	.0756	−.4498	.1952	−.4352	.3781		.5684	
49	.094	.417	−.0217	−.4644	.0060	−.4514	.0357	−.4516	.0766	−.4531	.2067	−.4476	.3964		.5834	
50	.094	.583	−.0312	−.4699	−.0037	−.4487	.0312	−.4595	.1366	−.4546	.2033	−.4536	.4231		.6158	
51	.094	.917	.3161	−.4635	.3489	−.4192	.3866	−.4269	.4410	−.4470	.5217	−.4484	.6831		.7748	
52	.063	0.000	−.0095	−.4404	.0341	−.4357	.0870	−.4403	.1594	−.4491	.2501	−.4200	.7280		.8475	
53	.063	.250	−.0123	−.4474	.0286	−.4462	.0825	−.4399	.1589	−.4441	.2430	−.4275	.7365		.8437	
54	.063	.417	−.0204	−.4593	.0230	−.4494	.0797	−.4463	.1734	−.4455	.2420	−.4425	.7510		.8415	
55	.063	.583	−.0005	−.4637	.0526	−.4447	.1228	−.4442	.1855	−.4455	.2535	−.4494	.7739		.8421	
56	.031	0.000	−.0061	−.4385	.0474	−.4340	.1195	−.4385	.2165	−.4286	.3403	−.4230	.7231		.7717	
57	.031	.250	−.0096	−.4475	.0439	−.4444	.1172	−.4396	.2177	−.4395	.3603	−.4335	.7177		.7648	
58	.031	.417	−.0118	−.4551	.0450	−.4449	.1242	−.4351	.2237	−.4435	.3861	−.4428	.7234		.7704	
59	.031	.583	.0251	−.4604	.0853	−.4388	.1569	−.4282	.2189	−.4452	.6327	−.4489	.7145		.7684	
60	.031	.750	.0640	−.4492	.1302	−.4185	.2205	−.4107	.3366	−.4350	.5730	−.4394	.6796		.7472	
61	.375	−.583	.6833	−.5120	.8153	−.4984	.9241	−.4815	1.0220	−.4752	1.1126	−.4657	1.1946		1.2725	
62	.156	−.583	.5778	−.4934	.6596	−.4548	.7248	−.4635	.7854	−.4632	.8472	−.4592	.9215		1.0134	

TABLE V.–Continued
(b) M = 2.16

			α =													
			−3.7		1.3		6.3		11.3		16.3		21.3		26.3	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	.0760	.2137	.1612	.1261	.2607	.0529	.3789	−.0102	.5210	−.0566	.6853	−.0893	.8474	−.1201
2	.896	0.000	.0727	.2139	.1582	.1259	.2591	.0515	.3800	−.0107	.5181	−.0581	.6859	−.0909	.8589	−.1218
3	.844	0.000	.0732	.2145	.1568	.1258	.2598	.0510	.3802	−.0102	.5148	−.0585	.6824	−.0936	.8588	−.1257
4	.838	.115	.0793	.2276	.1692	.1344	.2758	.0539	.3959	−.0226	.5315	−.1213	.6936	−.1837	.8667	−.2314
5	.857	.182	.0950	.2628	.2005	.1593	.3144	.0595	.4372	−.0523	.5729	−.1424	.7272	−.2103	.8903	−.2520
6	.781	0.000	−.0268	.0877	.0381	.0128	.1195	−.0474	.2178	−.1004	.3327	−.1364	.4675	−.1670	.6207	−.1893
7	.719	0.000	−.0415	.0731	.0221	−.0020	.1048	−.0585	.2032	−.1060	.3233	−.1422	.4571	−.1688	.6087	−.1948
8	.719	.105	−.0740	.0303	−.0162	−.0380	.0606	−.0906	.1491	−.1380	.2624	−.1720	.4043	−.1971	.5680	−.2089
9	.733	.223	.0800	.2314	.1675	.1367	.2787	.0537	.3862	−.0271	.5131	−.1324	.6374	−.2012	.7469	−.2466
10	.751	.289	.0919	.2562	.1896	.1538	.3068	.0604	.4216	−.0490	.5611	−.1361	.7119	−.2141	.8372	−.2581
11	.770	.356	.1130	.3008	.2285	.1855	.3526	.0595	.4702	−.0792	.6089	−.1770	.7575	−.2341	.8897	−.2667
12	.625	0.000	−.0419	.0716	.0208	−.0030	.1032	−.0590	.1993	−.1049	.3156	−.1397	.4500	−.1687	.6048	−.1937
13	.625	.131	−.0689	.0605	.0002	−.0284	.0928	−.0873	.1984	−.1302	.3163	−.1620	.4543	−.1914	.6074	−.2062
14	.625	.218	−.0816	.0247	−.0214	−.0453	.0502	−.0988	.1542	−.1504	.2945	−.1863	.4220	−.2234	.5951	−.2648
15	.625	.306	−.1097	−.0176	−.0601	−.0800	.0087	−.1248	.1045	−.1637	.2185	−.2086	.3788	−.2481	.5589	−.2678
16	.639	.410	.0865	.2461	.1826	.1468	.2861	.0550	.3861	−.0512	.4782	−.1468	.5799	−.2223	.7142	−.2666
17	.658	.477	.1030	.2809	.2111	.1698	.3264	.0649	.4455	−.0672	.5661	−.1633	.6742	−.2374	.7958	−.2712
18	.676	.543	.1243	.3274	.2518	.2033	.3737	.0511	.4981	−.1000	.6265	−.2020	.7407	−.2452	.8494	−.2721
19	.500	0.000	−.0481	.0641	.0146	−.0054	.0917	−.0625	.1922	−.1079	.3084	−.1415	.4455	−.1703	.5961	−.1962
20	.500	.222	−.0766	.0624	0.0000	−.0289	.0989	−.0944	.1968	−.1359	.3169	−.1702	.4531	−.2052	.6037	−.2658
21	.500	.370	−.0872	.0235	−.0289	−.0486	.0596	−.1073	.1809	−.1610	.3292	−.2079	.4679	−.2468	.6164	−.2718
22	.500	.518	−.1134	−.0252	−.0638	−.0828	.0030	−.1280	.0982	−.1764	.2185	−.2287	.4078	−.2548	.6011	−.2729
23	.514	.660	.0967	.2591	.1963	.1577	.2904	.0603	.3690	−.0683	.4457	−.1643	.5633	−.2404	.7122	−.2745
24	.533	.727	.1150	.3052	.2302	.1845	.3437	.0672	.4487	−.0825	.5390	−.1820	.6538	−.2491	.7863	−.2758
25	.551	.793	.1360	.3548	.2727	.2180	.3967	.0317	.5154	−.1228	.6151	−.2191	.7197	−.2546	.8348	−.2768
26	.375	0.000	−.0460	.0655	.0157	−.0067	.0963	−.0630	.1924	−.1083	.3096	−.1427	.4479	−.1707	.6051	−.1962
27	.375	.250	−.0591	.0696	.0195	−.0051	.0980	−.0847	.1919	−.1199	.3087	−.1596	.4510	−.1918	.6119	−.2464
28	.375	.417	−.0850	.0579	−.0119	−.0400	.0990	−.1035	.2005	−.1533	.3160	−.2076	.4586	−.2460	.6159	−.2697
29	.375	.583	−.1082	.0017	−.0461	−.0714	.0418	−.1309	.1960	−.1751	.3075	−.2133	.4303	−.2395	.5619	−.2601
30	.375	.750	−.1162	−.0438	−.0745	−.0878	−.0213	−.1274	.0650	−.1769	.1840	−.2244	.3581	−.2559	.4766	−.2729
31	.375	.833	−.0717	−.0105	−.0315	−.0383	.0024	−.0859	.0504	−.1572	.1697	−.2190	.3138	−.2614	.4542	−.2766
32	.375	.917	−.0143	.0223	.0124	.0035	.0389	−.0419	.0880	−.1612	.1557	−.2373	.2863	−.2725	.4291	−.2717
33	.250	0.000	−.0422	.0715	.0183	−.0056	.0962	−.0614	.1925	−.1075	.3056	−.1428	.4419	−.1714	.5951	−.1967
34	.250	.250	−.0407	.0720	.0200	−.0053	.0961	−.0606	.1967	−.1105	.3094	−.1518	.4373	−.1723	.5745	−.2062
35	.250	.417	−.0695	.0602	.0113	−.0171	.0836	−.0835	.1792	−.1348	.2894	−.1786	.4074	−.2473	.5421	−.2705
36	.250	.583	−.1005	.0400	−.0259	−.0536	.0691	−.1201	.1518	−.1655	.2605	−.2130	.3803	−.2451	.5145	−.2686
37	.250	.750	−.0937	−.0128	−.0499	−.0652	.0119	−.1069	.1366	−.1547	.2368	−.2098	.3525	−.2465	.4814	−.2766
38	.250	.833	−.0776	−.0213	−.0548	−.0637	−.0026	−.0905	.1021	−.1571	.2200	−.2216	.3324	−.2534	.4553	−.2754
39	.250	.917	−.0557	−.0282	−.0391	−.0289	−.0231	−.0820	.0596	−.1902	.1836	−.2670	.2919	−.2783	.4058	−.2794
40	.156	0.000	−.0453	.0700	.0171	−.0067	.0919	−.0637	.1889	−.1083	.3049	−.1448	.4283	−.1729	.5477	−.1980
41	.156	.250	−.0488	.0626	.0112	−.0107	.0866	−.0676	.1789	−.1124	.2901	−.1511	.4078	−.1722	.5391	−.2005
42	.156	.417	−.0631	.0470	−.0019	−.0204	.0713	−.0809	.1585	−.1247	.2661	−.1559	.3880	−.2478	.5240	−.2683
43	.156	.583	−.0566	.0332	−.0058	−.0295	.0614	−.0756	.1445	−.1364	.2488	−.1945	.3722	−.2223	.5063	−.2479
44	.156	.750	−.0799	.0075	−.0399	−.0586	.0408	−.1014	.1185	−.1540	.2135	−.2147	.3269	−.2502	.4491	−.2677
45	.156	.833	−.0822	−.0035	−.0394	−.0424	.0114	−.1004	.1016	−.1654	.1913	−.2373	.2994	−.2725	.4169	−.2755
46	.156	.917	−.0765	−.0085	−.0365	−.0436	−.0009	−.0981	.0823	−.2106	.1616	−.2687	.2589	−.2767	.3668	−.2769
47	.094	0.000	−.1938	−.1364	−.1592	−.1698	−.1249	−.2032	−.0804	−.2250	−.0245	−.2397	.0327	−.2315	.0932	−.2451
48	.094	.250	−.2053	−.1472	−.1724	−.1831	−.1348	−.2118	−.0928	−.2224	−.0404	−.2340	.0224	−.2456	.0886	−.2547
49	.094	.417	−.1944	−.1535	−.1753	−.1839	−.1399	−.2009	−.1004	−.2205	−.0476	−.2366	.0173	−.2616	.0874	−.2677
50	.094	.583	−.1917	−.1624	−.1819	−.1873	−.1511	−.1948	−.1075	−.2139	−.0573	−.2396	.0040	−.2581	.0732	−.2667
51	.094	.917	−.0841	−.0058	−.0366	−.0462	.0057	−.1074	.0708	−.2139	.1496	−.2623	.2425	−.2727	.3433	−.2712
52	.063	0.000	−.2001	−.1497	−.1726	−.1822	−.1388	−.1982	−.0952	−.2136	−.0397	−.2186	.0186	−.2244	.0829	−.2375
53	.063	.250	−.2084	−.1592	−.1823	−.1906	−.1479	−.2013	−.1073	−.2160	−.0522	−.2157	.0124	−.2295	.0811	−.2431
54	.063	.417	−.2024	−.1657	−.1863	−.1927	−.1543	−.2062	−.1145	−.2196	−.0610	−.2289	.0054	−.2538	.0776	−.2645
55	.063	.583	−.1918	−.1682	−.1851	−.1815	−.1595	−.1973	−.1170	−.2197	−.0658	−.2380	−.0015	−.2506	.0723	−.2586
56	.031	0.000	−.1889	−.1574	−.1796	−.1875	−.1472	−.1865	−.1044	−.2017	−.0501	−.2135	.0087	−.2222	.0750	−.2350
57	.031	.250	−.1917	−.1650	−.1872	−.1948	−.1540	−.1883	−.1133	−.2024	−.0576	−.2141	.0067	−.2278	.0751	−.2435
58	.031	.417	−.1846	−.1668	−.1851	−.1871	−.1567	−.1821	−.1158	−.1988	−.0620	−.2135	.0038	−.2398	.0749	−.2570
59	.031	.583	−.1706	−.1510	−.1698	−.1703	−.1520	−.1736	−.1112	−.1992	−.0571	−.2209	.0100	−.2388	.0873	−.2502
60	.031	.750	−.1756	−.1460	−.1542	−.1492	−.1427	−.1841	−.0963	−.2073	−.0352	−.2357	.0357	−.2424	.1160	−.2434
61	.375	−.583	−.1160	.0051	−.0516	−.0749	.0419	−.1353	.1968	−.1804	.3073	−.2225	.4293	−.2517	.5582	−.2738
62	.156	−.583	−.0619	.0319	−.0058	−.0288	.0563	−.0759	.1452	−.1322	.2509	−.1984	.3742	−.2296	.5099	−.2631

TABLE V.–Continued
(b) Concluded

			α =													
			31.3		36.3		41.3		46.3		51.3		56.3		61.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	1.0253	−.1437	1.2216	−.1670	1.4154	−.1881	1.5600	−.2186	1.6710	−.2428	1.7184	−.2530	1.7124	−.2490
2	.896	0.000	1.0362	−.1470	1.2131	−.1747	1.3771	−.1970	1.5060	−.2262	1.6194	−.2501	1.6941	−.2591	1.7126	−.2581
3	.844	0.000	1.0367	−.1453	1.1765	−.1728	1.3270	−.1956	1.4571	−.2248	1.5789	−.2518	1.6644	−.2569	1.6936	−.2579
4	.838	.115	1.0365	−.2517	1.1638	−.2719	1.3097	−.2802	1.4299	−.2804	1.5408	−.2738	1.6192	−.2685	1.6450	−.2586
5	.857	.182	1.0489	−.2708	1.1752	−.2819	1.3005	−.2852	1.3985	−.2839	1.4881	−.2747	1.5462	−.2690	1.5665	−.2592
6	.781	0.000	.7690	−.2035	.9632	−.2260	1.1756	−.2433	1.3665	−.2616	1.5161	−.2698	1.6088	−.2748	1.6661	−.2601
7	.719	0.000	.7738	−.2098	.9761	−.2338	1.1761	−.2510	1.3420	−.2640	1.4777	−.2733	1.5689	−.2672	1.6355	−.2606
8	.719	.105	.7496	−.2612	.9658	−.2754	1.1739	−.2805	1.3411	−.2775	1.4615	−.2705	1.5668	−.2682	1.6325	−.2604
9	.733	.223	.8776	−.2704	1.0461	−.2813	1.2232	−.2836	1.3533	−.2770	1.4702	−.2733	1.5560	−.2695	1.6015	−.2610
10	.751	.289	.9503	−.2752	1.0939	−.2850	1.2458	−.2840	1.3570	−.2780	1.4569	−.2736	1.5274	−.2694	1.5633	−.2608
11	.770	.356	.9922	−.2784	1.1107	−.2859	1.2336	−.2840	1.3225	−.2818	1.3933	−.2745	1.4438	−.2698	1.4779	−.2603
12	.625	0.000	.7767	−.2127	.9815	−.2381	1.1571	−.2581	1.2979	−.2700	1.4203	−.2687	1.5119	−.2673	1.5908	−.2614
13	.625	.131	.7805	−.2620	.9842	−.2748	1.1596	−.2773	1.3004	−.2746	1.4229	−.2726	1.5107	−.2690	1.5886	−.2619
14	.625	.218	.7798	−.2776	.9884	−.2845	1.1632	−.2843	1.3006	−.2777	1.4215	−.2741	1.5080	−.2702	1.5826	−.2625
15	.625	.306	.7631	−.2797	.9847	−.2836	1.1650	−.2832	1.3038	−.2780	1.4203	−.2737	1.5035	−.2702	1.5728	−.2623
16	.639	.410	.8701	−.2814	1.0516	−.2869	1.2043	−.2846	1.3208	−.2791	1.4197	−.2743	1.4860	−.2700	1.5455	−.2623
17	.658	.477	.9324	−.2821	1.0891	−.2875	1.2215	−.2835	1.3224	−.2782	1.4057	−.2742	1.4554	−.2701	1.5073	−.2625
18	.676	.543	.9631	−.2820	1.0937	−.2878	1.2012	−.2836	1.2777	−.2769	1.3445	−.2745	1.3835	−.2705	1.4138	−.2626
19	.500	0.000	.7755	−.2177	.9705	−.2386	1.1032	−.2582	1.2327	−.2631	1.3485	−.2684	1.4479	−.2680	1.5228	−.2640
20	.500	.222	.7827	−.2782	.9799	−.2820	1.1119	−.2782	1.2382	−.2717	1.3516	−.2728	1.4485	−.2706	1.5190	−.2639
21	.500	.370	.7935	−.2817	.9876	−.2835	1.1131	−.2795	1.2361	−.2761	1.3470	−.2738	1.4392	−.2707	1.5069	−.2642
22	.500	.518	.8021	−.2815	.9947	−.2820	1.1134	−.2766	1.2302	−.2724	1.3343	−.2727	1.4210	−.2691	1.4831	−.2634
23	.514	.660	.8828	−.2843	1.0495	−.2851	1.1425	−.2796	1.2249	−.2720	1.3108	−.2743	1.3755	−.2705	1.4310	−.2643
24	.533	.727	.9334	−.2845	1.0815	−.2858	1.1612	−.2804	1.2255	−.2721	1.2962	−.2739	1.3490	−.2704	1.3947	−.2637
25	.551	.793	.9567	−.2837	1.0797	−.2856	1.1409	−.2794	1.1876	−.2709	1.2364	−.2730	1.2767	−.2701	1.3086	−.2628
26	.375	0.000	.7821	−.2196	.9268	−.2408	1.0428	−.2607	1.1696	−.2502	1.2759	−.2674	1.3719	−.2677	1.4500	−.2648
27	.375	.250	.7821	−.2738	.9150	−.2785	1.0357	−.2709	1.1630	−.2684	1.2685	−.2704	1.3635	−.2687	1.4410	−.2632
28	.375	.417	.7694	−.2802	.8873	−.2831	1.0192	−.2748	1.1476	−.2736	1.2520	−.2738	1.3461	−.2709	1.4229	−.2651
29	.375	.583	.7002	−.2655	.8267	−.2680	.9820	−.2612	1.1104	−.2576	1.2126	−.2600	1.3020	−.2583	1.3755	−.2536
30	.375	.750	.6136	−.2774	.7581	−.2798	.9148	−.2700	1.0223	−.2663	1.1115	−.2703	1.1921	−.2678	1.2609	−.2624
31	.375	.833	.6028	−.2802	.7571	−.2831	.8942	−.2726	.9889	−.2687	1.0744	−.2730	1.1500	−.2707	1.2152	−.2645
32	.375	.917	.5694	−.2750	.7146	−.2765	.8250	−.2670	.9105	−.2641	.9884	−.2683	1.0584	−.2658	1.1189	−.2598
33	.250	0.000	.7286	−.2222	.8376	−.2443	.9833	−.2585	1.0913	−.2564	1.1800	−.2663	1.2635	−.2682	1.3415	−.2641
34	.250	.250	.7136	−.2533	.8318	−.2684	.9765	−.2632	1.0841	−.2644	1.1726	−.2676	1.2553	−.2670	1.3353	−.2616
35	.250	.417	.6901	−.2793	.8210	−.2791	.9610	−.2724	1.0683	−.2715	1.1568	−.2738	1.2382	−.2722	1.3187	−.2656
36	.250	.583	.6641	−.2804	.8010	−.2788	.9282	−.2729	1.0322	−.2704	1.1189	−.2735	1.1989	−.2722	1.2780	−.2658
37	.250	.750	.6184	−.2814	.7373	−.2800	.8458	−.2736	.9432	−.2706	1.0242	−.2733	1.0984	−.2728	1.1733	−.2659
38	.250	.833	.5873	−.2809	.7045	−.2796	.8081	−.2728	.9032	−.2699	.9818	−.2723	1.0524	−.2724	1.1264	−.2648
39	.250	.917	.5262	−.2822	.6348	−.2796	.7326	−.2730	.8220	−.2699	.8969	−.2728	.9632	−.2724	1.0341	−.2649
40	.156	0.000	.6711	−.2240	.8134	−.2452	.9204	−.2521	.9855	−.2592	1.0422	−.2665	1.0997	−.2671	1.1664	−.2618
41	.156	.250	.6711	−.2366	.8073	−.2647	.9129	−.2570	.9802	−.2659	1.0370	−.2704	1.0943	−.2683	1.1641	−.2631
42	.156	.417	.6638	−.2773	.7940	−.2711	.8983	−.2691	.9669	−.2692	1.0239	−.2720	1.0816	−.2707	1.1540	−.2636
43	.156	.583	.6437	−.2627	.7608	−.2626	.8662	−.2604	.9358	−.2587	.9940	−.2605	1.0513	−.2610	1.1209	−.2549
44	.156	.750	.5776	−.2782	.6838	−.2766	.7862	−.2732	.8553	−.2704	.9099	−.2720	.9650	−.2726	1.0452	−.2643
45	.156	.833	.5420	−.2781	.6496	−.2756	.7517	−.2721	.8197	−.2693	.8727	−.2709	.9283	−.2715	1.0168	−.2623
46	.156	.917	.4836	−.2786	.5829	−.2756	.6795	−.2721	.7456	−.2691	.7970	−.2707	.8514	−.2710	.9414	−.2619
47	.094	0.000	.1601	−.2565	.2191	−.2675	.2614	−.2580	.2870	−.2581	.3240	−.2608	.4439	−.2584	.6295	−.2580
48	.094	.250	.1573	−.2661	.2183	−.2650	.2531	−.2600	.2787	−.2588	.3171	−.2633	.4451	−.2599	.6375	−.2577
49	.094	.417	.1550	−.2767	.2102	−.2688	.2490	−.2652	.2753	−.2650	.3159	−.2689	.4478	−.2676	.6536	−.2613
50	.094	.583	.1395	−.2742	.1951	−.2688	.2352	−.2670	.2671	−.2646	.3719	−.2673	.4458	−.2674	.6759	−.2593
51	.094	.917	.4437	−.2747	.5204	−.2729	.5704	−.2695	.6026	−.2664	.6513	−.2689	.7384	−.2671	.8923	−.2580
52	.063	0.000	.1540	−.2490	.2229	−.2605	.2727	−.2532	.3226	−.2539	.4029	−.2570	.4933	−.2516	.9792	−.2535
53	.063	.250	.1525	−.2568	.2205	−.2618	.2660	−.2568	.3179	−.2567	.4007	−.2608	.4841	−.2564	.9820	−.2555
54	.063	.417	.1459	−.2746	.2087	−.2648	.2579	−.2613	.3130	−.2609	.4083	−.2655	.4820	−.2640	.9876	−.2579
55	.063	.583	.1425	−.2672	.2098	−.2612	.2753	−.2599	.3496	−.2571	.4219	−.2610	.4891	−.2615	.9822	−.2527
56	.031	0.000	.1487	−.2481	.2214	−.2588	.2785	−.2520	.3502	−.2517	.4551	−.2542	.6302	−.2468	.9175	−.2478
57	.031	.250	.1475	−.2576	.2172	−.2632	.2728	−.2584	.3470	−.2567	.4549	−.2609	.6214	−.2541	.9120	−.2530
58	.031	.417	.1439	−.2658	.2111	−.2560	.2706	−.2536	.3507	−.2523	.4617	−.2572	.6500	−.2550	.9176	−.2486
59	.031	.583	.1622	−.2630	.2328	−.2563	.3059	−.2550	.3833	−.2527	.4519	−.2570	.8377	−.2568	.9127	−.2475
60	.031	.750	.1956	−.2459	.2701	−.2438	.3509	−.2412	.4379	−.2395	.5555	−.2423	.7936	−.2410	.8831	−.2335
61	.375	−.583	.6952	−.2797	.8274	−.2826	.9847	−.2748	1.1116	−.2736	1.2138	−.2734	1.3051	−.2706	1.3787	−.2655
62	.156	−.583	.6448	−.2747	.7580	−.2715	.8691	−.2700	.9368	−.2680	.9946	−.2697	1.0544	−.2697	1.1219	−.2630

TABLE V.—Continued
(c) M = 2.86

			α =													
			−4.7		.3		5.4		10.4				20.4			
Tube	x/ℓ	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	.0408	.1976	.1060	.1081	.1899	.0368	.2984	−.0134			.5830	−.0734		
2	.896	0.000	.0391	.2005	.1060	.1089	.1911	.0372	.3007	−.0140			.5899	−.0746		
3	.844	0.000	.0396		.1061		.1911		.3009				.5910			
4	.838	.115	.0439	.2145	.1170	.1188	.2062	.0408	.3177	−.0197			.6059	−.0998		
5	.857	.182	.0572	.2521	.1458	.1488	.2444	.0530	.3614	−.0226			.6456	−.1115		
6	.781	0.000	−.0279	.0862	.0209	.0204	.0826	−.0326	.1624	−.0712			.3922	−.1184		
7	.719	0.000	−.0453	.0630	−.0003	−.0010	.0600	−.0497	.1399	−.0834			.3720	−.1233		
8	.719	.105	−.0629	.0336	−.0229	−.0248	.0328	−.0679	.1076	−.0960			.3243	−.1326		
9	.733	.223	.0453	.2190	.1217	.1238	.2126	.0426	.3230	−.0244			.6022	−.1120		
10	.751	.289	.0556	.2428	.1405	.1428	.2361	.0520	.3509	−.0231			.6355	−.1124		
11	.770	.356	.0718	.2908	.1755	.1802	.2834	.0684	.4041	−.0183			.6839	−.1173		
12	.625	0.000	−.0450	.0597	−.0014	−.0031	.0584	−.0494	.1366	−.0813			.3656	−.1152		
13	.625	.131	−.0584	.0453	−.0146	−.0173	.0458	−.0635	.1247	−.0962			.3643	−.1370		
14	.625	.218	−.0696	.0277	−.0288	−.0315	.0292	−.0747	.1061	−.1038			.3310	−.1410		
15	.625	.306	−.0709	.0183	−.0313	−.0345	.0190	−.0764	.0800	−.1096			.2835	−.1450		
16	.639	.410	.0545	.2384	.1392	.1407	.2343	.0514	.3433	−.0250			.5980	−.1162		
17	.658	.477	.0665	.2662	.1615	.1635	.2630	.0626	.3783	−.0209			.6571	−.1155		
18	.676	.543	.0754	.3120	.1927	.1946	.3095	.0707	.4312	−.0192			.7088	−.1234		
19	.500	0.000	−.0494	.0555	−.0042	−.0064	.0590	−.0524	.1374	−.0854			.3630	−.1222		
20	.500	.222	−.0610	.0430	−.0156	−.0181	.0459	−.0639	.1334	−.0976			.3702	−.1391		
21	.500	.370	−.0717	.0278	−.0283	−.0306	.0323	−.0750	.1103	−.1060			.3654	−.1419		
22	.500	.518	−.0698	.0267	−.0254	−.0269	.0294	−.0724	.0930	−.1094			.2986	−.1453		
23	.514	.660	.0636	.2580	.1559	.1584	.2579	.0597	.3647	−.0233			.5710	−.1189		
24	.533	.727	.0722	.2888	.1784	.1811	.2885	.0672	.4065	−.0201			.6537	−.1202		
25	.551	.793	.0770	.3354	.2041	.2065	.3352	.0718	.4623	−.0207			.7196	−.1297		
26	.375	0.000	−.0494	.0529	−.0037	−.0067	.0569	−.0523	.1346	−.0845			.3624	−.1223		
27	.375	.250	−.0614	.0554	−.0134	−.0178	.0598	−.0643	.1402	−.0994			.3650	−.1416		
28	.375	.417	−.0679	.0410	−.0249	−.0280	.0453	−.0709	.1383	−.1039			.3742	−.1425		
29	.375	.583	−.0717	.0199	−.0306	−.0341	.0291	−.0783	.1052	−.1085			.3698	−.1375		
30	.375	.750	−.0689	.0124	−.0299	−.0324	.0163	−.0722	.0697	−.1080			.2419	−.1451		
31	.375	.833	−.0498	.0431	−.0042	−.0068	.0457	−.0538	.0920	−.0986			.2228	−.1434		
32	.375	.917	−.0348	.0606	.0169	.0163	.0632	−.0392	.1271	−.0901			.2508	−.1456		
33	.250	0.000	−.0474	.0583	−.0017	−.0049	.0634	−.0504	.1418	−.0827			.3637	−.1211		
34	.250	.250	−.0604	.0590	−.0011	−.0047	.0643	−.0641	.1430	−.1001			.3681	−.1417		
35	.250	.417	−.0679	.0553	−.0151	−.0191	.0600	−.0704	.1416	−.1033			.3612	−.1420		
36	.250	.583	−.0740	.0257	−.0346	−.0381	.0316	−.0768	.1223	−.1079			.3283	−.1441		
37	.250	.750	−.0697	.0072	−.0338	−.0370	.0122	−.0734	.0804	−.1077			.2991	−.1446		
38	.250	.833	−.0604	.0056	−.0259	−.0288	.0102	−.0635	.0724	−.0969			.2927	−.1455		
39	.250	.917	−.0285	.0043	−.0071	−.0070	.0072	−.0332	.0577	−.0984			.2548	−.1503		
40	.156	0.000	−.0488	.0562	−.0025	−.0047	.0616	−.0520	.1397	−.0837			.3657	−.1225		
41	.156	.250	−.0519	.0561	−.0025	−.0055	.0610	−.0560	.1410	−.0985			.3619	−.1420		
42	.156	.417	−.0701	.0492	−.0100	−.0134	.0544	−.0743	.1311	−.1078			.3392	−.1444		
43	.156	.583	−.0683	.0317	−.0278	−.0310	.0417	−.0745	.1179	−.1028			.3112	−.1332		
44	.156	.750	−.0716	.0049	−.0350	−.0348	.0119	−.0741	.0942	−.0989			.2896	−.1368		
45	.156	.833	−.0532	−.0001	−.0300	−.0327	.0053	−.0556	.0753	−.0955			.2717	−.1465		
46	.156	.917	−.0432	−.0038	−.0119	−.0136	−.0004	−.0485	.0520	−.1068			.2404	−.1502		
47	.094	0.000	−.1255	−.0820	−.1033	−.1016	−.0764	−.1267	−.0421	−.1256			.0596	−.1446		
48	.094	.250	−.1285	−.0880	−.1114	−.1102	−.0831	−.1307	−.0465	−.1293			.0533	−.1454		
49	.094	.417	−.1304	−.0931	−.1156	−.1141	−.0886	−.1292	−.0534	−.1248			.0434	−.1434		
50	.094	.583	−.1212	−.1005	−.1200	−.1208	−.0956	−.1224	−.0617	−.1187			.0320	−.1429		
51	.094	.917	−.0533	−.0091	−.0197	−.0219	−.0058	−.0588	.0499	−.1126			.2209	−.1489		
52	.063	0.000	−.1265	−.0946	−.1139	−.1146	−.0895	−.1254	−.0571	−.1223			.0459	−.1426		
53	.063	.250	−.1340	−.0993	−.1199	−.1188	−.0944	−.1342	−.0617	−.1244			.0343	−.1441		
54	.063	.417	−.1205	−.1051	−.1221	−.1236	−.1002	−.1218	−.0685	−.1222			.0247	−.1442		
55	.063	.583	−.1142	−.1103	−.1126	−.1148	−.1053	−.1153	−.0747	−.1187			.0172	−.1445		
56	.031	0.000	−.1178	−.0996	−.1172	−.1169	−.0964	−.1168	−.0658	−.1149			.0354	−.1348		
57	.031	.250	−.1235	−.1062	−.1233	−.1244	−.1016	−.1246	−.0701	−.1231			.0270	−.1443		
58	.031	.417	−.1157	−.1104	−.1133	−.1147	−.1051	−.1177	−.0747	−.1218			.0197	−.1441		
59	.031	.583	−.1101	−.1108	−.1062	−.1094	−.1059	−.1118	−.0760	−.1179			.0218	−.1444		
60	.031	.750	−.1111	−.1033	−.1001	−.1028	−.1002	−.1129	−.0670	−.1174			.0409	−.1452		
61	.375	−.583	−.0775	.0202	−.0344	−.0359	.0264	−.0805	.1048	−.1125			.3739	−.1436		
62	.156	−.583	−.0732	.0347	−.0305	−.0326	.0415	−.0765	.1189	−.1070			.3148	−.1406		

TABLE V.—Continued
(c) Concluded

			α =													
			30.3				40.3				50.3				60.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	.9138	−.1104			1.2746	−.1290			1.6228	−.1396			1.7842	−.1469
2	.896	0.000	.9200	−.1103			1.2876	−.1290			1.5903	−.1455			1.7652	−.1525
3	.844	0.000	.9196				1.2763				1.5495				1.7424	
4	.838	.115	.9266	−.1406			1.2649	−.1540			1.5232	−.1557			1.7011	−.1537
5	.857	.182	.9508	−.1480			1.2673	−.1583			1.4931	−.1589			1.6303	−.1571
6	.781	0.000	.6866	−.1412			1.0065	−.1505			1.4335	−.1569			1.6933	−.1567
7	.719	0.000	.6737	−.1442			1.0216	−.1526			1.4263	−.1574			1.6687	−.1558
8	.719	.105	.6270	−.1506			1.0069	−.1571			1.4246	−.1568			1.6663	−.1554
9	.733	.223	.8642	−.1470			1.1167	−.1578			1.4599	−.1579			1.6549	−.1570
10	.751	.289	.9379	−.1486			1.1731	−.1580			1.4635	−.1582			1.6254	−.1570
11	.770	.356	.9729	−.1523			1.1965	−.1587			1.4268	−.1582			1.5438	−.1571
12	.625	0.000	.6662	−.1341			1.0292	−.1420			1.4005	−.1453			1.6256	−.1438
13	.625	.131	.6656	−.1539			1.0323	−.1594			1.4021	−.1580			1.6228	−.1564
14	.625	.218	.6496	−.1542			1.0371	−.1591			1.4054	−.1584			1.6203	−.1569
15	.625	.306	.6139	−.1553			1.0315	−.1596			1.4085	−.1588			1.6150	−.1570
16	.639	.410	.8039	−.1515			1.1171	−.1585			1.4324	−.1587			1.5962	−.1572
17	.658	.477	.8934	−.1521			1.1605	−.1584			1.4304	−.1582			1.5645	−.1569
18	.676	.543	.9514	−.1547			1.1712	−.1588			1.3860	−.1587			1.4828	−.1572
19	.500	0.000	.6719	−.1423			1.0431	−.1525			1.3497	−.1550			1.5599	−.1559
20	.500	.222	.6779	−.1537			1.0510	−.1586			1.3526	−.1582			1.5587	−.1572
21	.500	.370	.6893	−.1557			1.0589	−.1593			1.3527	−.1587			1.5511	−.1575
22	.500	.518	.6617	−.1568			1.0690	−.1591			1.3487	−.1584			1.5332	−.1577
23	.514	.660	.7917	−.1537			1.1303	−.1587			1.3547	−.1586			1.4940	−.1571
24	.533	.727	.8726	−.1543			1.1635	−.1586			1.3531	−.1584			1.4641	−.1571
25	.551	.793	.9273	−.1559			1.1649	−.1587			1.3113	−.1583			1.3877	−.1568
26	.375	0.000	.6736	−.1428			1.0431	−.1538			1.2930	−.1562			1.4922	−.1558
27	.375	.250	.6771	−.1548			1.0403	−.1586			1.2866	−.1581			1.4834	−.1572
28	.375	.417	.6881	−.1555			1.0262	−.1590			1.2720	−.1586			1.4657	−.1575
29	.375	.583	.6613	−.1484			.9479	−.1517			1.2250	−.1511			1.4182	−.1506
30	.375	.750	.5586	−.1564			.8524	−.1595			1.1424	−.1585			1.3142	−.1576
31	.375	.833	.5282	−.1562			.8414	−.1591			1.1134	−.1585			1.2706	−.1575
32	.375	.917	.5067	−.1576			.8094	−.1595			1.0387	−.1585			1.1809	−.1576
33	.250	0.000	.6795	−.1436			.9963	−.1547			1.2259	−.1555			1.3882	−.1557
34	.250	.250	.6789	−.1539			.9817	−.1578			1.2227	−.1574			1.3841	−.1565
35	.250	.417	.6467	−.1547			.9528	−.1580			1.2073	−.1579			1.3677	−.1573
36	.250	.583	.6044	−.1556			.9146	−.1581			1.1702	−.1582			1.3297	−.1575
37	.250	.750	.5615	−.1561			.8494	−.1588			1.0791	−.1582			1.2287	−.1579
38	.250	.833	.5479	−.1567			.8221	−.1590			1.0390	−.1583			1.1823	−.1577
39	.250	.917	.5059	−.1584			.7562	−.1599			.9595	−.1589			1.0939	−.1581
40	.156	0.000	.6705	−.1437			.9407	−.1547			1.1311	−.1547			1.2264	−.1546
41	.156	.250	.6481	−.1539			.9371	−.1571			1.1285	−.1563			1.2235	−.1557
42	.156	.417	.6192	−.1552			.9224	−.1578			1.1155	−.1577			1.2110	−.1571
43	.156	.583	.5913	−.1477			.8863	−.1516			1.0781	−.1521			1.1764	−.1521
44	.156	.750	.5483	−.1516			.8180	−.1564			1.0037	−.1562			1.1006	−.1559
45	.156	.833	.5197	−.1593			.7847	−.1622			.9675	−.1615			1.0639	−.1608
46	.156	.917	.4724	−.1607			.7188	−.1629			.8936	−.1619			.9905	−.1610
47	.094	0.000	.2157	−.1586			.3590	−.1573			.4441	−.1562			.6128	−.1561
48	.094	.250	.1996	−.1576			.3510	−.1591			.4269	−.1584			.6052	−.1578
49	.094	.417	.1910	−.1569			.3473	−.1596			.4230	−.1596			.6061	−.1595
50	.094	.583	.1758	−.1561			.3292	−.1595			.4133	−.1601			.6076	−.1593
51	.094	.917	.4450	−.1591			.6638	−.1617			.7454	−.1601			.8808	−.1588
52	.063	0.000	.2013	−.1556			.3558	−.1565			.4729	−.1555			.6548	−.1544
53	.063	.250	.1874	−.1570			.3496	−.1583			.4622	−.1571			.6434	−.1560
54	.063	.417	.1768	−.1569			.3411	−.1590			.4560	−.1593			.6517	−.1586
55	.063	.583	.1693	−.1573			.3373	−.1604			.4877	−.1607			.7103	−.1600
56	.031	0.000	.1866	−.1471			.3416	−.1452			.4894	−.1447			.8166	−.1423
57	.031	.250	.1802	−.1569			.3409	−.1587			.4850	−.1564			.8526	−.1539
58	.031	.417	.1746	−.1567			.3377	−.1590			.4869	−.1584			.9266	−.1574
59	.031	.583	.1816	−.1565			.3563	−.1598			.5215	−.1605			.9638	−.1590
60	.031	.750	.2128	−.1574			.3981	−.1617			.5727	−.1609			.9235	−.1591
61	.375	−.583	.6638	−.1551			.9559	−.1587			1.2295	−.1577			1.4239	−.1569
62	.156	−.583	.5962	−.1558			.8984	−.1599			1.0849	−.1608			1.1854	−.1601

TABLE V.—Continued
(d) M = 3.50

Tube	x′/l	y/b/2	α = −4.8		α = .2		α = 5.2		α = 10.2		α = 15.2		α = 20.2		α = 25.2	
			Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	.0303	.1670	.0861	.0896	.1664	.0282	.2676	−.0138	.3916	−.0384	.5363	−.0575	.6988	−.0675
2	.896	0.000	.0245	.1682	.0833	.0889	.1642	.0259	.2672	−.0176	.3944	−.0449	.5426	−.0647	.7054	−.0746
3	.844	0.000	.0240		.0830		.1637		.2684		.3949		.5445		.7060	
4	.838	.115	.0284	.1808	.0931	.0985	.1774	.0294	.2830	−.0212	.4105	−.0531	.5578	−.0739	.7163	−.0833
5	.857	.182	.0419	.2182	.1189	.1254	.2128	.0440	.3238	−.0152	.4537	−.0529	.5990	−.0758	.7535	−.0863
6	.781	0.000	−.0239	.0701	.0155	.0159	.0699	−.0258	.1420	−.0544	.2329	−.0738	.3486	−.0859	.4825	−.0916
7	.719	0.000	−.0405	.0447	−.0063	−.0057	.0453	−.0427	.1173	−.0674	.2084	−.0797	.3251	−.0882	.4607	−.0929
8	.719	.105	−.0503	.0240	−.0213	−.0214	.0256	−.0540	.0914	−.0731	.1760	−.0830	.2860	−.0899	.4137	−.0935
9	.733	.223	.0306	.1871	.0984	.1038	.1829	.0315	.2893	−.0237	.4138	−.0591	.5590	−.0796	.7109	−.0887
10	.751	.289	.0399	.2102	.1151	.1211	.2048	.0416	.3145	−.0182	.4416	−.0561	.5884	−.0779	.7431	−.0875
11	.770	.356	.0498	.2530	.1372	.1452	.2443	.0528	.3623	−.0112	.4938	−.0508	.6395	−.0750	.7891	−.0872
12	.625	0.000	−.0362	.0431	−.0044	−.0051	.0440	−.0389	.1134	−.0603	.2033	−.0722	.3183	−.0781	.4540	−.0810
13	.625	.131	−.0511	.0308	−.0174	−.0186	.0327	−.0542	.1025	−.0754	.1930	−.0867	.3098	−.0935	.4500	−.0966
14	.625	.218	−.0565	.0196	−.0264	−.0268	.0217	−.0601	.0885	−.0795	.1758	−.0887	.2909	−.0945	.4269	−.0972
15	.625	.306	−.0527	.0245	−.0201	−.0206	.0266	−.0562	.0863	−.0788	.1590	−.0899	.2500	−.0961	.3764	−.0986
16	.639	.410	.0385	.2078	.1141	.1196	.2019	.0402	.3088	−.0201	.4309	−.0586	.5696	−.0794	.7017	−.0887
17	.658	.477	.0451	.2341	.1300	.1362	.2270	.0475	.3388	−.0162	.4661	−.0547	.6129	−.0766	.7619	−.0872
18	.676	.543	.0496	.2692	.1402	.1470	.2602	.0522	.3859	−.0106	.5187	−.0505	.6644	−.0760	.8096	−.0887
19	.500	0.000	−.0474	.0353	−.0143	−.0122	.0383	−.0497	.1105	−.0735	.2009	−.0837	.3188	−.0906	.4590	−.0940
20	.500	.222	−.0523	.0282	−.0209	−.0187	.0316	−.0555	.1000	−.0773	.1944	−.0876	.3134	−.0940	.4588	−.0971
21	.500	.370	−.0573	.0217	−.0267	−.0244	.0250	−.0604	.0933	−.0811	.1815	−.0902	.3038	−.0955	.4537	−.0977
22	.500	.518	−.0510	.0335	−.0160	−.0137	.0355	−.0535	.0964	−.0791	.1721	−.0900	.2730	−.0961	.4069	−.0987
23	.514	.660	.0409	.2280	.1261	.1316	.2208	.0440	.3268	−.0196	.4432	−.0581	.5619	−.0787	.6658	−.0890
24	.533	.727	.0456	.2537	.1355	.1413	.2448	.0484	.3595	−.0156	.4875	−.0547	.6282	−.0771	.7549	−.0885
25	.551	.793	.0493	.2825	.1411	.1474	.2724	.0531	.4074	−.0101	.5427	−.0504	.6866	−.0778	.8199	−.0907
26	.375	0.000	−.0475	.0365	−.0144	−.0127	.0394	−.0497	.1076	−.0730	.1993	−.0832	.3157	−.0901	.4586	−.0928
27	.375	.250	−.0529	.0303	−.0210	−.0197	.0333	−.0554	.1083	−.0780	.2030	−.0880	.3202	−.0935	.4638	−.0966
28	.375	.417	−.0571	.0229	−.0262	−.0244	.0255	−.0602	.1011	−.0806	.2004	−.0893	.3219	−.0941	.4696	−.0969
29	.375	.583	−.0454	.0220	−.0212	−.0197	.0294	−.0550	.0960	−.0761	.1812	−.0831	.3079	−.0862	.4597	−.0876
30	.375	.750	−.0540	.0209	−.0205	−.0198	.0233	−.0564	.0743	−.0800	.1385	−.0901	.2222	−.0956	.3303	−.0983
31	.375	.833	−.0458	.0428	−.0074	−.0067	.0442	−.0479	.0984	−.0761	.1516	−.0881	.2121	−.0950	.3135	−.0983
32	.375	.917	−.0385	.0529	.0032	.0034	.0544	−.0395	.1192	−.0731	.1880	−.0864	.2559	−.0947	.3239	−.0988
33	.250	0.000	−.0464	.0373	−.0111	−.0111	.0393	−.0487	.1106	−.0719	.2033	−.0825	.3197	−.0887	.4619	−.0922
34	.250	.250	−.0531	.0389	−.0186	−.0184	.0405	−.0553	.1135	−.0782	.2058	−.0867	.3234	−.0926	.4678	−.0960
35	.250	.417	−.0546	.0311	−.0252	−.0226	.0328	−.0580	.1110	−.0788	.2053	−.0867	.3220	−.0928	.4622	−.0961
36	.250	.583	−.0599	.0164	−.0294	−.0293	.0190	−.0624	.0911	−.0825	.1856	−.0884	.2953	−.0935	.4229	−.0967
37	.250	.750	−.0549	.0120	−.0257	−.0263	.0148	−.0573	.0699	−.0811	.1475	−.0897	.2525	−.0944	.3779	−.0976
38	.250	.833	−.0491	.0143	−.0178	−.0183	.0166	−.0508	.0698	−.0781	.1386	−.0886	.2366	−.0946	.3716	−.0980
39	.250	.917	−.0396	.0171	−.0048	−.0056	.0196	−.0410	.0656	−.0739	.1294	−.0903	.2151	−.0974	.3342	−.0995
40	.156	0.000	−.0473	.0379	−.0122	−.0137	.0392	−.0490	.1114	−.0725	.2036	−.0825	.3190	−.0886	.4621	−.0929
41	.156	.250	−.0558	.0384	−.0141	−.0147	.0409	−.0582	.1112	−.0794	.2026	−.0872	.3203	−.0931	.4635	−.0965
42	.156	.417	−.0589	.0333	−.0234	−.0241	.0348	−.0613	.1071	−.0813	.1957	−.0875	.3070	−.0936	.4403	−.0971
43	.156	.583	−.0453	.0159	−.0264	−.0242	.0231	−.0551	.0957	−.0750	.1789	−.0804	.2786	−.0857	.4022	−.0881
44	.156	.750	−.0509	.0052	−.0315	−.0248	.0080	−.0547	.0700	−.0774	.1545	−.0845	.2535	−.0906	.3720	−.0936
45	.156	.833	−.0501	.0062	−.0236	−.0217	.0095	−.0533	.0638	−.0772	.1426	−.0900	.2435	−.0983	.3594	−.1014
46	.156	.917	−.0357	.0031	−.0135	−.0128	.0066	−.0374	.0533	−.0797	.1228	−.0948	.2174	−.1015	.3289	−.1026
47	.094	0.000	−.0830	−.0604	−.0758	−.0732	−.0569	−.0876	−.0285	−.0872	.0096	−.0928	.0595	−.0987	.1294	−.1009
48	.094	.250	−.0854	−.0684	−.0817	−.0808	−.0647	−.0890	−.0327	−.0866	.0066	−.0908	.0595	−.0968	.1258	−.1000
49	.094	.417	−.0819	−.0708	−.0823	−.0834	−.0674	−.0859	−.0372	−.0856	.0019	−.0903	.0522	−.0965	.1153	−.1003
50	.094	.583	−.0813	−.0788	−.0819	−.0852	−.0732	−.0854	−.0444	−.0850	−.0063	−.0899	.0400	−.0963	.1013	−.0993
51	.094	.917	−.0413	−.0057	−.0182	−.0180	−.0014	−.0435	.0434	−.0824	.1159	−.0947	.2054	−.0990	.3079	−.1014
52	.063	0.000	−.0802	−.0709	−.0799	−.0822	−.0660	−.0839	−.0410	−.0850	−.0057	−.0912	.0480	−.0972	.1208	−.0993
53	.063	.250	−.0810	−.0758	−.0832	−.0862	−.0711	−.0843	−.0451	−.0852	−.0094	−.0906	.0400	−.0965	.1044	−.0998
54	.063	.417	−.0795	−.0795	−.0799	−.0837	−.0738	−.0839	−.0493	−.0848	−.0145	−.0908	.0317	−.0971	.0933	−.1002
55	.063	.583	−.0800	−.0838	−.0768	−.0806	−.0772	−.0837	−.0552	−.0858	−.0218	−.0912	.0227	−.0974	.0834	−.1002
56	.031	0.000	−.0745	−.0696	−.0779	−.0788	−.0675	−.0744	−.0466	−.0740	−.0144	−.0802	.0374	−.0862	.1074	−.0883
57	.031	.250	−.0804	−.0807	−.0839	−.0880	−.0758	−.0837	−.0528	−.0855	−.0181	−.0908	.0307	−.0968	.0957	−.0999
58	.031	.417	−.0787	−.0827	−.0764	−.0806	−.0767	−.0834	−.0561	−.0848	−.0223	−.0907	.0247	−.0968	.0873	−.0998
59	.031	.583	−.0782	−.0818	−.0747	−.0786	−.0766	−.0824	−.0579	−.0855	−.0244	−.0912	.0220	−.0972	.0866	−.0993
60	.031	.750	−.0786	−.0791	−.0726	−.0758	−.0729	−.0830	−.0524	−.0856	−.0126	−.0921	.0416	−.0985	.1148	−.1006
61	.375	−.583	−.0564	.0224	−.0269	−.0235	.0256	−.0606	.0920	−.0822	.1825	−.0909	.3124	−.0944	.4655	−.0966
62	.156	−.583	−.0566	.0174	−.0315	−.0283	.0206	−.0608	.0942	−.0824	.1807	−.0892	.2825	−.0955	.4100	−.0992

TABLE V.—Continued
(d) Concluded

			α = 30.2		35.0		40.2		45.2		50.2		55.1		60.1	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	.8771	−.0748	1.0528		1.2472	−.0818	1.4530		1.6255	−.0864	1.7597		1.8410	−.0866
2	.896	0.000	.8852	−.0815	1.0607		1.2587	−.0880	1.4602		1.6069	−.0930	1.7318		1.8208	−.0952
3	.844	0.000	.8852		1.0578		1.2551		1.4334		1.5649		1.6946		1.7941	
4	.838	.115	.8913	−.0893	1.0583		1.2505	−.0943	1.4151		1.5407	−.0944	1.6628		1.7531	−.0900
5	.857	.182	.9183	−.0937	1.0759		1.2533	−.0989	1.4117		1.5217	−.0999	1.6192		1.6862	−.0994
6	.781	0.000	.6438	−.0959	.8089		.9851	−.0983	1.1741		1.4066	−.0997	1.5970		1.7318	−.1001
7	.719	0.000	.6219	−.0963	.7898		.9730	−.0989	1.1896		1.4148	−.0996	1.5838		1.7065	−.0989
8	.719	.105	.5706	−.0963	.7498		.9515	−.0986	1.1812		1.4126	−.0988	1.5829		1.7043	−.0982
9	.733	.223	.8664	−.0945	.9798		1.1016	−.0988	1.2801		1.4668	−.0998	1.6063		1.7021	−.0997
10	.751	.289	.9076	−.0941	1.0560		1.1785	−.0986	1.3262		1.4825	−.0996	1.5988		1.6766	−.0995
11	.770	.356	.9431	−.0950	1.0858		1.2168	−.0993	1.3367		1.4588	−.0998	1.5453		1.6000	−.0997
12	.625	0.000	.6134	−.0836	.7841		.9781	−.0852	1.1958		1.4065	−.0851	1.5522		1.6625	−.0843
13	.625	.131	.6150	−.0992	.7857		.9814	−.1007	1.1986		1.4097	−.1002	1.5523		1.6610	−.0998
14	.625	.218	.5912	−.0995	.7750		.9838	−.1004	1.2027		1.4132	−.1007	1.5538		1.6595	−.1000
15	.625	.306	.5418	−.1007	.7408		.9696	−.1011	1.2006		1.4161	−.1011	1.5558		1.6577	−.1005
16	.639	.410	.8100	−.0955	.9159		1.0859	−.0993	1.2770		1.4552	−.1003	1.5676		1.6463	−.1001
17	.658	.477	.8985	−.0947	.9986		1.1436	−.0990	1.3105		1.4626	−.0995	1.5553		1.6186	−.0994
18	.676	.543	.9489	−.0966	1.0503		1.1700	−.0997	1.3087		1.4291	−.1003	1.4968		1.5412	−.1000
19	.500	0.000	.6192	−.0986	.7866		.9857	−.0971	1.1948		1.3683	−.0990	1.4952		1.5952	−.0990
20	.500	.222	.6269	−.1016	.7960		.9947	−.1006	1.2034		1.3750	−.1009	1.4975		1.5959	−.1007
21	.500	.370	.6241	−.1020	.8004		1.0033	−.1008	1.2117		1.3802	−.1011	1.4954		1.5905	−.1007
22	.500	.518	.5870	−.1026	.7953		1.0130	−.1010	1.2230		1.3842	−.1010	1.4872		1.5760	−.1007
23	.514	.660	.7685	−.0959	.9103		1.0942	−.0995	1.2749		1.4085	−.0998	1.4777		1.5440	−.0999
24	.533	.727	.8576	−.0962	.9822		1.1426	−.0992	1.2998		1.4160	−.0998	1.4657		1.5171	−.0998
25	.551	.793	.9220	−.0973	1.0278		1.1611	−.0997	1.2885		1.3803	−.0995	1.4106		1.4449	−.0994
26	.375	0.000	.6271	−.0972	.7964		.9889	−.0986	1.1823		1.3078	−.0994	1.4347		1.5299	−.0993
27	.375	.250	.6278	−.1010	.7969		.9891	−.1007	1.1775		1.2990	−.1007	1.4274		1.5216	−.1005
28	.375	.417	.6370	−.1015	.8056		.9905	−.1003	1.1600		1.2774	−.1009	1.4111		1.5058	−.1007
29	.375	.583	.6254	−.0906	.7744		.9305	−.0905	1.0774		1.2187	−.0907	1.3585		1.4539	−.0906
30	.375	.750	.5094	−.1022	.6552		.8152	−.1009	.9672		1.1399	−.1007	1.2665		1.3542	−.1006
31	.375	.833	.4721	−.1025	.6267		.7947	−.1008	.9571		1.1301	−.1010	1.2349		1.3142	−.1007
32	.375	.917	.4503	−.1031	.6048		.7684	−.1012	.9238		1.0743	−.1008	1.1564		1.2275	−.1006
33	.250	0.000	.6304	−.0971	.7985		.9804	−.0970	1.1179		1.2397	−.0988	1.3549		1.4333	−.0990
34	.250	.250	.6373	−.1006	.8038		.9710	−.0998	1.1055		1.2345	−.1000	1.3509		1.4301	−.0997
35	.250	.417	.6208	−.1011	.7749		.9344	−.1003	1.0780		1.2198	−.1006	1.3357		1.4142	−.1005
36	.250	.583	.5709	−.1011	.7234		.8838	−.1003	1.0389		1.1851	−.1005	1.2989		1.3751	−.1003
37	.250	.750	.5190	−.1019	.6654		.8145	−.1007	.9674		1.0989	−.1007	1.2010		1.2733	−.1010
38	.250	.833	.5113	−.1017	.6516		.7986	−.1005	.9439		1.0644	−.1006	1.1608		1.2288	−.1005
39	.250	.917	.4775	−.1037	.6112		.7432	−.1018	.8731		.9881	−.1014	1.0769		1.1400	−.1015
40	.156	0.000	.6289	−.0978	.7990		.9485	−.0964	1.0556		1.1822	−.0984	1.2428		1.2837	−.0980
41	.156	.250	.6233	−.1010	.7791		.9360	−.0994	1.0569		1.1798	−.0996	1.2404		1.2817	−.0993
42	.156	.417	.5918	−.1018	.7454		.9078	−.1002	1.0437		1.1659	−.1008	1.2262		1.2686	−.1002
43	.156	.583	.5514	−.0902	.7036		.8644	−.0918	1.0098		1.1239	−.0922	1.1871		1.2295	−.0925
44	.156	.750	.5149	−.0957	.6584		.8044	−.0972	.9398		1.0484	−.0975	1.1109		1.1536	−.0979
45	.156	.833	.4961	−.1032	.6316		.7767	−.1044	.9089		1.0136	−.1047	1.0740		1.1167	−.1049
46	.156	.917	.4558	−.1041	.5822		.7152	−.1049	.8400		.9393	−.1051	.9984		1.0413	−.1050
47	.094	0.000	.2230	−.1022	.3102		.4004	−.1040	.4597		.5113	−.1032	.5368		.5987	−.1028
48	.094	.250	.2052	−.1019	.2897		.3785	−.1032	.4425		.4936	−.1036	.5194		.5891	−.1031
49	.094	.417	.1941	−.1026	.2781		.3696	−.1042	.4423		.4875	−.1043	.5148		.6011	−.1042
50	.094	.583	.1783	−.1019	.2603		.3504	−.1032	.4281		.4719	−.1041	.5127		.6505	−.1039
51	.094	.917	.4311	−.1027	.5525		.6787	−.1041	.7727		.8147	−.1036	.8412		.9047	−.1032
52	.063	0.000	.2074	−.1009	.2949		.3837	−.1022	.4522		.5161	−.1022	.5820		.6995	−.1012
53	.063	.250	.1870	−.1012	.2779		.3693	−.1032	.4398		.5025	−.1029	.5719		.6951	−.1022
54	.063	.417	.1746	−.1027	.2638		.3599	−.1034	.4337		.4940	−.1041	.5681		.6979	−.1037
55	.063	.583	.1639	−.1024	.2531		.3519	−.1043	.4374		.5086	−.1045	.6055		.6876	−.1045
56	.031	0.000	.1913	−.0898	.2770		.3588	−.0911	.4347		.5121	−.0894	.6072		.7501	−.0872
57	.031	.250	.1788	−.1011	.2691		.3566	−.1025	.4329		.5070	−.1020	.6047		.7516	−.1002
58	.031	.417	.1699	−.1020	.2609		.3521	−.1027	.4297		.5041	−.1033	.6095		.7560	−.1025
59	.031	.583	.1720	−.1013	.2649		.3647	−.1031	.4547		.5384	−.1043	.6409		.8085	−.1035
60	.031	.750	.2074	−.1025	.3035		.4097	−.1046	.5029		.5845	−.1047	.6990		.8589	−.1042
61	.375	−.583	.6316	−.1008	.7842		.9392	−.0998	1.0862		1.2227	−.1002	1.3663		1.4603	−.1000
62	.156	−.583	.5584	−.1018	.7107		.8762	−.1033	1.0178		1.1314	−.1041	1.1961		1.2402	−.1043

TABLE V.–Continued
(e) M = 4.60

			α =													
			−4.1		.8		5.9		10.9		15.9		20.8		25.9	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward.	Windward	Leeward
1	.948	0.000	.0397	.1415	.0811	.0685	.1617	.0272	.2640	.0051	.3871	−.0113	.5350	−.0182	.7004	−.0224
2	.896	0.000	.0247	.1403	.0732	.0634	.1556	.0168	.2596	−.0072	.3856	−.0245	.5355	−.0318	.7050	−.0362
3	.844	0.000	.0221		.0721		.1557		.2608		.3873		.5362		.7061	
4	.838	.115	.0267	.1508	.0821	.0713	.1681	.0192	.2733	−.0089	.3985	−.0271	.5469	−.0325	.7154	−.0332
5	.857	.182	.0383	.1843	.1042	.0912	.2009	.0287	.3116	−.0048	.4377	−.0263	.5865	−.0344	.7518	−.0392
6	.781	0.000	−.0069	.0573	.0196	.0124	.0697	−.0116	.1369	−.0258	.2249	−.0364	.3361	−.0393	.4737	−.0430
7	.719	0.000	−.0184	.0298	−.0015	−.0058	.0419	−.0229	.1078	−.0326	.1947	−.0402	.3054	−.0414	.4439	−.0439
8	.719	.105	−.0221	.0167	−.0088	−.0119	.0282	−.0261	.0890	−.0336	.1688	−.0395	.2703	−.0402	.4018	−.0425
9	.733	.223	.0287	.1576	.0868	.0753	.1730	.0188	.2769	−.0107	.4003	−.0305	.5458	−.0372	.7105	−.0412
10	.751	.289	.0350	.1786	.1003	.0880	.1941	.0254	.3008	−.0076	.4254	−.0286	.5736	−.0358	.7394	−.0401
11	.770	.356	.0411	.2025	.1127	.0995	.2203	.0322	.3433	−.0034	.4727	−.0254	.6232	−.0326	.7857	−.0383
12	.625	0.000	−.0056	.0355	.0110	.0038	.0478	−.0109	.1077	−.0187	.1911	−.0244	.2994	−.0244	.4364	−.0256
13	.625	.131	−.0258	.0167	−.0106	−.0153	.0288	−.0303	.0930	−.0380	.1781	−.0440	.2883	−.0443	.4275	−.0461
14	.625	.218	−.0267	.0119	−.0139	−.0172	.0238	−.0312	.0858	−.0385	.1670	−.0440	.2719	−.0442	.4093	−.0459
15	.625	.306	−.0227	.0236	−.0060	−.0097	.0347	−.0274	.0964	−.0369	.1705	−.0435	.2600	−.0441	.3679	−.0461
16	.639	.410	.0322	.1760	.0985	.0857	.1913	.0226	.2971	−.0102	.4180	−.0306	.5588	−.0371	.7099	−.0413
17	.658	.477	.0369	.1927	.1064	.0932	.2108	.0274	.3254	−.0071	.4502	−.0280	.5962	−.0346	.7570	−.0396
18	.676	.543	.0411	.2048	.1131	.0991	.2247	.0313	.3629	−.0042	.4971	−.0249	.6463	−.0323	.8043	−.0391
19	.500	0.000	−.0238	.0156	−.0118	−.0138	.0291	−.0284	.0958	−.0366	.1856	−.0421	.3002	−.0440	.4417	−.0452
20	.500	.222	−.0255	.0111	−.0149	−.0166	.0234	−.0305	.0906	−.0381	.1787	−.0432	.2933	−.0452	.4360	−.0463
21	.500	.370	−.0261	.0125	−.0148	−.0163	.0249	−.0307	.0904	−.0387	.1757	−.0438	.2850	−.0454	.4292	−.0464
22	.500	.518	−.0219	.0286	−.0058	−.0083	.0409	−.0266	.1057	−.0364	.1836	−.0423	.2776	−.0448	.3988	−.0460
23	.514	.660	.0313	.1866	.1011	.0870	.2040	.0218	.3162	−.0116	.4346	−.0307	.5639	−.0361	.6880	−.0408
24	.533	.727	.0359	.1973	.1072	.0928	.2165	.0257	.3436	−.0090	.4708	−.0285	.6121	−.0343	.7600	−.0398
25	.551	.793	.0406	.2054	.1131	.0983	.2249	.0304	.3764	−.0052	.5187	−.0244	.6660	−.0318	.8175	−.0388
26	.375	0.000	−.0243	.0137	−.0125	−.0141	.0255	−.0289	.0942	−.0370	.1848	−.0417	.3010	−.0439	.4426	−.0452
27	.375	.250	−.0267	.0107	−.0154	−.0171	.0237	−.0312	.0898	−.0385	.1793	−.0428	.2936	−.0448	.4349	−.0461
28	.375	.417	−.0272	.0098	−.0162	−.0182	.0218	−.0322	.0879	−.0394	.1776	−.0431	.2949	−.0449	.4360	−.0461
29	.375	.583	−.0074	.0156	.0029	−.0068	.0390	−.0188	.0975	−.0246	.1818	−.0283	.2839	−.0298	.4229	−.0307
30	.375	.750	−.0264	.0166	−.0134	−.0155	.0277	−.0307	.0822	−.0386	.1462	−.0432	.2251	−.0453	.3248	−.0463
31	.375	.833	−.0232	.0254	−.0093	−.0117	.0382	−.0280	.1009	−.0371	.1622	−.0425	.2263	−.0450	.3082	−.0465
32	.375	.917	−.0215	.0279	−.0064	−.0079	.0422	−.0257	.1137	−.0362	.1865	−.0421	.2641	−.0445	.3386	−.0462
33	.250	0.000	−.0250	.0139	−.0134	−.0152	.0262	−.0296	.0969	−.0374	.1871	−.0412	.3051	−.0437	.4455	−.0451
34	.250	.250	−.0266	.0096	−.0150	−.0173	.0220	−.0314	.0947	−.0385	.1881	−.0421	.3064	−.0442	.4463	−.0456
35	.250	.417	−.0266	.0085	−.0163	−.0176	.0205	−.0314	.0914	−.0386	.1848	−.0421	.3007	−.0443	.4429	−.0457
36	.250	.583	−.0287	.0090	−.0167	−.0194	.0204	−.0333	.0847	−.0400	.1698	−.0428	.2772	−.0445	.4084	−.0457
37	.250	.750	−.0279	.0090	−.0157	−.0177	.0195	−.0322	.0728	−.0403	.1425	−.0435	.2326	−.0451	.3492	−.0462
38	.250	.833	−.0255	.0121	−.0133	−.0146	.0227	−.0301	.0742	−.0389	.1390	−.0430	.2214	−.0448	.3319	−.0459
39	.250	.917	−.0240	.0141	−.0101	−.0109	.0251	−.0285	.0758	−.0386	.1367	−.0440	.2154	−.0463	.3190	−.0476
40	.156	0.000	−.0267	.0141	−.0146	−.0169	.0265	−.0310	.0955	−.0377	.1864	−.0409	.3046	−.0432	.4454	−.0446
41	.156	.250	−.0291	.0115	−.0167	−.0197	.0237	−.0333	.0964	−.0391	.1892	−.0422	.3070	−.0443	.4478	−.0457
42	.156	.417	−.0301	.0082	−.0180	−.0207	.0200	−.0347	.0924	−.0401	.1832	−.0432	.2987	−.0454	.4358	−.0466
43	.156	.583	−.0094	.0056	−.0010	−.0124	.0281	−.0224	.0830	−.0262	.1694	−.0295	.2706	−.0314	.3959	−.0327
44	.156	.750	−.0215	.0025	−.0148	−.0146	.0121	−.0265	.0616	−.0323	.1391	−.0355	.2325	−.0377	.3508	−.0392
45	.156	.833	−.0283	.0041	−.0170	−.0184	.0134	−.0339	.0636	−.0419	.1328	−.0459	.2263	−.0485	.3408	−.0499
46	.156	.917	−.0266	.0045	−.0143	−.0157	.0140	−.0311	.0603	−.0414	.1257	−.0474	.2117	−.0493	.3163	−.0507
47	.094	0.000	−.0430	−.0374	−.0408	−.0451	−.0304	−.0475	−.0114	−.0472	.0193	−.0497	.0598	−.0514	.1261	−.0525
48	.094	.250	−.0435	−.0429	−.0428	−.0480	−.0361	−.0480	−.0191	−.0473	.0172	−.0494	.0678	−.0507	.1295	−.0520
49	.094	.417	−.0436	−.0441	−.0440	−.0489	−.0371	−.0481	−.0203	−.0472	.0155	−.0495	.0641	−.0507	.1275	−.0522
50	.094	.583	−.0434	−.0452	−.0435	−.0485	−.0397	−.0472	−.0252	−.0461	.0057	−.0482	.0511	−.0496	.1116	−.0509
51	.094	.917	−.0259	−.0018	−.0158	−.0178	.0066	−.0298	.0486	−.0404	.1162	−.0456	.2015	−.0477	.3036	−.0490
52	.063	0.000	−.0418	−.0407	−.0415	−.0465	−.0350	−.0455	−.0206	−.0456	.0073	−.0479	.0515	−.0493	.1178	−.0503
53	.063	.250	−.0431	−.0451	−.0442	−.0489	−.0394	−.0470	−.0260	−.0466	.0033	−.0483	.0480	−.0499	.1106	−.0513
54	.063	.417	−.0428	−.0473	−.0444	−.0492	−.0413	−.0476	−.0285	−.0470	.0008	−.0490	.0443	−.0505	.1041	−.0517
55	.063	.583	−.0441	−.0496	−.0437	−.0491	−.0435	−.0485	−.0334	−.0482	−.0073	−.0504	.0341	−.0520	.0914	−.0530
56	.031	0.000	−.0326	−.0298	−.0342	−.0322	−.0297	−.0300	−.0186	−.0299	.0059	−.0321	.0471	−.0335	.1104	−.0345
57	.031	.250	−.0426	−.0475	−.0440	−.0486	−.0421	−.0470	−.0304	−.0466	−.0058	−.0485	.0371	−.0501	.1034	−.0513
58	.031	.417	−.0420	−.0484	−.0426	−.0477	−.0422	−.0470	−.0325	−.0468	−.0077	−.0487	.0343	−.0501	.0958	−.0515
59	.031	.583	−.0421	−.0484	−.0423	−.0477	−.0427	−.0474	−.0335	−.0476	−.0118	−.0497	.0278	−.0513	.0899	−.0524
60	.031	.750	−.0429	−.0484	−.0405	−.0463	−.0430	−.0477	−.0324	−.0482	−.0035	−.0504	.0462	−.0520	.1168	−.0533
61	.375	−.583	−.0239	.0135	−.0128	−.0151	.0263	−.0299	.0915	−.0376	.1768	−.0419	.2873	−.0436	.4317	−.0446
62	.156	−.583	−.0292	.0030	−.0191	−.0225	.0151	−.0358	.0779	−.0416	.1671	−.0451	.2742	−.0475	.4048	−.0490

TABLE V.- Concluded
(e) Concluded

			α = 30.8		35.6		40.8		45.8		50.8		55.8		60.8	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.948	0.000	.8734	−.0256	1.0427		1.2400	−.0276	1.4155		1.5932	−.0284	1.7354		1.8417	−.0284
2	.896	0.000	.8815	−.0391	1.0522		1.2516	−.0413	1.4265		1.5854	−.0418	1.7147		1.8210	−.0426
3	.844	0.000	.8829		1.0545		1.2503		1.4196		1.5466		1.6786		1.7909	
4	.838	.115	.8876	−.0352	1.0552		1.2448	−.0388	1.4015		1.5196	−.0378	1.6487		1.7535	−.0375
5	.857	.182	.9170	−.0430	1.0743		1.2502	−.0458	1.3923		1.5041	−.0468	1.6104		1.6930	−.0460
6	.781	0.000	.6294	−.0447	.7912		.9770	−.0466	1.1417		1.3593	−.0473	1.5694		1.7207	−.0462
7	.719	0.000	.6035	−.0452	.7704		.9592	−.0472	1.1590		1.3772	−.0477	1.5645		1.6999	−.0461
8	.719	.105	.5578	−.0434	.7280		.9317	−.0448	1.1459		1.3728	−.0454	1.5651		1.6993	−.0437
9	.733	.223	.8752	−.0441	1.0132		1.1255	−.0461	1.2589		1.4382	−.0471	1.5962		1.7035	−.0461
10	.751	.289	.9081	−.0432	1.0659		1.2120	−.0456	1.3100		1.4606	−.0463	1.5932		1.6823	−.0459
11	.770	.356	.9439	−.0426	1.0923		1.2411	−.0454	1.3244		1.4444	−.0466	1.5461		1.6112	−.0455
12	.625	0.000	.5978	−.0260	.7692		.9684	−.0266	1.1775		1.3831	−.0268	1.5429		1.6621	−.0249
13	.625	.131	.5936	−.0466	.7674		.9693	−.0479	1.1798		1.3852	−.0485	1.5454		1.6624	−.0468
14	.625	.218	.5745	−.0465	.7527		.9669	−.0476	1.1834		1.3893	−.0483	1.5491		1.6630	−.0467
15	.625	.306	.5218	−.0469	.7126		.9461	−.0480	1.1797		1.3926	−.0484	1.5526		1.6632	−.0469
16	.639	.410	.8412	−.0443	.9332		1.0885	−.0468	1.2658		1.4411	−.0475	1.5704		1.6565	−.0468
17	.658	.477	.9124	−.0430	1.0307		1.1555	−.0457	1.3038		1.4540	−.0464	1.5607		1.6309	−.0454
18	.676	.543	.9544	−.0436	1.0830		1.1897	−.0465	1.3074		1.4261	−.0469	1.5061		1.5559	−.0460
19	.500	0.000	.6092	−.0462	.7837		.9842	−.0466	1.1899		1.3704	−.0475	1.4964		1.6059	−.0469
20	.500	.222	.6060	−.0474	.7830		.9887	−.0481	1.1982		1.3788	−.0486	1.5035		1.6098	−.0479
21	.500	.370	.6027	−.0473	.7838		.9959	−.0479	1.2054		1.3851	−.0485	1.5038		1.6075	−.0478
22	.500	.518	.5678	−.0469	.7740		1.0032	−.0475	1.2172		1.3923	−.0479	1.5004		1.5962	−.0471
23	.514	.660	.7864	−.0443	.9105		1.0986	−.0465	1.2788		1.4214	−.0472	1.4934		1.5640	−.0464
24	.533	.727	.8830	−.0437	.9930		1.1570	−.0460	1.3081		1.4284	−.0466	1.4839		1.5387	−.0457
25	.551	.793	.9479	−.0433	1.0470		1.1849	−.0455	1.3027		1.3945	−.0461	1.4317		1.4678	−.0452
26	.375	0.000	.6098	−.0461	.7841		.9860	−.0470	1.1890		1.3267	−.0475	1.4446		1.5469	−.0469
27	.375	.250	.6056	−.0472	.7851		.9866	−.0480	1.1873		1.3172	−.0485	1.4382		1.5421	−.0479
28	.375	.417	.6081	−.0470	.7924		.9919	−.0479	1.1820		1.2950	−.0485	1.4229		1.5281	−.0479
29	.375	.583	.5987	−.0321	.7643		.9430	−.0326	1.1039		1.2171	−.0326	1.3657		1.4715	−.0320
30	.375	.750	.4753	−.0473	.6446		.8159	−.0479	.9802		1.1278	−.0481	1.2749		1.3762	−.0474
31	.375	.833	.4490	−.0475	.6117		.7879	−.0481	.9593		1.1197	−.0484	1.2495		1.3390	−.0476
32	.375	.917	.4333	−.0478	.5888		.7602	−.0480	.9261		1.0776	−.0483	1.1776		1.2557	−.0475
33	.250	0.000	.6084	−.0461	.7829		.9790	−.0468	1.1557		1.2506	−.0474	1.3707		1.4550	−.0467
34	.250	.250	.6133	−.0465	.7915		.9821	−.0475	1.1421		1.2471	−.0479	1.3701		1.4544	−.0473
35	.250	.417	.6114	−.0468	.7758		.9512	−.0476	1.1066		1.2330	−.0481	1.3556		1.4390	−.0471
36	.250	.583	.5651	−.0467	.7225		.8939	−.0476	1.0521		1.1966	−.0481	1.3159		1.4009	−.0474
37	.250	.750	.4965	−.0472	.6455		.8140	−.0483	.9733		1.1135	−.0487	1.2198		1.3000	−.0479
38	.250	.833	.4810	−.0470	.6346		.8019	−.0479	.9583		1.0838	−.0483	1.1825		1.2570	−.0475
39	.250	.917	.4496	−.0489	.6002		.7578	−.0494	.8979		1.0083	−.0494	1.0996		1.1695	−.0486
40	.156	0.000	.6071	−.0459	.7787		.9615	−.0465	1.0979		1.1994	−.0468	1.2699		1.3081	−.0459
41	.156	.250	.6118	−.0468	.7757		.9503	−.0477	1.0880		1.1990	−.0478	1.2702		1.3120	−.0468
42	.156	.417	.5900	−.0476	.7435		.9179	−.0486	1.0648		1.1878	−.0488	1.2586		1.3011	−.0476
43	.156	.583	.5429	−.0352	.6984		.8655	−.0352	1.0220		1.1479	−.0352	1.2172		1.2594	−.0341
44	.156	.750	.4977	−.0412	.6487		.8071	−.0418	.9586		1.0757	−.0420	1.1424		1.1864	−.0408
45	.156	.833	.4848	−.0523	.6322		.7912	−.0530	.9340		1.0441	−.0533	1.1066		1.1498	−.0517
46	.156	.917	.4538	−.0529	.5876		.7384	−.0535	.8687		.9716	−.0540	1.0310		1.0755	−.0523
47	.094	0.000	.2166	−.0544	.3198		.4289	−.0545	.4992		.5586	−.0541	.5802		.6337	−.0525
48	.094	.250	.2083	−.0540	.2974		.3995	−.0541	.4814		.5413	−.0542	.5615		.6191	−.0527
49	.094	.417	.2048	−.0540	.2910		.3876	−.0543	.4781		.5349	−.0546	.5563		.6220	−.0528
50	.094	.583	.1871	−.0527	.2704		.3730	−.0532	.4643		.5194	−.0534	.5500		.6748	−.0517
51	.094	.917	.4348	−.0510	.5695		.6993	−.0519	.8066		.8630	−.0519	.8761		.9287	−.0502
52	.063	0.000	.2083	−.0520	.3105		.4129	−.0524	.4808		.5531	−.0522	.6116		.7225	−.0503
53	.063	.250	.1944	−.0531	.2843		.3875	−.0532	.4685		.5398	−.0533	.6003		.7170	−.0513
54	.063	.417	.1811	−.0537	.2714		.3731	−.0537	.4637		.5320	−.0542	.5947		.7236	−.0521
55	.063	.583	.1684	−.0548	.2574		.3681	−.0552	.4665		.5431	−.0554	.6269		.7399	−.0535
56	.031	0.000	.1964	−.0358	.2905		.3825	−.0357	.4569		.5420	−.0344	.6282		.7646	−.0322
57	.031	.250	.1863	−.0532	.2753		.3703	−.0532	.4542		.5371	−.0526	.6234		.7659	−.0505
58	.031	.417	.1749	−.0533	.2655		.3618	−.0534	.4551		.5350	−.0534	.6268		.7725	−.0513
59	.031	.583	.1719	−.0545	.2658		.3720	−.0548	.4781		.5668	−.0548	.6618		.7838	−.0525
60	.031	.750	.2113	−.0551	.3128		.4250	−.0554	.5291		.6164	−.0553	.7140		.8553	−.0532
61	.375	−.583	.5996	−.0455	.7685		.9482	−.0464	1.1127		1.2243	−.0468	1.3727		1.4789	−.0463
62	.156	−.583	.5499	−.0513	.7060		.8737	−.0520	1.0308		1.1576	−.0522	1.2244		1.2685	−.0512

TABLE VI.–PRESSURE COEFFICIENTS FOR MODEL 6
(a) M = 1.60

			α =													
			−4.8		.3		5.3		10.2		15.3		20.3		25.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	.3999	.9918	.7934	.7152	1.0364	.3345	1.1829	.0820	1.2884	−.1214	1.3691	−.2846	1.4395	−.4075
2	.958	.333	.4021	.9797	.7852	.7133	1.0223	.3437	1.1691	.0928	1.2793	−.1162	1.3615	−.2784	1.4324	−.4067
3	.958	.583	.4044	.9328	.7463	.6869	.9743	.3502	1.1255	.1060	1.2398	−.0946	1.3296	−.2572	1.4023	−.3883
4	.958	.750	.4024	.8530	.6805	.6397	.8926	.3503	1.0443	.1200	1.1620	−.0762	1.2581	−.2341	1.3383	−.3620
5	.917	0.000	.4031	.8578	.7209	.6797	.8915	.3512	1.0097	.1300	1.1041	−.0552	1.1848	−.2041	1.2670	−.3279
6	.917	.333	.4023	.8407	.7053	.6635	.8741	.3510	.9947	.1319	1.0909	−.0528	1.1749	−.2006	1.2556	−.3240
7	.917	.583	.3973	.7821	.6508	.6165	.8136	.3472	.9357	.1352	1.0387	−.0464	1.1258	−.1937	1.2096	−.3151
8	.917	.750	.3587	.6644	.5476	.5157	.6887	.3178	.8071	.1294	.9081	−.0435	.9956	−.1875	1.0806	−.3058
9	.875	0.000	.3937	.7402	.6530	.6232	.7592	.3421	.8443	.1345	.9186	−.0392	.9854	−.1796	1.0639	−.2979
10	.875	.333	.3950	.7249	.6386	.6072	.7452	.3425	.8318	.1333	.9072	−.0390	.9756	−.1785	1.0519	−.2957
11	.875	.583	.3760	.6623	.5707	.5401	.6814	.3317	.7727	.1322	.8530	−.0374	.9265	−.1763	1.0022	−.2913
12	.875	.833	−.1685	−.0328	−.0970	−.1107	−.0294	−.1825	.0373	−.2410	.1122	−.2922	.2872	−.3539	.4870	−.4102
13	.875	.917	.0384	.1812	.0909	.0768	.1961	−.0246	.2798	−.0186	.3890	−.0945	.4863	−.1796	.5931	−.2758
14	.792	0.000	−.0956	.0419	−.0080	−.0139	.0502	−.1201	.1234	−.2247	.2265	−.3124	.3518	−.3801	.7460	−.4379
15	.792	.333	−.1083	.0162	−.0312	−.0379	.0237	−.1323	.0940	−.2347	.1902	−.3199	.3341	−.3873	.7148	−.4425
16	.792	.583	−.1572	−.0520	−.0933	−.1024	−.0449	−.1741	.0156	−.2487	.0984	−.3260	.2380	−.3886	.6661	−.4393
17	.792	.750	−.1902	−.1069	−.1274	−.1471	−.0841	−.2054	.0207	−.2556	.1420	−.3103	.3141	−.3629	.5755	−.4166
18	.792	.833	−.0479	.1752	.0768	.0219	.1728	−.0737	.1962	−.1477	.2673	−.3040	.3425	−.3515	.5895	−.3994
19	.792	.917	.0298	.1356	.1017	.0934	.1349	.0154	.1855	−.0805	.2462	−.1796	.3195	−.2695	.5180	−.3466
20	.667	0.000	−.1131	.0435	−.0295	−.0423	.0585	−.1378	.1687	−.2410	.3178	−.3251	.5106	−.3892	.6788	−.4193
21	.667	.333	−.1347	.0083	−.0606	−.0736	.0229	−.1547	.1284	−.2457	.2694	−.3272	.4931	−.3905	.6600	−.4224
22	.667	.583	−.1611	−.0240	−.0926	−.1064	−.0082	−.1824	.1054	−.2516	.2674	−.3129	.5196	−.3722	.6259	−.4222
23	.667	.750	−.0283	.0643	.0037	−.0025	.0694	−.0243	.1509	−.1170	.2603	−.2086	.4240	−.2204	.5577	−.2700
24	.667	.833	−.0111	.0439	.0226	.0250	.0526	−.0265	.1266	−.1090	.2278	−.1893	.3880	−.2607	.5220	−.3263
25	.667	.917	−.0043	.0438	.0423	.0455	.0392	−.0205	.0949	−.1254	.1795	−.2369	.3232	−.3212	.4536	−.3879
26	.500	0.000	−.1344	−.0010	−.0701	−.0836	.0150	−.1520	.1183	−.2473	.2559	−.3275	.4808	−.3595	.6011	−.4112
27	.500	.333	−.1409	−.0066	−.0742	−.0885	.0124	−.1593	.1395	−.2372	.2986	−.3113	.4642	−.3602	.5874	−.4106
28	.500	.583														
29	.500	.750	−.0438	.0446	.0077	.0072	.0501	−.0580	.1258	−.1401	.2292	−.2142	.3504	−.2832	.4739	−.3527
30	.500	.833	−.0413	.0446	.0152	.0111	.0510	−.0570	.1150	−.1438	.2121	−.2283	.3253	−.3070	.4426	−.3852
31	.500	.917														
32	.333	0.000	−.1681	−.0492	−.1147	−.1286	−.0278	−.1811	.1171	−.2351	.2775	−.2980	.4147	−.3562	.5410	−.4045
33	.333	.333	−.1302	.0057	−.0636	−.0774	.0224	−.1459	.1258	−.2249	.2530	−.2916	.3898	−.3608	.5191	−.4141
34	.333	.583	−.0608	.0372	−.0061	−.0107	.0492	−.0728	.1285	−.1520	.2302	−.2288	.3639	−.2785	.4867	−.3373
35	.333	.750	−.0499	.0320	−.0001	−.0012	.0415	−.0635	.1091	−.1420	.1950	−.2272	.3134	−.3096	.4255	−.3862
36	.333	.833	−.0512	.0290	.0018	.0010	.0349	−.0651	.0962	−.1577	.1731	−.2651	.2838	−.3539	.3920	−.4197
37	.333	.917	−.0586	.0189	.0054	.0023	.0263	−.0805	.0707	−.2042	.1364	−.3070	.2307	−.3742	.3332	−.4246
38	.208	0.000	−.1579	−.0226	−.0973	−.1114	−.0013	−.1694	.1242	−.2299	.2411	−.2913	.3640	−.3331	.4960	−.3533
39	.208	.333	−.1024	−.0082	−.0640	−.0767	.0066	−.1073	.1077	−.1700	.2336	−.2269	.3541	−.2670	.4849	−.3311
40	.208	.583	−.0645	.0170	−.0208	−.0228	.0277	−.0753	.1000	−.1492	.2137	−.2151	.3322	−.2797	.4522	−.3501
41	.208	.750	−.0550	.0131	−.0117	−.0121	.0234	−.0638	.0835	−.1491	.1736	−.2444	.2827	−.3336	.3883	−.4046
42	.208	.833	−.0533	.0127	−.0047	−.0035	.0224	−.0628	.0724	−.1747	.1516	−.2942	.2565	−.3787	.3575	−.4329
43	.208	.917	−.0647	.0067	.0009	.0054	.0146	−.0864	.0487	−.2224	.1133	−.3276	.2078	−.3893	.3016	−.4315
44	.125	0.000	−.3299	−.2853	−.2925	−.2944	−.2742	−.3213	−.2231	−.3061	−.1699	−.2857	−.1152	−.2983	−.0619	−.3205
45	.125	.333	−.3427	−.2998	−.3224	−.3285	−.2916	−.3469	−.2376	−.3735	−.1800	−.4030	−.1243	−.4139	−.0721	−.4455
46	.125	.583	−.3194	−.2967	−.3121	−.3131	−.2899	−.3261	−.2499	−.3751	−.1890	−.4121	−.1369	−.4377	−.0853	−.4339
47	.125	.833	−.0531	−.0007	−.0088	−.0025	.0024	−.0686	.0408	−.1975	.1147	−.3195	.1825	−.3957	.2438	−.4358
48	.125	.917	−.0694	.0070	.0064	.0120	.0039	−.1000	.0296	−.2400	.0956	−.3376	.1702	−.3960	.2341	−.4308
49	.083	0.000	−.3139	−.2705	−.2811	−.2886	−.2664	−.3091	−.2362	−.2678	−.1825	−.2784	−.1266	−.3008	−.0702	−.3114
50	.083	.333	−.3526	−.3045	−.3318	−.3356	−.2945	−.3569	−.2416	−.3789	−.1864	−.3819	−.1292	−.3906	−.0746	−.4212
51	.083	.583	−.3132	−.2937	−.3026	−.3027	−.2870	−.3169	−.2440	−.3674	−.1811	−.4021	−.1274	−.4130	−.0693	−.4325
52	.083	.750	−.3373	−.2748	−.3140	−.3169	−.2660	−.3467	−.2212	−.3947	−.1457	−.4061	−.0785	−.4100	−.0142	−.4212
53	.042	0.000	−.2543	−.2493	−.2799	−.2844	−.2392	−.2434	−.2241	−.2477	−.1860	−.2664	−.1284	−.2876	−.0694	−.2919
54	.042	.333	−.3485	−.2886	−.3329	−.3377	−.2828	−.3471	−.2439	−.3430	−.1913	−.3475	−.1332	−.3634	−.0761	−.3818
55	.042	.583	−.3101	−.2838	−.2949	−.2944	−.2776	−.3125	−.2327	−.3376	−.1730	−.3712	−.1096	−.4092	−.0459	−.4345
56	.042	.750	−.3176	−.2593	−.2886	−.2885	−.2553	−.3259	−.2142	−.3641	−.1451	−.3987	−.0816	−.4130	−.0151	−.4251
57	.792	−.583	−.1512	−.0560	−.0894	−.1049	−.0415	−.1745	.0174	−.2469	.0973	−.3219	.2363	−.3838	.5625	−.4303
58	.208	−.583	−.1512	−.0560	−.0894	−.1049	−.0415	−.1745	.0174	−.2469	.0973	−.3219	.2363	−.3838	.5625	−.4303

TABLE VI.–Continued
(a) Concluded

			α =													
			30.2		35.2		40.3		45.3		50.3		55.2		60.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	1.5015	−.4711	1.5453	−.4161	1.5754	−.4271	1.5855	−.4369	1.5793	−.4086	1.5599		1.5277	
2	.958	.333	1.4943	−.4807	1.5439	−.4251	1.5747	−.4390	1.5806	−.4479	1.5771	−.4170	1.5613		1.5275	
3	.958	.583	1.4704	−.4735	1.5213	−.4297	1.5545	−.4444	1.5660	−.4527	1.5648	−.4209	1.5465		1.5144	
4	.958	.750	1.4116	−.4630	1.4694	−.4301	1.5064	−.4442	1.5250	−.4524	1.5251	−.4211	1.5140		1.4850	
5	.917	0.000	1.3579	−.4421	1.4391	−.4224	1.5076	−.4356	1.5541	−.4465	1.5823	−.4179	1.5953		1.5885	
6	.917	.333	1.3467	−.4380	1.4312	−.4264	1.4997	−.4407	1.5450	−.4503	1.5750	−.4207	1.5900		1.5819	
7	.917	.583	1.3031	−.4272	1.3896	−.4302	1.4617	−.4460	1.5114	−.4548	1.5458	−.4235	1.5598		1.5565	
8	.917	.750	1.1787	−.4162	1.2766	−.4305	1.3563	−.4456	1.4190	−.4541	1.4600	−.4234	1.4898		1.4944	
9	.875	0.000	1.1792	−.4017	1.2977	−.4245	1.4012	−.4384	1.4803	−.4493	1.5374	−.4199	1.5797		1.5948	
10	.875	.333	1.1638	−.3990	1.2863	−.4277	1.3874	−.4428	1.4697	−.4527	1.5265	−.4225	1.5709		1.5860	
11	.875	.583	1.1104	−.3925	1.2311	−.4319	1.3369	−.4484	1.4212	−.4569	1.4828	−.4255	1.5275		1.5471	
12	.875	.833	.7927	−.4162	.9637	−.4311	1.0992	−.4469	1.1785	−.4557	1.2356	−.4257	1.2888		1.3335	
13	.875	.917	.7446	−.4187	.8781	−.4277	.9871	−.4429	1.0760	−.4526	1.1369	−.4227	1.1894		1.2284	
14	.792	0.000	.9597	−.3948	1.0873	−.4261	1.2200	−.4440	1.3318	−.4549	1.4206	−.4251	1.4978		1.5474	
15	.792	.333	.9416	−.4044	1.0669	−.4306	1.1991	−.4488	1.3119	−.4583	1.4014	−.4275	1.4814		1.5317	
16	.792	.583	.8619	−.4113	1.0071	−.4358	1.1329	−.4535	1.2474	−.4612	1.3339	−.4294	1.4065		1.4644	
17	.792	.750	.8022	−.4117	.9228	−.4356	1.0335	−.4531	1.1365	−.4612	1.2135	−.4292	1.2840		1.3379	
18	.792	.833	.7464	−.4088	.8740	−.4344	.9869	−.4522	1.0862	−.4603	1.1585	−.4284	1.2263		1.2795	
19	.792	.917	.6599	−.4092	.7832	−.4357	.8916	−.4511	.9844	−.4591	1.0519	−.4274	1.1139		1.1645	
20	.667	0.000	.8375	−.4013	.9846	−.4391	1.1124	−.4591	1.2246	−.4665	1.3180	−.4354	1.4053		1.4727	
21	.667	.333	.8160	−.4150	.9652	−.4413	1.0922	−.4609	1.2058	−.4678	1.2984	−.4372	1.3861		1.4536	
22	.667	.583	.7709	−.4166	.9143	−.4456	1.0374	−.4630	1.1476	−.4683	1.2361	−.4369	1.3210		1.3899	
23	.667	.750	.6896	−.4033	.8201	−.4453	.9349	−.4625	1.0357	−.4674	1.1146	−.4355	1.1923		1.2557	
24	.667	.833	.6479	−.3967	.7736	−.4488	.8848	−.4641	.9833	−.4677	1.0597	−.4351	1.1354		1.1986	
25	.667	.917	.5705	−.4282	.6878	−.4566	.7907	−.4648	.8828	−.4676	.9558	−.4339	1.0262		1.0873	
26	.500	0.000	.7467	−.4219	.8863	−.4513	1.0041	−.4731	1.1122	−.4775	1.2025	−.4435	1.2934		1.3750	
27	.500	.333	.7316	−.4261	.8710	−.4522	.9882	−.4740	1.0941	−.4780	1.1841	−.4461	1.2761		1.3557	
28	.500	.583														
29	.500	.750	.6018	−.4004	.7251	−.4517	.8312	−.4761	.9287	−.4752	1.0071	−.4445	1.0886		1.1620	
30	.500	.833	.5658	−.4320	.6862	−.4598	.7874	−.4761	.8811	−.4746	.9573	−.4437	1.0367		1.1095	
31	.500	.917														
32	.333	0.000	.6727	−.4036	.7978	−.4472	.8984	−.4750	.9933	−.4779	1.0751	−.4413	1.1638		1.2489	
33	.333	.333	.6566	−.4074	.7811	−.4467	.8859	−.4749	.9791	−.4797	1.0585	−.4465	1.1422		1.2290	
34	.333	.583	.6154	−.3864	.7339	−.4419	.8360	−.4754	.9276	−.4803	1.0045	−.4533	1.0878		1.1737	
35	.333	.750	.5420	−.4306	.6520	−.4584	.7422	−.4790	.8266	−.4787	.8994	−.4510	.9823		1.0641	
36	.333	.833	.5030	−.4513	.6087	−.4680	.6970	−.4801	.7814	−.4784	.8523	−.4501	.9341		1.0143	
37	.333	.917	.4360	−.4485	.5335	−.4689	.6184	−.4790	.6961	−.4781	.7616	−.4495	.8394		.9166	
38	.208	0.000	.6140	−.3905	.7046	−.4428	.7788	−.4700	.8466	−.4701	.9053	−.4353	.9738		1.0623	
39	.208	.333	.5999	−.3871	.6898	−.4384	.7648	−.4708	.8312	−.4766	.8899	−.4434	.9623		1.0496	
40	.208	.583	.5642	−.3834	.6535	−.4306	.7266	−.4677	.7946	−.4786	.8532	−.4553	.9289		1.0222	
41	.208	.750	.4926	−.4409	.5759	−.4603	.6452	−.4722	.7096	−.4770	.7660	−.4542	.8499		.9494	
42	.208	.833	.4578	−.4542	.5380	−.4679	.6077	−.4732	.6712	−.4764	.7276	−.4532	.8188		.9184	
43	.208	.917	.3949	−.4494	.4708	−.4670	.5349	−.4723	.5957	−.4762	.6525	−.4522	.7459		.8407	
44	.125	0.000	−.0236	−.3819	.0059	−.4150	.0380	−.4405	.0769	−.4515	.1813	−.4264	.3758		.5590	
45	.125	.333	−.0340	−.3708	−.0051	−.4308	.0279	−.4616	.0678	−.4690	.1911	−.4374	.3861		.5707	
46	.125	.583	−.0471	−.4438	−.0149	−.4323	.0195	−.4639	.1242	−.4771	.1880	−.4528	.4225		.6104	
47	.125	.833	.2958	−.4507	.3390	−.4528	.3888	−.4675	.4441	−.4743	.5283	−.4522	.7293		.8424	
48	.125	.917	.2886	−.4483	.3332	−.4532	.3831	−.4668	.4420	−.4743	.5234	−.4512	.6856		.7841	
49	.083	0.000	−.0243	−.3657	.0196	−.3972	.0744	−.4280	.1504	−.4460	.2451	−.4256	.6980		.8489	
50	.083	.333	−.0281	−.3729	.0163	−.4257	.0722	−.4558	.1539	−.4657	.2371	−.4365	.7254		.8476	
51	.083	.583	−.0178	−.4366	.0333	−.4302	.1106	−.4623	.1764	−.4751	.2923	−.4511	.7696		.8471	
52	.083	.750	.0440	−.4291	.1026	−.4341	.1757	−.4645	.2805	−.4741	.3965	−.4523	.7176		.8033	
53	.042	0.000	−.0159	−.3433	.0401	−.3846	.1130	−.4214	.2120	−.4453	.3393	−.4278	.7306		.7813	
54	.042	.333	−.0222	−.3747	.0352	−.4197	.1093	−.4511	.2149	−.4635	.3509	−.4373	.7256		.7743	
55	.042	.583	.0149	−.4079	.0793	−.4294	.1447	−.4598	.2092	−.4730	.5575	−.4495	.7150		.7709	
56	.042	.750	.0494	−.4132	.1204	−.4244	.2078	−.4618	.3258	−.4734	.5616	−.4515	.6786		.7478	
57	.792	−.583	.8740	−.4025	1.0018	−.4268	1.1253	−.4435	1.2407	−.4515	1.3289	−.4228	1.4016		1.4578	
58	.208	−.583	.8740	−.4025	1.0018	−.4268	1.1253	−.4435	1.2407	−.4515	1.3289	−.4228	1.4016		1.4578	

TABLE VI.–Continued
(b) M = 2.16

			α =													
			−3.7		1.3		6.3		11.3		16.3		21.3		26.3	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	.2782	.5837	.4451	.3836	.6738	.2215	1.0531	.0947	1.2979	.0074	1.4335	−.0874	1.5248	−.1695
2	.958	.333	.2769	.5892	.4445	.3879	.6775	.2232	1.0453	.0949	1.2850	.0068	1.4243	−.0884	1.5205	−.1733
3	.958	.583	.2758	.5915	.4461	.3877	.6758	.2213	1.0126	.0944	1.2417	.0063	1.3857	−.0826	1.4877	−.1642
4	.958	.750	.2762	.5875	.4458	.3846	.6709	.2199	.9545	.0932	1.1647	.0038	1.3090	−.0774	1.4183	−.1542
5	.917	0.000	.2712	.5842	.4381	.3823	.6689	.2178	.9843	.0864	1.1457	−.0009	1.2560	−.0753	1.3457	−.1445
6	.917	.333	.2706	.5824	.4379	.3822	.6662	.2173	.9712	.0858	1.1324	−.0029	1.2445	−.0755	1.3380	−.1442
7	.917	.583	.2704	.5824	.4397	.3797	.6668	.2150	.9224	.0858	1.0777	−.0050	1.1949	−.0772	1.2913	−.1417
8	.917	.750	.2683	.5675	.4340	.3749	.6379	.2126	.8171	.0855	.9548	−.0084	1.0694	−.0797	1.1652	−.1404
9	.875	0.000	.2675	.5759	.4353	.3778	.6603	.2137	.9085	.0822	1.0004	−.0091	1.0820	−.0779	1.1528	−.1387
10	.875	.333	.2678	.5754	.4347	.3775	.6585	.2139	.8956	.0822	.9890	−.0098	1.0724	−.0792	1.1454	−.1391
11	.875	.583	.2682	.5746	.4335	.3751	.6525	.2130	.8373	.0832	.9344	−.0117	1.0216	−.0824	1.0998	−.1396
12	.875	.833	−.0905	.0014	−.0402	−.0581	.0272	−.1079	.1376	−.1497	.2480	−.1841	.3152	−.2126	.4674	−.2338
13	.875	.917	−.0533	.0598	.0102	−.0119	.0918	−.0762	.2241	−.1294	.3778	−.1723	.5142	−.2039	.6408	−.2263
14	.792	0.000	−.0437	.1198	.0456	.0107	.1637	−.0742	.2621	−.1376	.3371	−.1797	.4476	−.2125	.5761	−.2367
15	.792	.333	−.0521	.1081	.0363	.0006	.1511	−.0823	.2393	−.1439	.3101	−.1857	.4110	−.2178	.5558	−.2408
16	.792	.583	−.0586	.0815	.0233	−.0085	.1114	−.0857	.1751	−.1453	.2339	−.1879	.3182	−.2198	.4448	−.2420
17	.792	.750	−.0911	−.0090	−.0491	−.0613	.0175	−.1073	.1157	−.1505	.1715	−.1864	.3265	−.2158	.4453	−.2366
18	.792	.833	−.0655	.0440	−.0059	−.0264	.0767	−.0860	.2006	−.1363	.3354	−.1779	.4214	−.2102	.5123	−.2334
19	.792	.917	−.0012	.0722	.0305	.0049	.0958	−.0078	.2055	−.0734	.3065	−.1278	.3933	−.1736	.4831	−.2065
20	.667	0.000	−.0574	.1040	.0319	−.0034	.1461	−.0895	.2461	−.1520	.3571	−.1927	.5002	−.2231	.6694	−.2316
21	.667	.333	−.0596	.0960	.0277	−.0069	.1317	−.0910	.2144	−.1529	.3171	−.1940	.4511	−.2242	.6305	−.2316
22	.667	.583	−.0889	.0068	−.0363	−.0552	.0346	−.1103	.1308	−.1560	.2497	−.1912	.4139	−.2193	.6189	−.2308
23	.667	.750	−.0825	.0263	−.0229	−.0445	.0587	−.1032	.1682	−.1535	.2800	−.1924	.3929	−.2215	.5441	−.2357
24	.667	.833	−.0620	.0518	.0080	−.0217	.0760	−.0374	.1588	−.0674	.2531	−.1211	.3623	−.1641	.5083	−.1970
25	.667	.917	−.0055	.0548	.0314	.0280	.0690	−.0254	.1357	−.0972	.2089	−.1623	.3137	−.2039	.4447	−.2279
26	.500	0.000	−.0573	.0983	.0297	−.0062	.1356	−.0912	.2062	−.1539	.3002	−.1968	.4130	−.2236	.5906	−.2247
27	.500	.333	−.0682	.0479	.0010	−.0263	.0757	−.0977	.1608	−.1552	.2802	−.1959	.4286	−.2198	.5824	−.2244
28	.500	.583														
29	.500	.750	−.0147	.0484	.0104	−.0057	.0691	−.0291	.1477	−.0868	.2423	−.1364	.3555	−.1811	.4824	−.2097
30	.500	.833	−.0182	.0432	.0160	.0120	.0588	−.0378	.1325	−.0987	.2247	−.1555	.3340	−.1989	.4556	−.2265
31	.500	.917														
32	.333	0.000	−.0586	.0681	.0201	−.0127	.0881	−.0928	.1381	−.1536	.2419	−.1968	.3929	−.2088	.5450	−.2245
33	.333	.333	−.0744	.0377	−.0148	−.0371	.0704	−.0963	.1601	−.1462	.2684	−.1877	.3821	−.2093	.5264	−.2258
34	.333	.583	−.0589	.0463	−.0021	−.0234	.0747	−.0792	.1564	−.1123	.2539	−.1573	.3629	−.2018	.4950	−.2254
35	.333	.750	−.0269	.0438	.0147	.0045	.0627	−.0484	.1305	−.1067	.2176	−.1574	.3211	−.1986	.4398	−.2281
36	.333	.833	−.0258	.0373	.0101	.0045	.0530	−.0478	.1179	−.1148	.1975	−.1772	.2970	−.2171	.4103	−.2379
37	.333	.917	−.0286	.0292	.0104	.0061	.0397	−.0635	.0921	−.1478	.1660	−.1955	.2560	−.2225	.3604	−.2372
38	.208	0.000	−.0723	.0162	−.0139	−.0357	.0332	−.0998	.1089	−.1535	.2405	−.1870	.3703	−.2076	.5040	−.2254
39	.208	.333	−.0739	.0385	−.0126	−.0366	.0663	−.0966	.1371	−.1462	.2334	−.1876	.3571	−.2071	.4918	−.2256
40	.208	.583	−.0374	.0454	−.0011	−.0142	.0704	−.0554	.1375	−.1122	.2241	−.1563	.3319	−.1869	.4664	−.2223
41	.208	.750	−.0291	.0407	.0108	.0019	.0566	−.0523	.1175	−.1118	.1975	−.1667	.2939	−.2089	.4119	−.2329
42	.208	.833	−.0281	.0361	.0104	.0036	.0500	−.0544	.1040	−.1294	.1801	−.1894	.2738	−.2236	.3859	−.2332
43	.208	.917	−.0346	.0285	.0097	.0045	.0358	−.0736	.0818	−.1588	.1501	−.1997	.2364	−.2251	.3405	−.2317
44	.125	0.000	−.2050	−.1751	−.1891	−.1957	−.1654	−.1841	−.1120	−.1769	−.0449	−.1852	.0190	−.2096	.0855	−.2254
45	.125	.333	−.1997	−.1590	−.1810	−.1898	−.1485	−.1978	−.1129	−.1930	−.0601	−.2073	.0073	−.2233	.0749	−.2268
46	.125	.583	−.1883	−.1534	−.1671	−.1757	−.1446	−.1944	−.1109	−.2057	−.0653	−.2108	−.0060	−.2305	.0589	−.2351
47	.125	.833	−.0324	.0329	.0087	−.0014	.0412	−.0593	.0871	−.1390	.1616	−.1971	.2442	−.2266	.3380	−.2317
48	.125	.917	−.0389	.0288	.0097	.0034	.0326	−.0814	.0731	−.1636	.1393	−.2044	.2246	−.2231	.3226	−.2311
49	.083	0.000	−.1892	−.1886	−.2038	−.2105	−.1765	−.1838	−.1200	−.1783	−.0570	−.1875	.0062	−.2111	.0735	−.2238
50	.083	.333	−.1950	−.1669	−.1869	−.1923	−.1571	−.1885	−.1207	−.1929	−.0663	−.2043	.0009	−.2208	.0689	−.2274
51	.083	.583	−.1859	−.1502	−.1715	−.1790	−.1449	−.1799	−.1135	−.1920	−.0667	−.2075	−.0032	−.2275	.0612	−.2352
52	.083	.750	−.1615	−.1493	−.1762	−.1611	−.1368	−.1685	−.0990	−.1886	−.0427	−.2044	.0283	−.2231	.1073	−.2306
53	.042	0.000	−.1858	−.1879	−.2013	−.1944	−.1766	−.1821	−.1211	−.1778	−.0617	−.1887	.0016	−.2092	.0704	−.2207
54	.042	.333	−.1877	−.1703	−.1858	−.1869	−.1619	−.1884	−.1262	−.1911	−.0703	−.1994	−.0051	−.2157	.0634	−.2273
55	.042	.583	−.1726	−.1354	−.1667	−.1719	−.1337	−.1740	−.1134	−.1924	−.0650	−.2087	.0022	−.2277	.0740	−.2379
56	.042	.750	−.1567	−.1434	−.1560	−.1477	−.1323	−.1662	−.0952	−.1869	−.0426	−.2036	.0255	−.2236	.1042	−.2302
57	.792	−.583	−.0438	.0829	.0343	−.0057	.1189	−.0814	.1797	−.1390	.2357	−.1783	.3172	−.2066	.4453	−.2272
58	.208	−.583	−.0438	.0829	.0343	−.0057	.1189	−.0814	.1797	−.1390	.2357	−.1783	.3172	−.2066	.4453	−.2272

TABLE VI.—Continued
(b) Concluded

			α =													
			31.3		36.3		41.3		46.3		51.3		56.3		61.3	
Tube	x/l	$y/b/2$	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	1.5941	−.2236	1.6513	−.2500	1.6914	−.2491	1.7133	−.2457	1.7086	−.2432	1.6924	−.2428	1.6724	−.2430
2	.958	.333	1.5891	−.2338	1.6443	−.2642	1.6864	−.2627	1.7117	−.2582	1.7109	−.2557	1.6993	−.2550	1.6702	−.2556
3	.958	.583	1.5630	−.2273	1.6225	−.2616	1.6672	−.2634	1.6981	−.2600	1.7044	−.2574	1.6916	−.2568	1.6643	−.2570
4	.958	.750	1.5013	−.2183	1.5706	−.2589	1.6251	−.2641	1.6658	−.2603	1.6733	−.2579	1.6631	−.2569	1.6424	−.2575
5	.917	0.000	1.4256	−.2058	1.5173	−.2522	1.5978	−.2611	1.6641	−.2586	1.6993	−.2562	1.7172	−.2558	1.7292	−.2566
6	.917	.333	1.4181	−.2041	1.5055	−.2507	1.5874	−.2612	1.6557	−.2590	1.6958	−.2571	1.7159	−.2568	1.7178	−.2576
7	.917	.583	1.3753	−.2000	1.4623	−.2460	1.5481	−.2612	1.6229	−.2598	1.6720	−.2580	1.6923	−.2573	1.6978	−.2579
8	.917	.750	1.2484	−.1959	1.3436	−.2416	1.4408	−.2611	1.5283	−.2596	1.5876	−.2579	1.6210	−.2574	1.6400	−.2578
9	.875	0.000	1.2265	−.1938	1.3443	−.2406	1.4628	−.2605	1.5666	−.2585	1.6413	−.2568	1.6933	−.2564	1.7282	−.2574
10	.875	.333	1.2166	−.1931	1.3288	−.2393	1.4488	−.2601	1.5553	−.2591	1.6335	−.2575	1.6855	−.2574	1.7137	−.2580
11	.875	.583	1.1719	−.1919	1.2722	−.2361	1.3954	−.2605	1.5077	−.2598	1.5933	−.2586	1.6472	−.2578	1.6794	−.2586
12	.875	.833	.6359	−.2507	.8736	−.2591	1.1084	−.2621	1.2444	−.2602	1.3366	−.2574	1.4056	−.2573	1.4581	−.2569
13	.875	.917	.7554	−.2459	.8954	−.2594	1.0378	−.2623	1.1571	−.2599	1.2474	−.2568	1.3145	−.2570	1.3604	−.2565
14	.792	0.000	.9393	−.2534	1.1078	−.2576	1.2494	−.2621	1.3924	−.2600	1.5064	−.2588	1.5971	−.2583	1.6662	−.2588
15	.792	.333	.8464	−.2563	1.0926	−.2585	1.2263	−.2619	1.3717	−.2602	1.4890	−.2595	1.5779	−.2586	1.6457	−.2594
16	.792	.583	.7620	−.2542	1.0154	−.2573	1.1578	−.2609	1.3025	−.2599	1.4180	−.2582	1.5088	−.2582	1.5734	−.2576
17	.792	.750	.6803	−.2484	.9483	−.2568	1.0757	−.2617	1.1992	−.2605	1.3049	−.2586	1.3889	−.2586	1.4513	−.2581
18	.792	.833	.6996	−.2487	.8946	−.2573	1.0274	−.2616	1.1525	−.2604	1.2538	−.2583	1.3360	−.2585	1.3960	−.2578
19	.792	.917	.6327	−.2314	.8090	−.2516	.9397	−.2607	1.0587	−.2599	1.1540	−.2578	1.2316	−.2578	1.2868	−.2573
20	.667	0.000	.8266	−.2434	.9934	−.2561	1.1420	−.2617	1.2814	−.2619	1.3996	−.2612	1.4990	−.2600	1.5820	−.2603
21	.667	.333	.8041	−.2432	.9696	−.2555	1.1211	−.2614	1.2597	−.2614	1.3794	−.2620	1.4767	−.2608	1.5606	−.2614
22	.667	.583	.7690	−.2439	.9197	−.2556	1.0670	−.2615	1.2027	−.2616	1.3196	−.2617	1.4147	−.2610	1.4960	−.2614
23	.667	.750	.6934	−.2458	.8374	−.2555	.9730	−.2614	1.0992	−.2616	1.2040	−.2605	1.2910	−.2609	1.3633	−.2600
24	.667	.833	.6607	−.2262	.7962	−.2533	.9276	−.2609	1.0505	−.2612	1.1535	−.2605	1.2386	−.2605	1.3072	−.2599
25	.667	.917	.5896	−.2446	.7217	−.2563	.8427	−.2613	.9586	−.2614	1.0556	−.2599	1.1369	−.2602	1.2015	−.2594
26	.500	0.000	.7518	−.2415	.9000	−.2552	1.0433	−.2616	1.1761	−.2627	1.2903	−.2627	1.3900	−.2610	1.4782	−.2615
27	.500	.333	.7380	−.2413	.8829	−.2540	1.0262	−.2603	1.1593	−.2616	1.2721	−.2623	1.3712	−.2616	1.4605	−.2623
28	.500	.583														
29	.500	.750	.6174	−.2335	.7524	−.2545	.8814	−.2615	1.0020	−.2624	1.1024	−.2628	1.1888	−.2631	1.2669	−.2629
30	.500	.833	.5868	−.2439	.7169	−.2535	.8419	−.2584	.9592	−.2595	1.0569	−.2594	1.1410	−.2600	1.2168	−.2596
31	.500	.917														
32	.333	0.000	.6879	−.2423	.8311	−.2560	.9619	−.2627	1.0806	−.2622	1.1792	−.2611	1.2674	−.2605	1.3555	−.2607
33	.333	.333	.6695	−.2430	.8114	−.2551	.9488	−.2620	1.0658	−.2638	1.1625	−.2634	1.2494	−.2639	1.3340	−.2633
34	.333	.583	.6350	−.2422	.7696	−.2555	.8999	−.2624	1.0156	−.2640	1.1098	−.2645	1.1942	−.2648	1.2781	−.2647
35	.333	.750	.5711	−.2457	.6960	−.2597	.8154	−.2630	.9233	−.2637	1.0124	−.2637	1.0908	−.2643	1.1703	−.2641
36	.333	.833	.5378	−.2458	.6590	−.2595	.7752	−.2630	.8803	−.2638	.9676	−.2641	1.0440	−.2646	1.1229	−.2644
37	.333	.917	.4808	−.2446	.5942	−.2586	.7044	−.2629	.8025	−.2636	.8856	−.2637	.9543	−.2643	1.0310	−.2641
38	.208	0.000	.6463	−.2423	.7791	−.2548	.8834	−.2614	.9661	−.2592	1.0346	−.2578	1.1002	−.2590	1.1725	−.2582
39	.208	.333	.6328	−.2433	.7640	−.2564	.8699	−.2628	.9532	−.2640	1.0211	−.2637	1.0852	−.2640	1.1609	−.2634
40	.208	.583	.5991	−.2413	.7268	−.2542	.8316	−.2607	.9159	−.2621	.9832	−.2624	1.0479	−.2626	1.1274	−.2627
41	.208	.750	.5343	−.2428	.6539	−.2571	.7551	−.2626	.8350	−.2639	.8978	−.2636	.9598	−.2641	1.0494	−.2638
42	.208	.833	.5046	−.2416	.6196	−.2567	.7208	−.2621	.7990	−.2630	.8607	−.2631	.9224	−.2636	1.0205	−.2636
43	.208	.917	.4519	−.2415	.5596	−.2563	.6558	−.2621	.7286	−.2633	.7888	−.2630	.8500	−.2635	.9488	−.2632
44	.125	0.000	.1467	−.2420	.1973	−.2543	.2348	−.2575	.2717	−.2525	.3178	−.2539	.4408	−.2572	.6405	−.2574
45	.125	.333	.1357	−.2436	.1861	−.2559	.2241	−.2616	.2630	−.2624	.3096	−.2624	.4375	−.2627	.6534	−.2621
46	.125	.583	.1206	−.2458	.1721	−.2571	.2140	−.2629	.2591	−.2639	.3697	−.2635	.4357	−.2641	.6853	−.2638
47	.125	.833	.4152	−.2415	.4837	−.2559	.5478	−.2626	.5954	−.2638	.6525	−.2633	.7529	−.2638	.9437	−.2636
48	.125	.917	.4038	−.2416	.4757	−.2550	.5386	−.2626	.5885	−.2636	.6483	−.2630	.7416	−.2634	.8948	−.2632
49	.083	0.000	.1386	−.2413	.1974	−.2528	.2528	−.2551	.3170	−.2519	.4039	−.2537	.4866	−.2570	.9761	−.2578
50	.083	.333	.1336	−.2437	.1931	−.2565	.2499	−.2618	.3160	−.2629	.4050	−.2631	.4915	−.2636	.9861	−.2628
51	.083	.583	.1330	−.2449	.1995	−.2562	.2723	−.2620	.3509	−.2628	.4119	−.2628	.5657	−.2631	.9829	−.2631
52	.083	.750	.1852	−.2434	.2587	−.2564	.3328	−.2626	.4107	−.2642	.5153	−.2629	.6577	−.2636	.9187	−.2630
53	.042	0.000	.1391	−.2396	.2058	−.2517	.2746	−.2551	.3573	−.2540	.4617	−.2550	.6169	−.2578	.9198	−.2586
54	.042	.333	.1320	−.2431	.1985	−.2553	.2683	−.2607	.3533	−.2622	.4614	−.2625	.6605	−.2631	.9145	−.2623
55	.042	.583	.1522	−.2445	.2284	−.2566	.3023	−.2616	.3821	−.2625	.4659	−.2628	.8022	−.2633	.9068	−.2633
56	.042	.750	.1834	−.2438	.2621	−.2568	.3447	−.2621	.4359	−.2638	.5525	−.2628	.7901	−.2636	.8751	−.2631
57	.792	−.583	.6836	−.2370	1.0302	−.2410	1.1534	−.2441	1.2964	−.2441	1.4130	−.2429	1.5041	−.2432	1.5735	−.2421
58	.208	−.583	.6836	−.2370	1.0302	−.2410	1.1534	−.2441	1.2964	−.2441	1.4130	−.2429	1.5041	−.2432	1.5735	−.2421

TABLE VI.—Continued
(c) M = 2.86

			α =													
			−5.1		−.1		4.9		9.9		14.9		19.9		24.9	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	.1861	.4869	.3076	.3263	.4604	.1954	.6528	.0941	.9054	.0222	1.3079	−.0171	1.4802	−.0413
2	.958	.333	.1904	.4984	.3142	.3344	.4700	.2022	.6615	.0986	.9136	.0246	1.3028	−.0178	1.4756	−.0416
3	.958	.583	.1908	.4997	.3142	.3354	.4702	.2020	.6622	.0984	.9127	.0251	1.2659	−.0204	1.4380	−.0425
4	.958	.750	.1897	.4988	.3136	.3343	.4697	.2006	.6629	.0978	.9116	.0250	1.2022	−.0238	1.3649	−.0464
5	.917	0.000	.1841	.4907	.3086	.3296	.4643	.1965	.6564	.0915	.9053	.0170	1.2075	−.0313	1.3294	−.0504
6	.917	.333	.1853	.4921	.3095	.3295	.4665	.1973	.6563	.0912	.9050	.0168	1.1964	−.0327	1.3196	−.0518
7	.917	.583	.1861	.4929	.3101	.3298	.4667	.1964	.6578	.0911	.9027	.0171	1.1493	−.0341	1.2718	−.0557
8	.917	.750	.1841	.4907	.3081	.3281	.4630	.1948	.6520	.0906	.8713	.0168	1.0391	−.0365	1.1500	−.0620
9	.875	0.000	.1826	.4858	.3065	.3256	.4611	.1936	.6511	.0883	.8923	.0138	1.0971	−.0382	1.1720	−.0603
10	.875	.333	.1831	.4883	.3072	.3264	.4626	.1948	.6516	.0884	.8923	.0138	1.0884	−.0389	1.1644	−.0617
11	.875	.583	.1833	.4898	.3076	.3274	.4639	.1946	.6527	.0890	.8837	.0146	1.0387	−.0397	1.1174	−.0655
12	.875	.833	−.0507	.0609	−.0079	−.0013	.0516	−.0492	.1220	−.0846	.2037	−.1076	.3390	−.1242	.4486	−.1350
13	.875	.917	−.0335	.0651	.0015	.0053	.0548	−.0313	.1396	−.0691	.2518	−.0959	.4100	−.1151	.5598	−.1288
14	.792	0.000	−.0317	.1171	.0257	.0339	.1046	−.0277	.2094	−.0730	.3483	−.1021	.4513	−.1204	.5587	−.1313
15	.792	.333	−.0380	.1068	.0173	.0249	.0949	−.0350	.1971	−.0789	.3334	−.1064	.4245	−.1245	.5250	−.1353
16	.792	.583	−.0387	.1025	.0145	.0223	.0912	−.0367	.1887	−.0792	.2906	−.1065	.3527	−.1244	.4339	−.1357
17	.792	.750	−.0594	.0467	−.0192	−.0132	.0387	−.0578	.1057	−.0904	.1891	−.1116	.3007	−.1279	.3714	−.1383
18	.792	.833	−.0413	.0592	−.0071	−.0031	.0503	−.0403	.1342	−.0770	.2456	−.1024	.3803	−.1210	.5013	−.1335
19	.792	.917	−.0333	.0653	.0083	.0127	.0565	−.0308	.1311	−.0723	.2328	−.0892	.3657	−.1078	.4703	−.1241
20	.667	0.000	−.0471	.0995	.0094	.0163	.0897	−.0441	.1924	−.0876	.3292	−.1139	.4434	−.1315	.5821	−.1399
21	.667	.333	−.0476	.0981	.0091	.0155	.0889	−.0452	.1903	−.0882	.3126	−.1139	.4069	−.1317	.5347	−.1400
22	.667	.583	−.0573	.0605	−.0107	−.0052	.0529	−.0554	.1227	−.0920	.2067	−.1146	.3241	−.1318	.4713	−.1363
23	.667	.750	−.0496	.0485	−.0134	−.0099	.0412	−.0472	.1190	−.0836	.2203	−.1079	.3324	−.1257	.4580	−.1330
24	.667	.833	−.0438	.0566	−.0027	.0011	.0497	−.0420	.1214	−.0804	.2139	−.1069	.3146	−.1201	.4314	−.1301
25	.667	.917	−.0127	.0556	.0099	.0135	.0492	−.0100	.1100	−.0548	.1929	−.0932	.2838	−.1212	.3855	−.1344
26	.500	0.000	−.0490	.0981	.0085	.0146	.0897	−.0455	.1907	−.0893	.3133	−.1151	.3886	−.1268	.5002	−.1315
27	.500	.333	−.0498	.0909	.0060	.0121	.0819	−.0466	.1666	−.0885	.2497	−.1131	.3499	−.1238	.4914	−.1284
28	.500	.583														
29	.500	.750	−.0505	.0530	−.0062	−.0024	.0466	−.0475	.1171	−.0882	.2053	−.1104	.3059	−.1181	.4203	−.1305
30	.500	.833	−.0294	.0504	−.0001	.0042	.0447	−.0297	.1069	−.0532	.1907	−.0876	.2865	−.1135	.3974	−.1275
31	.500	.917														
32	.333	0.000	−.0497	.0974	.0086	.0148	.0890	−.0456	.1844	−.0894	.2586	−.1152	.3191	−.1213	.4520	−.1291
33	.333	.333	−.0511	.0696	−.0032	.0029	.0624	−.0481	.1397	−.0867	.2381	−.1114	.3370	−.1209	.4573	−.1288
34	.333	.583	−.0507	.0567	−.0069	−.0030	.0504	−.0475	.1283	−.0861	.2209	−.1106	.3195	−.1209	.4373	−.1292
35	.333	.750	−.0289	.0497	−.0039	−.0004	.0445	−.0310	.1071	−.0531	.1942	−.0874	.2839	−.1145	.3944	−.1295
36	.333	.833	−.0185	.0452	.0057	.0065	.0412	−.0185	.0991	−.0617	.1753	−.0990	.2658	−.1262	.3733	−.1376
37	.333	.917	−.0267	.0351	.0081	.0086	.0320	−.0231	.0812	−.0810	.1503	−.1151	.2359	−.1310	.3335	−.1374
38	.208	0.000	−.0515	.0871	.0032	.0102	.0797	−.0481	.1583	−.0898	.2060	−.1131	.3003	−.1202	.4383	−.1281
39	.208	.333	−.0543	.0597	−.0097	−.0047	.0539	−.0519	.1352	−.0891	.2258	−.1117	.3096	−.1202	.4295	−.1284
40	.208	.583	−.0513	.0544	−.0094	−.0052	.0491	−.0500	.1234	−.0825	.2109	−.1032	.3001	−.1184	.4136	−.1273
41	.208	.750	−.0248	.0451	−.0024	−.0002	.0407	−.0225	.1050	−.0615	.1842	−.0935	.2697	−.1181	.3771	−.1292
42	.208	.833	−.0243	.0410	.0062	.0069	.0373	−.0213	.0920	−.0665	.1707	−.1047	.2527	−.1251	.3573	−.1322
43	.208	.917	−.0300	.0327	.0080	.0086	.0297	−.0261	.0772	−.0862	.1466	−.1159	.2231	−.1258	.3189	−.1320
44	.125	0.000	−.1053	−.0685	−.0990	−.0944	−.0722	−.1051	−.0456	−.1044	−.0172	−.1117	.0491	−.1193	.1208	−.1275
45	.125	.333	−.1099	−.0818	−.1098	−.1054	−.0857	−.1088	−.0488	−.1073	−.0080	−.1116	.0426	−.1195	.1102	−.1275
46	.125	.583	−.1109	−.0838	−.1012	−.1005	−.0860	−.1104	−.0545	−.1190	−.0119	−.1169	.0391	−.1241	.1002	−.1293
47	.125	.833	−.0271	.0296	.0039	.0040	.0260	−.0242	.0825	−.0717	.1540	−.1080	.2325	−.1240	.3290	−.1309
48	.125	.917	−.0337	.0281	.0067	.0073	.0246	−.0290	.0710	−.0897	.1414	−.1156	.2113	−.1243	.3058	−.1305
49	.083	0.000	−.1036	−.0848	−.1106	−.1078	−.0876	−.1028	−.0619	−.1052	−.0289	−.1121	.0374	−.1202	.1077	−.1281
50	.083	.333	−.1046	−.0912	−.1091	−.1105	−.0940	−.1040	−.0574	−.1077	−.0174	−.1134	.0339	−.1214	.1029	−.1291
51	.083	.583	−.1078	−.0893	−.1004	−.0983	−.0911	−.1077	−.0596	−.1089	−.0156	−.1154	.0348	−.1242	.0990	−.1303
52	.083	.750	−.0925	−.0839	−.0899	−.0899	−.0820	−.1012	−.0538	−.1113	−.0052	−.1163	.0544	−.1226	.1260	−.1302
53	.042	0.000	−.1006	−.0904	−.1015	−.1062	−.0921	−.1011	−.0676	−.1055	−.0313	−.1128	.0337	−.1209	.1030	−.1286
54	.042	.333	−.1025	−.0940	−.0997	−.1025	−.0957	−.1028	−.0604	−.1077	−.0225	−.1144	.0285	−.1212	.0976	−.1281
55	.042	.583	−.0986	−.0860	−.0941	−.0927	−.0879	−.0985	−.0601	−.1086	−.0159	−.1154	.0345	−.1251	.1017	−.1308
56	.042	.750	−.0970	−.0847	−.0880	−.0858	−.0848	−.0968	−.0557	−.1097	−.0050	−.1162	.0536	−.1231	.1242	−.1307
57	.792	−.583	−.0348	.0947	.0145	.0186	.0881	−.0369	.1862	−.0779	.2887	−.1028	.3479	−.1185	.4270	−.1287
58	.208	−.583	−.0348	.0947	.0145	.0186	.0881	−.0369	.1862	−.0779	.2887	−.1028	.3479	−.1185	.4270	−.1287

TABLE VI.–Continued
(c) Concluded

			α =											
			29.9		34.9		39.9		45.2		49.9		55.2		59.9	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	1.5852	−.0859	1.6533	−.1145	1.7123	−.1380	1.7541		1.7656	−.1403	1.7603		1.7399	−.1396
2	.958	.333	1.5824	−.0877	1.6517	−.1206	1.7080	−.1464	1.7522		1.7716	−.1480	1.7663		1.7454	−.1471
3	.958	.583	1.5496	−.0843	1.6250	−.1176	1.6864	−.1447	1.7344		1.7598	−.1481	1.7596		1.7424	−.1474
4	.958	.750	1.4813	−.0814	1.5676	−.1144	1.6354	−.1433	1.6951		1.7304	−.1488	1.7360		1.7250	−.1485
5	.917	0.000	1.4247	−.0801	1.5012	−.1095	1.5853	−.1384	1.6688		1.7277	−.1462	1.7640		1.7783	−.1467
6	.917	.333	1.4164	−.0805	1.4925	−.1094	1.5714	−.1380	1.6574		1.7229	−.1465	1.7602		1.7733	−.1472
7	.917	.583	1.3716	−.0810	1.4510	−.1081	1.5307	−.1345	1.6199		1.6916	−.1410	1.7366		1.7551	−.1410
8	.917	.750	1.2478	−.0840	1.3320	−.1084	1.4149	−.1344	1.5150		1.6033	−.1458	1.6622		1.6967	−.1469
9	.875	0.000	1.2445	−.0828	1.3121	−.1072	1.4169	−.1336	1.5390		1.6421	−.1456	1.7168		1.7619	−.1469
10	.875	.333	1.2373	−.0837	1.3024	−.1078	1.3983	−.1333	1.5216		1.6297	−.1454	1.7077		1.7528	−.1468
11	.875	.583	1.1930	−.0863	1.2597	−.1082	1.3450	−.1323	1.4674		1.5826	−.1456	1.6679		1.7197	−.1471
12	.875	.833	.5194	−.1434	.6714	−.1498	.8744	−.1492	1.1276		1.3196	−.1492	1.4261		1.5026	−.1482
13	.875	.917	.6979	−.1392	.8195	−.1472	.9539	−.1489	1.1155		1.2489	−.1494	1.3451		1.4134	−.1486
14	.792	0.000	.7070	−.1402	.9460	−.1471	1.1669	−.1483	1.3346		1.4813	−.1489	1.5957		1.6809	−.1485
15	.792	.333	.6701	−.1436	.8620	−.1493	1.1396	−.1492	1.3076		1.4599	−.1490	1.5770		1.6637	−.1482
16	.792	.583	.5532	−.1444	.7344	−.1503	1.0847	−.1486	1.2375		1.3949	−.1487	1.5165		1.6069	−.1482
17	.792	.750	.4924	−.1449	.7406	−.1481	.9963	−.1480	1.1599		1.2914	−.1491	1.4023		1.4871	−.1487
18	.792	.833	.5945	−.1420	.7351	−.1465	.9544	−.1473	1.1103		1.2445	−.1486	1.3522		1.4351	−.1483
19	.792	.917	.5669	−.1377	.6855	−.1453	.8737	−.1471	1.0228		1.1508	−.1485	1.2524		1.3306	−.1483
20	.667	0.000	.7359	−.1446	.8979	−.1444	1.0747	−.1462	1.2356		1.3809	−.1479	1.4973		1.5946	−.1473
21	.667	.333	.6906	−.1435	.8781	−.1442	1.0546	−.1465	1.2146		1.3614	−.1485	1.4796		1.5748	−.1481
22	.667	.583	.6598	−.1404	.8361	−.1434	1.0057	−.1464	1.1599		1.3048	−.1485	1.4222		1.5152	−.1483
23	.667	.750	.6032	−.1392	.7639	−.1448	.9230	−.1466	1.0672		1.1998	−.1488	1.3091		1.3969	−.1488
24	.667	.833	.5699	−.1385	.7316	−.1443	.8820	−.1463	1.0232		1.1519	−.1484	1.2592		1.3448	−.1484
25	.667	.917	.5132	−.1414	.6637	−.1455	.8106	−.1467	.9398		1.0603	−.1488	1.1617		1.2434	−.1488
26	.500	0.000	.6496	−.1378	.8333	−.1419	.9988	−.1458	1.1473		1.2871	−.1485	1.4000		1.4983	−.1483
27	.500	.333	.6496	−.1344	.8223	−.1385	.9833	−.1418	1.1310		1.2691	−.1442	1.3833		1.4792	−.1441
28	.500	.583														
29	.500	.750	.5581	−.1378	.7147	−.1435	.8550	−.1459	.9881		1.1139	−.1489	1.2194		1.3051	−.1491
30	.500	.833	.5302	−.1351	.6832	−.1404	.8192	−.1426	.9485		1.0713	−.1452	1.1731		1.2569	−.1456
31	.500	.917														
32	.333	0.000	.6201	−.1366	.7835	−.1415	.9360	−.1451	1.0783		1.2010	−.1480	1.2990		1.3883	−.1480
33	.333	.333	.6090	−.1373	.7734	−.1435	.9277	−.1460	1.0681		1.1916	−.1491	1.2900		1.3754	−.1496
34	.333	.583	.5812	−.1375	.7393	−.1438	.8841	−.1465	1.0193		1.1407	−.1497	1.2384		1.3207	−.1503
35	.333	.750	.5282	−.1376	.6745	−.1435	.8089	−.1459	.9342		1.0471	−.1491	1.1390		1.2164	−.1494
36	.333	.833	.5029	−.1386	.6438	−.1443	.7746	−.1466	.8963		1.0064	−.1486	1.0963		1.1705	−.1493
37	.333	.917	.4521	−.1383	.5860	−.1435	.7090	−.1457	.8226		.9268	−.1488	1.0117		1.0819	−.1490
38	.208	0.000	.5940	−.1365	.7543	−.1430	.8956	−.1458	1.0066		1.0917	−.1485	1.1594		1.2266	−.1494
39	.208	.333	.5825	−.1368	.7392	−.1432	.8785	−.1459	.9936		1.0785	−.1489	1.1465		1.2107	−.1499
40	.208	.583	.5580	−.1362	.7093	−.1408	.8456	−.1451	.9574		1.0460	−.1480	1.1141		1.1762	−.1487
41	.208	.750	.5084	−.1371	.6474	−.1416	.7751	−.1455	.8807		.9659	−.1488	1.0313		1.0904	−.1494
42	.208	.833	.4827	−.1374	.6168	−.1412	.7407	−.1452	.8454		.9295	−.1483	.9944		1.0543	−.1489
43	.208	.917	.4391	−.1366	.5643	−.1411	.6803	−.1449	.7796		.8599	−.1467	.9234		.9836	−.1469
44	.125	0.000	.1969	−.1355	.2722	−.1402	.3304	−.1443	.3763		.4187	−.1465	.4717		.6035	−.1480
45	.125	.333	.1887	−.1354	.2605	−.1398	.3188	−.1433	.3662		.4091	−.1470	.4659		.6090	−.1478
46	.125	.583	.1761	−.1368	.2459	−.1413	.3058	−.1449	.3559		.4111	−.1480	.5269		.6066	−.1483
47	.125	.833	.4402	−.1366	.5305	−.1412	.6100	−.1448	.6792		.7361	−.1477	.8017		.9142	−.1482
48	.125	917	.4177	−.1366	.5162	−.1408	.5990	−.1447	.6701		.7283	−.1476	.7924		.8926	−.1481
49	.083	0.000	.1849	−.1360	.2632	−.1404	.3330	−.1442	.3980		.4683	−.1465	.5649		.6650	−.1480
50	.083	.333	.1826	−.1368	.2585	−.1412	.3292	−.1450	.3963		.4675	−.1487	.5694		.6326	−.1493
51	.083	.583	.1796	−.1374	.2586	−.1419	.3371	−.1457	.4171		.5014	−.1491	.5698		.8523	−.1496
52	.083	.750	.2161	−.1376	.3067	−.1425	.3911	−.1459	.4729		.5612	−.1478	.6717		.8758	−.1484
53	.042	0.000	.1817	−.1361	.2630	−.1405	.3403	−.1444	.4182		.5066	−.1467	.6219		.9400	−.1483
54	.042	.333	.1771	−.1350	.2557	−.1396	.3340	−.1439	.4118		.5029	−.1480	.6231		.9703	−.1488
55	.042	.583	.1859	−.1374	.2742	−.1416	.3614	−.1453	.4430		.5324	−.1489	.6699		.9488	−.1494
56	.042	.750	.2121	−.1381	.3011	−.1429	.3892	−.1463	.4793		.5793	−.1494	.7090		.9203	−.1498
57	.792	−.583	.5422	−.1368	.7311	−.1418	1.0693	−.1411	1.2288		1.3888	−.1413	1.5109		1.5992	−.1409
58	.208	−.583	.5422	−.1368	.7311	−.1418	1.0693	−.1411	1.2288		1.3888	−.1413	1.5109		1.5992	−.1409

TABLE VI.–Continued
(d) M = 3.50

			α =													
			−5.3		−.3		4.7		9.7		14.8		19.7		24.7	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	.1567	.4214	.2598	.2846	.3935	.1706	.5668	.0878	.7749	.0281	1.0424	−.0094	1.4113	−.0171
2	.958	.333	.1569	.4303	.2629	.2906	.3995	.1751	.5748	.0893	.7845	.0269	1.0507	−.0129	1.4062	−.0203
3	.958	.583	.1559	.4305	.2624	.2905	.3985	.1746	.5740	.0894	.7823	.0266	1.0503	−.0132	1.3716	−.0242
4	.958	.750	.1547	.4290	.2612	.2898	.3972	.1736	.5712	.0889	.7800	.0259	1.0431	−.0145	1.3077	−.0297
5	.917	0.000	.1507	.4239	.2582	.2858	.3946	.1689	.5685	.0810	.7779	.0176	1.0422	−.0226	1.3001	−.0358
6	.917	.333	.1504	.4246	.2583	.2850	.3952	.1687	.5689	.0809	.7778	.0171	1.0407	−.0229	1.2882	−.0372
7	.917	.583	.1501	.4244	.2578	.2843	.3941	.1684	.5678	.0813	.7753	.0172	1.0360	−.0227	1.2436	−.0400
8	.917	.750	.1485	.4221	.2559	.2832	.3910	.1674	.5623	.0804	.7656	.0162	.9926	−.0241	1.1345	−.0442
9	.875	0.000	.1481	.4197	.2551	.2816	.3909	.1657	.5625	.0775	.7700	.0134	1.0256	−.0272	1.1747	−.0446
10	.875	.333	.1479	.4208	.2553	.2815	.3914	.1661	.5638	.0777	.7698	.0133	1.0240	−.0270	1.1653	−.0453
11	.875	.583	.1474	.4215	.2553	.2816	.3911	.1663	.5631	.0782	.7677	.0134	1.0089	−.0271	1.1205	−.0475
12	.875	.833	−.0306	.0626	.0011	.0128	.0521	−.0249	.1213	−.0491	.2004	−.0702	.2932	−.0841	.4383	−.0891
13	.875	.917	−.0243	.0546	0.0000	.0065	.0439	−.0192	.1161	−.0426	.2095	−.0650	.3315	−.0810	.4981	−.0875
14	.792	0.000	−.0189	.0979	.0232	.0335	.0852	−.0119	.1749	−.0432	.2936	−.0675	.4457	−.0810	.5480	−.0881
15	.792	.333	−.0249	.0874	.0150	.0251	.0753	−.0187	.1629	−.0481	.2795	−.0715	.4279	−.0838	.5184	−.0902
16	.792	.583	−.0260	.0846	.0121	.0237	.0726	−.0197	.1583	−.0466	.2696	−.0700	.3783	−.0850	.4418	−.0898
17	.792	.750	−.0400	.0493	−.0102	.0003	.0394	−.0347	.1064	−.0575	.1825	−.0759	.2763	−.0885	.3910	−.0917
18	.792	.833	−.0320	.0532	−.0060	.0026	.0426	−.0270	.1138	−.0499	.2061	−.0709	.3282	−.0850	.4580	−.0895
19	.792	.917	−.0247	.0501	.0033	.0081	.0404	−.0189	.1068	−.0445	.1943	−.0666	.3087	−.0813	.4432	−.0875
20	.667	0.000	−.0358	.0791	.0046	.0148	.0670	−.0299	.1556	−.0591	.2745	−.0792	.4221	−.0867	.5406	−.0903
21	.667	.333	−.0366	.0778	.0030	.0138	.0659	−.0306	.1540	−.0591	.2706	−.0792	.4007	−.0869	.5022	−.0902
22	.667	.583	−.0413	.0592	−.0062	.0037	.0486	−.0357	.1205	−.0619	.2030	−.0802	.2946	−.0866	.4227	−.0894
23	.667	.750	−.0369	.0441	−.0115	−.0040	.0342	−.0315	.1020	−.0554	.1896	−.0750	.2979	−.0865	.4097	−.0886
24	.667	.833	−.0325	.0455	−.0044	.0007	.0362	−.0271	.1026	−.0525	.1859	−.0735	.2868	−.0864	.3945	−.0885
25	.667	.917	−.0265	.0428	.0027	.0069	.0348	−.0221	.0935	−.0397	.1711	−.0653	.2646	−.0847	.3606	−.0898
26	.500	0.000	−.0382	.0783	.0019	.0128	.0651	−.0322	.1538	−.0612	.2711	−.0807	.3958	−.0833	.4780	−.0872
27	.500	.333	−.0370	.0760	.0013	.0125	.0633	−.0312	.1476	−.0586	.2485	−.0763	.3342	−.0782	.4448	−.0820
28	.500	.583														
29	.500	.750	−.0358	.0435	−.0067	−.0008	.0342	−.0304	.0982	−.0556	.1799	−.0760	.2738	−.0849	.3850	−.0877
30	.500	.833	−.0331	.0410	−.0041	.0031	.0325	−.0276	.0915	−.0480	.1694	−.0634	.2607	−.0771	.3674	−.0822
31	.500	.917														
32	.333	0.000	−.0387	.0795	.0021	.0129	.0656	−.0324	.1531	−.0622	.2596	−.0772	.3369	−.0812	.4164	−.0861
33	.333	.333	−.0380	.0687	−.0027	.0101	.0559	−.0318	.1303	−.0577	.2140	−.0754	.3163	−.0840	.4256	−.0870
34	.333	.583	−.0375	.0489	−.0085	−.0003	.0381	−.0319	.1070	−.0575	.1925	−.0765	.2915	−.0848	.4044	−.0878
35	.333	.750	−.0385	.0416	−.0055	.0008	.0330	−.0324	.0912	−.0590	.1683	−.0700	.2589	−.0831	.3660	−.0869
36	.333	.833	−.0212	.0382	−.0024	.0026	.0305	−.0196	.0846	−.0440	.1571	−.0711	.2397	−.0870	.3481	−.0881
37	.333	.917	−.0245	.0305	.0006	.0045	.0246	−.0175	.0707	−.0529	.1386	−.0778	.2166	−.0893	.3173	−.0877
38	.208	0.000	−.0398	.0734	−.0025	.0103	.0600	−.0334	.1436	−.0605	.2322	−.0734	.2881	−.0830	.3999	−.0867
39	.208	.333	−.0405	.0588	−.0073	.0041	.0476	−.0347	.1171	−.0605	.2025	−.0736	.3011	−.0830	.4007	−.0866
40	.208	.583	−.0389	.0458	−.0113	−.0012	.0359	−.0334	.1026	−.0569	.1839	−.0728	.2828	−.0802	.3883	−.0853
41	.208	.750	−.0376	.0383	−.0092	−.0001	.0300	−.0345	.0876	−.0420	.1622	−.0647	.2526	−.0792	.3557	−.0859
42	.208	.833	−.0209	.0348	−.0042	.0029	.0276	−.0153	.0787	−.0429	.1477	−.0703	.2387	−.0832	.3382	−.0865
43	.208	.917	−.0253	.0280	.0004	.0048	.0225	−.0177	.0674	−.0550	.1311	−.0780	.2121	−.0855	.3050	−.0869
44	.125	0.000	−.0640	−.0398	−.0640	−.0585	−.0459	−.0652	−.0141	−.0695	.0180	−.0737	.0543	−.0805	.1300	−.0855
45	.125	.333	−.0666	−.0514	−.0700	−.0666	−.0560	−.0701	−.0293	−.0711	.0100	−.0737	.0590	−.0803	.1222	−.0853
46	.125	.583	−.0686	−.0552	−.0680	−.0678	−.0581	−.0729	−.0344	−.0749	.0019	−.0757	.0536	−.0815	.1166	−.0862
47	.125	.833	−.0216	.0257	−.0077	−.0015	.0189	−.0156	.0681	−.0452	.1384	−.0730	.2216	−.0826	.3157	−.0859
48	.125	.917	−.0270	.0238	−.0008	.0036	.0184	−.0181	.0615	−.0565	.1222	−.0774	.2093	−.0835	.2942	−.0860
49	.083	0.000	−.0637	−.0554	−.0702	−.0713	−.0586	−.0678	−.0303	−.0704	.0008	−.0739	.0416	−.0806	.1164	−.0855
50	.083	.333	−.0642	−.0628	−.0691	−.0748	−.0639	−.0696	−.0397	−.0723	.0002	−.0761	.0491	−.0823	.1134	−.0870
51	.083	.583	−.0646	−.0621	−.0650	−.0681	−.0630	−.0701	−.0424	−.0733	−.0043	−.0769	.0491	−.0825	.1125	−.0871
52	.083	.750	−.0651	−.0572	−.0622	−.0645	−.0579	−.0725	−.0373	−.0746	.0025	−.0771	.0612	−.0825	.1353	−.0871
53	.042	0.000	−.0627	−.0590	−.0647	−.0701	−.0606	−.0671	−.0350	−.0709	−.0055	−.0752	.0385	−.0812	.1116	−.0859
54	.042	.333	−.0621	−.0649	−.0633	−.0692	−.0643	−.0679	−.0424	−.0718	−.0032	−.0760	.0436	−.0820	.1073	−.0864
55	.042	.583	−.0638	−.0624	−.0622	−.0642	−.0623	−.0676	−.0434	−.0717	−.0049	−.0769	.0484	−.0825	.1123	−.0869
56	.042	.750	−.0657	−.0589	−.0589	−.0580	−.0584	−.0697	−.0405	−.0735	0.0000	−.0777	.0609	−.0831	.1327	−.0875
57	.792	−.583	−.0163	.0819	.0153	.0244	.0742	−.0166	.1595	−.0406	.2691	−.0611	.3765	−.0743	.4369	−.0795
58	.208	−.583	−.0163	.0819	.0153	.0244	.0742	−.0166	.1595	−.0406	.2691	−.0611	.3765	−.0743	.4369	−.0795

TABLE VI.–Continued
(d) Concluded

			α =													
			29.8		35.1		39.8		45.1		49.7		55.1		59.7	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	1.5635	−.0303	1.6501		1.7000	−.0635	1.7933		1.8344	−.0774	1.8368		1.8164	−.0791
2	.958	.333	1.5599	−.0347	1.6503		1.7039	−.0751	1.7952		1.8400	−.0888	1.8409		1.8218	−.0899
3	.958	.583	1.5263	−.0353	1.6221		1.6795	−.0747	1.7779		1.8274	−.0892	1.8312		1.8219	−.0906
4	.958	.750	1.4596	−.0377	1.5617		1.6280	−.0764	1.7345		1.7922	−.0912	1.8096		1.8021	−.0925
5	.917	0.000	1.4168	−.0407	1.5005		1.5656	−.0736	1.6893		1.7793	−.0884	1.8272		1.8460	−.0906
6	.917	.333	1.4054	−.0419	1.4919		1.5597	−.0739	1.6804		1.7722	−.0888	1.8197		1.8395	−.0909
7	.917	.583	1.3613	−.0444	1.4517		1.5206	−.0729	1.6431		1.7393	−.0863	1.7919		1.8225	−.0885
8	.917	.750	1.2428	−.0497	1.3340		1.4072	−.0751	1.5323		1.6401	−.0893	1.7129		1.7565	−.0912
9	.875	0.000	1.2506	−.0487	1.3177		1.3876	−.0744	1.5388		1.6722	−.0893	1.7629		1.8171	−.0910
10	.875	.333	1.2416	−.0501	1.3110		1.3787	−.0747	1.5239		1.6604	−.0888	1.7511		1.8080	−.0907
11	.875	.583	1.1989	−.0536	1.2705		1.3342	−.0752	1.4694		1.6089	−.0893	1.7065		1.7748	−.0907
12	.875	.833	.5556	−.0921	.6605		.8154	−.0933	1.0578		1.3047	−.0942	1.4482		1.5421	−.0930
13	.875	.917	.6536	−.0913	.7999		.9159	−.0935	1.0904		1.2577	−.0945	1.3744		1.4573	−.0937
14	.792	0.000	.6792	−.0909	.8435		1.0930	−.0930	1.3055		1.4857	−.0948	1.6224		1.7186	−.0941
15	.792	.333	.6420	−.0928	.8104		1.0535	−.0938	1.2759		1.4619	−.0946	1.6006		1.7017	−.0935
16	.792	.583	.5407	−.0924	.6984		.9363	−.0928	1.1998		1.3925	−.0934	1.5355		1.6452	−.0926
17	.792	.750	.4798	−.0936	.6415		.8779	−.0934	1.1482		1.2992	−.0946	1.4249		1.5233	−.0939
18	.792	.833	.5768	−.0919	.6894		.8766	−.0921	1.0926		1.2545	−.0938	1.3764		1.4719	−.0931
19	.792	.917	.5538	−.0912	.6614		.8142	−.0922	1.0073		1.1628	−.0937	1.2789		1.3688	−.0932
20	.667	0.000	.6909	−.0918	.8516		1.0162	−.0913	1.2105		1.3816	−.0934	1.5209		1.6263	−.0924
21	.667	.333	.6433	−.0915	.8133		.9937	−.0915	1.1899		1.3623	−.0938	1.5016		1.6071	−.0927
22	.667	.583	.5854	−.0910	.7730		.9482	−.0911	1.1390		1.3068	−.0938	1.4419		1.5486	−.0928
23	.667	.750	.5539	−.0907	.7106		.8766	−.0918	1.0539		1.2086	−.0938	1.3321		1.4310	−.0935
24	.667	.833	.5273	−.0903	.6798		.8433	−.0916	1.0124		1.1627	−.0935	1.2827		1.3797	−.0932
25	.667	.917	.4798	−.0910	.6218		.7742	−.0917	.9355		1.0750	−.0938	1.1875		1.2795	−.0935
26	.500	0.000	.6095	−.0894	.7878		.9507	−.0905	1.1275		1.2885	−.0937	1.4255		1.5304	−.0926
27	.500	.333	.6013	−.0840	.7784		.9384	−.0848	1.1129		1.2728	−.0875	1.4075		1.5124	−.0866
28	.500	.583														
29	.500	.750	.5209	−.0898	.6805		.8250	−.0916	.9810		1.1238	−.0940	1.2444		1.3399	−.0938
30	.500	.833	.4975	−.0847	.6515		.7919	−.0860	.9429		1.0825	−.0881	1.2001		1.2924	−.0880
31	.500	.917														
32	.333	0.000	.5754	−.0884	.7528		.9017	−.0896	1.0672		1.2139	−.0926	1.3323		1.4269	−.0919
33	.333	.333	.5733	−.0895	.7453		.8930	−.0910	1.0605		1.2047	−.0936	1.3240		1.4159	−.0935
34	.333	.583	.5514	−.0900	.7149		.8559	−.0921	1.0150		1.1539	−.0945	1.2712		1.3612	−.0945
35	.333	.750	.5053	−.0891	.6534		.7875	−.0908	.9328		1.0639	−.0935	1.1718		1.2573	−.0932
36	.333	.833	.4823	−.0900	.6256		.7552	−.0918	.8964		1.0239	−.0939	1.1290		1.2127	−.0940
37	.333	.917	.4378	−.0891	.5693		.6939	−.0907	.8266		.9456	−.0930	1.0445		1.1237	−.0927
38	.208	0.000	.5564	−.0893	.7284		.8717	−.0913	1.0155		1.1257	−.0937	1.2086		1.2742	−.0939
39	.208	.333	.5499	−.0890	.7170		.8581	−.0911	1.0040		1.1131	−.0935	1.1953		1.2585	−.0936
40	.208	.583	.5317	−.0879	.6911		.8263	−.0897	.9688		1.0772	−.0923	1.1603		1.2247	−.0921
41	.208	.750	.4886	−.0887	.6352		.7605	−.0904	.8947		.9978	−.0932	1.0766		1.1383	−.0932
42	.208	.833	.4650	−.0884	.6063		.7279	−.0902	.8601		.9610	−.0926	1.0394		1.1009	−.0926
43	.208	.917	.4242	−.0889	.5587		.6718	−.0901	.7958		.8923	−.0921	.9679		1.0282	−.0921
44	.125	0.000	.2128	−.0881	.2956		.3589	−.0900	.4229		.4711	−.0923	.5214		.6348	−.0924
45	.125	.333	.2033	−.0877	.2844		.3476	−.0893	.4123		.4612	−.0925	.5132		.6299	−.0920
46	.125	.583	.1926	−.0887	.2709		.3349	−.0904	.4015		.4543	−.0932	.5386		.6518	−.0927
47	.125	.833	.4305	−.0881	.5466		.6239	−.0902	.7201		.7817	−.0924	.8430		.9267	−.0926
48	.125	.917	.4072	−.0882	.5291		.6103	−.0898	.7080		.7718	−.0923	.8332		.9114	−.0923
49	.083	0.000	.1985	−.0882	.2832		.3552	−.0900	.4346		.5044	−.0923	.5899		.7024	−.0926
50	.083	.333	.1950	−.0896	.2789		.3512	−.0910	.4318		.5021	−.0937	.5904		.7076	−.0938
51	.083	.583	.1913	−.0895	.2762		.3553	−.0911	.4456		.5259	−.0937	.6225		.6830	−.0938
52	.083	.750	.2214	−.0896	.3191		.4044	−.0911	.4985		.5807	−.0932	.6863		.8291	−.0934
53	.042	0.000	.1933	−.0885	.2805		.3575	−.0902	.4452		.5287	−.0926	.6338		.7696	−.0926
54	.042	.333	.1886	−.0889	.2737		.3502	−.0901	.4383		.5217	−.0932	.6315		.7768	−.0935
55	.042	.583	.1939	−.0890	.2862		.3709	−.0904	.4641		.5529	−.0934	.6546		.9197	−.0933
56	.042	.750	.2178	−.0899	.3126		.3965	−.0915	.4949		.5881	−.0941	.7048		.8815	−.0941
57	.792	−.583	.5339	−.0817	.6891		.9304	−.0821	1.1861		1.3785	−.0826	1.5245		1.6291	−.0822
58	.208	−.583	.5339	−.0817	.6891		.9304	−.0821	1.1861		1.3785	−.0826	1.5245		1.6291	−.0822

TABLE VI.—Continued
(e) M = 4.60

			α =													
			−4.6		.4		5.4		10.4		15.4		20.4		25.7	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	.1522	.3754	.2457	.2460	.3803	.1511	.5415	.0845	.7330	.0451	.9610	.0188	1.3416	
2	.958	.333	.1467	.3828	.2442	.2486	.3807	.1491	.5454	.0796	.7381	.0364	.9735	.0067	1.3490	
3	.958	.583	.1464	.3835	.2444	.2484	.3814	.1481	.5479	.0789	.7396	.0357	.9757	.0058	1.3264	
4	.958	.750	.1461	.3830	.2440	.2470	.3812	.1462	.5474	.0771	.7386	.0329	.9734	.0028	1.2822	
5	.917	0.000	.1385	.3758	.2388	.2418	.3771	.1395	.5416	.0682	.7350	.0254	.9638	−.0041	1.2890	
6	.917	.333	.1379	.3760	.2379	.2418	.3755	.1393	.5400	.0680	.7320	.0244	.9642	−.0055	1.2842	
7	.917	.583	.1386	.3764	.2383	.2415	.3758	.1391	.5420	.0681	.7324	.0248	.9650	−.0043	1.2503	
8	.917	.750	.1371	.3753	.2367	.2396	.3735	.1370	.5387	.0658	.7260	.0218	.9499	−.0076	1.1578	
9	.875	0.000	.1346	.3706	.2346	.2378	.3720	.1353	.5360	.0635	.7265	.0191	.9524	−.0099	1.2102	
10	.875	.333	.1346	.3720	.2346	.2383	.3712	.1352	.5351	.0632	.7248	.0185	.9529	−.0104	1.2078	
11	.875	.583	.1344	.3722	.2346	.2381	.3716	.1353	.5373	.0632	.7258	.0184	.9526	−.0104	1.1653	
12	.875	.833	−.0009	.0622	.0173	.0315	.0596	.0022	.1284	−.0191	.2109	−.0307	.3046	−.0370	.4377	
13	.875	.917	−.0034	.0517	.0106	.0202	.0498	−.0029	.1169	−.0207	.2020	−.0312	.3127	−.0381	.4707	
14	.792	0.000	.0074	.0869	.0346	.0418	.0880	.0083	.1689	−.0164	.2774	−.0303	.4195	−.0379	.5669	
15	.792	.333	.0009	.0764	.0250	.0347	.0765	.0026	.1558	−.0199	.2622	−.0325	.4030	−.0387	.5407	
16	.792	.583	.0015	.0720	.0223	.0356	.0712	.0049	.1505	−.0181	.2551	−.0305	.3866	−.0370	.4760	
17	.792	.750	−.0114	.0478	.0052	.0166	.0449	−.0093	.1132	−.0263	.1938	−.0351	.2840	−.0403	.4020	
18	.792	.833	−.0094	.0499	.0062	.0162	.0475	−.0078	.1162	−.0239	.2007	−.0332	.3103	−.0386	.4536	
19	.792	.917	−.0051	.0420	.0078	.0153	.0395	−.0049	.1029	−.0218	.1841	−.0319	.2917	−.0379	.4349	
20	.667	0.000	−.0115	.0642	.0122	.0195	.0646	−.0110	.1464	−.0283	.2536	−.0371	.3955	−.0407	.5381	
21	.667	.333	−.0128	.0623	.0094	.0196	.0619	−.0103	.1444	−.0278	.2519	−.0370	.3906	−.0405	.5077	
22	.667	.583	−.0154	.0535	.0047	.0137	.0524	−.0133	.1259	−.0293	.2124	−.0374	.3046	−.0404	.4214	
23	.667	.750	−.0141	.0410	−.0004	.0089	.0384	−.0137	.1050	−.0285	.1854	−.0361	.2865	−.0407	.4079	
24	.667	.833	−.0105	.0390	.0025	.0091	.0370	−.0113	.1008	−.0269	.1799	−.0355	.2778	−.0403	.3945	
25	.667	.917	−.0083	.0350	.0056	.0108	.0333	−.0089	.0913	−.0241	.1668	−.0338	.2614	−.0397	.3693	
26	.500	0.000	−.0154	.0602	.0066	.0166	.0593	−.0127	.1434	−.0287	.2515	−.0366	.3864	−.0391	.4867	
27	.500	.333	−.0086	.0603	.0103	.0198	.0587	−.0084	.1415	−.0233	.2450	−.0295	.3522	−.0309	.4426	
28	.500	.583														
29	.500	.750	−.0129	.0372	0.0000	.0080	.0349	−.0131	.0970	−.0284	.1735	−.0367	.2679	−.0408	.3760	
30	.500	.833	−.0062	.0336	.0037	.0120	.0303	−.0063	.0881	−.0207	.1638	−.0275	.2570	−.0310	.3641	
31	.500	.917														
32	.333	0.000	−.0158	.0609	.0069	.0159	.0592	−.0139	.1438	−.0298	.2470	−.0353	.3635	−.0375	.4295	
33	.333	.333	−.0142	.0546	.0038	.0196	.0517	−.0103	.1318	−.0287	.2181	−.0354	.3146	−.0392	.4258	
34	.333	.583	−.0159	.0409	−.0015	.0099	.0381	−.0143	.1055	−.0308	.1850	−.0376	.2834	−.0412	.3995	
35	.333	.750	−.0153	.0349	.0002	.0060	.0331	−.0152	.0912	−.0303	.1645	−.0361	.2566	−.0393	.3652	
36	.333	.833	−.0135	.0324	.0028	.0060	.0312	−.0162	.0855	−.0289	.1562	−.0371	.2431	−.0412	.3496	
37	.333	.917	−.0068	.0275	.0043	.0072	.0260	−.0088	.0745	−.0272	.1406	−.0355	.2229	−.0392	.3185	
38	.208	0.000	−.0167	.0531	.0007	.0168	.0494	−.0136	.1333	−.0304	.2307	−.0364	.3272	−.0401	.4037	
39	.208	.333	−.0161	.0492	.0003	.0146	.0463	−.0138	.1201	−.0298	.2010	−.0354	.3024	−.0395	.4072	
40	.208	.583	−.0116	.0361	−.0014	.0105	.0336	−.0122	.0974	−.0275	.1752	−.0337	.2777	−.0371	.3928	
41	.208	.750	−.0122	.0304	−.0020	.0083	.0273	−.0132	.0839	−.0291	.1573	−.0350	.2526	−.0387	.3618	
42	.208	.833	−.0079	.0276	.0004	.0089	.0251	−.0090	.0771	−.0246	.1450	−.0337	.2394	−.0378	.3460	
43	.208	.917	−.0059	.0245	.0034	.0092	.0230	−.0085	.0682	−.0269	.1327	−.0355	.2162	−.0385	.3187	
44	.125	0.000	−.0244	−.0194	−.0237	−.0266	−.0142	−.0323	.0085	−.0342	.0455	−.0372	.0889	−.0402	.1526	
45	.125	.333	−.0260	−.0247	−.0260	−.0303	−.0188	−.0340	−.0008	−.0343	.0287	−.0370	.0820	−.0394	.1474	
46	.125	.583	−.0259	−.0286	−.0260	−.0331	−.0206	−.0363	−.0062	−.0367	.0205	−.0389	.0725	−.0412	.1434	
47	.125	.833	−.0067	.0204	−.0021	.0035	.0187	−.0099	.0662	−.0262	.1343	−.0350	.2251	−.0385	.3260	
48	.125	.917	−.0079	.0205	.0002	.0066	.0184	−.0098	.0623	−.0274	.1255	−.0352	.2085	−.0380	.3067	
49	.083	0.000	−.0239	−.0302	−.0263	−.0353	−.0214	−.0352	−.0051	−.0355	.0265	−.0384	.0705	−.0407	.1371	
50	.083	.333	−.0245	−.0330	−.0269	−.0374	−.0234	−.0370	−.0109	−.0380	.0156	−.0401	.0705	−.0427	.1368	
51	.083	.583	−.0243	−.0322	−.0248	−.0342	−.0240	−.0361	−.0135	−.0377	.0100	−.0400	.0656	−.0424	.1379	
52	.083	.750	−.0224	−.0287	−.0212	−.0313	−.0201	−.0356	−.0087	−.0368	.0170	−.0388	.0754	−.0413	.1576	
53	.042	0.000	−.0225	−.0309	−.0239	−.0338	−.0221	−.0344	−.0077	−.0356	.0226	−.0383	.0652	−.0410	.1321	
54	.042	.333	−.0218	−.0329	−.0227	−.0348	−.0225	−.0348	−.0113	−.0367	.0148	−.0389	.0666	−.0414	.1305	
55	.042	.583	−.0232	−.0323	−.0229	−.0324	−.0240	−.0344	−.0148	−.0362	.0092	−.0390	.0656	−.0416	.1365	
56	.042	.750	−.0242	−.0306	−.0212	−.0296	−.0234	−.0344	−.0127	−.0368	.0132	−.0392	.0740	−.0419	.1540	
57	.792	−.583	.0194	.0692	.0355	.0429	.0768	.0163	.1525	−.0047	.2565	−.0152	.3884	−.0212	.4712	
58	.208	−.583	.0194	.0692	.0355	.0429	.0768	.0163	.1525	−.0047	.2565	−.0152	.3884	−.0212	.4712	

TABLE VI.—Concluded
(e) Concluded

			α =													
			30.4		35.7		40.4		45.7		50.4		55.7		60.4	
Tube	x'/l	$y/b/2$	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.958	0.000	1.5538	.0073	1.6582		1.7251	−.0145	1.7767		1.8103	−.0212	1.8203		1.8102	−.0227
2	.958	.333	1.5577	−.0042	1.6618		1.7323	−.0292	1.7839		1.8217	−.0370	1.8394		1.8310	−.0387
3	.958	.583	1.5217	−.0057	1.6358		1.7125	−.0299	1.7693		1.8129	−.0381	1.8357		1.8309	−.0400
4	.958	.750	1.4563	−.0105	1.5761		1.6634	−.0323	1.7289		1.7836	−.0409	1.8145		1.8158	−.0426
5	.917	0.000	1.4255	−.0139	1.5192		1.5962	−.0307	1.6798		1.7572	−.0382	1.8152		1.8435	−.0403
6	.917	.333	1.4182	−.0157	1.5101		1.5884	−.0313	1.6710		1.7501	−.0387	1.8152		1.8471	−.0407
7	.917	.583	1.3750	−.0156	1.4728		1.5551	−.0292	1.6373		1.7211	−.0362	1.7922		1.8308	−.0253
8	.917	.750	1.2625	−.0212	1.3588		1.4446	−.0328	1.5306		1.6270	−.0396	1.7134		1.7681	−.0405
9	.875	0.000	1.2751	−.0211	1.3441		1.4154	−.0320	1.5276		1.6467	−.0387	1.7506		1.8164	−.0406
10	.875	.333	1.2712	−.0216	1.3377		1.4071	−.0319	1.5151		1.6354	−.0383	1.7455		1.8153	−.0405
11	.875	.583	1.2299	−.0232	1.3006		1.3714	−.0322	1.4666		1.5883	−.0387	1.7052		1.7828	−.0407
12	.875	.833	.5822	−.0404	.7094		.8694	−.0423	1.0721		1.2802	−.0424	1.4419		1.5526	−.0418
13	.875	.917	.6369	−.0418	.7887		.9315	−.0437	1.0806		1.2420	−.0443	1.3775		1.4741	−.0436
14	.792	0.000	.6883	−.0418	.8606		1.0904	−.0441	1.2929		1.4636	−.0444	1.6122		1.7208	−.0449
15	.792	.333	.6549	−.0420	.8199		1.0455	−.0436	1.2611		1.4394	−.0434	1.5950		1.7094	−.0441
16	.792	.583	.5668	−.0404	.7025		.9286	−.0416	1.1767		1.3732	−.0419	1.5361		1.6565	−.0415
17	.792	.750	.5131	−.0429	.6341		.8530	−.0430	1.1291		1.2931	−.0436	1.4269		1.5373	−.0431
18	.792	.833	.5749	−.0412	.6964		.8675	−.0418	1.0843		1.2460	−.0429	1.3813		1.4880	−.0423
19	.792	.917	.5603	−.0415	.6749		.8202	−.0421	1.0065		1.1592	−.0430	1.2877		1.3879	−.0425
20	.667	0.000	.6773	−.0417	.8409		1.0218	−.0416	1.2109		1.3736	−.0425	1.5169		1.6325	−.0432
21	.667	.333	.6358	−.0417	.7982		.9939	−.0418	1.1888		1.3534	−.0429	1.5000		1.6180	−.0436
22	.667	.583	.5663	−.0415	.7482		.9498	−.0413	1.1405		1.3027	−.0424	1.4453		1.5627	−.0434
23	.667	.750	.5446	−.0420	.7002		.8884	−.0424	1.0619		1.2099	−.0433	1.3405		1.4491	−.0431
24	.667	.833	.5217	−.0415	.6750		.8605	−.0419	1.0252		1.1665	−.0431	1.2939		1.4002	−.0425
25	.667	.917	.4813	−.0414	.6237		.7952	−.0420	.9524		1.0830	−.0433	1.2014		1.3023	−.0431
26	.500	0.000	.6069	−.0403	.7761		.9610	−.0409	1.1390		1.2959	−.0423	1.4305		1.5423	−.0432
27	.500	.333	.5862	−.0319	.7682		.9514	−.0319	1.1266		1.2820	−.0325	1.4165		1.5295	−.0334
28	.500	.583														
29	.500	.750	.5142	−.0423	.6897		.8506	−.0430	1.0023		1.1381	−.0440	1.2587		1.3623	−.0436
30	.500	.833	.4953	−.0323	.6637		.8190	−.0327	.9660		1.0988	−.0336	1.2157		1.3169	−.0337
31	.500	.917														
32	.333	0.000	.5680	−.0393	.7442		.9188	−.0397	1.0828		1.2303	−.0407	1.3475		1.4438	−.0416
33	.333	.333	.5709	−.0412	.7419		.9160	−.0419	1.0776		1.2226	−.0431	1.3412		1.4395	−.0433
34	.333	.583	.5516	−.0430	.7143		.8834	−.0436	1.0369		1.1757	−.0449	1.2906		1.3861	−.0446
35	.333	.750	.5111	−.0407	.6609		.8178	−.0413	.9584		1.0859	−.0425	1.1925		1.2820	−.0422
36	.333	.833	.4900	−.0426	.6348		.7874	−.0431	.9239		1.0471	−.0442	1.1509		1.2382	−.0439
37	.333	.917	.4474	−.0402	.5821		.7280	−.0407	.8547		.9698	−.0418	1.0678		1.1505	−.0416
38	.208	0.000	.5508	−.0418	.7232		.8888	−.0427	1.0321		1.1460	−.0437	1.2290		1.2963	−.0439
39	.208	.333	.5491	−.0414	.7152		.8797	−.0420	1.0224		1.1354	−.0434	1.2188		1.2865	−.0432
40	.208	.583	.5353	−.0392	.6927		.8521	−.0398	.9906		1.1036	−.0411	1.1865		1.2540	−.0409
41	.208	.750	.4941	−.0407	.6435		.7929	−.0415	.9215		1.0280	−.0430	1.1057		1.1688	−.0429
42	.208	.833	.4734	−.0398	.6175		.7629	−.0404	.8884		.9927	−.0421	1.0696		1.1323	−.0415
43	.208	.917	.4348	−.0401	.5723		.7084	−.0405	.8256		.9253	−.0420	.9986		1.0603	−.0406
44	.125	0.000	.2369	−.0417	.3270		.4056	−.0419	.4712		.5253	−.0433	.5759		.6598	−.0425
45	.125	.333	.2288	−.0411	.3162		.3936	−.0408	.4604		.5151	−.0423	.5659		.6532	−.0415
46	.125	.583	.2198	−.0425	.3051		.3819	−.0421	.4511		.5110	−.0437	.5769		.7036	−.0429
47	.125	.833	.4415	−.0404	.5667		.6751	−.0406	.7619		.8271	−.0421	.8834		.9577	−.0416
48	.125	.917	.4198	−.0398	.5461		.6580	−.0401	.7488		.8163	−.0414	.8717		.9413	−.0410
49	.083	0.000	.2213	−.0421	.3115		.3966	−.0420	.4771		.5543	−.0434	.6352		.7486	−.0427
50	.083	.333	.2189	−.0437	.3075		.3928	−.0436	.4741		.5519	−.0448	.6335		.7531	−.0444
51	.083	.583	.2167	−.0436	.3082		.3971	−.0437	.4851		.5720	−.0447	.6643		.7538	−.0443
52	.083	.750	.2444	−.0423	.3436		.4408	−.0423	.5333		.6233	−.0440	.7182		.8415	−.0425
53	.042	0.000	.2157	−.0421	.3058		.3942	−.0422	.4811		.5711	−.0435	.6702		.8022	−.0424
54	.042	.333	.2116	−.0424	.3001		.3872	−.0423	.4730		.5638	−.0438	.6647		.8024	−.0432
55	.042	.583	.2166	−.0426	.3101		.4026	−.0428	.4949		.5919	−.0441	.6941		.8362	−.0435
56	.042	.750	.2390	−.0433	.3356		.4283	−.0435	.5226		.6222	−.0445	.7317		.8728	−.0440
57	.792	−.583	.5585	−.0246	.6924		.9170	−.0263	1.1583		1.3542	−.0261	1.5162		1.6363	−.0262
58	.208	−.583	.5585	−.0246	.6924		.9170	−.0263	1.1583		1.3542	−.0261	1.5162		1.6363	−.0262

TABLE VII.–PRESSURE COEFFICIENTS FOR MODEL 7
(a) M = 1.60

			α =													
			−4.8		.3		5.2		10.2		15.3		20.3		25.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.0519	.1887	.1232	.1066	.2074	.0350	.3161	−.0241	.4507	−.0714	.5970	−.1179	.7607	−.1593
2	.868	0.000	.0514	.1905	.1232	.1082	.2075	.0371	.3166	−.0245	.4475	−.0777	.6006	−.1199	.7667	−.1611
3	.881	.053	.0532	.2016	.1298	.1148	.2177	.0403	.3249	−.0098	.4535	−.2475	.5990	−.4421	.7557	−.4721
4	.802	0.000	.0511	.1929	.1203	.1070	.2083	.0363	.3165	−.0260	.4450	−.0760	.5969	−.1323	.7609	−.1677
5	.764	.039	.0487	.1911	.1169	.1035	.2050	.0320	.3148	−.0301	.4411	−.0781	.5850	−.1263	.7287	−.1819
6	.777	.091	.0526	.2026	.1265	.1121	.2167	.0353	.3260	−.0367	.4497	−.1419	.5906	−.3620	.7389	−.4706
7	.790	.144	.0801	.2231	.1412	.1244	.2377	.0648	.3452	−.2675	.4630	−.3819	.5961	−.4084	.7377	−.4785
8	.707	0.000	−.0461	.0882	.0205	.0067	.0991	−.0652	.2003	−.1251	.3169	−.1710	.4489	−.2125	.5988	−.2529
9	.648	0.000	−.0424	.0836	.0196	.0043	.0944	−.0611	.1954	−.1128	.3139	−.1590	.4489	−.2013	.6020	−.2562
10	.648	.068	−.0861	.0484	−.0189	−.0383	.0645	−.1125	.1721	−.1608	.2972	−.1961	.4379	−.2197	.5958	−.2798
11	.658	.144	.0227	.1464	.0828	.0694	.1574	.0065	.2536	−.0504	.3681	−.0995	.5010	−.4270	.6468	−.4921
12	.671	.197	.0544	.1993	.1272	.1117	.2112	.0354	.3073	−.1094	.4152	−.3784	.5395	−.4467	.6720	−.4848
13	.684	.250	.0577	.2354	.1524	.1326	.2487	−.0309	.3499	−.2922	.4523	−.3762	.5634	−.4242	.6782	−.4530
14	.530	0.000	−.0430	.0808	.0198	.0032	.0953	−.0597	.1918	−.1117	.3114	−.1607	.4500	−.2067	.6005	−.2680
15	.530	.082	−.0437	.0822	.0226	.0056	.0950	−.0625	.1916	−.1200	.3129	−.1656	.4521	−.2121	.6023	−.2813
16	.530	.143	−.0651	.0401	−.0354	−.0628	.0590	−.0824	.1754	−.1470	.3073	−.1850	.4505	−.2429	.6033	−.3946
17	.530	.184	−.1360	.0309	−.0410	−.0647	.0499	−.1619	.1622	−.2180	.2957	−.1978	.4440	−.4159	.6015	−.4830
18	.540	.263	−.0116	.1207	.0576	.0400	.1354	−.0267	.2368	−.1049	.3584	−.4089	.4940	−.4687	.6422	−.4929
19	.553	.315	.0410	.1731	.1076	.0916	.1852	.0238	.2834	−.2703	.3977	−.4151	.5230	−.4650	.6604	−.4938
20	.566	.368	.0076	.2232	.1493	.1302	.2350	−.0880	.3276	−.2889	.4302	−.3822	.5406	−.4350	.6598	−.4687
21	.383	0.000	−.0426	.0795	.0183	.0017	.0959	−.0592	.1943	−.1124	.3134	−.1628	.4482	−.2162	.6070	−.2734
22	.383	.136	−.0483	.0844	.0179	.0018	.1028	−.0635	.2000	−.1158	.3229	−.1686	.4523	−.2179	.6083	−.3133
23	.383	.238	−.0639	.0917	.0032	−.0192	.1098	−.0822	.2107	−.1351	.3251	−.1819	.4582	−.4120	.6148	−.4801
24	.383	.305	−.1137	.0279	−.0557	−.0932	.0500	−.1445	.1825	−.1971	.3176	−.4016	.4598	−.4783	.6180	−.4930
25	.393	.410	−.0357	.1122	.0430	.0210	.1300	−.0472	.2367	−.2997	.3617	−.4184	.5036	−.4632	.6525	−.4901
26	.406	.462	.0096	.1635	.0906	.0688	.1791	−.0364	.2816	−.3204	.3962	−.4199	.5275	−.4598	.6627	−.4838
27	.419	.515	−.0571	.2095	.1313	.1068	.2256	−.1473	.3220	−.3127	.4217	−.4224	.5367	−.4608	.6533	−.4855
28	.236	0.000	−.0439	.0857	.0196	.0018	.1032	−.0559	.2031	−.1096	.3191	−.1638	.4562	−.2191	.6127	−.2683
29	.236	.190	−.0484	.0834	.0217	.0029	.1040	−.0630	.2055	−.1187	.3229	−.1682	.4593	−.2244	.6178	−.3421
30	.236	.332	−.0704	.0825	.0261	.0004	.1053	−.0873	.2118	−.1446	.3331	−.3519	.4654	−.4722	.6262	−.4842
31	.236	.427	−.1154	.0464	−.0669	−.0980	.0743	−.1373	.2151	−.2607	.3370	−.4090	.4757	−.4766	.6336	−.4879
32	.236	.498	−.2334	.0155	−.0750	−.1086	.0462	−.2515	.1830	−.2894	.3228	−.4036	.4745	−.4686	.6357	−.4891
33	.245	.557	−.0621	.1036	.0299	.0067	.1327	−.0808	.2519	−.3161	.3771	−.4365	.5160	−.4707	.6638	−.4897
34	.259	.610	−.0219	.1516	.0781	.0550	.1805	−.0783	.2915	−.3524	.4067	−.4376	.5374	−.4701	.6699	−.4903
35	.272	.663	−.0906	.2004	.1188	.0915	.2274	−.1836	.3288	−.3605	.4296	−.4379	.5427	−.4685	.6547	−.4887
36	.147	0.000	−.0531	.0771	.0167	−.0020	.0964	−.0651	.1978	−.1191	.3147	−.1741	.4551	−.2221	.5985	−.2642
37	.147	.222	−.0510	.0824	.0198	.0018	.1047	−.0636	.2089	−.1205	.3278	−.1654	.4650	−.2275	.6059	−.3576
38	.147	.389	−.0717	.0793	.0163	−.0015	.1053	−.0866	.2135	−.1727	.3352	−.3936	.4751	−.4830	.6149	−.4755
39	.147	.500	−.1190	.0733	−.0784	−.1027	.1052	−.1399	.2232	−.2713	.3472	−.4122	.4826	−.4725	.6238	−.4829
40	.147	.583	−.2444	.0035	−.0902	−.1235	.0403	−.2570	.1908	−.2847	.3382	−.4133	.4842	−.4765	.6271	−.4814
41	.157	.646	−.0697	.1018	.0225	−.0005	.1320	−.0888	.2573	−.3265	.3912	−.4480	.5263	−.4782	.6583	−.4805
42	.170	.698	−.0283	.1482	.0710	.0486	.1785	−.0905	.2966	−.3730	.4204	−.4502	.5446	−.4707	.6660	−.4788
43	.183	.751	−.1247	.1952	.1132	.0884	.2236	−.1942	.3311	−.3806	.4407	−.4443	.5473	−.4671	.6500	−.4778
44	.118	.750	−.0361	.1520	.0640	.0451	.1689	−.1053	.2883	−.3819	.4083	−.4474	.5202	−.4655	.6154	−.4706
45	.088	0.000	−.3099	−.2436	−.2743	−.2868	−.2314	−.3186	−.1813	−.3496	−.1206	−.3815	−.0490	−.4068	.0053	−.4285
46	.088	.236	−.3207	−.2569	−.2855	−.2957	−.2420	−.3251	−.1912	−.3537	−.1311	−.3839	−.0654	−.4190	−.0073	−.4739
47	.088	.412	−.3325	−.2615	−.2938	−.3040	−.2465	−.3424	−.1890	−.3857	−.1258	−.4815	−.0595	−.4877	−.0077	−.4753
48	.088	.530	−.3474	−.2604	−.2996	−.3216	−.2452	−.3546	−.1908	−.4155	−.1222	−.4768	−.0536	−.4892	−.0063	−.4793
49	.088	.619	−.3950	−.2669	−.2861	−.2867	−.2486	−.4042	−.1708	−.4237	−.0977	−.4706	−.0348	−.4782	.0149	−.4788
50	.088	.846	−.1398	.2010	.1050	.0834	.2153	−.2165	.3203	−.4234	.4155	−.4317	.4909	−.4574	.5311	−.4537
51	.059	0.000	−.3304	−.2645	−.2927	−.3021	−.2524	−.3373	−.2003	−.3652	−.1391	−.3746	−.0707	−.3864	−.0104	−.3955
52	.059	.236	−.3330	−.2654	−.2969	−.3046	−.2521	−.3386	−.1981	−.3652	−.1364	−.3795	−.0659	−.4170	−.0097	−.4445
53	.059	.412	−.3414	−.2693	−.3041	−.3147	−.2546	−.3483	−.1957	−.3895	−.1320	−.4719	−.0609	−.4871	−.0090	−.4765
54	.059	.530	−.3514	−.2617	−.2864	−.2921	−.2479	−.3594	−.1948	−.4192	−.1262	−.4668	−.0562	−.4862	−.0037	−.4802
55	.059	.619	−.3788	−.2371	−.2859	−.2886	−.2246	−.3920	−.1705	−.4241	−.0972	−.4561	−.0265	−.4694	.0328	−.4786
56	.059	.714	−.4018	−.3161	−.2875	−.2879	−.3160	−.4191	−.2509	−.4535	−.1885	−.4380	−.1350	−.4538	−.0608	−.4732
57	.029	0.000	−.3042	−.2650	−.2874	−.2912	−.2551	−.3081	−.2047	−.3270	−.1432	−.3338	−.0759	−.3457	−.0122	−.3922
58	.029	.236	−.3257	−.2683	−.3000	−.3075	−.2555	−.3275	−.2003	−.3309	−.1387	−.3417	−.0675	−.3792	−.0111	−.4374
59	.029	.412	−.3348	−.2728	−.3066	−.3159	−.2583	−.3387	−.2007	−.3813	−.1372	−.4239	−.0652	−.4884	−.0099	−.4777
60	.029	.530	−.3371	−.2593	−.2715	−.2686	−.2465	−.3424	−.1921	−.3991	−.1236	−.4603	−.0540	−.4837	.0053	−.4801
61	.029	.619	−.3494	−.2234	−.2873	−.2916	−.2051	−.3588	−.1753	−.3977	−.1023	−.4419	−.0273	−.4556	.0380	−.4755
62	.029	.714	−.3613	−.2986	−.2858	−.2865	−.2938	−.3717	−.2377	−.4128	−.1029	−.4274	−.0128	−.4423	.0536	−.4649
63	.029	.809	−.3863	−.3010	−.2775	−.2775	−.3204	−.3940	−.2978	−.4362	−.2216	−.4122	−.1653	−.4310	−.1180	−.4583
64	.383	−.305	−.1085	.0234	−.0533	−.0840	.0498	−.1422	.1770	−.1860	.3121	−.3929	.4517	−.4689	.6144	−.4834
65	.147	−.583	−.2357	.0031	−.0881	−.1251	.0418	−.2494	.1847	−.2863	.3252	−.4100	.4684	−.4643	.6198	−.4789

TABLE VII.–Continued
(a) Concluded

			α =													
			30.2		35.3		40.2		45.3		50.3		55.3		60.3	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.9378	−.2107	1.1207	−.2650	1.3083	−.3224	1.4561	−.3877	1.5530	−.4280	1.5949		1.5921	
2	.868	0.000	.9371	−.2122	1.1055	−.2667	1.2749	−.3285	1.4100	−.3922	1.5090	−.4327	1.5718		1.5929	
3	.881	.053	.9163	−.4893	1.0745	−.5020	1.2348	−.5071	1.3612	−.5083	1.4524	−.4852	1.5088		1.5221	
4	.802	0.000	.9140	−.2190	1.0747	−.2726	1.2372	−.3342	1.3700	−.3964	1.4735	−.4339	1.5438		1.5811	
5	.764	.039	.8677	−.2855	1.0323	−.3662	1.1973	−.4073	1.3318	−.4273	1.4351	−.4354	1.5108		1.5571	
6	.777	.091	.8770	−.4977	1.0322	−.5090	1.1868	−.5080	1.3135	−.4982	1.4078	−.4836	1.4757		1.5140	
7	.790	.144	.8632	−.5012	1.0028	−.5119	1.1370	−.5095	1.2504	−.4998	1.3302	−.4879	1.3857		1.4146	
8	.707	0.000	.7715	−.3029	.9590	−.3467	1.1336	−.3863	1.2756	−.4409	1.3889	−.4540	1.4762		1.5381	
9	.648	0.000	.7778	−.3129	.9620	−.3568	1.1260	−.3930	1.2606	−.4266	1.3692	−.4549	1.4563		1.5220	
10	.648	.068	.7733	−.3616	.9606	−.4168	1.1228	−.4397	1.2596	−.4272	1.3654	−.4544	1.4521		1.5157	
11	.658	.144	.8096	−.5112	.9845	−.5126	1.1345	−.5015	1.2605	−.4751	1.3572	−.4792	1.4318		1.4840	
12	.671	.197	.8229	−.5064	.9829	−.5103	1.1197	−.4983	1.2351	−.4799	1.3220	−.4808	1.3871		1.4342	
13	.684	.250	.8122	−.4815	.9490	−.5086	1.0651	−.4919	1.1642	−.4769	1.2364	−.4795	1.2904		1.3293	
14	.530	0.000	.7783	−.3273	.9510	−.3438	1.0919	−.4162	1.2146	−.4150	1.3155	−.4401	1.4048		1.4759	
15	.530	.082	.7809	−.3562	.9522	−.3921	1.0922	−.4173	1.2144	−.4369	1.3139	−.4489	1.4010		1.4730	
16	.530	.143	.7837	−.4519	.9530	−.4742	1.0912	−.4483	1.2115	−.4626	1.3090	−.4661	1.3948		1.4638	
17	.530	.184	.7814	−.5009	.9524	−.4980	1.0911	−.4694	1.2083	−.4687	1.3036	−.4710	1.3886		1.4529	
18	.540	.263	.8083	−.4995	.9672	−.4970	1.0937	−.4803	1.2009	−.4699	1.2861	−.4729	1.3597		1.4140	
19	.553	.315	.8124	−.5052	.9596	−.4903	1.0733	−.4761	1.1711	−.4688	1.2481	−.4703	1.3125		1.3619	
20	.566	.368	.7925	−.4880	.9176	−.4879	1.0138	−.4690	1.0987	−.4656	1.1619	−.4673	1.2145		1.2584	
21	.383	0.000	.7804	−.3178	.9264	−.3822	1.0405	−.3743	1.1456	−.4283	1.2383	−.4341	1.3260		1.4023	
22	.383	.136	.7832	−.3911	.9263	−.4203	1.0394	−.4287	1.1455	−.4494	1.2355	−.4490	1.3228		1.3992	
23	.383	.238	.7880	−.4890	.9285	−.4767	1.0402	−.4667	1.1432	−.4613	1.2298	−.4607	1.3136		1.3895	
24	.383	.305	.7914	−.4906	.9307	−.4798	1.0431	−.4680	1.1392	−.4634	1.2236	−.4620	1.3053		1.3753	
25	.393	.410	.8110	−.4902	.9389	−.4794	1.0347	−.4671	1.1254	−.4650	1.1978	−.4585	1.2661		1.3289	
26	.406	.462	.8078	−.4887	.9266	−.4727	1.0119	−.4646	1.0943	−.4639	1.1598	−.4561	1.2227		1.2791	
27	.419	.515	.7794	−.4871	.8800	−.4621	.9507	−.4621	1.0209	−.4622	1.0751	−.4552	1.1272		1.1761	
28	.236	0.000	.7641	−.3154	.8671	−.3633	.9493	−.3960	1.0331	−.4144	1.1116	−.4147	1.1949		1.2799	
29	.236	.190	.7681	−.4169	.8689	−.4190	.9503	−.4339	1.0334	−.4400	1.1109	−.4431	1.1947		1.2766	
30	.236	.332	.7733	−.4815	.8728	−.4702	.9509	−.4564	1.0326	−.4593	1.1073	−.4556	1.1904		1.2703	
31	.236	.427	.7785	−.4832	.8744	−.4750	.9511	−.4637	1.0292	−.4634	1.1024	−.4554	1.1833		1.2598	
32	.236	.498	.7806	−.4834	.8763	−.4730	.9497	−.4636	1.0256	−.4608	1.0933	−.4551	1.1713		1.2429	
33	.245	.557	.7977	−.4828	.8856	−.4708	.9482	−.4617	1.0201	−.4578	1.0829	−.4544	1.1552		1.2220	
34	.259	.610	.7941	−.4826	.8737	−.4711	.9310	−.4598	.9965	−.4556	1.0544	−.4537	1.1206		1.1824	
35	.272	.663	.7618	−.4824	.8292	−.4731	.8758	−.4581	.9309	−.4547	.9776	−.4529	1.0352		1.0908	
36	.147	0.000	.7056	−.3205	.7685	−.3392	.8185	−.4018	.8776	−.3987	.9344	−.4140	1.0104		1.0990	
37	.147	.222	.7101	−.4286	.7722	−.4290	.8216	−.4324	.8797	−.4412	.9356	−.4428	1.0145		1.1008	
38	.147	.389	.7152	−.4676	.7746	−.4669	.8218	−.4587	.8785	−.4567	.9350	−.4519	1.0156		1.1029	
39	.147	.500	.7210	−.4698	.7780	−.4640	.8271	−.4587	.8779	−.4503	.9357	−.4514	1.0200		1.1063	
40	.147	.583	.7241	−.4716	.7790	−.4599	.8266	−.4543	.8761	−.4432	.9332	−.4509	1.0210		1.1054	
41	.157	.646	.7514	−.4696	.8037	−.4595	.8412	−.4511	.8956	−.4417	.9524	−.4503	1.0387		1.1157	
42	.170	.698	.7539	−.4679	.8036	−.4582	.8396	−.4483	.8920	−.4410	.9471	−.4490	1.0284		1.0973	
43	.183	.751	.7266	−.4709	.7678	−.4587	.7979	−.4470	.8434	−.4404	.8936	−.4479	.9630		1.0253	
44	.118	.750	.6611	−.4618	.6844	−.4421	.7136	−.4326	.7555	−.4375	.8484	−.4456	.9569		1.0363	
45	.088	0.000	.0323	−.4624	.0506	−.4628	.0758	−.4482	.1122	−.4438	.2705	−.4197	.4614		.6516	
46	.088	.236	.0170	−.4642	.0352	−.4649	.0606	−.4490	.0989	−.4408	.2691	−.4347	.4703		.6598	
47	.088	.412	.0178	−.4620	.0379	−.4553	.0658	−.4520	.1295	−.4421	.3014	−.4446	.5103		.6954	
48	.088	.530	.0197	−.4649	.0419	−.4567	.0740	−.4472	.1931	−.4382	.3390	−.4458	.5595		.7454	
49	.088	.619	.0443	−.4656	.0725	−.4545	.1188	−.4386	.2083	−.4370	.3625	−.4466	.6713		.8738	
50	.088	.846	.5529	−.4493	.5714	−.4117	.6039	−.4152	.6621	−.4315	.7849	−.4393	.8690		.9365	
51	.059	0.000	.0247	−.4363	.0593	−.4417	.1105	−.4428	.1941	−.4347	.2837	−.4138	.8172		.8807	
52	.059	.236	.0255	−.4611	.0620	−.4633	.1151	−.4455	.2052	−.4350	.3159	−.4282	.8226		.8813	
53	.059	.412	.0281	−.4612	.0680	−.4536	.1278	−.4440	.2297	−.4357	.4568	−.4381	.8297		.8881	
54	.059	.530	.0367	−.4638	.0838	−.4464	.1654	−.4359	.2420	−.4346	.6433	−.4418	.8354		.8945	
55	.059	.619	.0821	−.4634	.1363	−.4378	.2135	−.4276	.3151	−.4343	.7646	−.4432	.8255		.8998	
56	.059	.714	.1159	−.4569	.2236	−.4211	.3295	−.4193	.3242	−.4345	.7673	−.4427	.8179		.8947	
57	.029	0.000	.0338	−.4316	.0832	−.4362	.1548	−.4346	.2583	−.4212	.7081	−.4181	.7448		.8069	
58	.029	.236	.0328	−.4658	.0829	−.4636	.1571	−.4413	.2679	−.4366	.7125	−.4329	.7423		.8035	
59	.029	.412	.0370	−.4601	.0921	−.4521	.1744	−.4398	.2849	−.4394	.7126	−.4391	.7437		.8053	
60	.029	.530	.0588	−.4629	.1223	−.4385	.2119	−.4308	.2950	−.4359	.7124	−.4411	.7486		.8115	
61	.029	.619	.1002	−.4574	.1731	−.4255	.2814	−.4227	.4839	−.4339	.6955	−.4417	.7496		.8146	
62	.029	.714	.1251	−.4470	.2046	−.4083	.3196	−.4155	.5009	−.4320	.6829	−.4400	.7490		.8144	
63	.029	.809	−.0942	−.4415	.0317	−.3930	.1440	−.4097	.4282	−.4299	.6817	−.4364	.7531		.8134	
64	.383	−.305	.7848	−.4799	.9257	−.4737	1.0388	−.4615	1.1349	−.4560	1.2205	−.4536	1.3030		1.3726	
65	.147	−.583	.7196	−.4675	.7764	−.4555	.8247	−.4486	.8735	−.4434	.9317	−.4456	1.0188		1.1044	

TABLE VII.—Continued
(b) M = 2.16

			α =													
			−3.7		1.3		6.3		11.3		16.3		21.3		26.3	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.0488	.1543	.1151	.0809	.1967	.0222	.2995	−.0242	.4256	−.0608	.5687	−.0896	.7248	−.1216
2	.868	0.000	.0416	.1538	.1079	.0799	.1930	.0212	.2974	−.0271	.4233	−.0644	.5700	−.0927	.7273	−.1238
3	.881	.053	.0453	.1647	.1178	.0867	.2045	.0263	.3095	−.0901	.4302	−.2080	.5725	−.2347	.7207	−.2549
4	.802	0.000	.0413	.1529	.1067	.0795	.1921	.0201	.2970	−.0301	.4193	−.0696	.5651	−.0986	.7296	−.1279
5	.764	.039	.0398	.1515	.1047	.0775	.1912	.0177	.2944	−.0305	.4161	−.0670	.5592	−.0917	.7217	−.1553
6	.777	.091	.0432	.1616	.1141	.0846	.2019	.0206	.3040	−.0114	.4243	−.2099	.5637	−.2475	.7217	−.2654
7	.790	.144	.0514	.1827	.1324	.0974	.2251	−.0302	.3269	−.1553	.4437	−.2199	.5759	−.2505	.7219	−.2680
8	.707	0.000	−.0319	.0678	.0275	.0046	.1012	−.0529	.1920	−.0952	.3014	−.1261	.4294	−.1525	.5766	−.1790
9	.648	0.000	−.0354	.0603	.0192	−.0025	.0934	−.0520	.1841	−.0937	.2955	−.1247	.4210	−.1502	.5690	−.1814
10	.648	.068	−.0623	.0319	−.0083	−.0303	.0667	−.0854	.1601	−.1199	.2754	−.1462	.4046	−.1629	.5558	−.2117
11	.658	.144	.0351	.1478	.1006	.0742	.1839	.0120	.2726	−.0275	.3773	−.2209	.4956	−.2611	.6323	−.2772
12	.671	.197	.0465	.1728	.1210	.0905	.2121	.0336	.3113	−.1595	.4263	−.2348	.5498	−.2589	.6769	−.2728
13	.684	.250	.0429	.1994	.1435	.1069	.2405	−.0538	.3397	−.1745	.4514	−.2270	.5778	−.2545	.7013	−.2707
14	.530	0.000	−.0347	.0592	.0193	−.0023	.0911	−.0505	.1795	−.0919	.2906	−.1227	.4177	−.1532	.5628	−.1854
15	.530	.082	−.0477	.0577	.0181	−.0057	.0900	−.0587	.1806	−.1254	.2917	−.1427	.4181	−.1583	.5636	−.2070
16	.530	.143	−.0793	.0210	−.0220	−.0461	.0575	−.1014	.1600	−.1361	.2799	−.1468	.4140	−.2465	.5636	−.2729
17	.530	.184	−.1005	.0063	−.0315	−.0544	.0413	−.1188	.1451	−.1455	.2653	−.2038	.4021	−.2678	.5568	−.2772
18	.540	.263	.0349	.1386	.0972	.0717	.1667	.0106	.2470	−.0857	.3504	−.2231	.4715	−.2658	.6150	−.2776
19	.553	.315	.0520	.1801	.1274	.0955	.2145	.0193	.3009	−.1614	.4008	−.2308	.5142	−.2653	.6471	−.2773
20	.566	.368	.0126	.2133	.1529	.1139	.2505	−.0889	.3434	−.1924	.4425	−.2375	.5454	−.2610	.6637	−.2744
21	.383	0.000	−.0348	.0579	.0177	−.0034	.0852	−.0543	.1764	−.0940	.2841	−.1282	.4111	−.1608	.5590	−.1913
22	.383	.136	−.0370	.0645	.0190	.0005	.0925	−.0546	.1820	−.1030	.2932	−.1464	.4199	−.1644	.5643	−.2377
23	.383	.238	−.0691	.0471	−.0289	−.0502	.0881	−.0956	.1865	−.1454	.2983	−.2058	.4279	−.2607	.5721	−.2732
24	.383	.305	−.1185	−.0045	−.0437	−.0651	.0320	−.1369	.1518	−.1662	.2812	−.2253	.4224	−.2603	.5752	−.2741
25	.393	.410	.0346	.1279	.0921	.0672	.1518	.0178	.2386	−.1519	.3451	−.2403	.4735	−.2672	.6183	−.2759
26	.406	.462	.0698	.1759	.1300	.0967	.2028	−.0309	.2893	−.2005	.3889	−.2514	.5089	−.2673	.6412	−.2762
27	.419	.515	−.0132	.2167	.1603	.1171	.2477	−.0960	.3331	−.2030	.4236	−.2534	.5311	−.2675	.6472	−.2760
28	.236	0.000	−.0318	.0614	.0188	−.0053	.0903	−.0535	.1795	−.0953	.2876	−.1318	.4131	−.1643	.5559	−.1931
29	.236	.190	−.0369	.0612	.0214	−.0031	.0898	−.0580	.1822	−.1053	.2907	−.1453	.4152	−.1925	.5609	−.2539
30	.236	.332	−.0590	.0632	.0071	−.0564	.0936	−.0890	.1870	−.1401	.3004	−.2098	.4260	−.2490	.5707	−.2739
31	.236	.427	−.1272	.0013	−.0543	−.0735	.0577	−.1461	.1834	−.1792	.3078	−.2342	.4333	−.2578	.5814	−.2751
32	.236	.498	−.1440	−.0397	−.0819	−.0948	.0072	−.1456	.1405	−.2156	.2819	−.2559	.4253	−.2729	.5816	−.2776
33	.245	.557	.0349	.1198	.0849	.0635	.1463	.0027	.2332	−.1987	.3511	−.2552	.4806	−.2710	.6255	−.2772
34	.259	.610	.0658	.1673	.1243	.0952	.1967	−.0848	.2829	−.2101	.3901	−.2602	.5102	−.2750	.6448	−.2767
35	.272	.663	−.0242	.2125	.1604	.1198	.2435	−.1022	.3268	−.2104	.4223	−.2603	.5287	−.2742	.6463	−.2766
36	.147	0.000	−.0373	.0554	.0148	−.0094	.0836	−.0577	.1738	−.0997	.2839	−.1344	.4073	−.1673	.5506	−.1970
37	.147	.222	−.0371	.0600	.0188	−.0046	.0905	−.0605	.1797	−.1100	.2928	−.1561	.4178	−.2164	.5612	−.2593
38	.147	.389	−.0562	.0611	.0198	−.0518	.0935	−.0889	.1848	−.1405	.2982	−.2124	.4290	−.2422	.5709	−.2718
39	.147	.500	−.1312	.0314	−.0628	−.0846	.0865	−.1501	.1965	−.2007	.3093	−.2417	.4409	−.2609	.5818	−.2747
40	.147	.583	−.1424	−.0494	−.0971	−.1114	.0034	−.1439	.1481	−.2275	.2890	−.2555	.4337	−.2658	.5840	−.2718
41	.157	.646	.0359	.1164	.0821	.0607	.1419	−.0096	.2373	−.2049	.3569	−.2534	.4847	−.2678	.6252	−.2714
42	.170	.698	.0624	.1648	.1220	.0927	.1916	−.0945	.2830	−.2149	.3933	−.2533	.5123	−.2666	.6422	−.2706
43	.183	.751	−.0245	.2100	.1582	.1176	.2367	−.1059	.3241	−.2165	.4229	−.2505	.5284	−.2650	.6417	−.2688
44	.118	.750	.0521	.1595	.1166	.0866	.1856	−.1001	.2754	−.2145	.3898	−.2407	.5104	−.2603	.6374	−.2640
45	.088	0.000	−.1845	−.1327	−.1532	−.1670	−.1189	−.1936	−.0779	−.2125	−.0202	−.2202	.0475	−.2500	.1240	−.2653
46	.088	.236	−.1863	−.1433	−.1639	−.1790	−.1286	−.1947	−.0865	−.2229	−.0311	−.2477	.0330	−.2615	.1073	−.2707
47	.088	.412	−.1960	−.1475	−.1671	−.1871	−.1319	−.2086	−.0880	−.2328	−.0327	−.2537	.0330	−.2692	.1082	−.2693
48	.088	.530	−.2225	−.1512	−.1872	−.1810	−.1350	−.2358	−.0878	−.2444	−.0314	−.2501	.0391	−.2655	.1198	−.2677
49	.088	.619	−.2257	−.1921	−.1775	−.1733	−.1637	−.2386	−.0900	−.2396	−.0183	−.2501	.0568	−.2621	.1362	−.2649
50	.088	.846	−.0293	.2065	.1555	.1156	.2333	−.1149	.3146	−.2254	.4162	−.2423	.5252	−.2578	.6344	−.2573
51	.059	0.000	−.1989	−.1561	−.1736	−.1849	−.1433	−.2077	−.1016	−.2008	−.0424	−.2128	.0245	−.2346	.1047	−.2509
52	.059	.236	−.1979	−.1564	−.1755	−.1864	−.1426	−.2064	−.1016	−.2260	−.0446	−.2484	.0233	−.2533	.1010	−.2681
53	.059	.412	−.2067	−.1592	−.1795	−.1897	−.1444	−.2173	−.0992	−.2364	−.0424	−.2442	.0252	−.2627	.1063	−.2676
54	.059	.530	−.2108	−.1581	−.1736	−.1787	−.1438	−.2192	−.0964	−.2391	−.0378	−.2427	.0329	−.2629	.1135	−.2654
55	.059	.619	−.2114	−.1826	−.1761	−.1753	−.1553	−.2194	−.0833	−.2394	−.0129	−.2466	.0608	−.2607	.1463	−.2625
56	.059	.714	−.2248	−.2052	−.1835	−.1786	−.1956	−.2320	−.1459	−.2343	−.0728	−.2464	.0018	−.2581	.0754	−.2591
57	.029	0.000	−.1918	−.1618	−.1787	−.1879	−.1494	−.1900	−.1074	−.1995	−.0490	−.2119	.0178	−.2331	.0978	−.2495
58	.029	.236	−.1925	−.1614	−.1805	−.1904	−.1471	−.1927	−.1050	−.2062	−.0482	−.2320	.0201	−.2512	.0987	−.2671
59	.029	.412	−.1933	−.1631	−.1812	−.1851	−.1486	−.1996	−.1030	−.2165	−.0461	−.2391	.0213	−.2501	.1030	−.2664
60	.029	.530	−.2088	−.1589	−.1717	−.1783	−.1448	−.2154	−.0979	−.2297	−.0397	−.2366	.0299	−.2552	.1113	−.2635
61	.029	.619	−.2085	−.1712	−.1775	−.1778	−.1460	−.2181	−.0865	−.2359	−.0229	−.2473	.0516	−.2577	.1382	−.2605
62	.029	.714	−.2074	−.1930	−.1778	−.1769	−.1870	−.2231	−.1280	−.2297	−.0579	−.2472	.0272	−.2557	.1592	−.2564
63	.029	.809	−.2167	−.1885	−.2004	−.1890	−.1787	−.2223	−.1441	−.2285	−.0988	−.2431	−.0405	−.2523	.0444	−.2532
64	.383	−.305	−.1029	−.0057	−.0320	−.0590	.0434	−.1174	.1564	−.1578	.2819	−.2133	.4174	−.2521	.5703	−.2603
65	.147	−.583	−.1293	−.0470	−.0818	−.10 5	.0109	−.1456	.1490	−.2160	.2847	−.2422	.4294	−.2529	.5847	−.2594

TABLE VII.–Continued
(b) Concluded

			α =													
			31.3		36.3		41.3		46.3		51.3		56.3		61.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.8934	−.1518	1.0697	−.1819	1.2468	−.2111	1.4205	−.2333	1.5733	−.2452	1.6825	−.2489	1.7450	−.2525
2	.868	0.000	.8988	−.1570	1.0715	−.1884	1.2460	−.2237	1.4046	−.2427	1.5456	−.2547	1.6517	−.2639	1.7209	−.2643
3	.881	.053	.8807	−.2681	1.0431	−.2748	1.2097	−.2747	1.3584	−.2831	1.4895	−.2831	1.5883	−.2739	1.6511	−.2663
4	.802	0.000	.8993	−.1590	1.0719	−.1894	1.2249	−.2279	1.3768	−.2448	1.5173	−.2538	1.6234	−.2527	1.6940	−.2600
5	.764	.039	.8903	−.2241	1.0394	−.2479	1.1761	−.2579	1.3364	−.2677	1.4796	−.2640	1.5892	−.2594	1.6627	−.2593
6	.777	.091	.8842	−.2758	1.0398	−.2801	1.1749	−.2728	1.3229	−.2833	1.4557	−.2799	1.5547	−.2713	1.6227	−.2648
7	.790	.144	.8711	−.2770	1.0171	−.2808	1.1419	−.2737	1.2697	−.2836	1.3851	−.2804	1.4683	−.2713	1.5271	−.2645
8	.707	0.000	.7369	−.2074	.9025	−.2296	1.0844	−.2535	1.2745	−.2613	1.4303	−.2685	1.5482	−.2608	1.6331	−.2594
9	.648	0.000	.7287	−.2111	.8982	−.2343	1.0887	−.2555	1.2743	−.2591	1.4214	−.2619	1.5326	−.2574	1.6192	−.2587
10	.648	.068	.7213	−.2520	.8946	−.2653	1.0868	−.2666	1.2717	−.2710	1.4189	−.2638	1.5283	−.2616	1.6126	−.2602
11	.658	.144	.7823	−.2804	.9404	−.2824	1.1149	−.2714	1.2824	−.2810	1.4170	−.2749	1.5142	−.2691	1.5881	−.2631
12	.671	.197	.8123	−.2787	.9553	−.2816	1.1141	−.2711	1.2648	−.2810	1.3866	−.2747	1.4722	−.2688	1.5385	−.2631
13	.684	.250	.8187	−.2779	.9418	−.2813	1.0771	−.2712	1.2074	−.2815	1.3097	−.2742	1.3823	−.2683	1.4365	−.2628
14	.530	0.000	.7268	−.2180	.9054	−.2412	1.0889	−.2555	1.2568	−.2708	1.3870	−.2500	1.4896	−.2581	1.5759	−.2577
15	.530	.082	.7282	−.2435	.9065	−.2605	1.0909	−.2613	1.2569	−.2722	1.3858	−.2613	1.4857	−.2605	1.5709	−.2583
16	.530	.143	.7295	−.2777	.9076	−.2802	1.0909	−.2700	1.2557	−.2752	1.3823	−.2685	1.4801	−.2640	1.5620	−.2596
17	.530	.184	.7269	−.2795	.9070	−.2811	1.0911	−.2712	1.2542	−.2756	1.3789	−.2700	1.4736	−.2653	1.5525	−.2604
18	.540	.263	.7714	−.2806	.9381	−.2823	1.1063	−.2722	1.2533	−.2783	1.3662	−.2696	1.4484	−.2652	1.5168	−.2612
19	.553	.315	.7902	−.2807	.9434	−.2820	1.0963	−.2724	1.2300	−.2779	1.3321	−.2683	1.4058	−.2646	1.4659	−.2605
20	.566	.368	.7887	−.2790	.9208	−.2811	1.0526	−.2722	1.1689	−.2761	1.2547	−.2677	1.3160	−.2646	1.3660	−.2605
21	.383	0.000	.7258	−.2226	.9045	−.2419	1.0813	−.2424	1.2240	−.2485	1.3317	−.2567	1.4227	−.2583	1.5062	−.2557
22	.383	.136	.7302	−.2622	.9076	−.2695	1.0817	−.2644	1.2239	−.2547	1.3302	−.2625	1.4188	−.2603	1.5022	−.2559
23	.383	.238	.7368	−.2785	.9128	−.2789	1.0846	−.2711	1.2238	−.2692	1.3259	−.2659	1.4120	−.2625	1.4932	−.2570
24	.383	.305	.7402	−.2783	.9160	−.2785	1.0879	−.2714	1.2222	−.2698	1.3219	−.2649	1.4043	−.2613	1.4805	−.2565
25	.393	.410	.7746	−.2807	.9371	−.2804	1.0914	−.2733	1.2125	−.2687	1.2988	−.2651	1.3686	−.2620	1.4342	−.2574
26	.406	.462	.7851	−.2808	.9344	−.2802	1.0757	−.2731	1.1863	−.2678	1.2639	−.2645	1.3264	−.2616	1.3861	−.2569
27	.419	.515	.7734	−.2803	.9037	−.2790	1.0250	−.2727	1.1199	−.2669	1.1860	−.2645	1.2384	−.2617	1.2884	−.2565
28	.236	0.000	.7231	−.2261	.8961	−.2463	1.0611	−.2498	1.1592	−.2402	1.2354	−.2553	1.3067	−.2581	1.3885	−.2519
29	.236	.190	.7266	−.2684	.9000	−.2697	1.0634	−.2687	1.1593	−.2624	1.2346	−.2636	1.3054	−.2607	1.3870	−.2521
30	.236	.332	.7368	−.2780	.9085	−.2744	1.0663	−.2717	1.1595	−.2642	1.2327	−.2642	1.3005	−.2611	1.3818	−.2531
31	.236	.427	.7456	−.2782	.9159	−.2747	1.0675	−.2713	1.1573	−.2613	1.2278	−.2639	1.2941	−.2609	1.3721	−.2533
32	.236	.498	.7505	−.2783	.9202	−.2747	1.0680	−.2715	1.1539	−.2607	1.2207	−.2638	1.2830	−.2608	1.3571	−.2527
33	.245	.557	.7799	−.2787	.9359	−.2750	1.0689	−.2719	1.1488	−.2614	1.2091	−.2636	1.2643	−.2606	1.3344	−.2527
34	.259	.610	.7855	−.2784	.9286	−.2745	1.0503	−.2714	1.1242	−.2610	1.1799	−.2634	1.2323	−.2604	1.2956	−.2523
35	.272	.663	.7688	−.2782	.8924	−.2739	.9974	−.2713	1.0607	−.2604	1.1085	−.2630	1.1537	−.2599	1.2092	−.2515
36	.147	0.000	.7106	−.2206	.8787	−.2398	1.0013	−.2553	1.0484	−.2488	1.0906	−.2570	1.1374	−.2543	1.212	−.2470
37	.147	.222	.7189	−.2713	.8872	−.2680	1.0047	−.2692	1.0510	−.2610	1.0923	−.2619	1.1378	−.2575	1.215	−.2478
38	.147	.389	.7314	−.2757	.8953	−.2719	1.0081	−.2707	1.0514	−.2614	1.0908	−.2638	1.1352	−.2604	1.2155	−.2497
39	.147	.500	.7422	−.2758	.9021	−.2727	1.0109	−.2707	1.0506	−.2610	1.0886	−.2637	1.1342	−.2610	1.2179	−.2503
40	.147	.583	.7477	−.2729	.9054	−.2705	1.0115	−.2693	1.0470	−.2602	1.0826	−.2623	1.1281	−.2598	1.2164	−.2493
41	.157	.646	.7754	−.2745	.9216	−.2713	1.0240	−.2697	1.0589	−.2596	1.0951	−.2622	1.1396	−.2589	1.2277	−.2486
42	.170	.698	.7794	−.2741	.9144	−.2702	1.0127	−.2690	1.0477	−.2586	1.0835	−.2613	1.1284	−.2578	1.2126	−.2475
43	.183	.751	.7605	−.2733	.8762	−.2696	.9643	−.2683	.9958	−.2583	1.0283	−.2603	1.0696	−.2566	1.1439	−.2465
44	.118	.750	.7658	−.2705	.8768	−.2686	.9131	−.2665	.9180	−.2591	.9444	−.2590	1.0251	−.2554	1.1493	−.2455
45	.088	0.000	.2043	−.2725	.2768	−.2681	.3060	−.2638	.3199	−.2507	.3498	−.2494	.4867	−.2450	.7189	−.2432
46	.088	.236	.1930	−.2741	.2629	−.2694	.2907	−.2652	.3043	−.2568	.3363	−.2562	.4800	−.2519	.7286	−.2447
47	.088	.412	.1964	−.2729	.2639	−.2705	.2927	−.2682	.3078	−.2601	.3487	−.2617	.5042	−.2582	.7660	−.2475
48	.088	.530	.2009	−.2725	.2672	−.2705	.2950	−.2699	.3123	−.2617	.4026	−.2632	.5354	−.2597	.8091	−.2473
49	.088	.619	.2187	−.2706	.2877	−.2694	.3165	−.2687	.3449	−.2615	.4368	−.2617	.5587	−.2579	.8956	−.2464
50	.088	.846	.7306	−.2667	.7748	−.2644	.7768	−.2633	.7911	−.2569	.8407	−.2561	.9663	−.2513	1.0605	−.2408
51	.059	0.000	.1877	−.2620	.2642	−.2622	.3045	−.2621	.3420	−.2503	.4241	−.2484	.5051	−.2412	1.0239	−.2407
52	.059	.236	.1882	−.2731	.2636	−.2688	.3052	−.2643	.3457	−.2550	.4320	−.2543	.5102	−.2491	1.0265	−.2425
53	.059	.412	.1910	−.2715	.2650	−.2694	.3082	−.2669	.3544	−.2575	.4556	−.2600	.5671	−.2565	1.0320	−.2454
54	.059	.530	.1967	−.2710	.2710	−.2695	.3160	−.2689	.3742	−.2608	.4788	−.2620	.7815	−.2582	1.0372	−.2457
55	.059	.619	.2383	−.2694	.3211	−.2683	.3713	−.2676	.4326	−.2609	.5167	−.2606	.9607	−.2567	1.0587	−.2447
56	.059	.714	.1523	−.2682	.3396	−.2667	.4184	−.2649	.5031	−.2590	.6426	−.2582	.9768	−.2538	1.0223	−.2425
57	.029	0.000	.1839	−.2609	.2667	−.2615	.3155	−.2622	.3766	−.2511	.4852	−.2480	.8298	−.2382	.9484	−.2355
58	.029	.236	.1852	−.2736	.2639	−.2691	.3146	−.2634	.3788	−.2533	.4907	−.2531	.8917	−.2467	.9459	−.2382
59	.029	.412	.1870	−.2711	.2648	−.2688	.3192	−.2667	.3903	−.2561	.5123	−.2587	.9126	−.2542	.9493	−.2418
60	.029	.530	.1977	−.2693	.2782	−.2682	.3381	−.2676	.4209	−.2592	.5263	−.2608	.9164	−.2564	.9553	−.2431
61	.029	.619	.2283	−.2681	.3131	−.2670	.3781	−.2664	.4690	−.2599	.6548	−.2593	.9016	−.2550	.9578	−.2425
62	.029	.714	.2482	−.2660	.3341	−.2648	.4086	−.2632	.5101	−.2575	.6742	−.2561	.8883	−.2515	.9568	−.2399
63	.029	.809	.1058	−.2654	.1601	−.2627	.2269	−.2621	.3628	−.2561	.6044	−.2550	.8864	−.2499	.9610	−.2384
64	.383	−.305	.7353	−.2634	.9089	−.2621	1.0829	−.2576	1.2203	−.2568	1.3194	−.2528	1.4047	−.2504	1.4803	−.2449
65	.147	−.583	.7477	−.2605	.9060	−.2551	1.0077	−.2566	1.0450	−.2503	1.0829	−.2520	1.1290	−.2513	1.2156	−.2414

TABLE VII.–Continued
(c) M = 2.86

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.0231	.1509	.0720	.0778	.1400	.0216	.2333	−.0169	.3473	−.0424	.4770	−.0641	.6273	−.0823
2	.868	0.000	.0208	.1513	.0707	.0764	.1391	.0204	.2323	−.0177	.3476	−.0430	.4782	−.0638	.6287	−.0818
3	.881	.053	.0211	.1621	.0803	.0847	.1532	.0207	.2481	−.0368	.3622	−.0818	.4886	−.1088	.6331	−.1241
4	.802	0.000	.0201	.1500	.0702	.0753	.1383	.0195	.2307	−.0189	.3467	−.0446	.4782	−.0652	.6272	−.0824
5	.764	.039	.0195	.1477	.0702	.0737	.1390	.0180	.2309	−.0182	.3469	−.0410	.4775	−.0682	.6251	−.1145
6	.777	.091	.0209	.1584	.0781	.0816	.1503	.0203	.2430	−.0374	.3578	−.0864	.4861	−.1135	.6303	−.1282
7	.790	.144	.0216	.1821	.0964	.0985	.1763	.0210	.2721	−.0502	.3860	−.0959	.5091	−.1205	.6464	−.1335
8	.707	0.000	−.0298	.0735	.0115	.0158	.0647	−.0289	.1378	−.0631	.2339	−.0812	.3480	−.0969	.4823	−.1106
9	.648	0.000	−.0352	.0650	.0034	.0080	.0568	−.0345	.1295	−.0649	.2263	−.0837	.3423	−.0994	.4769	−.1130
10	.648	.068	−.0488	.0474	−.0121	−.0069	.0384	−.0467	.1084	−.0767	.2022	−.0932	.3173	−.1119	.4547	−.1306
11	.658	.144	.0164	.1518	.0749	.0767	.1461	.0161	.2352	−.0431	.3459	−.0939	.4627	−.1231	.5858	−.1342
12	.671	.197	.0222	.1707	.0889	.0901	.1656	.0220	.2585	−.0490	.3721	−.0986	.4974	−.1230	.6345	−.1355
13	.684	.250	.0208	.1988	.1103	.1113	.1947	.0204	.2904	−.0618	.4029	−.1055	.5232	−.1262	.6534	−.1366
14	.530	0.000	−.0368	.0610	.0014	.0048	.0549	−.0358	.1282	−.0629	.2218	−.0827	.3383	−.1004	.4739	−.1135
15	.530	.082	−.0477	.0545	−.0084	−.0034	.0467	−.0455	.1233	−.0755	.2213	−.0872	.3384	−.1119	.4763	−.1306
16	.530	.143	−.0553	.0400	−.0178	−.0131	.0326	−.0527	.1022	−.0815	.2037	−.1118	.3240	−.1298	.4704	−.1381
17	.530	.184	−.0658	.0259	−.0317	−.0260	.0176	−.0625	.0866	−.0874	.1795	−.1148	.3081	−.1303	.4557	−.1398
18	.540	.263	.0180	.1578	.0824	.0834	.1559	.0181	.2395	−.0576	.3321	−.1065	.4303	−.1282	.5509	−.1389
19	.553	.315	.0228	.1821	.0991	.1001	.1798	.0233	.2722	−.0620	.3795	−.1078	.4914	−.1291	.6063	−.1391
20	.566	.368	.0171	.2116	.1216	.1219	.2106	.0164	.3064	−.0731	.4140	−.1122	.5287	−.1311	.6426	−.1401
21	.383	0.000	−.0360	.0597	.0024	.0060	.0560	−.0349	.1243	−.0626	.2179	−.0821	.3354	−.0983	.4722	−.1136
22	.383	.136	−.0528	.0612	−.0114	−.0017	.0551	−.0497	.1312	−.0811	.2263	−.1012	.3431	−.1295	.4778	−.1381
23	.383	.238	−.0587	.0445	−.0226	−.0186	.0332	−.0563	.1230	−.0891	.2271	−.1192	.3506	−.1352	.4878	−.1405
24	.383	.305	−.0696	.0215	−.0362	−.0311	.0163	−.0650	.0856	−.0944	.2002	−.1183	.3344	−.1330	.4794	−.1385
25	.393	.410	.0192	.1612	.0909	.0898	.1660	.0199	.2381	−.0650	.3147	−.1122	.4170	−.1323	.5479	−.1395
26	.406	.462	.0228	.1913	.1088	.1087	.1946	.0238	.2812	−.0693	.3718	−.1149	.4726	−.1331	.5927	−.1396
27	.419	.515	.0114	.2240	.1325	.1324	.2271	.0095	.3187	−.0832	.4155	−.1195	.5143	−.1344	.6230	−.1406
28	.236	0.000	−.0356	.0616	.0035	.0056	.0601	−.0345	.1309	−.0631	.2220	−.0832	.3378	−.1007	.4762	−.1125
29	.236	.190	−.0544	.0635	.0001	.0053	.0613	−.0518	.1331	−.0808	.2251	−.1144	.3427	−.1345	.4849	−.1388
30	.236	.332	−.0618	.0582	−.0261	−.0215	.0494	−.0584	.1354	−.0945	.2336	−.1207	.3530	−.1344	.4979	−.1394
31	.236	.427	−.0718	.0204	−.0358	−.0337	.0180	−.0692	.1064	−.0996	.2298	−.1225	.3606	−.1332	.5070	−.1400
32	.236	.498	−.0697	−.0036	−.0371	−.0388	−.0016	−.0687	.0585	−.1070	.1794	−.1265	.3240	−.1336	.4892	−.1397
33	.245	.557	.0206	.1611	.0976	.0940	.1708	.0222	.2353	−.0704	.3090	−.1156	.4142	−.1316	.5561	−.1383
34	.259	.610	.0214	.1944	.1170	.1131	.2042	.0193	.2845	−.0758	.3656	−.1183	.4644	−.1312	.5938	−.1377
35	.272	.663	.0055	.2291	.1402	.1373	.2388	.0012	.3266	−.0893	.4115	−.1237	.5034	−.1329	.6187	−.1377
36	.147	0.000	−.0370	.0610	.0041	.0062	.0585	−.0357	.1288	−.0638	.2214	−.0833	.3341	−.1008	.4744	−.1127
37	.147	.222	−.0565	.0626	.0035	.0062	.0620	−.0539	.1335	−.0824	.2253	−.1196	.3433	−.1344	.4867	−.1379
38	.147	.389	−.0666	.0611	−.0266	−.0200	.0548	−.0641	.1404	−.0990	.2355	−.1217	.3538	−.1326	.4989	−.1382
39	.147	.500	−.0739	.0185	−.0363	−.0345	.0159	−.0708	.1186	−.1015	.2415	−.1198	.3648	−.1301	.5111	−.1364
40	.147	.583	−.0661	−.0055	−.0370	−.0369	−.0008	−.0632	.0608	−.0949	.1859	−.1111	.3364	−.1183	.4992	−.1222
41	.157	.646	.0221	.1593	.1014	.0950	.1723	.0226	.2351	−.0719	.3086	−.1153	.4198	−.1292	.5624	−.1353
42	.170	.698	.0188	.1957	.1217	.1157	.2079	.0151	.2839	−.0791	.3639	−.1209	.4669	−.1319	.5965	−.1366
43	.183	.751	.0025	.2315	.1445	.1401	.2425	−.0024	.3271	−.0935	.4095	−.1257	.5042	−.1331	.6183	−.1373
44	.118	.750	.0160	.1938	.1214	.1152	.2065	.0122	.2808	−.0756	.3611	−.1147	.4685	−.1281	.5973	−.1324
45	.088	0.000	−.1149	−.0702	−.0954	−.0911	−.0710	−.1112	−.0409	−.1180	−.0017	−.1280	.0505	−.1361	.1213	−.1409
46	.088	.236	−.1178	−.0756	−.1015	−.0971	−.0766	−.1140	−.0458	−.1196	−.0039	−.1284	.0520	−.1365	.1202	−.1381
47	.088	.412	−.1106	−.0788	−.1109	−.1048	−.0806	−.1115	−.0466	−.1121	−.0039	−.1241	.0527	−.1339	.1212	−.1373
48	.088	.530	−.1092	−.0956	−.1061	−.1052	−.0992	−.1108	−.0548	−.1090	−.0054	−.1211	.0508	−.1318	.1235	−.1364
49	.088	.619	−.1086	−.1095	−.1067	−.1062	−.1076	−.1142	−.0804	−.1089	−.0188	−.1212	.0566	−.1321	.1378	−.1358
50	.088	.846	−.0014	.2328	.1475	.1417	.2446	−.0054	.3255	−.0916	.4049	−.1189	.5014	−.1297	.6160	−.1325
51	.059	0.000	−.1153	−.0858	−.1061	−.1038	−.0853	−.1145	−.0591	−.1133	−.0236	−.1224	.0335	−.1309	.1068	−.1364
52	.059	.236	−.1122	−.0875	−.1076	−.1058	−.0871	−.1144	−.0602	−.1131	−.0214	−.1268	.0326	−.1370	.1036	−.1380
53	.059	.412	−.1051	−.0905	−.0999	−.1028	−.0908	−.1072	−.0600	−.1101	−.0207	−.1234	.0360	−.1328	.1078	−.1359
54	.059	.530	−.1041	−.0990	−.0964	−.0981	−.1006	−.1066	−.0614	−.1078	−.0182	−.1208	.0403	−.1310	.1151	−.1343
55	.059	.619	−.1070	−.1091	−.0984	−.0996	−.1072	−.1096	−.0761	−.1087	−.0139	−.1212	.0573	−.1321	.1363	−.1351
56	.059	.714	−.1051	−.1007	−.1056	−.1050	−.0965	−.1116	−.0804	−.1048	−.0556	−.1171	.0051	−.1270	.0864	−.1298
57	.029	0.000	−.1102	−.0923	−.1117	−.1091	−.0931	−.1101	−.0663	−.1119	−.0297	−.1218	.0263	−.1300	.0988	−.1353
58	.029	.236	−.1087	−.0935	−.1104	−.1103	−.0932	−.1105	−.0653	−.1117	−.0270	−.1259	.0270	−.1353	.0986	−.1369
59	.029	.412	−.1070	−.0955	−.0998	−.0998	−.0965	−.1071	−.0657	−.1103	−.0254	−.1243	.0300	−.1339	.1021	−.1358
60	.029	.530	−.1054	−.0980	−.0966	−.0975	−.0989	−.1072	−.0625	−.1087	−.0205	−.1225	.0363	−.1323	.1103	−.1346
61	.029	.619	−.1086	−.1041	−.0995	−.0979	−.1013	−.1093	−.0731	−.1085	−.0108	−.1219	.0516	−.1329	.1299	−.1347
62	.029	.714	−.1092	−.1108	−.1019	−.0999	−.1079	−.1092	−.0930	−.1072	−.0466	−.1214	.0216	−.1317	.1045	−.1341
63	.029	.809	−.1086	−.0928	−.1101	−.1093	−.0902	−.1093	−.0665	−.1068	−.0389	−.1211	.0030	−.1308	.0570	−.1327
64	.383	−.305	−.0659	.0195	−.0344	−.0311	.0174	−.0637	.0885	−.0895	.1999	−.1115	.3257	−.1236	.4752	−.1293
65	.147	−.583														

TABLE VII.—Continued
(c) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000		−.0947	.9588		1.1347	−.1110	1.3072		1.4711	−.1214	1.6124		1.7198	−.1252
2	.868	0.000		−.0949	.9597		1.1357	−.1193	1.3082		1.4634	−.1273	1.5972		1.6968	−.1347
3	.881	.053		−.1333	.9498		1.1145	−.1411	1.2761		1.4224	−.1437	1.5469		1.6406	−.1404
4	.802	0.000		−.0958	.9563		1.1332	−.1196	1.3006		1.4385	−.1316	1.5749		1.6723	−.1360
5	.764	.039		−.1300	.9516		1.1222	−.1376	1.2605		1.3975	−.1400	1.5425		1.6452	−.1390
6	.777	.091		−.1368	.9471		1.1138	−.1433	1.2615		1.3892	−.1439	1.5214		1.6148	−.1401
7	.790	.144		−.1399	.9404		1.0936	−.1440	1.2316		1.3443	−.1442	1.4566		1.5353	−.1406
8	.707	0.000		−.1209	.7959		.9652	−.1336	1.1401		1.3300	−.1372	1.5021		1.6215	−.1378
9	.648	0.000		−.1229	.7895		.9613	−.1353	1.1463		1.3334	−.1381	1.4955		1.6091	−.1377
10	.648	.068		−.1377	.7763		.9550	−.1423	1.1435		1.3332	−.1415	1.4938		1.6070	−.1390
11	.658	.144		−.1408	.8578		1.0143	−.1450	1.1825		1.3500	−.1440	1.4909		1.5850	−.1401
12	.671	.197		−.1414	.9022		1.0402	−.1442	1.1884		1.3370	−.1431	1.4639		1.5448	−.1397
13	.684	.250		−.1421	.9170		1.0359	−.1448	1.1602		1.2865	−.1433	1.3930		1.4585	−.1395
14	.530	0.000		−.1234	.7861		.9660	−.1359	1.1543		1.3331	−.1373	1.4726		1.5761	−.1375
15	.530	.082		−.1379	.7899		.9700	−.1419	1.1571		1.3342	−.1403	1.4728		1.5747	−.1385
16	.530	.143		−.1431	.7919		.9732	−.1447	1.1599		1.3359	−.1426	1.4714		1.5712	−.1393
17	.530	.184		−.1434	.7871		.9719	−.1448	1.1599		1.3349	−.1430	1.4692		1.5662	−.1395
18	.540	.263		−.1439	.8440		1.0122	−.1448	1.1815		1.3364	−.1430	1.4553		1.5332	−.1394
19	.553	.315		−.1443	.8715		1.0237	−.1443	1.1770		1.3164	−.1427	1.4232		1.4902	−.1393
20	.566	.368		−.1441	.8757		1.0069	−.1444	1.1396		1.2575	−.1428	1.3470		1.4021	−.1391
21	.383	0.000		−.1246	.7901		.9703	−.1352	1.1545		1.3222	−.1374	1.4328		1.5208	−.1380
22	.383	.136		−.1425	.7955		.9747	−.1426	1.1580		1.3239	−.1419	1.4330		1.5202	−.1393
23	.383	.238		−.1451	.8058		.9829	−.1451	1.1630		1.3262	−.1445	1.4320		1.5151	−.1409
24	.383	.305		−.1422	.8121		.9895	−.1429	1.1667		1.3267	−.1426	1.4304		1.5105	−.1393
25	.393	.410		−.1431	.8564		1.0189	−.1430	1.1772		1.3174	−.1426	1.4062		1.4665	−.1389
26	.406	.462		−.1420	.8736		1.0216	−.1427	1.1650		1.2914	−.1421	1.3711		1.4253	−.1379
27	.419	.515		−.1424	.8687		.9966	−.1426	1.1199		1.2269	−.1419	1.2942		1.3388	−.1381
28	.236	0.000		−.1235	.7952		.9743	−.1354	1.1560		1.2847	−.1383	1.3517		1.4174	−.1370
29	.236	.190		−.1429	.8031		.9811	−.1429	1.1609		1.2880	−.1425	1.3537		1.4187	−.1389
30	.236	.332		−.1430	.8154		.9910	−.1429	1.1674		1.2919	−.1430	1.3552		1.4188	−.1386
31	.236	.427		−.1434	.8253		1.0004	−.1433	1.1725		1.2926	−.1430	1.3535		1.4148	−.1386
32	.236	.498		−.1416	.8279		1.0046	−.1428	1.1741		1.2901	−.1429	1.3476		1.4033	−.1383
33	.245	.557		−.1407	.8645		1.0228	−.1422	1.1758		1.2814	−.1424	1.3340		1.3795	−.1376
34	.259	.610		−.1399	.8762		1.0209	−.1413	1.1581		1.2547	−.1414	1.3038		1.3460	−.1368
35	.272	.663		−.1404	.8644		.9889	−.1413	1.1059		1.1892	−.1417	1.2316		1.2663	−.1367
36	.147	0.000		−.1237	.7912		.9658	−.1365	1.1333		1.1989	−.1384	1.2194		1.2556	−.1358
37	.147	.222		−.1410	.8040		.9757	−.1429	1.1412		1.2041	−.1422	1.2235		1.2590	−.1376
38	.147	.389		−.1414	.8158		.9882	−.1430	1.1502		1.2080	−.1428	1.2250		1.2596	−.1375
39	.147	.500		−.1398	.8261		.9973	−.1428	1.1542		1.2069	−.1427	1.2251		1.2601	−.1384
40	.147	.583		−.1244	.8317		1.0032	−.1263	1.1567		1.2039	−.1268	1.2209		1.2545	−.1244
41	.157	.646		−.1389	.8680		1.0244	−.1405	1.1656		1.2123	−.1411	1.2319		1.2606	−.1357
42	.170	.698		−.1412	.8785		1.0204	−.1421	1.1499		1.1975	−.1424	1.2193		1.2486	−.1367
43	.183	.751		−.1410	.8649		.9869	−.1423	1.0994		1.1421	−.1423	1.1623		1.1895	−.1357
44	.118	.750		−.1370	.8729		1.0053	−.1392	1.0894		1.0748	−.1394	1.0813		1.1410	−.1347
45	.088	0.000		−.1415	.2988		.3911	−.1422	.4586		.4631	−.1385	.4791		.6159	−.1366
46	.088	.236		−.1402	.2953		.3869	−.1437	.4527		.4559	−.1418	.4746		.6196	−.1383
47	.088	.412		−.1402	.2990		.3926	−.1444	.4561		.4579	−.1437	.4855		.6390	−.1387
48	.088	.530		−.1401	.3050		.3981	−.1434	.4574		.4604	−.1433	.5154		.6640	−.1382
49	.088	.619		−.1405	.3230		.4177	−.1435	.4765		.4873	−.1429	.5693		.6851	−.1374
50	.088	.846		−.1367	.8485		.9394	−.1392	.9509		.9375	−.1388	.9756		1.0818	−.1335
51	.059	0.000		−.1389	.2852		.3813	−.1414	.4572		.4786	−.1384	.5484		.6616	−.1364
52	.059	.236		−.1402	.2858		.3837	−.1441	.4578		.4811	−.1423	.5573		.6613	−.1379
53	.059	.412		−.1386	.2921		.3882	−.1429	.4584		.4865	−.1424	.5806		.6756	−.1368
54	.059	.530		−.1381	.2983		.3939	−.1420	.4627		.5009	−.1416	.6196		.8309	−.1358
55	.059	.619		−.1395	.3239		.4254	−.1432	.5009		.5515	−.1423	.6496		1.0640	−.1367
56	.059	.714		−.1349	.2619		.3809	−.1381	.5505		.6210	−.1367	.7669		1.0757	−.1310
57	.029	0.000		−.1383	.2787		.3781	−.1411	.4572		.4984	−.1371	.6022		.8166	−.1340
58	.029	.236		−.1388	.2799		.3795	−.1423	.4568		.5004	−.1401	.6099		.9402	−.1353
59	.029	.412		−.1390	.2854		.3817	−.1438	.4581		.5098	−.1427	.6343		1.0138	−.1361
60	.029	.530		−.1384	.2934		.3924	−.1429	.4714		.5366	−.1419	.6586		1.0285	−.1354
61	.029	.619		−.1392	.3182		.4238	−.1431	.5088		.5855	−.1421	.7430		1.0182	−.1360
62	.029	.714		−.1388	.3399		.4447	−.1426	.5342		.6242	−.1410	.7898		1.0118	−.1351
63	.029	.809		−.1379	.2221		.2889	−.1412	.3656		.4825	−.1394	.6757		1.0143	−.1337
64	.383	−.305		−.1326	.7979		.9766	−.1340	1.1557		1.3157	−.1339	1.4203		1.4979	−.1316
65	.147	−.583														

TABLE VII.—Continued
(d) M = 3.50

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.0220	.1304	.0654	.0671	.1302	.0248	.2190	−.0076	.3302	−.0282	.4592	−.0414	.6110	−.0497
2	.868	0.000	.0157	.1293	.0608	.0645	.1270	.0206	.2157	−.0115	.3288	−.0318	.4600	−.0456	.6119	−.0555
3	.881	.053	.0172	.1398	.0704	.0721	.1411	.0211	.2321	−.0197	.3441	−.0458	.4707	−.0621	.6183	−.0728
4	.802	0.000	.0147	.1282	.0596	.0635	.1259	.0190	.2141	−.0126	.3270	−.0324	.4599	−.0459	.6099	−.0559
5	.764	.039	.0142	.1262	.0593	.0620	.1256	.0172	.2143	−.0169	.3268	−.0455	.4589	−.0637	.6065	−.0742
6	.777	.091	.0162	.1364	.0672	.0695	.1364	.0196	.2260	−.0200	.3375	−.0478	.4679	−.0647	.6123	−.0755
7	.790	.144	.0210	.1598	.0861	.0862	.1627	.0231	.2556	−.0262	.3674	−.0536	.4929	−.0691	.6318	−.0777
8	.707	0.000	−.0197	.0636	.0128	.0172	.0594	−.0151	.1273	−.0405	.2153	−.0568	.3258	−.0670	.4552	−.0738
9	.648	0.000	−.0262	.0531	.0033	.0083	.0485	−.0219	.1167	−.0438	.2053	−.0581	.3187	−.0681	.4479	−.0752
10	.648	.068	−.0347	.0405	−.0072	−.0024	.0361	−.0306	.0996	−.0497	.1851	−.0646	.2941	−.0742	.4218	−.0795
11	.658	.144	.0126	.1328	.0650	.0657	.1326	.0146	.2215	−.0287	.3299	−.0557	.4549	−.0708	.5858	−.0795
12	.671	.197	.0184	.1494	.0780	.0784	.1505	.0204	.2423	−.0271	.3532	−.0548	.4802	−.0703	.6171	−.0788
13	.684	.250	.0265	.1772	.0992	.0990	.1796	.0268	.2752	−.0288	.3856	−.0582	.5083	−.0735	.6389	−.0807
14	.530	0.000	−.0300	.0471	−.0006	.0036	.0439	−.0263	.1131	−.0476	.2001	−.0593	.3127	−.0691	.4434	−.0757
15	.530	.082	−.0340	.0424	−.0052	−.0007	.0389	−.0298	.1092	−.0505	.1970	−.0663	.3104	−.0762	.4434	−.0815
16	.530	.143	−.0392	.0356	−.0125	−.0073	.0305	−.0350	.0978	−.0547	.1861	−.0695	.2962	−.0782	.4346	−.0831
17	.530	.184	−.0436	.0252	−.0190	−.0146	.0209	−.0400	.0830	−.0579	.1677	−.0710	.2796	−.0785	.4167	−.0832
18	.540	.263	.0227	.1423	.0733	.0736	.1434	.0165	.2311	−.0317	.3312	−.0598	.4404	−.0745	.5451	−.0819
19	.553	.315	.0220	.1621	.0886	.0884	.1637	.0235	.2579	−.0303	.3653	−.0597	.4870	−.0751	.6084	−.0821
20	.566	.368	.0270	.1907	.1089	.1089	.1944	.0281	.2913	−.0312	.3986	−.0617	.5193	−.0773	.6406	−.0836
21	.383	0.000	−.0312	.0485	−.0016	.0030	.0436	−.0280	.1096	−.0478	.1982	−.0604	.3096	−.0696	.4441	−.0753
22	.383	.136	−.0373	.0467	−.0097	−.0054	.0416	−.0339	.1127	−.0554	.1995	−.0703	.3137	−.0786	.4454	−.0831
23	.383	.238	−.0428	.0325	−.0153	−.0106	.0286	−.0385	.0990	−.0597	.1977	−.0748	.3188	−.0815	.4529	−.0855
24	.383	.305	−.0450	.0265	−.0190	−.0145	.0232	−.0400	.0866	−.0607	.1688	−.0735	.2976	−.0793	.4406	−.0825
25	.393	.410	.0182	.1517	.0827	.0817	.1544	.0198	.2383	−.0330	.3262	−.0615	.4168	−.0761	.5306	−.0820
26	.406	.462	.0248	.1747	.0983	.0974	.1774	.0263	.2693	−.0312	.3702	−.0611	.4778	−.0764	.5857	−.0821
27	.419	.515	.0269	.2049	.1177	.1189	.2077	.0286	.3045	−.0343	.4075	−.0651	.5188	−.0789	.6242	−.0830
28	.236	0.000	−.0306	.0500	.0003	.0034	.0467	−.0280	.1119	−.0469	.1988	−.0597	.3117	−.0692	.4447	−.0751
29	.236	.190	−.0387	.0509	−.0086	−.0011	.0464	−.0347	.1156	−.0577	.2048	−.0725	.3176	−.0790	.4548	−.0828
30	.236	.332	−.0431	.0373	−.0159	−.0124	.0305	−.0395	.1103	−.0606	.2086	−.0725	.3260	−.0791	.4650	−.0830
31	.236	.427	−.0461	.0302	−.0171	−.0143	.0289	−.0431	.0897	−.0642	.1899	−.0738	.3258	−.0795	.4664	−.0832
32	.236	.498	−.0410	.0257	−.0103	−.0094	.0260	−.0390	.0725	−.0644	.1493	−.0761	.2804	−.0802	.4437	−.0833
33	.245	.557	.0210	.1592	.0897	.0883	.1630	.0210	.2404	−.0345	.3181	−.0629	.4050	−.0772	.5317	−.0819
34	.259	.610	.0261	.1831	.1052	.1038	.1874	.0262	.2763	−.0329	.3686	−.0624	.4623	−.0769	.5784	−.0810
35	.272	.663	.0277	.2139	.1239	.1250	.2178	.0271	.3130	−.0370	.4107	−.0667	.5076	−.0793	.6122	−.0819
36	.147	0.000	−.0307	.0515	0.0000	.0038	.0469	−.0276	.1113	−.0467	.2008	−.0592	.3099	−.0683	.4429	−.0741
37	.147	.222	−.0214	.0523	−.0045	.0012	.0476	−.0382	.1151	−.0605	.2043	−.0727	.3164	−.0791	.4551	−.0828
38	.147	.389	−.0454	.0417	−.0171	−.0139	.0344	−.0429	.1146	−.0627	.2111	−.0722	.3251	−.0791	.4654	−.0831
39	.147	.500	−.0441	.0298	−.0153	−.0122	.0284	−.0405	.0901	−.0637	.2013	−.0721	.3328	−.0783	.4755	−.0840
40	.147	.583	−.0260	.0242	−.0037	−.0013	.0240	−.0246	.0738	−.0469	.1547	−.0557	.2905	−.0599	.4542	−.0630
41	.157	.646	.0224	.1625	.0932	.0910	.1672	.0216	.2412	−.0338	.3155	−.0617	.4040	−.0751	.5363	−.0800
42	.170	.698	.0270	.1885	.1091	.1075	.1925	.0263	.2803	−.0341	.3685	−.0647	.4585	−.0776	.5812	−.0820
43	.183	.751	.0273	.2196	.1266	.1279	.2237	.0258	.3174	−.0390	.4110	−.0690	.5022	−.0799	.6117	−.0832
44	.118	.750	.0246	.1885	.1075	.1079	.1913	.0287	.2780	−.0311	.3635	−.0604	.4546	−.0731	.5795	−.0787
45	.088	0.000	−.0668	−.0421	−.0584	−.0556	−.0443	−.0684	−.0191	−.0706	.0175	−.0771	.0591	−.0834	.1190	−.0884
46	.088	.236	−.0641	−.0483	−.0649	−.0615	−.0508	−.0669	−.0249	−.0689	.0128	−.0749	.0638	−.0812	.1276	−.0865
47	.088	.412	−.0607	−.0526	−.0678	−.0672	−.0541	−.0645	−.0271	−.0659	.0115	−.0736	.0643	−.0800	.1279	−.0858
48	.088	.530	−.0603	−.0599	−.0673	−.0687	−.0601	−.0643	−.0381	−.0652	.0055	−.0731	.0616	−.0791	.1269	−.0847
49	.088	.619	−.0609	−.0631	−.0697	−.0712	−.0622	−.0657	−.0473	−.0661	−.0127	−.0734	.0537	−.0797	.1318	−.0854
50	.088	.846	.0252	.2223	.1268	.1298	.2256	.0276	.3179	−.0382	.4070	−.0667	.4953	−.0751	.6089	−.0795
51	.059	0.000	−.0640	−.0541	−.0664	−.0664	−.0542	−.0696	−.0342	−.0690	−.0039	−.0754	.0422	−.0814	.1067	−.0863
52	.059	.236	−.0599	−.0564	−.0676	−.0690	−.0555	−.0660	−.0347	−.0686	−.0029	−.0754	.0429	−.0817	.1061	−.0869
53	.059	.412	−.0570	−.0582	−.0575	−.0614	−.0596	−.0616	−.0372	−.0645	−.0044	−.0725	.0447	−.0787	.1089	−.0842
54	.059	.530	−.0548	−.0623	−.0554	−.0600	−.0618	−.0601	−.0426	−.0633	−.0048	−.0716	.0457	−.0775	.1153	−.0829
55	.059	.619	−.0576	−.0647	−.0591	−.0628	−.0645	−.0623	−.0490	−.0652	−.0122	−.0729	.0547	−.0793	.1311	−.0848
56	.059	.714	−.0535	−.0556	−.0596	−.0654	−.0514	−.0607	−.0382	−.0622	−.0216	−.0685	.0122	−.0748	.0814	−.0801
57	.029	0.000	−.0637	−.0588	−.0712	−.0702	−.0595	−.0674	−.0420	−.0680	−.0134	−.0747	.0353	−.0805	.1018	−.0856
58	.029	.236	−.0604	−.0607	−.0639	−.0695	−.0601	−.0651	−.0414	−.0676	−.0111	−.0749	.0343	−.0807	.0995	−.0856
59	.029	.412	−.0601	−.0623	−.0596	−.0614	−.0654	−.0627	−.0447	−.0660	−.0124	−.0739	.0367	−.0801	.1033	−.0858
60	.029	.530	−.0578	−.0624	−.0566	−.0596	−.0605	−.0614	−.0446	−.0643	−.0085	−.0729	.0406	−.0789	.1104	−.0845
61	.029	.619	−.0603	−.0616	−.0598	−.0603	−.0629	−.0619	−.0513	−.0655	−.0122	−.0735	.0520	−.0795	.1269	−.0849
62	.029	.714	−.0617	−.0642	−.0630	−.0638	−.0653	−.0632	−.0545	−.0660	−.0345	−.0734	.0223	−.0794	.0999	−.0850
63	.029	.809	−.0634	−.0542	−.0681	−.0674	−.0539	−.0654	−.0327	−.0666	−.0079	−.0741	.0256	−.0796	.0776	−.0828
64	.383	−.305	−.0377	.0265	−.0164	−.0103	.0232	−.0341	.0875	−.0536	.1729	−.0639	.2939	−.0685	.4390	−.0716
65	.147	−.583														

TABLE VII.—Continued
(d) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		59.9	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.7768	−.0553	.9556		1.1391	−.0603	1.3207		1.4846	−.0635	1.6399		1.7604	−.0663
2	.868	0.000	.7757	−.0630	.9555		1.1380	−.0714	1.3215		1.4862	−.0779	1.6298		1.7423	−.0789
3	.881	.053	.7775	−.0788	.9472		1.1203	−.0833	1.2933		1.4457	−.0850	1.5823		1.6853	−.0830
4	.802	0.000	.7732	−.0637	.9511		1.1319	−.0730	1.3170		1.4719	−.0776	1.6072		1.7212	−.0787
5	.764	.039	.7688	−.0804	.9438		1.1213	−.0840	1.3005		1.4236	−.0838	1.5700		1.6938	−.0821
6	.777	.091	.7707	−.0810	.9402		1.1135	−.0852	1.2900		1.4207	−.0849	1.5536		1.6642	−.0821
7	.790	.144	.7814	−.0826	.9401		1.0990	−.0855	1.2598		1.3817	−.0845	1.4957		1.5870	−.0822
8	.707	0.000	.6067	−.0782	.7750		.9518	−.0817	1.1335		1.3259	−.0828	1.5156		1.6613	−.0813
9	.648	0.000	.5992	−.0793	.7651		.9425	−.0832	1.1352		1.3337	−.0834	1.5158		1.6522	−.0810
10	.648	.068	.5767	−.0825	.7490		.9320	−.0849	1.1302		1.3318	−.0833	1.5153		1.6511	−.0812
11	.658	.144	.7180	−.0839	.8550		1.0114	−.0866	1.1847		1.3632	−.0851	1.5218		1.6396	−.0828
12	.671	.197	.7656	−.0834	.9116		1.0506	−.0856	1.2011		1.3597	−.0841	1.5005		1.6023	−.0819
13	.684	.250	.7795	−.0838	.9226		1.0577	−.0857	1.1845		1.3185	−.0841	1.4346		1.5182	−.0820
14	.530	0.000	.5939	−.0798	.7599		.9432	−.0818	1.1401		1.3360	−.0830	1.5042		1.6225	−.0812
15	.530	.082	.5949	−.0843	.7623		.9464	−.0848	1.1436		1.3389	−.0837	1.5058		1.6222	−.0816
16	.530	.143	.5909	−.0854	.7620		.9495	−.0863	1.1480		1.3420	−.0847	1.5058		1.6199	−.0824
17	.530	.184	.5771	−.0851	.7539		.9459	−.0863	1.1478		1.3415	−.0849	1.5047		1.6151	−.0823
18	.540	.263	.6739	−.0842	.8245		.9991	−.0861	1.1838		1.3558	−.0850	1.4973		1.5918	−.0824
19	.553	.315	.7295	−.0844	.8625		1.0210	−.0860	1.1904		1.3438	−.0847	1.4670		1.5517	−.0826
20	.566	.368	.7611	−.0848	.8771		1.0143	−.0866	1.1625		1.2928	−.0850	1.3954		1.4652	−.0824
21	.383	0.000	.5958	−.0781	.7636		.9448	−.0826	1.1344		1.3259	−.0836	1.4767		1.5694	−.0818
22	.383	.136	.5980	−.0848	.7683		.9495	−.0861	1.1392		1.3293	−.0854	1.4789		1.5713	−.0825
23	.383	.238	.6042	−.0876	.7768		.9593	−.0884	1.1472		1.3345	−.0877	1.4795		1.5689	−.0847
24	.383	.305	.6043	−.0845	.7822		.9665	−.0853	1.1528		1.3389	−.0851	1.4779		1.5631	−.0825
25	.393	.410	.6721	−.0844	.8345		1.0057	−.0852	1.1779		1.3406	−.0849	1.4590		1.5309	−.0822
26	.406	.462	.7123	−.0835	.8606		1.0175	−.0847	1.1748		1.3205	−.0844	1.4254		1.4904	−.0814
27	.419	.515	.7357	−.0845	.8659		1.0033	−.0851	1.1394		1.2626	−.0846	1.3505		1.4037	−.0815
28	.236	0.000	.5982	−.0803	.7655		.9447	−.0832	1.1285		1.3152	−.0837	1.4176		1.4767	−.0816
29	.236	.190	.6110	−.0850	.7719		.9516	−.0852	1.1349		1.3194	−.0852	1.4202		1.4786	−.0823
30	.236	.332	.6210	−.0847	.7841		.9619	−.0856	1.1441		1.3261	−.0855	1.4212		1.4782	−.0827
31	.236	.427	.6248	−.0851	.7953		.9718	−.0860	1.1516		1.3293	−.0860	1.4197		1.4742	−.0826
32	.236	.498	.6183	−.0848	.7957		.9758	−.0854	1.1555		1.3305	−.0854	1.4139		1.4636	−.0825
33	.245	.557	.6839	−.0837	.8423		1.0046	−.0845	1.1671		1.3254	−.0845	1.3994		1.4459	−.0818
34	.259	.610	.7175	−.0828	.8629		1.0107	−.0839	1.1568		1.3010	−.0841	1.3685		1.4113	−.0805
35	.272	.663	.7345	−.0833	.8604		.9892	−.0837	1.1142		1.2391	−.0837	1.2942		1.3303	−.0807
36	.147	0.000	.5970	−.0767	.7633		.9354	−.0823	1.1135		1.2731	−.0829	1.3067		1.3247	−.0804
37	.147	.222	.6142	−.0848	.7774		.9459	−.0854	1.1238		1.2801	−.0848	1.3106		1.3290	−.0818
38	.147	.389	.6252	−.0844	.7866		.9591	−.0853	1.1345		1.2871	−.0852	1.3131		1.3311	−.0821
39	.147	.500	.6322	−.0839	.7962		.9685	−.0849	1.1407		1.2896	−.0849	1.3099		1.3272	−.0835
40	.147	.583	.6258	−.0644	.7992		.9750	−.0650	1.1448		1.2890	−.0656	1.3033		1.3201	−.0650
41	.157	.646	.6900	−.0815	.8482		1.0056	−.0828	1.1607		1.2955	−.0827	1.3119		1.3317	−.0798
42	.170	.698	.7218	−.0841	.8660		1.0094	−.0847	1.1502		1.2766	−.0842	1.2951		1.3169	−.0811
43	.183	.751	.7360	−.0841	.8612		.9848	−.0849	1.1051		1.2169	−.0843	1.2344		1.2555	−.0809
44	.118	.750	.7204	−.0807	.8634		1.0016	−.0817	1.1304		1.1902	−.0811	1.1596		1.1789	−.0789
45	.088	0.000	.2033	−.0872	.2965		.3979	−.0863	.4924		.5522	−.0846	.5478		.5879	−.0823
46	.088	.236	.2064	−.0867	.2933		.3939	−.0871	.4875		.5442	−.0859	.5404		.5896	−.0842
47	.088	.412	.2065	−.0859	.2988		.4001	−.0867	.4934		.5448	−.0862	.5445		.6286	−.0842
48	.088	.530	.2098	−.0851	.3053		.4063	−.0854	.4980		.5437	−.0852	.5495		.6843	−.0834
49	.088	.619	.2230	−.0852	.3203		.4248	−.0860	.5175		.5634	−.0855	.5857		.7025	−.0834
50	.088	.846	.7315	−.0811	.8525		.9650	−.0822	1.0403		1.0321	−.0809	1.0262		1.0891	−.0781
51	.059	0.000	.1913	−.0861	.2836		.3847	−.0858	.4827		.5485	−.0847	.5810		.6944	−.0826
52	.059	.236	.1885	−.0870	.2821		.3870	−.0875	.4839		.5488	−.0860	.5855		.7068	−.0843
53	.059	.412	.1931	−.0845	.2905		.3916	−.0850	.4868		.5490	−.0843	.5957		.7262	−.0823
54	.059	.530	.2038	−.0833	.2968		.3975	−.0835	.4926		.5538	−.0830	.6189		.7351	−.0813
55	.059	.619	.2206	−.0847	.3176		.4229	−.0854	.5257		.5940	−.0844	.6730		.7941	−.0825
56	.059	.714	.1736	−.0801	.2698		.3683	−.0800	.5148		.6445	−.0779	.7553		.8478	−.0761
57	.029	0.000	.1848	−.0850	.2773		.3773	−.0852	.4769		.5505	−.0829	.6144		.7549	−.0804
58	.029	.236	.1829	−.0861	.2769		.3798	−.0860	.4778		.5497	−.0838	.6190		.7651	−.0819
59	.029	.412	.1878	−.0857	.2836		.3826	−.0859	.4809		.5518	−.0844	.6330		.7871	−.0829
60	.029	.530	.1974	−.0846	.2904		.3913	−.0850	.4916		.5658	−.0836	.6669		.8404	−.0816
61	.029	.619	.2149	−.0850	.3104		.4176	−.0852	.5252		.6059	−.0836	.7186		.9850	−.0822
62	.029	.714	.1958	−.0849	.3179		.4406	−.0854	.5495		.6345	−.0831	.7678		.9782	−.0815
63	.029	.809	.1382	−.0839	.2200		.3198	−.0844	.3836		.4617	−.0814	.6381		.9075	−.0802
64	.383	−.305	.5991	−.0729	.7722		.9535	−.0741	1.1368		1.3222	−.0743	1.4620		1.5463	−.0725
65	.147	−.583														

TABLE VII.–Continued
(e) M = 4.60

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.0426	.1289	.0621	.0791	.1201	.0439	.2114	.0230	.3158	.0121	.4493	.0034	.6026	.0008
2	.868	0.000	.0281	.1262	.0527	.0707	.1144	.0330	.2061	.0093	.3133	−.0045	.4462	−.0141	.6038	−.0182
3	.881	.053	.0298	.1362	.0606	.0760	.1287	.0336	.2211	.0063	.3269	−.0089	.4586	−.0191	.6099	−.0221
4	.802	0.000	.0263	.1245	.0519	.0678	.1140	.0306	.2043	.0073	.3121	−.0060	.4442	−.0155	.6017	−.0196
5	.764	.039	.0541	.1225	.0592	.0660	.1116	.0285	.2041	.0041	.3108	−.0100	.4424	−.0199	.5977	−.0233
6	.777	.091	.0284	.1320	.0584	.0722	.1246	.0308	.2148	.0046	.3217	−.0105	.4513	−.0201	.6045	−.0238
7	.790	.144	.0332	.1554	.0742	.0871	.1499	.0370	.2434	.0055	.3495	−.0101	.4776	−.0205	.6254	−.0243
8	.707	0.000	.0074	.0693	.0207	.0347	.0592	.0102	.1227	−.0063	.2009	−.0156	.3044	−.0226	.4369	−.0249
9	.648	0.000	.0013	.0563	.0127	.0254	.0468	.0035	.1086	−.0101	.1882	−.0182	.2925	−.0239	.4269	−.0262
10	.648	.068	−.0017	.0473	.0073	.0183	.0394	−.0002	.0963	−.0120	.1713	−.0181	.2716	−.0239	.4013	−.0258
11	.658	.144	.0230	.1281	.0563	.0676	.1223	.0257	.2095	−.0014	.3143	−.0158	.4395	−.0241	.5869	−.0270
12	.671	.197	.0287	.1446	.0671	.0797	.1382	.0325	.2296	.0027	.3347	−.0127	.4611	−.0220	.6115	−.0258
13	.684	.250	.0779	.1707	.0889	.0958	.1651	.0392	.2598	.0061	.3668	−.0104	.4922	−.0192	.6367	−.0225
14	.530	0.000	−.0038	.0491	.0079	.0188	.0414	−.0021	.1008	−.0145	.1813	−.0216	.2867	−.0263	.4211	−.0277
15	.530	.082	−.0049	.0471	.0058	.0180	.0386	−.0023	.0994	−.0147	.1756	−.0213	.2818	−.0255	.4185	−.0270
16	.530	.143	−.0078	.0420	.0019	.0131	.0336	−.0060	.0916	−.0172	.1708	−.0237	.2726	−.0273	.4092	−.0286
17	.530	.184	−.0088	.0399	.0013	.0122	.0323	−.0069	.0879	−.0181	.1585	−.0239	.2557	−.0275	.3891	−.0290
18	.540	.263	.0269	.1378	.0632	.0743	.1313	.0283	.2194	−.0006	.3202	−.0151	.4372	−.0236	.5634	−.0273
19	.553	.315	.0297	.1566	.0752	.0864	.1505	.0336	.2419	.0015	.3466	−.0141	.4708	−.0233	.6125	−.0266
20	.566	.368	.0348	.1816	.0844	.0992	.1748	.0385	.2736	.0056	.3804	−.0121	.5025	−.0227	.6416	−.0274
21	.383	0.000	−.0069	.0439	.0050	.0146	.0373	−.0050	.0993	−.0175	.1793	−.0237	.2866	−.0270	.4222	−.0281
22	.383	.136	−.0082	.0413	.0024	.0127	.0337	−.0064	.0935	−.0177	.1779	−.0234	.2855	−.0270	.4212	−.0291
23	.383	.238	−.0127	.0402	−.0017	.0098	.0314	−.0104	.0914	−.0223	.1695	−.0272	.2768	−.0309	.4169	−.0321
24	.383	.305	−.0081	.0419	.0016	.0152	.0328	−.0056	.0920	−.0181	.1652	−.0233	.2636	−.0265	.4094	−.0282
25	.393	.410	.0267	.1467	.0704	.0808	.1423	.0301	.2309	−.0009	.3257	−.0153	.4295	−.0244	.5321	−.0268
26	.406	.462	.0312	.1660	.0796	.0911	.1615	.0340	.2565	.0026	.3602	−.0132	.4760	−.0222	.5969	−.0266
27	.419	.515	.0345	.1909	.0869	.1011	.1844	.0383	.2893	.0051	.3947	−.0123	.5124	−.0234	.6359	−.0265
28	.236	0.000	−.0078	.0453	.0030	.0129	.0369	−.0064	.0981	−.0178	.1795	−.0226	.2885	−.0266	.4254	−.0286
29	.236	.190	−.0097	.0453	.0011	.0116	.0346	−.0075	.1007	−.0191	.1836	−.0236	.2932	−.0275	.4250	−.0286
30	.236	.332	−.0109	.0399	−.0001	.0102	.0335	−.0093	.0942	−.0199	.1814	−.0240	.2936	−.0269	.4337	−.0286
31	.236	.427	−.0104	.0441	.0033	.0125	.0380	−.0086	.0983	−.0204	.1722	−.0242	.2821	−.0277	.4267	−.0289
32	.236	.498	−.0052	.0507	.0116	.0199	.0464	−.0041	.0971	−.0184	.1588	−.0241	.2535	−.0269	.4057	−.0284
33	.245	.557	.0270	.1535	.0741	.0840	.1500	.0294	.2375	−.0010	.3280	−.0154	.4166	−.0235	.5207	−.0266
34	.259	.610	.0314	.1725	.0815	.0936	.1678	.0342	.2650	.0030	.3656	−.0125	.4712	−.0224	.5764	−.0252
35	.272	.663	.0362	.1976	.0883	.1025	.1899	.0389	.2967	.0055	.4027	−.0124	.5110	−.0227	.6194	−.0260
36	.147	0.000	−.0087	.0462	.0035	.0134	.0377	−.0070	.0994	−.0175	.1797	−.0220	.2875	−.0260	.4225	−.0280
37	.147	.222	−.0112	.0463	0.0000	.0100	.0371	−.0099	.1028	−.0198	.1850	−.0240	.2958	−.0275	.4328	−.0289
38	.147	.389	−.0123	.0397	−.0005	.0090	.0333	−.0107	.0983	−.0200	.1866	−.0240	.2991	−.0270	.4368	−.0287
39	.147	.500	−.0051	.0455	.0058	.0168	.0393	−.0069	.0986	−.0187	.1730	−.0232	.2919	−.0290	.4350	−.0273
40	.147	.583	.0229	.0561	.0286	.0382	.0541	.0210	.1027	.0097	.1590	.0047	.2604	.0004	.4158	.0001
41	.157	.646	.0286	.1567	.0748	.0860	.1529	.0309	.2413	.0015	.3266	−.0128	.4123	−.0214	.5212	−.0235
42	.170	.698	.0315	.1764	.0828	.0947	.1720	.0338	.2692	.0014	.3686	−.0145	.4689	−.0247	.5759	−.0268
43	.183	.751	.0348	.2007	.0886	.1021	.1925	.0375	.3026	.0041	.4068	−.0150	.5118	−.0253	.6153	−.0277
44	.118	.750	.0370	.1761	.0796	.0982	.1706	.0400	.2691	.0070	.3665	−.0097	.4650	−.0205	.5734	−.0221
45	.088	0.000	−.0198	−.0115	−.0186	−.0186	−.0098	−.0272	.0111	−.0263	.0382	−.0289	.0729	−.0337	.1223	−.0322
46	.088	.236	−.0230	−.0186	−.0249	−.0239	−.0183	−.0287	.0026	−.0272	.0289	−.0296	.0757	−.0342	.1326	−.0326
47	.088	.412	−.0209	−.0209	−.0235	−.0256	−.0186	−.0283	.0012	−.0265	.0286	−.0288	.0750	−.0334	.1331	−.0322
48	.088	.530	−.0202	−.0207	−.0226	−.0245	−.0186	−.0266	−.0015	−.0253	.0221	−.0274	.0683	−.0324	.1256	−.0308
49	.088	.619	−.0203	−.0213	−.0216	−.0248	−.0170	−.0285	−.0033	−.0264	.0158	−.0286	.0559	−.0329	.1215	−.0309
50	.088	.846	.0399	.2027	.0881	.1042	.1947	.0418	.3055	.0079	.4091	−.0099	.5097	−.0210	.6130	−.0231
51	.059	0.000	−.0205	−.0213	−.0224	−.0253	−.0176	−.0286	−.0015	−.0271	.0185	−.0295	.0527	−.0342	.1047	−.0327
52	.059	.236	−.0193	−.0250	−.0210	−.0283	−.0179	−.0298	−.0023	−.0282	.0203	−.0306	.0592	−.0351	.1108	−.0335
53	.059	.412	−.0158	−.0234	−.0165	−.0230	−.0179	−.0251	−.0029	−.0244	.0185	−.0265	.0586	−.0313	.1118	−.0300
54	.059	.530	−.0122	−.0224	−.0123	−.0214	−.0144	−.0226	−.0030	−.0226	.0159	−.0250	.0563	−.0295	.1148	−.0280
55	.059	.619	−.0177	−.0252	−.0191	−.0258	−.0194	−.0265	−.0071	−.0254	.0119	−.0277	.0526	−.0323	.1190	−.0308
56	.059	.714	−.0074	−.0127	−.0072	−.0171	−.0019	−.0207	.0114	−.0195	.0231	−.0209	.0430	−.0243	.0843	−.0224
57	.029	0.000	−.0221	−.0239	−.0249	−.0272	−.0218	−.0281	−.0089	−.0264	.0101	−.0288	.0445	−.0332	.0992	−.0318
58	.029	.236	−.0195	−.0259	−.0202	−.0265	−.0207	−.0278	−.0070	−.0270	.0130	−.0290	.0490	−.0337	.1013	−.0317
59	.029	.412	−.0206	−.0268	−.0207	−.0245	−.0239	−.0272	−.0123	−.0266	.0091	−.0289	.0468	−.0333	.1032	−.0320
60	.029	.530	−.0163	−.0255	−.0155	−.0225	−.0189	−.0249	−.0087	−.0245	.0108	−.0268	.0504	−.0318	.1095	−.0301
61	.029	.619	−.0210	−.0262	−.0211	−.0238	−.0239	−.0262	−.0140	−.0259	.0064	−.0282	.0483	−.0324	.1160	−.0311
62	.029	.714	−.0227	−.0254	−.0232	−.0259	−.0233	−.0277	−.0123	−.0264	−.0002	−.0286	.0280	−.0326	.0905	−.0308
63	.029	.809	−.0217	−.0186	−.0223	−.0237	−.0154	−.0278	.0029	−.0263	.0242	−.0282	.0535	−.0324	.0941	−.0305
64	.383	−.305	.0063	.0451	.0119	.0242	.0373	.0068	.0936	−.0033	.1659	−.0081	.2722	−.0112	.4118	−.0117
65	.147	−.583														

TABLE VII.—Concluded
(e) Concluded

			α =													
			30.0		35.1		40.0		45.0		50.0		55.0		60.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.7601	−.0011	.9343		1.1075	−.0033	1.2911		1.4671	−.0046	1.6295		1.7709	−.0050
2	.868	0.000	.7627	−.0204	.9338		1.1077	−.0226	1.2897		1.4629	−.0235	1.6174		1.7532	−.0237
3	.881	.053	.7626	−.0244	.9277		1.0926	−.0270	1.2629		1.4247	−.0279	1.5720		1.6980	−.0265
4	.802	0.000	.7620	−.0221	.9303		1.1068	−.0235	1.2807		1.4534	−.0255	1.5909		1.7243	−.0249
5	.764	.039	.7576	−.0254	.9243		1.0982	−.0281	1.2651		1.4129	−.0282	1.5447		1.6886	−.0274
6	.777	.091	.7594	−.0265	.9207		1.0907	−.0280	1.2535		1.4080	−.0282	1.5333		1.6651	−.0270
7	.790	.144	.7723	−.0263	.9250		1.0809	−.0284	1.2301		1.3705	−.0281	1.4818		1.5949	−.0269
8	.707	0.000	.5845	−.0263	.7486		.9208	−.0275	1.0955		1.2763	−.0278	1.4752		1.6461	−.0264
9	.648	0.000	.5752	−.0280	.7413		.9131	−.0282	1.0964		1.2877	−.0281	1.4818		1.6411	−.0267
10	.648	.068	.5507	−.0273	.7223		.8990	−.0287	1.0874		1.2824	−.0280	1.4799		1.6393	−.0263
11	.658	.144	.7284	−.0290	.8621		1.0013	−.0301	1.1517		1.3239	−.0294	1.4975		1.6352	−.0281
12	.671	.197	.7611	−.0278	.9130		1.0520	−.0292	1.1764		1.3261	−.0286	1.4814		1.6039	−.0275
13	.684	.250	.7771	−.0256	.9198		1.0602	−.0274	1.1681		1.2922	−.0270	1.4241		1.5248	−.0258
14	.530	0.000	.5744	−.0287	.7471		.9222	−.0297	1.1073		1.2990	−.0293	1.4783		1.6165	−.0278
15	.530	.082	.5737	−.0284	.7484		.9237	−.0295	1.1104		1.3013	−.0289	1.4808		1.6174	−.0278
16	.530	.143	.5666	−.0298	.7449		.9242	−.0305	1.1134		1.3048	−.0297	1.4839		1.6167	−.0282
17	.530	.184	.5498	−.0299	.7335		.9175	−.0308	1.1122		1.3053	−.0298	1.4839		1.6141	−.0282
18	.540	.263	.6790	−.0285	.8222		.9812	−.0302	1.1555		1.3283	−.0295	1.4855		1.5965	−.0279
19	.553	.315	.7448	−.0282	.8709		1.0095	−.0295	1.1656		1.3220	−.0286	1.4627		1.5587	−.0272
20	.566	.368	.7736	−.0290	.8940		1.0108	−.0296	1.1452		1.2783	−.0290	1.3952		1.4755	−.0271
21	.383	0.000	.5789	−.0299	.7531		.9299	−.0306	1.1160		1.2942	−.0301	1.4649		1.5742	−.0291
22	.383	.136	.5797	−.0303	.7562		.9339	−.0309	1.1212		1.2981	−.0302	1.4688		1.5764	−.0286
23	.383	.238	.5804	−.0335	.7616		.9429	−.0343	1.1300		1.3049	−.0332	1.4745		1.5776	−.0318
24	.383	.305	.5770	−.0292	.7634		.9481	−.0301	1.1375		1.3095	−.0294	1.4738		1.5729	−.0277
25	.393	.410	.6625	−.0283	.8266		.9968	−.0296	1.1669		1.3209	−.0285	1.4644		1.5463	−.0276
26	.406	.462	.7137	−.0276	.8607		1.0148	−.0282	1.1688		1.3071	−.0276	1.4328		1.5078	−.0261
27	.419	.515	.7476	−.0275	.8742		1.0084	−.0288	1.1405		1.2577	−.0279	1.3629		1.4242	−.0267
28	.236	0.000	.5800	−.0301	.7544		.9299	−.0305	1.1171		1.2931	−.0301	1.4256		1.4932	−.0288
29	.236	.190	.5818	−.0302	.7593		.9372	−.0306	1.1233		1.2972	−.0299	1.4308		1.4969	−.0287
30	.236	.332	.5894	−.0301	.7690		.9475	−.0303	1.1343		1.3054	−.0296	1.4355		1.4998	−.0282
31	.236	.427	.5945	−.0301	.7784		.9581	−.0307	1.1430		1.3111	−.0300	1.4367		1.4987	−.0286
32	.236	.498	.5835	−.0299	.7761		.9607	−.0297	1.1487		1.3139	−.0289	1.4328		1.4910	−.0276
33	.245	.557	.6676	−.0280	.8359		.9991	−.0281	1.1675		1.3133	−.0275	1.4191		1.4728	−.0264
34	.259	.610	.7123	−.0262	.8647		1.0122	−.0273	1.1629		1.2911	−.0268	1.3873		1.4376	−.0257
35	.272	.663	.7379	−.0270	.8708		.9980	−.0265	1.1284		1.2343	−.0262	1.3151		1.3586	−.0249
36	.147	0.000	.5756	−.0292	.7474		.9214	−.0303	1.1019		1.2679	−.0296	1.3411		1.3551	−.0287
37	.147	.222	.5852	−.0306	.7575		.9317	−.0304	1.1130		1.2752	−.0296	1.3464		1.3600	−.0284
38	.147	.389	.5938	−.0299	.7694		.9455	−.0303	1.1256		1.2853	−.0294	1.3502		1.3646	−.0277
39	.147	.500	.5968	−.0292	.7784		.9562	−.0327	1.1363		1.2919	−.0291	1.3487		1.3613	−.0277
40	.147	.583	.5919	−.0006	.7802		.9620	−.0022	1.1425		1.2930	−.0012	1.3418		1.3545	−.0007
41	.157	.646	.6744	−.0250	.8412		1.0045	−.0261	1.1632		1.2986	−.0257	1.3476		1.3662	−.0245
42	.170	.698	.7150	−.0285	.8669		1.0143	−.0286	1.1578		1.2782	−.0281	1.3287		1.3504	−.0269
43	.183	.751	.7410	−.0288	.8734		.9987	−.0289	1.1207		1.2212	−.0285	1.2654		1.2890	−.0267
44	.118	.750	.7150	−.0239	.8650		1.0105	−.0248	1.1447		1.2354	−.0244	1.2076		1.2122	−.0233
45	.088	0.000	.1990	−.0334	.2990		.4059	−.0361	.5164		.6017	−.0317	.6034		.6217	−.0298
46	.088	.236	.2061	−.0339	.2972		.4015	−.0373	.5102		.5925	−.0328	.5933		.6170	−.0310
47	.088	.412	.2063	−.0336	.3023		.4082	−.0364	.5166		.5952	−.0323	.5946		.6331	−.0304
48	.088	.530	.2052	−.0320	.3080		.4156	−.0351	.5218		.5952	−.0311	.5940		.6661	−.0292
49	.088	.619	.2128	−.0326	.3211		.4326	−.0353	.5399		.6141	−.0313	.6193		.7239	−.0294
50	.088	.846	.7366	−.0248	.8646		.9845	−.0255	1.0821		1.0986	−.0254	1.0561		1.1072	−.0235
51	.059	0.000	.1828	−.0337	.2828		.3883	−.0369	.4972		.5865	−.0325	.6082		.7002	−.0307
52	.059	.236	.1850	−.0348	.2841		.3915	−.0378	.4989		.5874	−.0334	.6113		.7110	−.0312
53	.059	.412	.1911	−.0311	.2917		.3970	−.0340	.5033		.5888	−.0299	.6165		.7360	−.0278
54	.059	.530	.1970	−.0292	.2983		.4038	−.0319	.5095		.5935	−.0279	.6292		.7739	−.0259
55	.059	.619	.2078	−.0321	.3150		.4248	−.0351	.5384		.6279	−.0311	.6760		.8128	−.0288
56	.059	.714	.1657	−.0240	.2740		.3851	−.0263	.5039		.6426	−.0221	.7294		.8168	−.0198
57	.029	0.000	.1766	−.0327	.2751		.3769	−.0354	.4860		.5820	−.0310	.6243		.7530	−.0287
58	.029	.236	.1781	−.0330	.2779		.3809	−.0363	.4876		.5816	−.0316	.6266		.7630	−.0295
59	.029	.412	.1835	−.0334	.2833		.3846	−.0360	.4924		.5841	−.0315	.6352		.7882	−.0291
60	.029	.530	.1918	−.0314	.2907		.3933	−.0344	.5029		.5954	−.0300	.6594		.8188	−.0277
61	.029	.619	.2020	−.0326	.3059		.4148	−.0348	.5318		.6299	−.0307	.7053		.8813	−.0282
62	.029	.714	.1848	−.0320	.3002		.4310	−.0352	.5569		.6588	−.0309	.7493		.9428	−.0286
63	.029	.809	.1538	−.0308	.2272		.3263	−.0338	.4291		.5044	−.0294	.6261		.8350	−.0272
64	.383	−.305	.5741	−.0127	.7538		.9345	−.0132	1.1205		1.2933	−.0131	1.4569		1.5575	−.0121
65	.147	−.583														

TABLE VIII.–PRESSURE COEFFICIENTS FOR MODEL 8
(a) M = 1.60

			α =													
			−4.8		2		5.3		10.2		15.3		20.3		25.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	.2055	.4613	.3407	.3050	.5031	.1690	.6965	.0667	.9167	−.0088	1.1216	−.0604	1.3018	−.1140
2	.894	0.000	.2003	.4571	.3385	.3041	.5006	.1681	.6895	.0654	.8672	−.0171	1.0210	−.0778	1.1849	−.1354
3	.841	0.000	.1956	.4507	.3335	.2996	.4939	.1655	.6754	.0627	.8014	−.0247	.9186	−.0885	1.0760	−.1499
4	.751	0.000	−.0624	.1264	.0401	.0114	.1506	−.0885	.2565	−.1663	.3768	−.2331	.5789	−.2807	.8203	−.3254
5	.813	.055	.1976	.4507	.3365	.2986	.4954	.1665	.6590	.0617	.7560	−.0288	.8583	−.0907	1.0176	−.1446
6	.850	.088	.2131	.4783	.3588	.3181	.5243	.1777	.7127	.0645	.8475	−.0266	.9764	−.2476	1.1317	−.3783
7	.887	.120	.2458	.5407	.4077	.3676	.5868	.2058	.7807	.0438	.9441	−.1632	1.0883	−.3411	1.2334	−.4582
8	.663	0.000	−.0663	.1234	.0363	.0059	.1480	−.0902	.2640	−.1644	.4182	−.2339	.6321	−.2803	.8302	−.3280
9	.663	.126	−.1324	.0354	−.0377	−.0674	.0553	−.1569	.1503	−.2286	.4214	−.2985	.6633	−.3393	.8432	−.3629
10	.663	.210	−.1757	−.0494	−.1058	−.1283	−.0201	−.1920	.0890	−.2497	.1900	−.3100	.4709	−.3577	.7447	−.4498
11	.690	.302	.2242	.4781	.3777	.3361	.5097	.1864	.6006	.0499	.6748	−.1430	.7869	−.2957	.9629	−.4201
12	.727	.334	.2561	.5555	.4305	.3841	.5994	.2149	.7250	.0260	.8187	−.1831	.9274	−.3392	1.0840	−.4684
13	.763	.367	.3057	.6471	.5050	.4529	.6947	.2591	.8445	−.0529	.9458	−.2706	1.0586	−.4080	1.1870	−.4617
14	.530	0.000	−.0708	.1178	.0325	−.0004	.1463	−.0919	.2713	−.1679	.4352	−.2383	.6405	−.2882	.7911	−.3353
15	.530	.246	−.1444	.0223	−.0482	−.0734	.0434	−.1705	.2922	−.2542	.4408	−.3200	.6458	−.3584	.8059	−.4522
16	.530	.410	−.1803	−.0597	−.1149	−.1318	−.0317	−.1994	.0900	−.2663	.2139	−.3632	.6646	−.4341	.8287	−.4855
17	.530	.492	−.1754	−.0894	−.1220	−.1348	−.0780	−.1933	.0134	−.2632	.1869	−.3734	.5076	−.4373	.7449	−.4872
18	.557	.567	.2509	.4861	.4022	.3662	.5081	.2126	.5909	.0030	.6601	−.1874	.7901	−.3211	.9373	−.4536
19	.594	.600	.2870	.5877	.4750	.4258	.6208	.2472	.7242	−.0224	.8096	−.2151	.9271	−.3742	1.0572	−.4743
20	.631	.632	.3416	.6960	.5608	.4985	.7380	.2156	.8572	−.1042	.9446	−.3070	1.0542	−.4313	1.1578	−.4763
21	.464	.753	.2572	.4769	.4113	.3727	.5031	.2192	.5758	−.0104	.6389	−.1912	.7456	−.3401	.8529	−.4629
22	.501	.786	.2973	.5868	.4939	.4410	.6230	.2566	.7175	−.0338	.7928	−.2215	.8898	−.3853	.9826	−.4794
23	.537	.819	.3383	.7054	.5831	.5120	.7485	.1845	.8558	−.1131	.9315	−.3177	1.0239	−.4437	1.0975	−.4849
24	.412	0.000	−.0727	.1089	.0223	−.0062	.1401	−.0955	.2754	−.1712	.4420	−.2415	.6327	−.2922	.7581	−.3388
25	.412	.354	−.1540	.0567	−.0420	−.0722	.0967	−.1850	.2840	−.2617	.4489	−.3228	.6312	−.3877	.7553	−.4516
26	.412	.589	−.1794	−.0449	−.1058	−.1255	−.0089	−.1984	.1128	−.2711	.4704	−.3735	.6398	−.4394	.7441	−.4901
27	.412	.707	−.1608	−.0854	−.1079	−.1345	−.0586	−.1939	.0167	−.2816	.1453	−.3749	.4590	−.4403	.6673	−.4861
28	.412	.823	−.1404	−.0610	−.0840	−.0961	−.0525	−.1585	−.0272	−.2760	.0029	−.3714	.1002	−.4440	.2852	−.5021
29	.412	.882	−.1409	−.0317	−.0638	−.0767	−.0190	−.1510	.0211	−.2855	.0674	−.3830	.1618	−.4570	.3035	−.5101
30	.412	.942	−.0259	.0249	.0208	.0098	.0444	−.0504	.1053	−.2466	.1767	−.3685	.2823	−.4592	.4163	−.5146
31	.309	0.000	−.0753	.1055	.0192	−.0070	.1374	−.0971	.2730	−.1753	.4317	−.2452	.5882	−.2953	.6996	−.3433
32	.309	.354	−.1242	.1051	−.0137	−.0493	.1453	−.1499	.2787	−.2427	.4406	−.3110	.5806	−.3675	.6905	−.4260
33	.309	.589	−.1803	.0062	−.0805	−.1119	.0486	−.2008	.2999	−.2702	.4198	−.3691	.5248	−.4347	.6477	−.4854
34	.309	.707	−.2179	−.0913	−.1487	−.1670	−.0604	−.2323	.0705	−.2992	.3172	−.3922	.4209	−.4481	.5949	−.4894
35	.309	.823	−.2049	−.1452	−.1656	−.1668	−.1188	−.2138	−.0519	−.2819	.1417	−.3615	.3981	−.4285	.6297	−.4814
36	.309	.882	−.0975	−.1040	−.1064	−.1078	−.0940	−.0842	−.0213	−.1960	.1580	−.3159	.4180	−.4069	.6121	−.4747
37	.309	.942	.0014	−.0021	.0366	.0551	−.0178	−.0198	.0115	−.1973	.1192	−.3421	.3541	−.4487	.5178	−.5074
38	.221	0.000	−.0774	.1029	.0175	−.0079	.1330	−.0977	.2723	−.1749	.4365	−.2463	.5598	−.2976	.6469	−.3465
39	.221	.354	−.0989	.1055	.0151	−.0236	.1403	−.1191	.2775	−.2090	.4214	−.2856	.5291	−.3476	.6322	−.4147
40	.221	.589	−.1932	.0149	−.0837	−.1130	.0534	−.2129	.2205	−.2769	.3362	−.3672	.4568	−.4184	.6163	−.4712
41	.221	.707	−.2115	−.0848	−.1411	−.1671	−.0386	−.2365	.1642	−.2936	.2734	−.3811	.4498	−.4216	.6006	−.4609
42	.221	.823	−.1449	−.1027	−.1512	−.1686	−.0826	−.1458	.0561	−.2196	.2962	−.3179	.4372	−.3904	.5356	−.4402
43	.221	.882	−.1005	−.0712	−.0725	−.0508	−.0629	−.1136	.0349	−.1972	.2894	−.2989	.4049	−.3925	.5015	−.4685
44	.221	.942	−.0699	−.0462	−.0473	−.0407	−.0494	−.0822	−.0109	−.2195	.2076	−.3744	.3392	−.4688	.4294	−.5108
45	.133	0.000	−.3293	−.2403	−.2785	−.2907	−.2211	−.3376	−.1579	−.3322	−.0785	−.4130	−.0390	−.3837	−.0163	−.3996
46	.133	.354	−.3393	−.2477	−.2901	−.3029	−.2314	−.3522	−.1647	−.3916	−.1016	−.4171	−.0544	−.4151	−.0181	−.4270
47	.133	.589	−.3694	−.2884	−.2583	−.2656	−.2624	−.3614	−.2076	−.3623	−.1460	−.3643	−.0719	−.3857	−.0285	−.4167
48	.133	.707	−.3613	−.3139	−.2621	−.2753	−.3014	−.3599	−.2188	−.3656	−.1415	−.3756	−.0722	−.3787	−.0441	−.4125
49	.133	.942	−.1047	−.0353	−.0612	−.0666	−.0310	−.1205	.0561	−.2527	.1872	−.4067	.2601	−.4810	.3067	−.4897
50	.088	0.000	−.2955	−.2482	−.2852	−.2976	−.2289	−.3000	−.1589	−.3285	−.0854	−.3779	−.0469	−.3852	−.0102	−.3981
51	.088	.354	−.3455	−.2565	−.2984	−.3104	−.2367	−.3586	−.1738	−.3638	−.1125	−.3755	−.0663	−.3839	−.0185	−.4140
52	.088	.589	−.3354	−.2897	−.2606	−.2666	−.2743	−.3333	−.2173	−.3423	−.1502	−.3483	−.0710	−.3859	−.0278	−.4129
53	.088	.707	−.3382	−.2765	−.2672	−.2785	−.2781	−.3417	−.2116	−.3567	−.1289	−.3584	−.0576	−.3649	−.0149	−.4078
54	.044	0.000	−.2911	−.2552	−.2618	−.2700	−.2376	−.3046	−.1687	−.3360	−.0988	−.3295	−.0569	−.3696	−.0106	−.3966
55	.044	.354	−.3224	−.2616	−.3000	−.3056	−.2438	−.3223	−.1840	−.3158	−.1266	−.3201	−.0754	−.3498	−.0180	−.3966
56	.044	.589	−.2799	−.2663	−.2659	−.2729	−.2804	−.2919	−.2252	−.3217	−.1496	−.3350	−.0739	−.3642	−.0265	−.4021
57	.044	.707	−.3045	−.2551	−.2712	−.2841	−.2509	−.3119	−.1920	−.3381	−.1124	−.3552	−.0392	−.3709	.0092	−.4115
58	.044	.823	−.3228	−.2558	−.3089	−.3096	−.2394	−.3208	−.1601	−.3624	−.0881	−.4253	−.0154	−.4328	.0412	−.4491
59	.412	−.707	−.1760	−.0863	−.1235	−.1338	−.0713	−.1901	0.0000	−.2825	.1600	−.3795	.4765	−.4482	.6619	−.4956
60	.221	−.707	−.2243	−.0810	−.1506	−.1669	−.0433	−.2359	.1686	−.2972	.2718	−.3843	.4414	−.4206	.6059	−.4703

TABLE VIII.—Continued
(a) Concluded

			α =													
			30.2		35.2		40.2		45.3		50.3		55.3		60.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	1.4462	−.2043	1.5320	−.3270	1.5756	−.4457	1.5822	−.4656	1.5668	−.4563	1.5363		1.4838	
2	.894	0.000	1.3356	−.2036	1.4469	−.2921	1.5226	−.3841	1.5629	−.4701	1.5823	−.4624	1.5832		1.5599	
3	.841	0.000	1.2333	−.2114	1.3614	−.2870	1.4560	−.3664	1.5187	−.4558	1.5615	−.4630	1.5849		1.5812	
4	.751	0.000	1.0253	−.3686	1.1865	−.4188	1.3139	−.4623	1.4112	−.4834	1.4842	−.4640	1.5402		1.5687	
5	.813	.055	1.1802	−.1877	1.3171	−.4439	1.4187	−.4543	1.4906	−.4667	1.5399	−.4622	1.5717		1.5760	
6	.850	.088	1.2771	−.4593	1.3906	−.4466	1.4714	−.4578	1.5202	−.4678	1.5506	−.4618	1.5639		1.5534	
7	.887	.120	1.3543	−.5000	1.4391	−.4474	1.4902	−.4591	1.5117	−.4680	1.5143	−.4619	1.5040		1.4751	
8	.663	0.000	.9942	−.3732	1.1343	−.4278	1.2506	−.4514	1.3450	−.4675	1.4243	−.4652	1.4904		1.5334	
9	.663	.126	.9914	−.4118	1.1327	−.4497	1.2509	−.4662	1.3460	−.4693	1.4221	−.4656	1.4900		1.5310	
10	.663	.210	.9749	−.4957	1.1342	−.4533	1.2565	−.4659	1.3529	−.4694	1.4284	−.4660	1.4904		1.5294	
11	.690	.302	1.1120	−.4900	1.2365	−.4551	1.3321	−.4652	1.4031	−.4692	1.4568	−.4652	1.4998		1.5191	
12	.727	.334	1.2082	−.4966	1.3091	−.4544	1.3805	−.4646	1.4315	−.4691	1.4652	−.4649	1.4879		1.4936	
13	.763	.367	1.2814	−.4947	1.3483	−.4539	1.3928	−.4641	1.4157	−.4691	1.4245	−.4645	1.4248		1.4105	
14	.530	0.000	.9255	−.3804	1.0479	−.3974	1.1534	−.4402	1.2455	−.4636	1.3278	−.4668	1.4053		1.4643	
15	.530	.246	.9414	−.4958	1.0622	−.4655	1.1636	−.4708	1.2533	−.4727	1.3332	−.4682	1.4049		1.4645	
16	.530	.410	.9507	−.4999	1.0731	−.4677	1.1740	−.4673	1.2636	−.4716	1.3384	−.4675	1.4059		1.4606	
17	.530	.492	.9279	−.4985	1.0651	−.4647	1.1728	−.4652	1.2643	−.4711	1.3387	−.4670	1.4051		1.4548	
18	.557	.567	1.0617	−.4963	1.1674	−.4585	1.2503	−.4634	1.3208	−.4699	1.3701	−.4652	1.4173		1.4465	
19	.594	.600	1.1587	−.4964	1.2402	−.4568	1.3008	−.4629	1.3500	−.4693	1.3808	−.4650	1.4104		1.4250	
20	.631	.632	1.2313	−.4946	1.2832	−.4550	1.3144	−.4622	1.3382	−.4688	1.3435	−.4644	1.3498		1.3475	
21	.464	.753	.9501	−.4861	1.0423	−.4469	1.1224	−.4586	1.1898	−.4687	1.2465	−.4636	1.3041		1.3419	
22	.501	.786	1.0612	−.4853	1.1298	−.4444	1.1867	−.4571	1.2358	−.4678	1.2716	−.4624	1.3084		1.3318	
23	.537	.819	1.1485	−.4790	1.1900	−.4427	1.2196	−.4562	1.2439	−.4677	1.2534	−.4620	1.2665		1.2727	
24	.412	0.000	.8733	−.3805	.9755	−.4021	1.0687	−.4423	1.1542	−.4681	1.2343	−.4676	1.3136		1.3848	
25	.412	.354	.8756	−.4968	.9794	−.4718	1.0724	−.4667	1.1547	−.4751	1.2353	−.4682	1.3139		1.3808	
26	.412	.589	.8644	−.4904	.9728	−.4592	1.0653	−.4621	1.1498	−.4712	1.2260	−.4660	1.3018		1.3640	
27	.412	.707	.8071	−.4770	.9273	−.4447	1.0269	−.4528	1.1145	−.4622	1.1920	−.4579	1.2668		1.3262	
28	.412	.823	.4362	−.4854	.6228	−.4443	.7644	−.4574	.8818	−.4694	.9853	−.4637	1.0806		1.1530	
29	.412	.882	.4726	−.4802	.6434	−.4401	.7848	−.4544	.9166	−.4672	1.0098	−.4609	1.0783		1.1331	
30	.412	.942	.6948	−.4809	.8035	−.4397	.8356	−.4547	.8864	−.4678	.9417	−.4607	.9987		1.0435	
31	.309	0.000	.8018	−.3768	.8880	−.4215	.9681	−.4351	1.0440	−.4703	1.1233	−.4655	1.2051		1.2853	
32	.309	.354	.7990	−.4818	.8893	−.4702	.9699	−.4639	1.0450	−.4749	1.1240	−.4674	1.2061		1.2827	
33	.309	.589	.7814	−.4763	.8736	−.4599	.9548	−.4610	1.0321	−.4728	1.1096	−.4663	1.1932		1.2662	
34	.309	.707	.7455	−.4762	.8375	−.4535	.9159	−.4604	.9935	−.4725	1.0695	−.4664	1.1540		1.2260	
35	.309	.823	.6894	−.4798	.7622	−.4466	.8326	−.4579	.8993	−.4705	.9705	−.4642	1.0484		1.1132	
36	.309	.882	.6560	−.4810	.7288	−.4440	.7973	−.4568	.8631	−.4699	.9334	−.4633	1.0098		1.0717	
37	.309	.942	.5741	−.4815	.6455	−.4422	.7127	−.4557	.7761	−.4690	.8437	−.4620	.9137		.9696	
38	.221	0.000	.7202	−.3776	.7832	−.4258	.8440	−.4311	.9021	−.4737	.9691	−.4679	1.0503		1.1393	
39	.221	.354	.7121	−.4551	.7783	−.4610	.8378	−.4607	.8970	−.4695	.9642	−.4648	1.0484		1.1359	
40	.221	.589	.6960	−.4589	.7628	−.4591	.8228	−.4614	.8837	−.4753	.9527	−.4679	1.0416		1.1273	
41	.221	.707	.6703	−.4546	.7346	−.4500	.7943	−.4542	.8548	−.4670	.9262	−.4606	1.0172		1.1004	
42	.221	.823	.5986	−.4729	.6590	−.4500	.7140	−.4584	.7711	−.4711	.8506	−.4641	.9454		1.0255	
43	.221	.882	.5677	−.4829	.6271	−.4453	.6827	−.4567	.7409	−.4698	.8293	−.4626	.9218		.9951	
44	.221	.942	.4924	−.4866	.5516	−.4434	.6058	−.4559	.6642	−.4691	.7531	−.4615	.8382		.9037	
45	.133	0.000	.0164	−.4339	.0481	−.4254	.0864	−.4505	.1759	−.4708	.3657	−.4659	.5587		.7452	
46	.133	.354	.0129	−.4507	.0426	−.4442	.0816	−.4555	.1796	−.4583	.3738	−.4599	.5654		.7504	
47	.133	.589	.0011	−.4432	.0341	−.4476	.0755	−.4566	.2007	−.4710	.4037	−.4630	.5950		.7600	
48	.133	.707	−.0105	−.4436	.0268	−.4505	.1295	−.4578	.2071	−.4724	.4291	−.4633	.6153		.7747	
49	.133	.942	.3466	−.4723	.3881	−.4434	.4413	−.4547	.5227	−.4666	.6794	−.4580	.7669		.8364	
50	.088	0.000	.0347	−.4304	.0896	−.4252	.1605	−.4461	.2629	−.4640	.7107	−.4633	.8233		.8952	
51	.088	.354	.0275	−.4394	.0825	−.4206	.1566	−.4493	.2604	−.4599	.7217	−.4597	.8198		.8918	
52	.088	.589	.0169	−.4330	.0756	−.4398	.1644	−.4521	.2552	−.4673	.7480	−.4595	.8178		.8892	
53	.088	.707	.0422	−.4377	.1150	−.4456	.1858	−.4547	.2472	−.4690	.7640	−.4598	.8204		.8882	
54	.044	0.000	.0461	−.4321	.1186	−.4289	.2114	−.4442	.3245	−.4631	.6979	−.4591	.7418		.8084	
55	.044	.354	.0400	−.4286	.1129	−.4086	.2086	−.4441	.3157	−.4627	.6960	−.4588	.7416		.8071	
56	.044	.589	.0318	−.4207	.1124	−.4349	.2181	−.4503	.3435	−.4671	.6983	−.4585	.7452		.8078	
57	.044	.707	.0714	−.4301	.1486	−.4426	.2271	−.4532	.5791	−.4667	.6811	−.4572	.7354		.7989	
58	.044	.823	.1140	−.4467	.2066	−.4484	.3201	−.4567	.5339	−.4682	.6508	−.4580	.7192		.7837	
59	.412	−.707	.8050	−.4714	.9260	−.4522	1.0262	−.4617	1.1131	−.4731	1.1908	−.4654	1.2639		1.3271	
60	.221	−.707	.6740	−.4638	.7382	−.4563	.7980	−.4609	.8576	−.4749	.9292	−.4660	1.0179		1.1047	

TABLE VIII.—Continued
(b) M = 2.16

			α =													
			−3.7		1.3		6.3		11.3		16.3		21.3		26.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	.1703	.3249	.2777	.2078	.4099	.1099	.5612	.0186	.7364	−.0383	.9293	−.0858	1.1458	−.1137
2	.894	0.000	.1577	.3213	.2692	.2041	.4031	.1063	.5563	.0147	.7335	−.0417	.9256	−.0895	1.1184	−.1195
3	.841	0.000	.1537	.3173	.2652	.1996	.3983	.1022	.5490	.0113	.7251	−.0441	.9176	−.0911	1.0633	−.1225
4	.751	0.000	−.0327	.0795	.0422	−.0027	.1383	−.0696	.2471	−.1276	.3761	−.1637	.5041	−.1949	.6359	−.2138
5	.813	.055	.1576	.3225	.2708	.2038	.4043	.1043	.5566	.0098	.7280	−.0497	.9121	−.1077	1.0268	−.1633
6	.850	.088	.1725	.3443	.2901	.2211	.4270	.1138	.5842	.0104	.7573	−.0600	.9499	−.1202	1.1118	−.1693
7	.887	.120	.2133	.4066	.3466	.2718	.4938	.1434	.6545	.0216	.8307	−.0624	1.0177	−.1328	1.1831	−.1942
8	.663	0.000	−.0407	.0702	.0326	−.0120	.1273	−.0778	.2385	−.1346	.3695	−.1681	.5023	−.1956	.6694	−.2153
9	.663	.126	−.0801	.0210	−.0163	−.0547	.0743	−.1128	.1845	−.1626	.3164	−.1920	.4404	−.2194	.6843	−.2425
10	.663	.210	−.0740	.0212	−.0123	−.0486	.0635	−.1065	.1429	−.1615	.2311	−.2010	.3509	−.2334	.5023	−.2557
11	.690	.302	.1993	.3835	.3276	.2534	.4652	.1312	.6161	.0106	.7596	−.0714	.8505	−.1401	.9286	−.1956
12	.727	.334	.2235	.4305	.3683	.2886	.5155	.1447	.6769	.0177	.8476	−.0671	.9783	−.1411	1.0722	−.2028
13	.763	.367	.2359	.4982	.4174	.3144	.5968	.1531	.7677	.0238	.9455	−.0685	1.0939	−.1608	1.1890	−.2317
14	.530	0.000	−.0423	.0681	.0283	−.0146	.1195	−.0798	.2331	−.1357	.3641	−.1687	.4971	−.1954	.6797	−.2156
15	.530	.246	−.0844	.0245	−.0138	−.0549	.0750	−.1156	.1927	−.1680	.3313	−.2024	.5304	−.2288	.6965	−.2423
16	.530	.410	−.0709	.0320	−.0012	−.0408	.0724	−.1037	.1570	−.1642	.2521	−.2059	.3796	−.2387	.6316	−.2464
17	.530	.492	−.0556	.0438	.0147	−.0244	.0784	−.0925	.1368	−.1582	.1899	−.2015	.3171	−.2356	.5449	−.2570
18	.557	.567	.2174	.4299	.3711	.2870	.5127	.1388	.6530	.0128	.7553	−.0700	.8316	−.1440	.9181	−.1998
19	.594	.600	.2252	.4746	.4056	.3034	.5691	.1456	.7361	.0180	.8747	−.0680	.9710	−.1492	1.0644	−.2105
20	.631	.632	.2340	.5325	.4319	.3134	.6448	.1544	.8334	.0222	.9916	−.0810	1.0993	−.1795	1.1865	−.2436
21	.464	.753	.2154	.4477	.3836	.2921	.5335	.1378	.6587	.0127	.7494	−.0710	.8216	−.1451	.9118	−.2013
22	.501	.786	.2234	.4919	.4111	.3039	.5933	.1450	.7550	.0184	.8726	−.0703	.9644	−.1510	1.0572	−.2135
23	.537	.819	.2335	.5428	.4323	.3129	.6710	.1541	.8617	.0198	.9999	−.0890	1.0983	−.1856	1.1811	−.2477
24	.412	0.000	−.0444	.0682	.0292	−.0144	.1183	−.0806	.2306	−.1355	.3550	−.1680	.5006	−.1951	.6829	−.2149
25	.412	.354	−.0819	.0280	−.0105	−.0521	.0800	−.1140	.2026	−.1686	.3562	−.2044	.5206	−.2193	.6983	−.2390
26	.412	.589	−.0637	.0426	.0080	−.0307	.0864	−.1007	.1745	−.1643	.2893	−.2059	.4284	−.2331	.7777	−.2399
27	.412	.707	−.0291	.0538	.0417	−.0149	.1024	−.0917	.1603	−.1552	.2265	−.1956	.3493	−.2262	.5898	−.2400
28	.412	.823	−.0460	.0792	.0429	−.0050	.1172	−.0870	.1742	−.1507	.2098	−.1929	.2383	−.2277	.2818	−.2529
29	.412	.882	−.0496	.0882	.0462	−.0084	.1324	−.0897	.2026	−.1525	.2467	−.1951	.2848	−.2314	.3363	−.2570
30	.412	.942	−.0199	.0946	.0531	.0136	.1435	−.0613	.2276	−.1324	.2917	−.1862	.3505	−.2330	.4237	−.2641
31	.309	0.000	−.0452	.0654	.0249	−.0160	.1156	−.0814	.2234	−.1356	.3540	−.1671	.4979	−.1947	.6724	−.2126
32	.309	.354	−.0767	.0418	−.0015	−.0453	.0981	−.1105	.2211	−.1648	.3590	−.1983	.5093	−.2166	.6887	−.2390
33	.309	.589	−.0711	.0369	−.0013	−.0397	.0851	−.1059	.1944	−.1678	.3435	−.2077	.5490	−.2166	.6961	−.2363
34	.309	.707	−.0729	.0289	−.0051	−.0411	.0692	−.1117	.1605	−.1727	.2759	−.2124	.4822	−.2236	.6018	−.2379
35	.309	.823	−.0775	−.0037	−.0269	−.0537	.0227	−.1102	.0809	−.1631	.1597	−.2010	.2453	−.2309	.4873	−.2397
36	.309	.882	−.0370	.0273	.0123	−.0068	.0462	−.0766	.0883	−.1403	.1537	−.1847	.2601	−.2227	.4655	−.2422
37	.309	.942	−.0102	.0696	.0592	.0243	.0899	−.0316	.1379	−.1095	.1923	−.1750	.2691	−.2275	.4612	−.2585
38	.221	0.000	−.0477	.0626	.0223	−.0184	.1118	−.0828	.2201	−.1369	.3525	−.1684	.4981	−.1959	.6787	−.2142
39	.221	.354	−.0743	.0483	.0033	−.0415	.1067	−.1093	.2231	−.1646	.3642	−.1943	.5113	−.2161	.6799	−.2392
40	.221	.589	−.0781	.0294	−.0084	−.0475	.0783	−.1117	.1975	−.1716	.3503	−.2052	.4925	−.2167	.6175	−.2385
41	.221	.707	−.0630	.0060	−.0094	−.0582	.0574	−.1155	.1468	−.1706	.2734	−.1984	.4274	−.2106	.5464	−.2288
42	.221	.823	−.0692	−.0072	−.0267	−.0450	.0239	−.1042	.0992	−.1610	.2078	−.1971	.3837	−.2181	.5288	−.2362
43	.221	.882	−.0516	.0036	−.0062	−.0271	.0271	−.0863	.0964	−.1296	.1967	−.1676	.3762	−.2108	.5345	−.2411
44	.221	.942	.0150	.0244	.0332	.0282	.0300	−.0364	.0765	−.1285	.1633	−.1933	.3061	−.2400	.4817	−.2626
45	.133	0.000	−.1945	−.1453	−.1632	−.1825	−.1218	−.1765	−.0624	−.1824	.0098	−.1951	.0863	−.2175	.1702	−.2389
46	.133	.354	−.1646	−.1498	−.1717	−.1716	−.1205	−.1693	−.0602	−.1797	.0056	−.1920	.0865	−.2165	.1660	−.2402
47	.133	.589	−.1677	−.1708	−.1601	−.1597	−.1460	−.1737	−.0835	−.1816	−.0114	−.1907	.0506	−.2155	.1180	−.2371
48	.133	.707	−.1710	−.1823	−.1489	−.1613	−.1633	−.1760	−.1148	−.1824	−.0424	−.1928	.0237	−.2166	.0997	−.2381
49	.133	.942	−.0129	.0071	.0131	.0178	.0177	−.0586	.0696	−.1446	.1633	−.2049	.3238	−.2404	.4239	−.2553
50	.088	0.000	−.1763	−.1514	−.1686	−.1872	−.1267	−.1705	−.0697	−.1807	−.0017	−.1936	.0793	−.2156	.1684	−.2370
51	.088	.354	−.1592	−.1542	−.1596	−.1579	−.1251	−.1673	−.0664	−.1791	−.0014	−.1905	.0769	−.2148	.1527	−.2377
52	.088	.589	−.1624	−.1658	−.1443	−.1529	−.1506	−.1704	−.0898	−.1795	−.0232	−.1889	.0392	−.2133	.1094	−.2336
53	.088	.707	−.1666	−.1530	−.1428	−.1566	−.1611	−.1731	−.1124	−.1803	−.0418	−.1911	.0265	−.2153	.1128	−.2358
54	.044	0.000	−.1741	−.1590	−.1755	−.1809	−.1343	−.1727	−.0779	−.1825	−.0115	−.1941	.0692	−.2161	.1593	−.2384
55	.044	.354	−.1580	−.1500	−.1459	−.1547	−.1285	−.1656	−.0722	−.1776	−.0069	−.1882	.0710	−.2117	.1419	−.2336
56	.044	.589	−.1612	−.1489	−.1432	−.1527	−.1527	−.1689	−.0948	−.1786	−.0335	−.1883	.0295	−.2119	.1042	−.2308
57	.044	.707	−.1642	−.1452	−.1431	−.1539	−.1521	−.1700	−.1067	−.1790	−.0348	−.1894	.0390	−.2132	.1310	−.2328
58	.044	.823	−.1657	−.1537	−.1510	−.1597	−.1494	−.1728	−.0953	−.1813	−.0082	−.1917	.0803	−.2209	.1705	−.2360
59	.412	−.707	−.0544	.0543	.0246	−.0166	.0867	−.0945	.1474	−.1605	.2151	−.2029	.3398	−.2366	.5661	−.2495
60	.221	−.707	−.0857	.0082	−.0236	−.0590	.0491	−.1187	.1416	−.1754	.2711	−.2048	.4293	−.2156	.5531	−.2365

TABLE VIII.—Continued
(b) Concluded

			α = 31.3		36.3		41.3		46.3		51.3		56.3		61.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	1.3457	−.1263	1.5149	−.1433	1.6371	−.2050	1.6921	−.2506	1.6954	−.2572	1.6719	−.2591	1.6361	−.2564
2	.894	0.000	1.2599	−.1399	1.4133	−.1560	1.5537	−.1960	1.6421	−.2403	1.6879	−.2661	1.7042	−.2691	1.6991	−.2667
3	.841	0.000	1.1662	−.1470	1.3174	−.1645	1.4701	−.1951	1.5807	−.2300	1.6539	−.2656	1.6965	−.2697	1.7114	−.2668
4	.751	0.000	.8649	−.2285	1.1032	−.2397	1.3018	−.2592	1.4504	−.2736	1.5613	−.2695	1.6376	−.2707	1.6888	−.2682
5	.813	.055	1.1070	−.2178	1.2646	−.2617	1.4286	−.2671	1.5470	−.2640	1.6289	−.2671	1.6792	−.2699	1.7006	−.2672
6	.850	.088	1.2149	−.2260	1.3613	−.2655	1.4997	−.2666	1.5930	−.2648	1.6502	−.2680	1.6804	−.2699	1.6834	−.2675
7	.887	.120	1.3116	−.2476	1.4399	−.2762	1.5431	−.2679	1.6036	−.2649	1.6294	−.2680	1.6323	−.2704	1.6151	−.2675
8	.663	0.000	.8931	−.2320	1.0991	−.2440	1.2615	−.2639	1.3938	−.2669	1.5018	−.2689	1.5822	−.2707	1.6465	−.2682
9	.663	.126	.9106	−.2664	1.0987	−.2796	1.2619	−.2667	1.3958	−.2656	1.5022	−.2685	1.5814	−.2708	1.6461	−.2682
10	.663	.210	.8011	−.2656	1.0865	−.2811	1.2671	−.2666	1.4042	−.2654	1.5093	−.2687	1.5857	−.2706	1.6462	−.2682
11	.690	.302	1.0549	−.2435	1.2273	−.2732	1.3703	−.2667	1.4738	−.2654	1.5502	−.2679	1.6006	−.2703	1.6386	−.2674
12	.727	.334	1.1806	−.2553	1.3236	−.2715	1.4370	−.2664	1.5151	−.2653	1.5670	−.2682	1.5955	−.2702	1.6164	−.2677
13	.763	.367	1.2854	−.2691	1.3939	−.2734	1.4685	−.2667	1.5148	−.2654	1.5365	−.2684	1.5407	−.2706	1.5403	−.2678
14	.530	0.000	.9018	−.2330	1.0699	−.2456	1.1941	−.2667	1.3078	−.2622	1.4094	−.2692	1.4945	−.2709	1.5715	−.2681
15	.530	.246	.9095	−.2564	1.0890	−.2736	1.2189	−.2681	1.3286	−.2668	1.4226	−.2691	1.5023	−.2711	1.5721	−.2687
16	.530	.410	.9371	−.2570	1.1050	−.2676	1.2363	−.2673	1.3440	−.2665	1.4325	−.2685	1.5079	−.2706	1.5695	−.2681
17	.530	.492	.8561	−.2607	1.0869	−.2680	1.2348	−.2669	1.3473	−.2664	1.4355	−.2687	1.5095	−.2705	1.5661	−.2685
18	.557	.567	1.0694	−.2530	1.2098	−.2686	1.3214	−.2666	1.4100	−.2657	1.4733	−.2681	1.5274	−.2705	1.5655	−.2680
19	.594	.600	1.1849	−.2659	1.3006	−.2692	1.3863	−.2663	1.4505	−.2652	1.4929	−.2682	1.5257	−.2701	1.5454	−.2683
20	.631	.632	1.2795	−.2771	1.3628	−.2699	1.4142	−.2659	1.4495	−.2650	1.4631	−.2681	1.4723	−.2702	1.4695	−.2678
21	.464	.753	1.0421	−.2579	1.1303	−.2677	1.2129	−.2661	1.2926	−.2641	1.3566	−.2673	1.4119	−.2701	1.4633	−.2684
22	.501	.786	1.1586	−.2683	1.2276	−.2660	1.2895	−.2648	1.3458	−.2626	1.3902	−.2659	1.4240	−.2686	1.4559	−.2675
23	.537	.819	1.2543	−.2795	1.3023	−.2679	1.3354	−.2651	1.3625	−.2630	1.3801	−.2664	1.3899	−.2694	1.4006	−.2680
24	.412	0.000	.8961	−.2291	1.0388	−.2452	1.1474	−.2486	1.2422	−.2623	1.3298	−.2680	1.4119	−.2699	1.4915	−.2674
25	.412	.354	.9038	−.2546	1.0444	−.2673	1.1534	−.2674	1.2471	−.2667	1.3340	−.2689	1.4148	−.2711	1.4901	−.2685
26	.412	.589	.9245	−.2524	1.0401	−.2652	1.1533	−.2652	1.2482	−.2643	1.3305	−.2667	1.4075	−.2690	1.4779	−.2669
27	.412	.707	.8633	−.2430	.9932	−.2532	1.1140	−.2553	1.2138	−.2540	1.2978	−.2560	1.3758	−.2587	1.4450	−.2573
28	.412	.823	.4311	−.2711	.5661	−.2672	.7748	−.2662	.9508	−.2640	1.0772	−.2671	1.1790	−.2703	1.2709	−.2687
29	.412	.882	.4587	−.2712	.5913	−.2631	.7919	−.2631	.9697	−.2608	1.1106	−.2634	1.1924	−.2666	1.2599	−.2653
30	.412	.942	.5491	−.2772	.6646	−.2664	1.0095	−.2656	1.0252	−.2629	1.0709	−.2661	1.1265	−.2694	1.1806	−.2682
31	.309	0.000	.8658	−.2275	.9821	−.2417	1.0715	−.2333	1.1507	−.2599	1.2270	−.2643	1.3066	−.2660	1.3921	−.2638
32	.309	.354	.8653	−.2552	.9789	−.2682	1.0753	−.2678	1.1550	−.2674	1.2301	−.2696	1.3096	−.2717	1.3935	−.2691
33	.309	.589	.8256	−.2517	.9528	−.2645	1.0609	−.2648	1.1436	−.2635	1.2185	−.2660	1.2988	−.2681	1.3800	−.2660
34	.309	.707	.7255	−.2549	.9023	−.2682	1.0205	−.2676	1.1055	−.2658	1.1795	−.2692	1.2595	−.2720	1.3428	−.2693
35	.309	.823	.6431	−.2616	.8655	−.2680	.9435	−.2674	1.0174	−.2649	1.0835	−.2685	1.1565	−.2714	1.2355	−.2692
36	.309	.882	.7159	−.2694	.8513	−.2686	.9177	−.2676	.9882	−.2648	1.0516	−.2686	1.1240	−.2716	1.1995	−.2694
37	.309	.942	.6649	−.2719	.7719	−.2674	.8391	−.2667	.9088	−.2643	.9693	−.2677	1.0381	−.2709	1.1078	−.2687
38	.221	0.000	.8403	−.2310	.9154	−.2443	.9751	−.2543	1.0321	−.2648	1.0913	−.2699	1.1599	−.2715	1.2501	−.2693
39	.221	.354	.8187	−.2556	.9070	−.2689	.9726	−.2688	1.0301	−.2675	1.0888	−.2700	1.1583	−.2717	1.2479	−.2690
40	.221	.589	.7540	−.2551	.8864	−.2684	.9579	−.2679	1.0180	−.2669	1.0768	−.2697	1.1495	−.2716	1.2413	−.2691
41	.221	.707	.7126	−.2438	.8601	−.2557	.9291	−.2586	.9886	−.2568	1.0464	−.2592	1.1237	−.2612	1.2176	−.2595
42	.221	.823	.7075	−.2576	.7869	−.2671	.8493	−.2671	.9059	−.2645	.9609	−.2676	1.0467	−.2700	1.1452	−.2679
43	.221	.882	.6774	−.2667	.7595	−.2677	.8217	−.2667	.8783	−.2644	.9336	−.2678	1.0283	−.2698	1.1219	−.2680
44	.221	.942	.6038	−.2707	.6872	−.2685	.7488	−.2670	.8051	−.2643	.8605	−.2679	.9559	−.2705	1.0402	−.2683
45	.133	0.000	.2279	−.2536	.2518	−.2623	.2828	−.2654	.3228	−.2613	.4419	−.2663	.6257	−.2682	.8355	−.2662
46	.133	.354	.2148	−.2554	.2452	−.2682	.2746	−.2686	.3167	−.2660	.4388	−.2688	.6304	−.2703	.8406	−.2680
47	.133	.589	.1862	−.2537	.2326	−.2639	.2640	−.2625	.3095	−.2631	.4391	−.2664	.6568	−.2680	.8547	−.2655
48	.133	.707	.1824	−.2555	.2188	−.2662	.2536	−.2660	.3577	−.2641	.4413	−.2672	.6777	−.2692	.8752	−.2668
49	.133	.942	.5072	−.2658	.5493	−.2637	.5887	−.2627	.6455	−.2602	.7340	−.2637	.8870	−.2655	.9752	−.2636
50	.088	0.000	.2320	−.2507	.2706	−.2585	.3238	−.2623	.4019	−.2604	.4907	−.2622	.9606	−.2646	1.0288	−.2632
51	.088	.354	.2091	−.2518	.2577	−.2630	.3135	−.2654	.3947	−.2619	.4916	−.2652	.9643	−.2667	1.0265	−.2644
52	.088	.589	.1855	−.2490	.2436	−.2567	.3026	−.2579	.3960	−.2569	.4959	−.2599	.9711	−.2614	1.0257	−.2595
53	.088	.707	.1992	−.2512	.2587	−.2597	.3330	−.2606	.4153	−.2585	.4666	−.2617	.9667	−.2635	1.0281	−.2610
54	.044	0.000	.2283	−.2527	.2769	−.2618	.3474	−.2639	.4486	−.2597	.5908	−.2612	.8839	−.2634	.9469	−.2640
55	.044	.354	.2046	−.2468	.2650	−.2569	.3392	−.2587	.4438	−.2548	.5774	−.2585	.8832	−.2598	.9471	−.2578
56	.044	.589	.1888	−.2459	.2528	−.2529	.3334	−.2564	.4482	−.2539	.6066	−.2567	.8894	−.2583	.9498	−.2559
57	.044	.707	.2227	−.2469	.2848	−.2544	.3655	−.2565	.4586	−.2539	.7918	−.2567	.8798	−.2582	.9433	−.2562
58	.044	.823	.2593	−.2533	.3302	−.2618	.4211	−.2622	.5373	−.2593	.7653	−.2624	.8568	−.2640	.9293	−.2617
59	.412	−.707	.8618	−.2550	.9957	−.2660	1.1158	−.2666	1.2147	−.2659	1.3012	−.2677	1.3788	−.2703	1.4440	−.2689
60	.221	−.707	.7198	−.2538	.8683	−.2657	.9337	−.2666	.9933	−.2655	1.0533	−.2679	1.1287	−.2695	1.2188	−.2677

TABLE VIII.—Continued
(c) M = 2.86

			α =													
			−5.5		.3		5.3		10.3		15.3		20.3		25.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	.1047	.3071	.1923	.1936	.3013	.1001	.4381	.0312	.5997	−.0173	.7791	−.0523	.9737	−.0806
2	.894	0.000	.1019	.3076	.1909	.1936	.3012	.0994	.4386	.0288	.6009	−.0212	.7809	−.0576	.9758	−.0861
3	.841	0.000	.0983	.3038	.1871	.1901	.2978	.0969	.4340	.0266	.5953	−.0230	.7751	−.0593	.9699	−.0872
4	.751	0.000	−.0322	.0893	.0187	.0177	.0871	−.0342	.1763	−.0731	.2883	−.0982	.4255	−.1160	.5782	−.1324
5	.813	.055	.1017	.3100	.1925	.1952	.3048	.0998	.4415	.0266	.6027	−.0262	.7825	−.0657	.9750	−.0964
6	.850	.088	.1145	.3342	.2118	.2141	.3281	.1120	.4662	.0315	.6280	−.0273	.8086	−.0698	1.0026	−.1008
7	.887	.120	.1415	.3975	.2559	.2569	.3905	.1383	.5382	.0474	.7009	−.0173	.8813	−.0616	1.0712	−.0931
8	.663	0.000	−.0449	.0734	.0047	.0029	.0725	−.0470	.1592	−.0843	.2692	−.1080	.4066	−.1245	.5623	−.1336
9	.663	.126	−.0574	.0477	−.0136	−.0151	.0471	−.0590	.1258	−.0914	.2260	−.1109	.3579	−.1231	.5147	−.1240
10	.663	.210	−.0483	.0633	−.0003	−.0017	.0623	−.0504	.1385	−.0889	.2267	−.1139	.3265	−.1317	.4301	−.1380
11	.690	.302	.1309	.3819	.2455	.2460	.3789	.1280	.5142	.0370	.6690	−.0270	.8373	−.0707	.9839	−.0999
12	.727	.334	.1375	.4125	.2570	.2569	.4097	.1341	.5635	.0417	.7232	−.0222	.9043	−.0641	1.0830	−.0935
13	.763	.367	.1445	.4299	.2652	.2657	.4265	.1409	.6253	.0482	.8086	−.0135	.9994	−.0527	1.1822	−.0905
14	.530	0.000	−.0476	.0694	.0017	0.0000	.0698	−.0495	.1548	−.0868	.2621	−.1105	.3966	−.1234	.5493	−.1305
15	.530	.246	−.0573	.0529	−.0082	−.0110	.0570	−.0594	.1370	−.0957	.2407	−.1184	.3748	−.1250	.5400	−.1312
16	.530	.410	−.0467	.0797	.0117	.0081	.0828	−.0500	.1596	−.0911	.2496	−.1156	.3537	−.1317	.4805	−.1351
17	.530	.492	−.0373	.0996	.0230	.0195	.1032	−.0407	.1772	−.0832	.2506	−.1095	.3193	−.1274	.3937	−.1399
18	.557	.567	.1320	.4088	.2489	.2490	.4082	.1288	.5694	.0375	.7206	−.0254	.8610	−.0664	.9560	−.0952
19	.594	.600	.1373	.4200	.2559	.2562	.4192	.1341	.6100	.0417	.7826	−.0205	.9551	−.0595	1.0842	−.0922
20	.631	.632	.1449	.4307	.2645	.2652	.4286	.1416	.6525	.0488	.8662	−.0101	1.0590	−.0501	1.2062	−.0972
21	.464	.753	.1301	.4076	.2469	.2472	.4070	.1280	.5867	.0370	.7354	−.0250	.8533	−.0645	.9373	−.0950
22	.501	.786	.1363	.4184	.2546	.2550	.4184	.1331	.6240	.0411	.8052	−.0198	.9659	−.0573	1.0791	−.0929
23	.537	.819	.1440	.4309	.2637	.2650	.4300	.1412	.6590	.0483	.8912	−.0078	1.0803	−.0506	1.2088	−.1019
24	.412	0.000	−.0455	.0706	.0057	.0016	.0758	−.0480	.1605	−.0851	.2677	−.1085	.3982	−.1192	.5453	−.1281
25	.412	.354	−.0549	.0583	−.0036	−.0074	.0626	−.0577	.1433	−.0958	.2484	−.1195	.3857	−.1226	.5519	−.1297
26	.412	.589	−.0482	.0895	.0123	.0078	.0934	−.0518	.1723	−.0931	.2664	−.1170	.3790	−.1301	.5273	−.1329
27	.412	.707	−.0368	.0972	.0208	.0151	.1043	−.0420	.1872	−.0819	.2599	−.1053	.3345	−.1210	.4399	−.1326
28	.412	.823	−.0345	.1007	.0242	.0195	.1058	−.0382	.2032	−.0795	.2806	−.1053	.3342	−.1216	.3727	−.1352
29	.412	.882	−.0416	.0932	.0144	.0104	.0979	−.0453	.2075	−.0849	.3000	−.1082	.3675	−.1233	.4125	−.1375
30	.412	.942	−.0343	.0885	.0129	.0096	.0931	−.0375	.2097	−.0768	.3147	−.1024	.3966	−.1193	.4569	−.1373
31	.309	0.000	−.0466	.0685	.0037	.0001	.0735	−.0490	.1584	−.0857	.2651	−.1088	.3928	−.1182	.5397	−.1282
32	.309	.354	−.0581	.0548	−.0078	−.0122	.0595	−.0611	.1454	−.0977	.2559	−.1152	.3927	−.1209	.5483	−.1299
33	.309	.589	−.0516	.0782	.0083	.0033	.0827	−.0555	.1636	−.0965	.2655	−.1204	.3918	−.1228	.5633	−.1303
34	.309	.707	−.0541	.0822	.0054	.0001	.0868	−.0578	.1665	−.0975	.2586	−.1202	.3731	−.1264	.5211	−.1315
35	.309	.823	−.0574	.0560	−.0082	−.0131	.0603	−.0611	.1265	−.0956	.1884	−.1172	.2652	−.1304	.3630	−.1351
36	.309	.882	−.0412	.0729	.0045	.0001	.0772	−.0452	.1515	−.0837	.1969	−.1095	.2553	−.1257	.3558	−.1357
37	.309	.942	−.0289	.0752	.0183	.0156	.0795	−.0331	.1719	−.0750	.2357	−.1008	.2891	−.1203	.3571	−.1376
38	.221	0.000	−.0474	.0665	.0029	−.0011	.0717	−.0502	.1565	−.0865	.2617	−.1087	.3880	−.1179	.5373	−.1289
39	.221	.354	−.0593	.0551	−.0090	−.0137	.0604	−.0629	.1496	−.0986	.2627	−.1102	.3983	−.1203	.5532	−.1303
40	.221	.589	−.0531	.0703	.0056	.0007	.0759	−.0562	.1572	−.0964	.2585	−.1122	.3914	−.1202	.5550	−.1291
41	.221	.707	−.0524	.0632	.0005	−.0049	.0705	−.0571	.1424	−.0932	.2282	−.1100	.3366	−.1166	.4801	−.1243
42	.221	.823	−.0531	.0505	−.0098	−.0134	.0551	−.0557	.1208	−.0906	.1928	−.1117	.2878	−.1210	.4141	−.1296
43	.221	.882	−.0413	.0538	.0009	−.0019	.0583	−.0448	.1219	−.0833	.1884	−.1077	.2793	−.1209	.3984	−.1307
44	.221	.942	−.0281	.0614	.0171	.0143	.0648	−.0308	.1221	−.0639	.1773	−.1020	.2599	−.1243	.3756	−.1385
45	.133	0.000	−.1044	−.0816	−.1033	−.1028	−.0790	−.1036	−.0428	−.1010	.0072	−.1094	.0762	−.1197	.1635	−.1300
46	.133	.354	−.1011	−.0885	−.1016	−.1009	−.0852	−.1015	−.0408	−.1019	.0160	−.1082	.0863	−.1195	.1689	−.1294
47	.133	.589	−.0942	−.0888	−.0974	−.0968	−.0857	−.0955	−.0473	−.0987	.0068	−.1077	.0779	−.1192	.1519	−.1300
48	.133	.707	−.0948	−.0942	−.0970	−.0970	−.0909	−.0960	−.0580	−.1008	−.0133	−.1085	.0455	−.1200	.1197	−.1302
49	.133	.942	−.0154	.0412	.0084	.0056	.0432	−.0191	.0922	−.0759	.1550	−.1116	.2420	−.1299	.3533	−.1371
50	.088	0.000	−.0979	−.0894	−.1099	−.1111	−.0861	−.0991	−.0488	−.1003	.0013	−.1094	.0704	−.1206	.1580	−.1300
51	.088	.354	−.0991	−.0953	−.0910	−.0929	−.0909	−.0993	−.0485	−.1018	.0064	−.1084	.0747	−.1195	.1580	−.1290
52	.088	.589	−.0929	−.0978	−.0840	−.0863	−.0935	−.0941	−.0561	−.1000	−.0043	−.1088	.0645	−.1202	.1381	−.1307
53	.088	.707		−.0986		−.0879		−.0945		−.1008		−.1094		−.1210		−.1311
54	.044	0.000	−.0986	−.0982	−.1107	−.1112	−.0935	−.1005	−.0569	−.1013	−.0078	−.1097	.0599	−.1209	.1458	−.1306
55	.044	.354	−.0995	−.0960	−.0907	−.0931	−.0924	−.1000	−.0520	−.1020	.0012	−.1095	.0680	−.1196	.1515	−.1288
56	044	.589	−.0948	−.0951	−.0829	−.0853	−.0943	−.0958	−.0611	−.1011	−.0100	−.1094	.0548	−.1201	.1280	−.1307
57	.044	.707	−.0933	−.0933	−.0841	−.0863	−.0924	−.0943	−.0632	−.1011	−.0209	−.1099	.0415	−.1214	.1149	−.1313
58	.044	.823	−.0943	−.0927	−.0842	−.0864	−.0897	−.0959	−.0535	−.1014	−.0011	−.1105	.0668	−.1217	.1569	−.1315
59	412	−.707	−.0406	.0971	.0181	.0153	.1034	−.0426	.1871	−.0842	.2598	−.1094	.3343	−.1263	.4454	−.1388
60	221	−.707	−.0586	.0647	−.0030	−.0066	.0711	−.0611	.1439	−.0985	.2335	−.1147	.3456	−.1211	.4923	−.1299

TABLE VIII.–Continued
(c) Concluded

			α =													
			30.3		35.3		40.3		45.3		50.3		55.3		60.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	1.1871	−.0986	1.4211	−.1076	1.5842	−.1048	1.7214		1.7841	−.1321	1.7969		1.7692	−.1422
2	.894	0.000	1.1903	−.1031	1.3780	−.1101	1.5099	−.1102	1.6508		1.7416	−.1356	1.7949		1.8088	−.1479
3	.841	0.000	1.1792	−.1037	1.3077	−.1110	1.4187	−.1137	1.5730		1.6874	−.1342	1.7640		1.8058	−.1479
4	.751	0.000	.7184	−.1431	.9009	−.1493	1.1513	−.1515	1.3996		1.5617	−.1561	1.6744		1.7528	−.1550
5	.813	.055	1.1646	−.1155	1.2504	−.1294	1.3596	−.1419	1.5294		1.6562	−.1493	1.7409		1.7911	−.1523
6	.850	.088	1.2065	−.1195	1.3446	−.1340	1.4577	−.1471	1.5958		1.6958	−.1516	1.7567		1.7847	−.1534
7	.887	.120	1.2706	−.1161	1.4284	−.1397	1.5338	−.1516	1.6386		1.7032	−.1533	1.7301		1.7318	−.1539
8	.663	0.000	.7150	−.1400	.9161	−.1478	1.1669	−.1528	1.3764		1.5169	−.1534	1.6236		1.7072	−.1545
9	.663	.126	.6786	−.1285	.9138	−.1335	1.1646	−.1381	1.3779		1.5187	−.1388	1.6253		1.7060	−.1403
10	.663	.210	.5793	−.1413	.8198	−.1458	1.1386	−.1496	1.3816		1.5278	−.1511	1.6328		1.7092	−.1534
11	.690	.302	1.0605	−.1201	1.1584	−.1399	1.3247	−.1494	1.4889		1.6011	−.1520	1.6744		1.7232	−.1535
12	.727	.334	1.1943	−.1185	1.2942	−.1415	1.4237	−.1503	1.5507		1.6335	−.1518	1.6837		1.7123	−.1533
13	.763	.367	1.3087	−.1260	1.4041	−.1495	1.4982	−.1528	1.5812		1.6266	−.1530	1.6482		1.6500	−.1539
14	.530	0.000	.7097	−.1365	.9260	−.1405	1.1710	−.1383	1.3283		1.4464	−.1494	1.5428		1.6302	−.1538
15	.530	.246	.7463	−.1374	.9464	−.1444	1.1840	−.1494	1.3395		1.4547	−.1522	1.5490		1.6305	−.1534
16	.530	.410	.6260	−.1391	.9427	−.1452	1.2019	−.1500	1.3599		1.4757	−.1525	1.5659		1.6396	−.1538
17	.530	.492	.5785	−.1441	.8847	−.1472	1.1834	−.1502	1.3606		1.4824	−.1522	1.5727		1.6424	−.1536
18	.557	.567	1.0379	−.1197	1.1655	−.1414	1.3410	−.1494	1.4648		1.5526	−.1518	1.6176		1.6621	−.1533
19	.594	.600	1.1809	−.1213	1.2953	−.1447	1.4281	−.1499	1.5215		1.5845	−.1516	1.6274		1.6540	−.1531
20	.631	.632	1.3039	−.1315	1.3995	−.1512	1.4892	−.1519	1.5450		1.5751	−.1519	1.5908		1.5936	−.1528
21	.464	.753	1.0213	−.1207	1.1618	−.1435	1.2877	−.1500	1.3697		1.4470	−.1518	1.5086		1.5585	−.1532
22	.501	.786	1.1724	−.1226	1.2901	−.1465	1.3868	−.1504	1.4420		1.4936	−.1514	1.5322		1.5636	−.1529
23	.537	.819	1.3000	−.1354	1.3931	−.1539	1.4552	−.1525	1.4825		1.5021	−.1521	1.5154		1.5222	−.1532
24	.412	0.000	.7210	−.1353	.9435	−.1424	1.1625	−.1483	1.2799		1.3783	−.1513	1.4631		1.5497	−.1533
25	.412	.354	.7393	−.1368	.9600	−.1443	1.1670	−.1495	1.2870		1.3871	−.1520	1.4718		1.5513	−.1534
26	.412	.589	.7790	−.1377	1.0029	−.1438	1.1704	−.1495	1.2893		1.3909	−.1521	1.4752		1.5500	−.1535
27	.412	.707	.6128	−.1362	.9395	−.1391	1.1219	−.1422	1.2413		1.3494	−.1445	1.4376		1.5127	−.1451
28	.412	.823	.4132	−.1453	.4885	−.1533	.6775	−.1524	.8787		1.0908	−.1528	1.2253		1.3293	−.1535
29	.412	.882	.4563	−.1481	.5382	−.1549	.7116	−.1531	.8855		1.1107	−.1527	1.2519		1.3303	−.1534
30	.412	.942	.5208	−.1499	.6218	−.1563	.7938	−.1534	1.0589		1.1528	−.1530	1.2081		1.2645	−.1536
31	.309	0.000	.7218	−.1366	.9362	−.1442	1.1195	−.1515	1.2119		1.2883	−.1521	1.3633		1.4459	−.1538
32	.309	.354	.7334	−.1375	.9534	−.1450	1.1193	−.1505	1.2171		1.2980	−.1524	1.3731		1.4503	−.1538
33	.309	.589	.7615	−.1372	.9508	−.1442	1.0822	−.1501	1.1987		1.2894	−.1524	1.3659		1.4439	−.1535
34	.309	.707	.7118	−.1377	.8475	−.1444	.9967	−.1493	1.1536		1.2481	−.1516	1.3288		1.4076	−.1528
35	.309	.823	.5520	−.1405	.7112	−.1485	.9274	−.1512	1.0730		1.1533	−.1524	1.2254		1.3011	−.1534
36	.309	.882	.5145	−.1425	.7272	−.1514	.9737	−.1517	1.0535		1.1268	−.1527	1.1944		1.2675	−.1536
37	.309	.942	.5107	−.1470	.7213	−.1522	.9038	−.1521	.9781		1.0488	−.1526	1.1117		1.1803	−.1534
38	.221	0.000	.7209	−.1375	.9397	−.1449	1.0704	−.1488	1.1208		1.1680	−.1517	1.2233		1.2978	−.1538
39	.221	.354	.7367	−.1378	.9395	−.1451	1.0575	−.1504	1.1205		1.1714	−.1523	1.2289		1.2979	−.1535
40	.221	.589	.7198	−.1366	.8747	−.1440	1.0118	−.1482	1.1030		1.1635	−.1510	1.2232		1.2950	−.1513
41	.221	.707	.6280	−.1307	.7932	−.1374	.9677	−.1414	1.0610		1.1244	−.1435	1.1863		1.2625	−.1434
42	.221	.823	.5696	−.1373	.7556	−.1459	.9079	−.1492	.9878		1.0476	−.1508	1.1055		1.1949	−.1510
43	.221	.882	.5827	−.1390	.7659	−.1480	.8918	−.1503	.9623		1.0211	−.1514	1.0783		1.1758	−.1516
44	.221	.942	.5333	−.1449	.6982	−.1495	.8155	−.1507	.8891		.9489	−.1512	1.0057		1.1035	−.1513
45	.133	0.000	.2744	−.1370	.3687	−.1441	.4184	−.1475	.4411		.4791	−.1504	.5975		.8044	−.1513
46	.133	.354	.2670	−.1366	.3521	−.1439	.3936	−.1490	.4192		.4613	−.1513	.5887		.8034	−.1518
47	.133	.589	.2323	−.1374	.3084	−.1449	.3693	−.1484	.4035		.4532	−.1506	.5898		.8238	−.1512
48	.133	.707	.1978	−.1378	.2833	−.1452	.3565	−.1491	.3918		.4927	−.1508	.5946		.8503	−.1512
49	.133	.942	.4972	−.1429	.6104	−.1484	.6765	−.1502	.7213		.7813	−.1511	.8770		1.0309	−.1513
50	.088	0.000	.2660	−.1371	.3657	−.1449	.4296	−.1478	.4721		.5509	−.1501	.6489		1.0943	−.1512
51	.088	.354	.2565	−.1361	.3463	−.1437	.4034	−.1486	.4533		.5391	−.1510	.6458		1.0918	−.1515
52	.088	.589	.2170	−.1382	.3004	−.1455	.3774	−.1489	.4394		.5377	−.1510	.6512		1.1029	−.1516
53	.088	.707		−.1386		−.1462		−.1498				−.1513				−.1516
54	.044	0.000	.2445	−.1376	.3551	−.1442	.4197	−.1480	.4811		.5860	−.1499	.7664		1.0122	−.1512
55	.044	.354	.2491	−.1358	.3381	−.1440	.4030	−.1489	.4720		.5820	−.1513	.7596		1.0105	−.1516
56	.044	.589	.2069	−.1380	.2951	−.1452	.3833	−.1491	.4647		.5854	−.1511	.7696		1.0186	−.1516
57	.044	.707	.2056	−.1389	.3135	−.1463	.4073	−.1498	.4955		.6019	−.1515	.9197		1.0153	−.1517
58	.044	.823	.2569	−.1397	.3653	−.1477	.4583	−.1505	.5531		.6770	−.1516	.8820		.9974	−.1519
59	.412	−.707	.6284	−.1422	.9421	−.1450	1.1342	−.1487	1.2505		1.3570	−.1509	1.4425		1.5176	−.1521
60	.221	−.707	.6451	−.1368	.8096	−.1442	.9765	−.1488	1.0727		1.1355	−.1504	1.1958		1.2706	−.1509

TABLE VIII.–Continued
(d) M = 3.50

			α =													
			−4.9		.2		5.2		10.2		15.2		20.2		24.8	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	.0847	.2708	.1635	.1699	.2654	.0892	.3942	.0323	.5423	−.0071	.7150	−.0349	.8998	−.0504
2	.894	0.000	.0789	.2710	.1594	.1681	.2632	.0854	.3934	.0261	.5431	−.0157	.7170	−.0446	.9034	−.0611
3	.841	0.000	.0759	.2675	.1561	.1652	.2592	.0828	.3885	.0237	.5375	−.0179	.7113	−.0469	.8976	−.0638
4	.751	0.000	−.0240	.0746	.0163	.0198	.0732	−.0213	.1510	−.0487	.2478	−.0670	.3743	−.0797	.5192	−.0871
5	.813	.055	.0786	.2729	.1609	.1698	.2654	.0854	.3946	.0237	.5442	−.0198	.7170	−.0502	.9023	−.0675
6	.850	.088	.0905	.2963	.1790	.1883	.2883	.0977	.4201	.0297	.5695	−.0180	.7410	−.0503	.9244	−.0684
7	.887	.120	.1088	.3435	.2080	.2183	.3348	.1164	.4862	.0421	.6410	−.0094	.8125	−.0425	.9913	−.0598
8	.663	0.000	−.0379	.0572	.0007	.0035	.0563	−.0357	.1325	−.0610	.2276	−.0774	.3534	−.0875	.4993	−.0899
9	.663	.126	−.0377	.0460	−.0044	−.0016	.0451	−.0354	.1147	−.0562	.2000	−.0686	.3128	−.0750	.4522	−.0745
10	.663	.210	−.0333	.0631	.0070	.0102	.0620	−.0308	.1333	−.0587	.2171	−.0766	.3186	−.0879	.4242	−.0911
11	.690	.302	.0970	.3317	.1961	.2059	.3231	.1048	.4690	.0317	.6116	−.0190	.7770	−.0512	.9455	−.0671
12	.727	.334	.1022	.3434	.2030	.2127	.3347	.1102	.5007	.0362	.6610	−.0150	.8328	−.0462	1.0135	−.0608
13	.763	.367	.1091	.3525	.2101	.2202	.3431	.1169	.5194	.0426	.7250	−.0087	.9159	−.0363	1.1016	−.0505
14	.530	0.000	−.0411	.0535	−.0030	−.0001	.0524	−.0390	.1278	−.0647	.2227	−.0803	.3454	−.0853	.4890	−.0887
15	.530	.246	−.0438	.0507	−.0063	.0009	.0498	−.0390	.1229	−.0651	.2124	−.0814	.3285	−.0864	.4731	−.0889
16	.530	.410	−.0386	.0728	.0054	.0111	.0717	−.0340	.1520	−.0623	.2383	−.0800	.3408	−.0900	.4563	−.0920
17	.530	.492	−.0285	.0854	.0168	.0220	.0843	−.0239	.1740	−.0539	.2571	−.0740	.3392	−.0869	.4128	−.0926
18	.557	.567	.0972	.3351	.1958	.2047	.3250	.1053	.4943	.0319	.6630	−.0189	.8201	−.0491	.9524	−.0622
19	.594	.600	.1020	.3430	.2019	.2113	.3328	.1103	.5066	.0359	.7052	−.0157	.8844	−.0441	1.0519	−.0558
20	.631	.632	.1090	.3522	.2098	.2199	.3417	.1177	.5176	.0433	.7512	−.0086	.9673	−.0324	1.1542	−.0483
21	.464	.753	.0962	.3346	.1938	.2045	.3221	.1045	.4905	.0308	.6785	−.0199	.8275	−.0486	.9381	−.0604
22	.501	.786	.1012	.3433	.2005	.2115	.3313	.1094	.5028	.0350	.7187	−.0159	.9025	−.0424	1.0554	−.0537
23	.537	.819	.1095	.3536	.2095	.2208	.3419	.1170	.5162	.0422	.7583	−.0086	.9901	−.0294	1.1698	−.0487
24	.412	0.000	−.0411	.0551	−.0030	.0026	.0543	−.0369	.1320	−.0625	.2300	−.0768	.3516	−.0837	.4925	−.0877
25	.412	.354	−.0445	.0553	−.0037	.0022	.0545	−.0399	.1275	−.0670	.2180	−.0807	.3333	−.0848	.4818	−.0880
26	.412	.589	−.0407	.0726	.0032	.0082	.0713	−.0362	.1620	−.0643	.2508	−.0813	.3562	−.0885	.4824	−.0907
27	.412	.707	−.0227	.0795	.0155	.0219	.0806	−.0217	.1744	−.0489	.2668	−.0660	.3486	−.0774	.4336	−.0820
28	.412	.823	−.0254	.0835	.0194	.0241	.0829	−.0212	.1698	−.0512	.2759	−.0712	.3545	−.0837	.4048	−.0889
29	.412	.882	−.0331	.0721	.0082	.0130	.0708	−.0291	.1608	−.0564	.2798	−.0745	.3758	−.0852	.4402	−.0899
30	.412	.942	−.0313	.0666	.0052	.0095	.0657	−.0278	.1554	−.0539	.2824	−.0727	.3914	−.0834	.4703	−.0887
31	.309	0.000	−.0426	.0530	−.0043	.0002	.0519	−.0386	.1288	−.0638	.2263	−.0754	.3468	−.0829	.4884	−.0873
32	.309	.354	−.0468	.0491	−.0072	−.0029	.0486	−.0430	.1219	−.0692	.2156	−.0775	.3364	−.0835	.4820	−.0876
33	.309	.589	−.0444	.0677	−.0004	.0041	.0668	−.0401	.1502	−.0682	.2394	−.0803	.3525	−.0847	.4909	−.0884
34	.309	.707	−.0449	.0653	−.0028	.0021	.0643	−.0409	.1554	−.0677	.2448	−.0825	.3497	−.0863	.4788	−.0891
35	.309	.823	−.0468	.0480	−.0095	−.0055	.0473	−.0433	.1238	−.0676	.1957	−.0825	.2675	−.0891	.3538	−.0918
36	.309	.882	−.0389	.0567	−.0028	.0003	.0561	−.0359	.1384	−.0617	.2167	−.0794	.2690	−.0886	.3404	−.0924
37	.309	.942	−.0304	.0540	.0051	.0074	.0536	−.0273	.1376	−.0556	.2387	−.0747	.3025	−.0860	.3577	−.0911
38	.221	0.000	−.0442	.0505	−.0055	−.0024	.0498	−.0408	.1268	−.0658	.2230	−.0759	.3429	−.0837	.4854	−.0882
39	.221	.354	−.0483	.0459	−.0094	−.0061	.0457	−.0450	.1208	−.0701	.2161	−.0762	.3391	−.0830	.4826	−.0875
40	.221	.589	−.0450	.0652	−.0031	.0043	.0639	−.0401	.1429	−.0669	.2315	−.0751	.3441	−.0813	.4871	−.0853
41	.221	.707	−.0360	.0584	−.0034	.0059	.0592	−.0348	.1412	−.0587	.2219	−.0675	.3201	−.0731	.4373	−.0761
42	.221	.823	−.0445	.0447	−.0130	−.0048	.0430	−.0401	.1185	−.0639	.1903	−.0756	.2722	−.0822	.3761	−.0859
43	.221	.882	−.0375	.0472	−.0055	.0002	.0459	−.0335	.1204	−.0595	.1903	−.0748	.2668	−.0826	.3663	−.0863
44	.221	.942	−.0312	.0465	.0032	.0078	.0456	−.0272	.1190	−.0525	.1876	−.0712	.2559	−.0838	.3494	−.0891
45	.133	0.000	−.0703	−.0548	−.0692	−.0654	−.0554	−.0694	−.0282	−.0694	.0119	−.0743	.0723	−.0814	.1513	−.0853
46	.133	.354	−.0718	−.0616	−.0748	−.0726	−.0625	−.0721	−.0316	−.0708	.0167	−.0745	.0803	−.0815	.1587	−.0854
47	.133	.589	−.0645	−.0569	−.0674	−.0664	−.0573	−.0646	−.0285	−.0664	.0158	−.0733	.0762	−.0808	.1513	−.0851
48	.133	.707	−.0655	−.0604	−.0682	−.0679	−.0606	−.0659	−.0332	−.0677	.0060	−.0740	.0580	−.0811	.1201	−.0853
49	.133	.942	−.0313	.0346	−.0014	.0016	.0337	−.0284	.0955	−.0523	.1566	−.0749	.2335	−.0853	.3286	−.0886
50	.088	0.000	−.0681	−.0638	−.0721	−.0720	−.0629	−.0681	−.0355	−.0685	.0047	−.0746	.0651	−.0820	.1433	−.0857
51	.088	.354	−.0692	−.0678	−.0675	−.0682	−.0673	−.0695	−.0399	−.0703	.0071	−.0747	.0690	−.0814	.1461	−.0853
52	.088	.589	−.0637	−.0650	−.0582	−.0594	−.0634	−.0630	−.0382	−.0672	.0055	−.0742	.0655	−.0814	.1371	−.0855
53	088	.707		−.0652		−.0611		−.0636		−.0683		−.0749		−.0819		−.0859
54	.044	0.000	−.0664	−.0708	−.0674	−.0716	−.0669	−.0688	−.0429	−.0696	−.0040	−.0750	.0552	−.0819	.1314	−.0857
55	.044	.354	−.0695	−.0695	−.0661	−.0674	−.0678	−.0696	−.0423	−.0705	.0026	−.0754	.0633	−.0817	.1390	−.0855
56	.044	.589	−.0650	−.0656	−.0578	−.0588	−.0639	−.0643	−.0425	−.0684	−.0004	−.0742	.0583	−.0811	.1273	−.0853
57	.044	.707	−.0643	−.0640	−.0587	−.0595	−.0623	−.0637	−.0408	−.0690	−.0029	−.0753	.0480	−.0822	.1121	−.0861
58	.044	.823	−.0651	−.0649	−.0590	−.0599	−.0630	−.0644	−.0336	−.0700	.0096	−.0758	.0708	−.0826	.1406	−.0868
59	412	−.707	−.0291	.0813	.0128	.0205	.0798	−.0244	.1738	−.0540	.2687	−.0732	.3503	−.0860	.4358	−.0911
60	.221	−.707	−.0463	.0595	−.0068	.0005	.0587	−.0418	.1423	−.0673	.2256	−.0756	.3269	−.0815	.4477	−.0850

TABLE VIII.—Continued
(d) Concluded

			α =													
			30.2		35.1		40.2		45.2		50.2		55.2		60.1	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	1.1057	−.0639	1.3299		1.5432	−.0709	1.7140		1.8348	−.0761	1.8732		1.8595	−.0826
2	.894	0.000	1.1067	−.0744	1.3269		1.4917	−.0792	1.6407		1.7772	−.0832	1.8542		1.8817	−.0914
3	.841	0.000	1.0994	−.0768	1.3003		1.4124	−.0812	1.5513		1.7092	−.0847	1.8116		1.8643	−.0928
4	.751	0.000	.6826	−.0923	.8238		1.0439	−.0972	1.3172		1.5567	−.0989	1.7025		1.7899	−.0985
5	.813	.055	1.1017	−.0808	1.2704		1.3501	−.0888	1.4967		1.6721	−.0934	1.7829		1.8442	−.0961
6	.850	.088	1.1262	−.0816	1.3258		1.4486	−.0906	1.5851		1.7263	−.0947	1.8075		1.8467	−.0969
7	.887	.120	1.1889	−.0738	1.3886		1.5281	−.0904	1.6498		1.7523	−.0959	1.7948		1.8038	−.0978
8	.663	0.000	.6644	−.0916	.8302		1.0536	−.0950	1.3199		1.5219	−.0965	1.6535		1.7406	−.0979
9	.663	.126	.6215	−.0752	.8068		1.0476	−.0778	1.3206		1.5250	−.0784	1.6556		1.7415	−.0799
10	.663	.210	.5375	−.0917	.7137		1.0021	−.0941	1.3139		1.5326	−.0949	1.6643		1.7479	−.0959
11	.690	.302	1.0792	−.0785	1.1479		1.2734	−.0915	1.4649		1.6271	−.0949	1.7192		1.7741	−.0969
12	.727	.334	1.1837	−.0734	1.2838		1.3991	−.0908	1.5485		1.6753	−.0948	1.7369		1.7700	−.0965
13	.763	.367	1.2798	−.0710	1.3936		1.4945	−.0920	1.6038		1.6856	−.0957	1.7100		1.7156	−.0973
14	.530	0.000	.6509	−.0906	.8296		1.0600	−.0938	1.3023		1.4610	−.0951	1.5776		1.6625	−.0970
15	.530	.246	.6489	−.0912	.8584		1.0759	−.0943	1.3139		1.4709	−.0964	1.5856		1.6671	−.0975
16	.530	.410	.6030	−.0930	.7965		1.0902	−.0954	1.3348		1.4934	−.0973	1.6040		1.6814	−.0982
17	.530	.492	.5170	−.0954	.7496		1.0524	−.0960	1.3285		1.4985	−.0970	1.6113		1.6865	−.0979
18	.557	.567	1.0426	−.0745	1.1298		1.2816	−.0908	1.4608		1.5893	−.0945	1.6649		1.7113	−.0966
19	.594	.600	1.1739	−.0719	1.2694		1.3976	−.0902	1.5330		1.6341	−.0943	1.6827		1.7090	−.0964
20	.631	.632	1.2922	−.0739	1.3836		1.4850	−.0917	1.5749		1.6391	−.0944	1.6551		1.6551	−.0960
21	.464	.753	1.0255	−.0744	1.1209		1.2752	−.0904	1.3904		1.4849	−.0944	1.5571		1.6038	−.0968
22	.501	.786	1.1677	−.0719	1.2661		1.3896	−.0902	1.4733		1.5448	−.0937	1.5892		1.6144	−.0958
23	.537	.819	1.2937	−.0766	1.3829		1.4758	−.0923	1.5249		1.5680	−.0945	1.5797		1.5796	−.0963
24	.412	0.000	.6564	−.0906	.8485		1.0779	−.0941	1.2811		1.4024	−.0960	1.5037		1.5834	−.0973
25	.412	.354	.6591	−.0905	.8602		1.0903	−.0936	1.2873		1.4107	−.0958	1.5118		1.5878	−.0974
26	.412	.589	.6552	−.0921	.8892		1.1161	−.0947	1.2890		1.4142	−.0968	1.5151		1.5878	−.0977
27	.412	.707	.5692	−.0850	.8106		1.0820	−.0854	1.2382		1.3650	−.0856	1.4728		1.5464	−.0861
28	.412	.823	.4514	−.0934	.5023		.5944	−.0959	.8003		1.0390	−.0970	1.2321		1.3456	−.0976
29	.412	.882	.4923	−.0944	.5437		.6539	−.0963	.8302		1.0591	−.0969	1.2660		1.3573	−.0972
30	.412	.942	.5364	−.0948	.6068		.7281	−.0965	.9089		1.1393	−.0971	1.2490		1.3026	−.0975
31	.309	0.000	.6539	−.0907	.8479		1.0671	−.0947	1.2295		1.3236	−.0962	1.4080		1.4763	−.0973
32	.309	.354	.6585	−.0905	.8618		1.0837	−.0941	1.2356		1.3319	−.0961	1.4177		1.4840	−.0974
33	.309	.589	.6763	−.0909	.8852		1.0712	−.0947	1.1995		1.3157	−.0962	1.4085		1.4765	−.0973
34	.309	.707	.6477	−.0912	.8234		.9633	−.0940	1.1262		1.2675	−.0959	1.3662		1.4359	−.0970
35	.309	.823	.4899	−.0933	.6537		.8255	−.0958	1.0457		1.1732	−.0969	1.2601		1.3247	−.0975
36	.309	.882	.4669	−.0945	.6346		.8595	−.0956	1.0638		1.1557	−.0971	1.2338		1.2943	−.0980
37	.309	.942	.4565	−.0953	.6351		.8375	−.0960	.9936		1.0812	−.0969	1.1548		1.2119	−.0975
38	.221	0.000	.6529	−.0912	.8496		1.0598	−.0945	1.1675		1.2202	−.0964	1.2760		1.3293	−.0980
39	.221	.354	.6623	−.0902	.8658		1.0627	−.0940	1.1626		1.2216	−.0955	1.2797		1.3310	−.0969
40	.221	.589	.6636	−.0889	.8443		.9978	−.0913	1.1243		1.2035	−.0928	1.2702		1.3272	−.0940
41	.221	.707	.5887	−.0794	.7503		.9108	−.0819	1.0740		1.1581	−.0823	1.2281		1.2860	−.0829
42	.221	.823	.5166	−.0893	.6772		.8506	−.0913	1.0001		1.0797	−.0929	1.1463		1.2060	−.0939
43	.221	.882	.5028	−.0899	.6834		.8618	−.0926	.9828		1.0566	−.0934	1.1207		1.1850	−.0941
44	.221	.942	.4813	−.0924	.6509		.8002	−.0934	.9096		.9842	−.0936	1.0483		1.1164	−.0940
45	.133	0.000	.2521	−.0886	.3743		.4665	−.0922	.5086		.5285	−.0931	.5885		.7462	−.0939
46	.133	.354	.2543	−.0888	.3621		.4437	−.0921	.4784		.5055	−.0934	.5711		.7440	−.0945
47	.133	.589	.2385	−.0888	.3272		.3963	−.0915	.4531		.4897	−.0926	.5684		.7540	−.0938
48	.133	.707	.2067	−.0889	.2909		.3761	−.0920	.4354		.4811	−.0931	.6202		.7679	−.0937
49	.133	.942	.4642	−.0909	.5981		.7017	−.0928	.7585		.8075	−.0933	.8934		1.0303	−.0937
50	.088	0.000	.2446	−.0889	.3670		.4678	−.0919	.5186		.5681	−.0928	.6812		.8846	−.0942
51	.088	.354	.2457	−.0883	.3550		.4435	−.0916	.4924		.5503	−.0928	.6725		.8634	−.0940
52	.088	.589	.2247	−.0891	.3128		.3929	−.0923	.4689		.5380	−.0931	.6762		.9066	−.0942
53	.088	.707		−.0895				−.0926				−.0934				−.0939
54	.044	0.000	.2309	−.0888	.3426		.4533	−.0922	.5067		.5833	−.0928	.7224		1.0409	−.0939
55	.044	.354	.2398	−.0884	.3449		.4351	−.0919	.4936		.5752	−.0931	.7220		1.0501	−.0941
56	.044	.589	.2155	−.0888	.3018		.3910	−.0919	.4779		.5703	−.0930	.7281		1.0654	−.0939
57	.044	.707	.2000	−.0895	.2972		.4059	−.0926	.5037		.5999	−.0935	.7562		1.0576	−.0940
58	.044	.823	.2448	−.0901	.3547		.4634	−.0930	.5622		.6644	−.0938	.8293		1.0229	−.0946
59	.412	−.707	.5771	−.0941	.8174		1.0943	−.0946	1.2513		1.3703	−.0955	1.4782		1.5512	−.0961
60	.221	−.707	.6033	−.0886	.7647		.9242	−.0918	1.0857		1.1667	−.0927	1.2369		1.2954	−.0933

TABLE VIII.–Continued
(e) M = 4.60

			α =													
			−4.2		.8		5.8		10.8		15.8		20.8		25.8	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	.0966	.2405	.1550	.1515	.2619	.0839	.3865	.0413	.5332	.0117	.6993	−.0055	.8890	
2	.894	0.000	.0816	.2387	.1493	.1438	.2565	.0729	.3836	.0276	.5335	−.0042	.7000	−.0218	.8911	
3	.841	0.000	.0780	.2350	.1458	.1406	.2519	.0699	.3788	.0244	.5280	−.0075	.6935	−.0253	.8827	
4	.751	0.000	.0021	.0642	.0260	.0272	.0782	−.0017	.1470	−.0196	.2396	−.0326	.3570	−.0395	.4996	
5	.813	.055	.0802	.2404	.1494	.1447	.2570	.0722	.3839	.0249	.5323	−.0083	.6980	−.0264	.8879	
6	.850	.088	.0892	.2634	.1667	.1595	.2793	.0807	.4089	.0292	.5565	−.0060	.7205	−.0256	.9107	
7	.887	.120	.1026	.2953	.1885	.1794	.3122	.0940	.4604	.0383	.6233	.0007	.7894	−.0202	.9773	
8	.663	0.000	−.0129	.0431	.0064	.0087	.0575	−.0165	.1254	−.0303	.2166	−.0395	.3324	−.0436	.4736	
9	.663	.126	.0018	.0482	.0189	.0187	.0611	−.0019	.1215	−.0121	.2030	−.0189	.3060	−.0214	.4332	
10	.663	.210	−.0044	.0595	.0194	.0203	.0730	−.0089	.1404	−.0256	.2250	−.0363	.3255	−.0416	.4369	
11	.690	.302	.0912	.2787	.1744	.1649	.2970	.0817	.4465	.0280	.6019	−.0078	.7576	−.0268	.9311	
12	.727	.334	.0966	.2874	.1809	.1716	.3061	.0869	.4619	.0324	.6415	−.0044	.8088	−.0238	.9900	
13	.763	.367	.1031	.2965	.1892	.1788	.3150	.0933	.4731	.0381	.6712	.0012	.8804	−.0181	1.0752	
14	.530	0.000	−.0163	.0375	.0011	.0040	.0518	−.0201	.1196	−.0329	.2099	−.0400	.3259	−.0428	.4634	
15	.530	.246	−.0129	.0403	−.0006	.0113	.0558	−.0160	.1232	−.0313	.2101	−.0404	.3184	−.0435	.4511	
16	.530	.410	−.0096	.0533	.0082	.0161	.0696	−.0134	.1505	−.0305	.2436	−.0411	.3468	−.0452	.4642	
17	.530	.492	.0012	.0677	.0233	.0284	.0839	−.0036	.1669	−.0236	.2690	−.0366	.3631	−.0431	.4512	
18	.557	.567	.0910	.2770	.1740	.1626	.2959	.0801	.4510	.0270	.6379	−.0082	.8017	−.0264	.9573	
19	.594	.600	.0955	.2849	.1805	.1686	.3043	.0845	.4614	.0306	.6568	−.0055	.8527	−.0240	1.0357	
20	.631	.632	.1032	.2947	.1891	.1768	.3139	.0919	.4722	.0374	.6714	.0011	.9149	−.0170	1.1243	
21	.464	.753	.0896	.2750	.1742	.1609	.2946	.0780	.4488	.0246	.6385	−.0106	.8178	−.0282	.9572	
22	.501	.786	.0945	.2837	.1809	.1672	.3037	.0829	.4606	.0290	.6563	−.0066	.8721	−.0243	1.0532	
23	.537	.819	.1022	.2946	.1905	.1763	.3152	.0908	.4738	.0361	.6737	−.0001	.9344	−.0172	1.1511	
24	.412	0.000	−.0150	.0358	−.0028	.0074	.0507	−.0177	.1210	−.0320	.2152	−.0394	.3345	−.0427	.4736	
25	.412	.354	−.0158	.0419	−.0020	.0083	.0575	−.0187	.1280	−.0337	.2144	−.0401	.3231	−.0429	.4581	
26	.412	.589	−.0125	.0495	.0048	.0122	.0660	−.0161	.1501	−.0320	.2536	−.0413	.3595	−.0444	.4824	
27	.412	.707	.0164	.0616	.0310	.0338	.0851	.0059	.1649	−.0107	.2763	−.0219	.3751	−.0273	.4660	
28	.412	.823	.0037	.0703	.0291	.0309	.0873	−.0013	.1622	−.0218	.2662	−.0354	.3763	−.0419	.4461	
29	.412	.882	−.0044	.0543	.0157	.0194	.0704	−.0083	.1473	−.0255	.2563	−.0367	.3841	−.0423	.4743	
30	.412	.942	−.0070	.0473	.0096	.0142	.0635	−.0107	.1398	−.0264	.2494	−.0370	.3901	−.0425	.4950	
31	.309	0.000	−.0180	.0340	−.0043	.0033	.0482	−.0206	.1180	−.0337	.2112	−.0394	.3323	−.0428	.4727	
32	.309	.354	−.0192	.0378	−.0035	.0036	.0527	−.0219	.1202	−.0351	.2070	−.0400	.3199	−.0427	.4569	
33	.309	.589	−.0176	.0442	.0001	.0062	.0607	−.0206	.1433	−.0350	.2391	−.0401	.3476	−.0428	.4779	
34	.309	.707	−.0162	.0418	−.0006	.0064	.0589	−.0191	.1421	−.0330	.2483	−.0398	.3537	−.0426	.4771	
35	.309	.823	−.0191	.0326	−.0048	.0011	.0486	−.0219	.1183	−.0346	.2084	−.0416	.2874	−.0439	.3727	
36	.309	.882	−.0165	.0371	−.0009	.0030	.0535	−.0199	.1271	−.0332	.2239	−.0412	.2980	−.0442	.3651	
37	.309	.942	−.0124	.0343	.0016	.0066	.0502	−.0154	.1234	−.0297	.2266	−.0392	.3255	−.0434	.3872	
38	.221	0.000	−.0215	.0306	−.0066	−.0016	.0451	−.0243	.1152	−.0352	.2092	−.0405	.3306	−.0436	.4715	
39	.221	.354	−.0210	.0343	−.0048	.0003	.0489	−.0235	.1160	−.0341	.2047	−.0389	.3195	−.0418	.4580	
40	.221	.589	−.0154	.0408	−.0017	.0081	.0575	−.0187	.1390	−.0301	.2306	−.0357	.3381	−.0389	.4665	
41	.221	.707	.0023	.0382	.0128	.0174	.0614	−.0054	.1375	−.0159	.2341	−.0212	.3294	−.0239	.4424	
42	.221	.823	−.0164	.0279	−.0062	.0035	.0434	−.0185	.1126	−.0298	.2011	−.0360	.2824	−.0389	.3793	
43	.221	.882	−.0143	.0299	−.0035	.0050	.0452	−.0167	.1142	−.0290	.2027	−.0360	.2805	−.0393	.3719	
44	.221	.942	−.0113	.0267	−.0006	.0076	.0410	−.0133	.1085	−.0262	.1997	−.0352	.2745	−.0391	.3594	
45	.133	0.000	−.0361	−.0295	−.0332	−.0318	−.0217	−.0348	−.0038	−.0350	.0275	−.0378	.0795	−.0404	.1571	
46	.133	.354	−.0383	−.0354	−.0369	−.0371	−.0278	−.0377	−.0096	−.0366	.0286	−.0389	.0856	−.0412	.1613	
47	.133	.589	−.0343	−.0327	−.0348	−.0349	−.0253	−.0337	−.0038	−.0336	.0337	−.0371	.0887	−.0398	.1587	
48	.133	.707	−.0364	−.0348	−.0365	−.0368	−.0277	−.0356	−.0080	−.0347	.0282	−.0377	.0778	−.0402	.1379	
49	.133	.942	−.0150	.0194	−.0039	.0010	.0327	−.0175	.0935	−.0275	.1708	−.0356	.2459	−.0391	.3359	
50	.088	0.000	−.0371	−.0359	−.0359	−.0368	−.0285	−.0360	−.0120	−.0355	.0198	−.0385	.0718	−.0409	.1489	
51	.088	.354	−.0371	−.0386	−.0364	−.0376	−.0329	−.0369	−.0188	−.0363	.0165	−.0386	.0724	−.0408	.1484	
52	.088	.589	−.0330	−.0361	−.0319	−.0339	−.0309	−.0335	−.0153	−.0342	.0202	−.0375	.0757	−.0403	.1459	
53	.088	.707		−.0368		−.0344		−.0347		−.0350		−.0381		−.0406		
54	.044	0.000	−.0321	−.0404	−.0309	−.0388	−.0285	−.0370	−.0166	−.0360	.0111	−.0388	.0621	−.0412	.1373	
55	.044	.354	−.0362	−.0397	−.0341	−.0374	−.0339	−.0371	−.0215	−.0366	.0127	−.0389	.0681	−.0410	.1428	
56	.044	.589	−.0329	−.0366	−.0305	−.0331	−.0320	−.0340	−.0188	−.0342	.0140	−.0368	.0680	−.0398	.1378	
57	.044	.707	−.0339	−.0369	−.0315	−.0336	−.0323	−.0349	−.0176	−.0354	.0158	−.0383	.0648	−.0405	.1250	
58	.044	.823	−.0342	−.0379	−.0321	−.0343	−.0323	−.0351	−.0146	−.0360	.0267	−.0393	.0849	−.0416	.1510	
59	.412	−.707	.0024	.0626	.0198	.0290	.0783	−.0020	.1600	−.0215	.2739	−.0344	.3736	−.0406	.4645	
60	.221	−.707	−.0155	.0383	−.0027	.0074	.0543	−.0184	.1349	−.0303	.2329	−.0359	.3317	−.0386	.4488	

TABLE VIII.–Concluded
(e) Concluded

			α = 30.8		35.8		40.8		45.8		50.8		55.8		60.8	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.947	0.000	1.0879	−.0172	1.2909		1.5051	−.0226	1.6633		1.7817	−.0261	1.8404		1.8402	−.0282
2	.894	0.000	1.0914	−.0327	1.2987		1.4811	−.0373	1.6084		1.7323	−.0393	1.8190		1.8594	−.0426
3	.841	0.000	1.0840	−.0358	1.2910		1.4244	−.0400	1.5264		1.6654	−.0420	1.7768		1.8412	−.0445
4	.751	0.000	.6683	−.0426	.8323		1.0028	−.0446	1.2538		1.5057	−.0474	1.6677		1.7703	−.0474
5	.813	.055	1.0884	−.0373	1.2847		1.3702	−.0417	1.4683		1.6258	−.0449	1.7508		1.8225	−.0460
6	.850	.088	1.1101	−.0368	1.3118		1.4513	−.0416	1.5575		1.6827	−.0449	1.7783		1.8269	−.0462
7	.887	.120	1.1713	−.0315	1.3633		1.5192	−.0398	1.6217		1.7127	−.0451	1.7707		1.7881	−.0466
8	.663	0.000	.6449	−.0437	.8124		1.0144	−.0444	1.2672		1.4873	−.0465	1.6263		1.7266	−.0474
9	.663	.126	.6004	−.0200	.7806		1.0038	−.0194	1.2665		1.4903	−.0217	1.6315		1.7313	−.0220
10	.663	.210	.5573	−.0426	.6996		.9574	−.0426	1.2554		1.4960	−.0442	1.6418		1.7393	−.0443
11	.690	.302	1.0988	−.0359	1.1817		1.2700	−.0412	1.4335		1.5967	−.0443	1.7034		1.7691	−.0457
12	.727	.334	1.1783	−.0331	1.3053		1.3974	−.0407	1.5257		1.6455	−.0442	1.7236		1.7656	−.0452
13	.763	.367	1.2625	−.0282	1.4056		1.4949	−.0394	1.5876		1.6609	−.0442	1.7013		1.7131	−.0458
14	.530	0.000	.6304	−.0430	.8057		1.0249	−.0432	1.2760		1.4485	−.0451	1.5607		1.6542	−.0463
15	.530	.246	.6230	−.0446	.8153		1.0341	−.0453	1.2857		1.4600	−.0465	1.5741		1.6674	−.0471
16	.530	.410	.6018	−.0460	.7894		1.0437	−.0466	1.3052		1.4834	−.0476	1.5963		1.6844	−.0483
17	.530	.492	.5432	−.0453	.7241		1.0071	−.0456	1.2975		1.4890	−.0467	1.6046		1.6912	−.0474
18	.557	.567	1.0698	−.0338	1.1485		1.2732	−.0407	1.4508		1.5771	−.0438	1.6571		1.7160	−.0452
19	.594	.600	1.1876	−.0311	1.2842		1.3955	−.0396	1.5319		1.6200	−.0437	1.6751		1.7135	−.0450
20	.631	.632	1.2925	−.0271	1.3950		1.4885	−.0386	1.5818		1.6260	−.0427	1.6493		1.6621	−.0440
21	.464	.753	1.0513	−.0339	1.1357		1.2723	−.0403	1.4129		1.4880	−.0439	1.5546		1.6146	−.0456
22	.501	.786	1.1845	−.0312	1.2809		1.3932	−.0404	1.4999		1.5450	−.0435	1.5873		1.6262	−.0446
23	.537	.819	1.3010	−.0291	1.3961		1.4841	−.0404	1.5542		1.5653	−.0435	1.5798		1.5929	−.0447
24	.412	0.000	.6416	−.0441	.8249		1.0406	−.0448	1.2770		1.4082	−.0462	1.4989		1.5832	−.0471
25	.412	.354	.6305	−.0438	.8301		1.0509	−.0442	1.2847		1.4166	−.0462	1.5099		1.5948	−.0472
26	.412	.589	.6397	−.0453	.8475		1.0786	−.0460	1.2945		1.4197	−.0473	1.5143		1.5982	−.0477
27	.412	.707	.5843	−.0294	.7885		1.0506	−.0293	1.2489		1.3675	−.0305	1.4673		1.5531	−.0304
28	.412	.823	.4942	−.0443	.5419		.6194	−.0465	.7935		1.0403	−.0470	1.2264		1.3568	−.0472
29	.412	.882	.5329	−.0444	.5823		.6548	−.0465	.8517		1.0657	−.0466	1.2599		1.3678	−.0467
30	.412	.942	.5682	−.0447	.6314		.7228	−.0472	.9044		1.1130	−.0472	1.2496		1.3191	−.0471
31	.309	0.000	.6392	−.0444	.8213		1.0305	−.0456	1.2425		1.3376	−.0467	1.4075		1.4809	−.0472
32	.309	.354	.6309	−.0439	.8303		1.0510	−.0447	1.2531		1.3492	−.0464	1.4221		1.4968	−.0472
33	.309	.589	.6449	−.0443	.8502		1.0576	−.0456	1.2174		1.3301	−.0464	1.4131		1.4913	−.0470
34	.309	.707	.6330	−.0436	.8139		.9760	−.0448	1.1238		1.2761	−.0464	1.3686		1.4512	−.0469
35	.309	.823	.4837	−.0453	.6505		.8112	−.0465	1.0108		1.1765	−.0471	1.2611		1.3393	−.0474
36	.309	.882	.4710	−.0452	.6263		.8049	−.0460	1.0410		1.1691	−.0472	1.2399		1.3125	−.0478
37	.309	.942	.4647	−.0451	.6189		.7991	−.0467	1.0249		1.1035	−.0469	1.1669		1.2319	−.0473
38	.221	0.000	.6376	−.0448	.8216		1.0271	−.0456	1.1983		1.2438	−.0471	1.2832		1.3374	−.0481
39	.221	.354	.6343	−.0429	.8377		1.0466	−.0440	1.1945		1.2479	−.0455	1.2917		1.3469	−.0462
40	.221	.589	.6362	−.0395	.8378		1.0052	−.0399	1.1397		1.2271	−.0434	1.2829		1.3431	−.0435
41	.221	.707	.5823	−.0249	.7500		.9072	−.0249	1.0742		1.1772	−.0273	1.2361		1.3000	−.0267
42	.221	.823	.5064	−.0393	.6587		.8297	−.0399	1.0087		1.1022	−.0432	1.1583		1.2224	−.0432
43	.221	.882	.4951	−.0406	.6558		.8360	−.0413	1.0070		1.0847	−.0440	1.1366		1.2015	−.0434
44	.221	.942	.4792	−.0412	.6239		.7980	−.0418	.9409		1.0177	−.0437	1.0688		1.1349	−.0431
45	.133	0.000	.2589	−.0414	.3742		.4959	−.0415	.5774		.5900	−.0442	.6342		.7958	−.0438
46	.133	.354	.2596	−.0417	.3720		.4733	−.0418	.5407		.5629	−.0450	.6132		.7821	−.0447
47	.133	.589	.2545	−.0405	.3535		.4394	−.0406	.5026		.5440	−.0435	.6052		.7856	−.0437
48	.133	.707	.2212	−.0409	.3167		.4041	−.0412	.4822		.5334	−.0440	.6497		.7979	−.0436
49	.133	.942	.4480	−.0407	.5914		.7253	−.0409	.8098		.8512	−.0434	.9150		1.0338	−.0428
50	.088	0.000	.2488	−.0408	.3649		.4876	−.0411	.5772		.6171	−.0445	.7132		.8471	−.0445
51	.088	.354	.2496	−.0411	.3620		.4697	−.0409	.5463		.5998	−.0441	.7008		.8445	−.0441
52	.088	.589	.2408	−.0411	.3363		.4270	−.0415	.5105		.5857	−.0444	.7005		.8416	−.0441
53	.088	.707		−.0416				−.0417				−.0443				−.0436
54	.044	0.000	.2348	−.0416	.3469		.4596	−.0421	.5543		.6210	−.0443	.7443		1.0013	−.0437
55	.044	.354	.2428	−.0410	.3538		.4579	−.0413	.5366		.6150	−.0443	.7412		.9834	−.0440
56	.044	.589	.2298	−.0406	.3237		.4156	−.0410	.5117		.6088	−.0438	.7454		1.0279	−.0435
57	.044	.707	.2130	−.0411	.3101		.4188	−.0415	.5329		.6388	−.0444	.7624		1.0755	−.0436
58	.044	.823	.2458	−.0417	.3623		.4824	−.0414	.5952		.7023	−.0446	.8359		1.0317	−.0443
59	.412	−.707	.5829	−.0432	.7920		1.0575	−.0438	1.2627		1.3796	−.0447	1.4792		1.5670	−.0451
60	.221	−.707	.5901	−.0401	.7598		.9185	−.0406	1.0862		1.1895	−.0428	1.2492		1.3159	−.0426

TABLE IX.–PRESSURE COEFFICIENTS FOR MODEL 9
(a) M = 1.60

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/ℓ	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	.3841	1.0338	.7865	.7454	1.0519	.3437	1.1988	.0722	1.3001	−.1325	1.3770	−.3128	1.4535	−.4376
2	.941	.295	.3872	1.0248	.7861	.7411	1.0423	.3465	1.1919	.0818	1.2956	−.1266	1.3722	−.3042	1.4480	−.4379
3	.941	.530	.3917	1.0002	.7666	.7311	1.0202	.3525	1.1704	.0924	1.2785	−.1145	1.3602	−.2873	1.4320	−.4257
4	.941	.707	.3922	.9507	.7325	.7002	.9679	.3589	1.1230	.1085	1.2377	−.0925	1.3244	−.2606	1.4016	−.4024
5	.941	.882	.3795	.7822	.6081	.5830	.8033	.3491	.9532	.1309	1.0702	−.0585	1.1644	−.2176	1.2512	−.3519
6	.882	0.000	.3928	.8912	.7239	.6957	.9030	.3589	1.0233	.1343	1.1171	−.0538	1.1951	−.2123	1.2977	−.3532
7	.882	.295	.3895	.8816	.7196	.6922	.8962	.3589	1.0145	.1302	1.1113	−.0525	1.1902	−.2076	1.2909	−.3465
8	.882	.530	.3901	.8566	.6952	.6719	.8699	.3568	.9923	.1334	1.0900	−.0486	1.1740	−.2006	1.2686	−.3346
9	.882	.707	.3878	.7970	.6439	.6240	.8118	.3541	.9345	.1371	1.0388	−.0424	1.1259	−.1917	1.2218	−.3207
10	.882	.823	.3526	.6764	.5403	.5230	.6918	.3251	.8110	.1338	.9131	−.0391	1.0005	−.1839	1.0958	−.3095
11	.882	.941	−.1326	.0273	−.0592	−.0669	.0344	−.1430	.1498	−.2199	.3435	−.2801	.5601	−.3536	.7590	−.4148
12	.823	0.000	.3815	.7630	.6554	.6376	.7710	.3464	.8550	.1416	.9288	−.0348	.9947	−.1829	1.1141	−.3118
13	.823	.295	.3813	.7568	.6509	.6337	.7674	.3489	.8517	.1382	.9266	−.0344	.9919	−.1799	1.1050	−.3078
14	.823	.530	.3815	.7301	.6241	.6071	.7415	.3430	.8285	.1373	.9059	−.0346	.9739	−.1762	1.0738	−.3013
15	.823	.707	.3636	.6671	.5589	.5420	.6778	.3314	.7708	.1349	.8531	−.0343	.9233	−.1727	1.0162	−.2935
16	.823	.882	−.1704	−.0364	−.1000	−.1078	−.0299	−.1781	.0464	−.2303	.1046	−.2873	.2066	−.3514	.4142	−.4122
17	.736	0.000	−.1035	.0357	−.0064	−.0102	.0416	−.1184	.1047	−.2212	.2003	−.3073	.3730	−.3804	.7057	−.4414
18	.736	.295	−.1079	.0279	−.0133	−.0171	.0340	−.1229	.0942	−.2232	.1805	−.3109	.3555	−.3826	.6665	−.4428
19	.736	.530	−.1092	.0132	−.0260	−.0299	.0192	−.1231	.0760	−.2243	.1518	−.3120	.3099	−.3823	.5803	−.4409
20	.736	.707	−.1416	−.0358	−.0741	−.0805	−.0319	−.1523	.0194	−.2336	.0836	−.3158	.2202	−.3837	.4947	−.4383
21	.736	.823	−.1923	−.0931	−.1363	−.1425	−.0908	−.2000	−.0497	−.2496	−.0209	−.3078	.1284	−.3608	.4891	−.4155
22	.736	.882	−.1074	.0428	−.0225	−.0191	.0474	−.1395	.2664	−.2247	.3265	−.2724	.4032	−.3617	.6500	−.4250
23	.736	.941	.0344	.1441	.1046	.0965	.1471	.0190	.2144	−.0672	.2809	−.1613	.3646	−.2488	.5596	−.3289
24	.618	0.000	−.1111	.0793	−.0048	−.0136	.0913	−.1275	.2132	−.2272	.3787	−.3138	.6928	−.3830	.8263	−.4242
25	.618	.295	−.1108	.0689	−.0110	−.0199	.0807	−.1266	.1983	−.2283	.3612	−.3144	.6785	−.3833	.8106	−.4359
26	.618	.530	−.1203	.0323	−.0390	−.0475	.0443	−.1345	.1503	−.2319	.2957	−.3177	.6483	−.3849	.7697	−.4403
27	.618	.707	−.2068	−.0774	−.1428	−.1503	−.0703	−.2147	.0449	−.2653	.1946	−.3214	.4726	−.3747	.7068	−.4223
28	.618	.823	−.1886	.0046	−.0793	−.0764	.0069	−.1961	.1446	−.2535	.2733	−.3167	.4629	−.3713	.6452	−.4142
29	.618	.882	−.0038	.0727	.0495	.0437	.0787	−.0099	.1200	−.0718	.2190	−.1463	.4190	−.2203	.5965	−.2904
30	.618	.941	.0204	.0703	.0774	.0754	.0706	.0094	.1077	−.0915	.1745	−.2001	.3249	−.2926	.5133	−.3684
31	.500	0.000	−.1153	.0903	−.0067	−.0177	.1047	−.1320	.2423	−.2312	.4274	−.3160	.6049	−.3825	.7642	−.4095
32	.500	.295	−.1145	.0753	−.0165	−.0270	.0894	−.1315	.2201	−.2312	.3985	−.3168	.5908	−.3834	.7520	−.4160
33	.500	.530	−.1422	.0163	−.0628	−.0742	.0275	−.1550	.1444	−.2403	.3083	−.3203	.5707	−.3840	.6998	−.4241
34	.500	.707	−.1614	−.0030	−.0830	−.0943	.0052	−.1707	.1246	−.2397	.3068	−.3041	.5355	−.3617	.6478	−.4174
35	.500	.823	−.0388	.0582	.0196	.0087	.0620	−.0469	.1436	−.1005	.2731	−.1761	.4579	−.2241	.5738	−.2840
36	.500	.882	−.0243	.0473	.0223	.0200	.0557	−.0322	.1267	−.1086	.2425	−.1839	.4283	−.2642	.5333	−.3319
37	.500	.941	−.0166	.0387	.0408	.0391	.0412	−.0281	.0937	−.1318	.1845	−.2367	.3588	−.3212	.4627	−.3878
38	.382	0.000	−.1187	.0866	−.0109	−.0240	.1015	−.1339	.2380	−.2346	.4079	−.3169	.5623	−.3816	.6995	−.4081
39	.382	.295	−.1208	.0670	−.0256	−.0386	.0805	−.1355	.2125	−.2358	.3734	−.3188	.5544	−.3838	.6891	−.4116
40	.382	.530	−.1682	−.0002	−.0858	−.0980	.0121	−.1762	.1478	−.2477	.3475	−.3146	.5280	−.3720	.6571	−.4131
41	.382	.707	−.1421	.0220	−.0670	−.0787	.0332	−.1483	.1685	−.2130	.3311	−.2655	.4799	−.2957	.6028	−.3569
42	.382	.823	−.0445	.0490	.0198	.0120	.0566	−.0544	.1373	−.1270	.2639	−.1991	.4072	−.2530	.5271	−.3264
43	.382	.882	−.0444	.0490	.0189	.0129	.0574	−.0526	.1248	−.1298	.2400	−.2117	.3785	−.2837	.4815	−.3620
44	.382	.941	−.0393	.0389	.0213	.0177	.0453	−.0479	.0953	−.1541	.1879	−.2581	.3185	−.3392	.4087	−.3992
45	.264	0.000	−.1241	.0728	−.0225	−.0349	.0864	−.1399	.2145	−.2376	.3637	−.3206	.5131	−.3690	.6149	−.4042
46	.264	.295	−.1326	.0452	−.0437	−.0567	.0587	−.1469	.1823	−.2430	.3426	−.3239	.5042	−.3761	.6067	−.4129
47	.264	.530	−.1663	.0106	−.0833	−.0955	.0226	−.1750	.1690	−.2468	.3427	−.3125	.4783	−.3689	.5831	−.4127
48	.264	.707	−.0595	.0398	−.0036	−.0064	.0485	−.0657	.1708	−.1452	.3038	−.2161	.4348	−.2753	.5321	−.3472
49	.264	.823	−.0501	.0462	.0119	.0062	.0565	−.0569	.1419	−.1325	.2537	−.2067	.3744	−.2772	.4675	−.3527
50	.264	.882	−.0483	.0457	.0129	.0085	.0554	−.0554	.1308	−.1355	.2322	−.2261	.3437	−.3128	.4361	−.3869
51	.264	.941	−.0524	.0340	.0161	.0139	.0422	−.0618	.0981	−.1710	.1870	−.2732	.2879	−.3535	.3714	−.4044
52	.177	0.000	−.3561	−.2574	−.3063	−.3121	−.2506	−.3632	−.1864	−.3518	−.1249	−.3483	−.0572	−.3597	−.0193	−.3986
53	.177	.295	−.3650	−.2781	−.3229	−.3279	−.2710	−.3485	−.2064	−.3465	−.1194	−.3514	−.0630	−.3653	−.0240	−.4145
54	.177	.530	−.3524	−.2494	−.3174	−.3209	−.2597	−.3425	−.1952	−.3670	−.1216	−.3828	−.0736	−.4074	−.0346	−.4412
55	.177	.707	−.3311	−.2588	−.3028	−.3069	−.2489	−.3325	−.2010	−.3588	−.1393	−.3920	−.0901	−.4197	−.0494	−.4259
56	.177	.882	−.0522	.0374	.0065	.0031	.0451	−.0574	.1018	−.1459	.1733	−.2398	.2392	−.3345	.2835	−.4040
57	.118	0.000	−.3629	−.2685	−.3167	−.3234	−.2616	−.3694	−.1991	−.3460	−.1372	−.3498	−.0661	−.3618	−.0188	−.3996
58	.118	.295	−.3299	−.2667	−.2837	−.2866	−.2691	−.3252	−.2140	−.3472	−.1265	−.3555	−.0696	−.3680	−.0208	−.4175
59	.118	.530	−.3319	−.2146	−.2850	−.2914	−.2248	−.3315	−.1957	−.3647	−.1280	−.3844	−.0767	−.3966	−.0282	−.4340
60	.118	.707	−.3155	−.2393	−.2813	−.2860	−.2379	−.3173	−.1903	−.3458	−.1284	−.3765	−.0758	−.3983	−.0234	−.4181
61	.118	.823	−.3416	−.2575	−.2987	−.3054	−.2330	−.3421	−.1591	−.3629	−.0822	−.3628	−.0184	−.3891	.0391	−.4097
62	.118	.941	−.0639	.0190	.0053	.0068	.0253	−.0695	.0515	−.1978	.0939	−.3002	.1356	−.3714	.1769	−.4095
63	.059	0.000	−.3587	−.2766	−.3230	−.3295	−.2698	−.3539	−.2089	−.3446	−.1452	−.3522	−.0662	−.3634	−.0097	−.4045
64	.059	.295	−.3218	−.2505	−.2811	−.2850	−.2482	−.3186	−.2156	−.3495	−.1293	−.3622	−.0699	−.3731	−.0127	−.4153
65	.059	.530	−.3283	−.2145	−.2749	−.2795	−.2094	−.3208	−.1996	−.3569	−.1357	−.3793	−.0834	−.3881	−.0272	−.4058
66	.059	.707	−.2906	−.2089	−.2657	−.2697	−.2076	−.2880	−.1638	−.3233	−.1174	−.3633	−.0576	−.3915	.0040	−.4173
67	.059	.882	−.3123	−.3002	−.3044	−.3096	−.2950	−.3090	−.2410	−.3382	−.1339	−.3469	−.0537	−.3845	.0231	−.4052
68	.736	−.707	−.1361	−.0372	−.0700	−.0796	−.0291	−.1514	.0201	−.2319	.0833	−.3132	.2196	−.3791	.4326	−.4291
69	.288	−.707	−.0561	.0385	−.0092	−.0258	.0461	−.0649	.1709	−.1403	.3089	−.2185	.4369	−.2732	.5318	−.3460

TABLE IX.–Continued
(a) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x′/ℓ	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	1.5169	−.4806	1.5562	−.4244	1.5776	−.4150	1.5800	−.4228	1.5746	−.4302	1.5600		1.5212	
2	.941	.295	1.5101	−.4873	1.5533	−.4309	1.5731	−.4181	1.5787	−.4242	1.5754	−.4310	1.5566		1.5214	
3	.941	.530	1.4947	−.4855	1.5400	−.4353	1.5659	−.4225	1.5712	−.4275	1.5684	−.4322	1.5472		1.5167	
4	.941	.707	1.4670	−.4797	1.5162	−.4367	1.5418	−.4245	1.5457	−.4291	1.5486	−.4324	1.5288		1.5029	
5	.941	.882	1.3227	−.4544	1.3842	−.4329	1.4236	−.4221	1.4407	−.4272	1.4548	−.4320	1.4438		1.4287	
6	.882	0.000	1.3873	−.4653	1.4639	−.4252	1.5190	−.4183	1.5523	−.4259	1.5776	−.4332	1.5877		1.5767	
7	.882	.295	1.3778	−.4598	1.4569	−.4283	1.5104	−.4187	1.5485	−.4248	1.5746	−.4318	1.5827		1.5737	
8	.882	.530	1.3556	−.4477	1.4364	−.4329	1.4948	−.4230	1.5345	−.4276	1.5603	−.4324	1.5678		1.5627	
9	.882	.707	1.3106	−.4299	1.3924	−.4338	1.4530	−.4248	1.4934	−.4291	1.5247	−.4329	1.5340		1.5341	
10	.882	.823	1.1894	−.4152	1.2766	−.4331	1.3445	−.4238	1.3955	−.4279	1.4393	−.4327	1.4558		1.4663	
11	.882	.941	.9082	−.4539	.9878	−.4326	1.0579	−.4214	1.1057	−.4258	1.1559	−.4309	1.1949		1.2235	
12	.823	0.000	1.2294	−.4202	1.3350	−.4248	1.4178	−.4190	1.4833	−.4264	1.5331	−.4337	1.5683		1.5779	
13	.823	.295	1.2209	−.4146	1.3268	−.4283	1.4105	−.4193	1.4763	−.4252	1.5276	−.4323	1.5613		1.5740	
14	.823	.530	1.1881	−.4053	1.2973	−.4327	1.3866	−.4238	1.4532	−.4281	1.5069	−.4329	1.5398		1.5568	
15	.823	.707	1.1267	−.3950	1.2376	−.4343	1.3273	−.4254	1.3967	−.4296	1.4551	−.4336	1.4924		1.5143	
16	.823	.882	.6859	−.4466	.9980	−.4330	1.0988	−.4236	1.1714	−.4279	1.2216	−.4318	1.2578		1.2916	
17	.736	0.000	.9545	−.4235	1.1469	−.4250	1.2602	−.4204	1.3527	−.4273	1.4287	−.4344	1.4929		1.5345	
18	.736	.295	.9354	−.4306	1.1336	−.4286	1.2469	−.4208	1.3430	−.4266	1.4184	−.4333	1.4840		1.5258	
19	.736	.530	.8837	−.4391	1.0905	−.4344	1.2122	−.4254	1.3099	−.4296	1.3891	−.4339	1.4546		1.5009	
20	.736	.707	.7975	−.4375	1.0117	−.4360	1.1315	−.4270	1.2294	−.4306	1.3150	−.4328	1.3804		1.4361	
21	.736	.823	.7808	−.4388	.9468	−.4352	1.0414	−.4266	1.1158	−.4305	1.1873	−.4332	1.2487		1.3016	
22	.736	.882	.7865	−.4438	.8902	−.4351	.9854	−.4266	1.0649	−.4299	1.1339	−.4328	1.1926		1.2432	
23	.736	.941	.6935	−.3922	.7985	−.4320	.8867	−.4245	.9621	−.4289	1.0261	−.4324	1.0832		1.1307	
24	.618	0.000	.9641	−.4238	1.0748	−.4266	1.1764	−.4229	1.2640	−.4299	1.3408	−.4361	1.4142		1.4690	
25	.618	.295	.9510	−.4312	1.0623	−.4304	1.1655	−.4242	1.2522	−.4291	1.3300	−.4348	1.4046		1.4588	
26	.618	.530	.9102	−.4372	1.0238	−.4376	1.1283	−.4279	1.2187	−.4321	1.2982	−.4354	1.3707		1.4316	
27	.618	.707	.8420	−.4337	.9546	−.4408	1.0553	−.4296	1.1460	−.4333	1.2269	−.4359	1.3015		1.3625	
28	.618	.823	.7509	−.4320	.8556	−.4386	.9464	−.4288	1.0275	−.4320	1.1008	−.4342	1.1699		1.2304	
29	.618	.882	.7049	−.3535	.8068	−.4382	.8965	−.4281	.9747	−.4317	1.0463	−.4337	1.1155		1.1765	
30	.618	.941	.6223	−.4218	.7171	−.4442	.8020	−.4290	.8734	−.4318	.9399	−.4336	1.0069		1.0632	
31	.500	0.000	.8903	−.4245	.9885	−.4296	1.0807	−.4252	1.1658	−.4317	1.2453	−.4372	1.3247		1.3908	
32	.500	.295	.8784	−.4340	.9782	−.4337	1.0689	−.4268	1.1558	−.4318	1.2345	−.4364	1.3149		1.3816	
33	.500	.530	.8303	−.4398	.9424	−.4409	1.0376	−.4296	1.1210	−.4337	1.2026	−.4357	1.2812		1.3513	
34	.500	.707	.7694	−.4338	.8788	−.4442	.9713	−.4307	1.0531	−.4343	1.1362	−.4358	1.2128		1.2855	
35	.500	.823	.6870	−.3859	.7820	−.4436	.8650	−.4300	.9406	−.4337	1.0152	−.4355	1.0912		1.1610	
36	.500	.882	.6443	−.3895	.7383	−.4461	.8191	−.4296	.8937	−.4334	.9663	−.4353	1.0436		1.1096	
37	.500	.941	.5636	−.4321	.6523	−.4558	.7284	−.4301	.7998	−.4335	.8677	−.4349	.9412		1.0037	
38	.382	0.000	.8045	−.4258	.8959	−.4324	.9764	−.4269	1.0495	−.4331	1.1267	−.4370	1.2086		1.2872	
39	.382	.295	.7946	−.4377	.8871	−.4371	.9663	−.4288	1.0410	−.4332	1.1188	−.4357	1.2030		1.2785	
40	.382	.530	.7612	−.4448	.8576	−.4438	.9367	−.4314	1.0118	−.4357	1.0919	−.4371	1.1753		1.2537	
41	.382	.707	.7051	−.4344	.7997	−.4464	.8794	−.4315	.9541	−.4357	1.0344	−.4375	1.1178		1.1987	
42	.382	.823	.6276	−.3719	.7079	−.4477	.7808	−.4317	.8505	−.4356	.9239	−.4376	1.0100		1.0859	
43	.382	.882	.5811	−.4195	.6678	−.4514	.7400	−.4319	.8061	−.4352	.8828	−.4369	.9652		1.0400	
44	.382	.941	.5034	−.4369	.5869	−.4596	.6556	−.4321	.7179	−.4350	.7920	−.4358	.8702		.9402	
45	.264	0.000	.6827	−.4260	.7477	−.4358	.8040	−.4304	.8583	−.4347	.9202	−.4366	1.0066		1.0990	
46	.264	.295	.6756	−.4427	.7398	−.4409	.7955	−.4317	.8509	−.4348	.9135	−.4358	.9997		1.0896	
47	.264	.530	.6521	−.4476	.7200	−.4457	.7772	−.4328	.8319	−.4370	.8954	−.4385	.9825		1.0726	
48	.264	.707	.6085	−.4358	.6770	−.4462	.7346	−.4324	.7882	−.4371	.8591	−.4394	.9491		1.0417	
49	.264	.823	.5389	−.4005	.6025	−.4453	.6564	−.4320	.7073	−.4360	.7914	−.4382	.8956		.9885	
50	.264	.882	.5083	−.4341	.5717	−.4533	.6255	−.4320	.6779	−.4354	.7768	−.4373	.8818		.9645	
51	.264	.941	.4409	−.4377	.5026	−.4564	.5548	−.4303	.6082	−.4342	.7104	−.4358	.8050		.8799	
52	.177	0.000	.0098	−.4246	.0469	−.4303	.0841	−.4242	.1725	−.4285	.3931	−.4326	.5843		.7735	
53	.177	.295	.0047	−.4368	.0430	−.4351	.0795	−.4278	.1806	−.4311	.3846	−.4328	.5779		.7784	
54	.177	.530	−.0066	−.4472	.0317	−.4431	.0689	−.4317	.1847	−.4363	.3862	−.4396	.5709		.7802	
55	.177	.707	−.0203	−.4580	.0208	−.4438	.1174	−.4323	.1946	−.4376	.4128	−.4408	.5982		.7731	
56	.177	.882	.3230	−.4405	.3705	−.4505	.4216	−.4310	.4979	−.4350	.7073	−.4372	.8179		.9042	
57	.118	0.000	.0259	−.4273	.0879	−.4258	.1674	−.4186	.2703	−.4251	.7508	−.4330	.8438		.9164	
58	.118	.295	.0246	−.4334	.0878	−.4293	.1671	−.4246	.2590	−.4293	.7420	−.4331	.8350		.9056	
59	.118	.530	.0173	−.4414	.0787	−.4383	.1552	−.4292	.2458	−.4353	.7276	−.4398	.8260		.8958	
60	.118	.707	.0286	−.4499	.1074	−.4400	.1761	−.4317	.2284	−.4374	.7535	−.4409	.8248		.8926	
61	.118	.823	.0962	−.4358	.1699	−.4360	.2687	−.4323	.4069	−.4373	.6998	−.4400	.7834		.8647	
62	.118	.941	.2168	−.4334	.2718	−.4403	.3455	−.4305	.4483	−.4354	.6276	−.4372	.7188		.7931	
63	.059	0.000	.0538	−.4275	.1315	−.4186	.2302	−.4126	.3534	−.4229	.7098	−.4341	.7648		.8305	
64	.059	.295	.0494	−.4239	.1268	−.4212	.2251	−.4209	.3430	−.4280	.7105	−.4335	.7629		.8278	
65	.059	.530	.0336	−.4296	.1112	−.4323	.2128	−.4274	.3317	−.4354	.7031	−.4406	.7533		.8165	
66	.059	.707	.0700	−.4464	.1412	−.4346	.2125	−.4297	.5402	−.4372	.6910	−.4407	.7465		.8100	
67	.059	.882	.0991	−.4333	.1527	−.4236	.2275	−.4323	.4044	−.4375	.6273	−.4401	.6942		.7622	
68	.736	−.707	.8137	−.4272	1.0101	−.4282	1.1302	−.4199	1.2297	−.4238	1.3130	−.4268	1.3825		1.4404	
69	.288	−.707	.6108	−.4313	.6787	−.4435	.7356	−.4326	.7904	−.4330	.8607	−.4331	.9536		1.0471	

TABLE IX.–Continued
(b) M = 2.16

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	.2483	.6446	.4030	.4361	.6184	.2640	.9515	.1273	1.2755	.0316	1.4226	−.0680	1.5156	−.1606
2	.941	.295	.2462	.6453	.4057	.4369	.6168	.2644	.9533	.1275	1.2692	.0316	1.4186	−.0673	1.5140	−.1610
3	.941	.530	.2493	.6466	.4086	.4361	.6207	.2635	.9506	.1282	1.2495	.0321	1.4013	−.0644	1.5005	−.1565
4	.941	.707	.2495	.6466	.4074	.4347	.6190	.2630	.9392	.1286	1.2047	.0308	1.3567	−.0596	1.4622	−.1466
5	.941	.882	.2466	.6334	.4051	.4317	.6126	.2618	.8529	.1269	1.0490	.0263	1.1928	−.0539	1.3037	−.1295
6	.882	0.000	.2397	.6356	.3965	.4286	.6086	.2586	.9205	.1202	1.1301	.0210	1.2465	−.0545	1.3361	−.1311
7	.882	.295	.2397	.6357	.3976	.4272	.6092	.2584	.9201	.1194	1.1257	.0203	1.2423	−.0547	1.3343	−.1302
8	.882	.530	.2417	.6368	.4012	.4273	.6090	.2577	.9118	.1205	1.1055	.0204	1.2227	−.0559	1.3166	−.1289
9	.882	.707	.2434	.6369	.4004	.4261	.6092	.2578	.8807	.1214	1.0543	.0191	1.1730	−.0579	1.2702	−.1264
10	.882	.823	.2386	.6152	.3944	.4187	.5918	.2556	.7917	.1191	.9374	.0157	1.0523	−.0612	1.1489	−.1259
11	.882	.941	−.0683	.0581	−.0182	−.0107	.0469	−.0611	.1634	−.1125	.3027	−.1533	.4259	−.1903	.6512	−.2140
12	.823	0.000	.2338	.6243	.3916	.4198	.5982	.2532	.8834	.1146	.9962	.0131	1.0769	−.0579	1.1468	−.1246
13	.823	.295	.2349	.6264	.3917	.4214	.6000	.2531	.8830	.1150	.9937	.0131	1.0750	−.0582	1.1468	−.1246
14	.823	.530	.2358	.6240	.3927	.4204	.5966	.2519	.8657	.1159	.9738	.0128	1.0567	−.0614	1.1293	−.1253
15	.823	.707	.2380	.6206	.3930	.4194	.5947	.2527	.8107	.1171	.9191	.0120	1.0056	−.0647	1.0825	−.1263
16	.823	.882	−.0954	.0224	−.0496	−.0413	.0129	−.0889	.1144	−.1331	.2329	−.1687	.3116	−.2035	.3817	−.2254
17	.736	0.000	−.0622	.1456	.0191	.0356	.1299	−.0509	.2539	−.1214	.3020	−.1680	.3831	−.2045	.5260	−.2273
18	.736	.295	−.0645	.1428	.0163	.0328	.1270	−.0539	.2477	−.1235	.2938	−.1706	.3721	−.2065	.5155	−.2298
19	.736	.530	−.0642	.1429	.0173	.0325	.1263	−.0542	.2369	−.1228	.2805	−.1707	.3510	−.2087	.4837	−.2301
20	.736	.707	−.0651	.1205	.0142	.0284	.1100	−.0577	.1868	−.1228	.2288	−.1702	.2895	−.2123	.3765	−.2289
21	.736	.823	−.1081	.0029	−.0627	−.0544	−.0052	−.1020	.0800	−.1436	.1679	−.1777	.2180	−.2114	.3205	−.2296
22	.736	.882	−.0756	.0617	−.0202	−.0110	.0506	−.0694	.1636	−.1214	.2821	−.1627	.4624	−.2009	.5431	−.2232
23	.736	.941	−.0315	.0922	.0060	.0211	.0827	−.0208	.1834	−.0456	.3028	−.1026	.4024	−.1529	.4966	−.1906
24	.618	0.000	−.0742	.1372	.0090	.0246	.1206	−.0641	.2486	−.1341	.3628	−.1777	.5217	−.2119	.8122	−.2290
25	.618	.295	−.0739	.1372	.0089	.0253	.1204	−.0641	.2455	−.1335	.3538	−.1780	.5042	−.2128	.7531	−.2322
26	.618	.530	−.0748	.1341	.0087	.0240	.1183	−.0645	.2207	−.1333	.3159	−.1788	.4475	−.2150	.6318	−.2343
27	.618	.707	−.0978	.0400	−.0343	−.0248	.0325	−.0887	.1046	−.1453	.1953	−.1856	.3205	−.2181	.5237	−.2344
28	.618	.823	−.0911	.0356	−.0379	−.0290	.0255	−.0846	.1218	−.1329	.2213	−.1720	.3857	−.2080	.5360	−.2266
29	.618	.882	−.0791	.0716	−.0213	−.0093	.0606	−.0752	.1600	−.1329	.2482	−.1743	.3378	−.1790	.4823	−.2039
30	.618	.941	−.0093	.0805	.0376	.0403	.0736	−.0028	.1487	−.0680	.2209	−.1328	.2996	−.1855	.4094	−.2152
31	.500	0.000	−.0765	.1332	.0063	.0220	.1158	−.0674	.2458	−.1376	.3734	−.1820	.5387	−.2152	.7298	−.2160
32	.500	.295	−.0764	.1347	.0064	.0222	.1168	−.0666	.2387	−.1368	.3583	−.1824	.5159	−.2160	.7063	−.2187
33	.500	.530	−.0771	.1176	.0048	.0192	.1060	−.0696	.1942	−.1355	.2946	−.1813	.4317	−.2190	.6305	−.2235
34	.500	.707	−.1004	.0294	−.0471	−.0375	.0189	−.0929	.1141	−.1403	.2343	−.1784	.3951	−.2128	.5982	−.2228
35	.500	.823	−.1017	.0552	−.0352	−.0244	.0421	−.0928	.1456	−.1440	.2504	−.1859	.3657	−.2214	.5180	−.2307
36	.500	.882	−.0154	.0673	−.0007	.0116	.0595	−.0005	.1353	−.0595	.2280	−.1150	.3376	−.1630	.4850	−.1980
37	.500	.941	−.0163	.0599	.0279	.0313	.0541	−.0103	.1143	−.0826	.1830	−.1525	.2874	−.2014	.4163	−.2235
38	.382	0.000	−.0767	.1304	.0051	.0203	.1128	−.0711	.2403	−.1383	.3653	−.1830	.5197	−.2170	.6808	−.2138
39	.382	.295	−.0768	.1321	.0057	.0211	.1147	−.0701	.2290	−.1377	.3453	−.1832	.4923	−.2182	.6563	−.2153
40	.382	.530	−.0817	.0874	−.0056	.0070	.0785	−.0745	.1610	−.1386	.2700	−.1847	.4241	−.2189	.6303	−.2187
41	.382	.707	−.0962	.0460	−.0400	−.0289	.0348	−.0899	.1367	−.1403	.2642	−.1804	.4125	−.2148	.5753	−.2193
42	.382	.823	−.0750	.0648	−.0392	−.0221	.0544	−.0752	.1342	−.0852	.2343	−.1018	.3521	−.1498	.4988	−.1842
43	.382	.882	−.0231	.0587	.0186	.0237	.0521	−.0194	.1211	−.0769	.2115	−.1334	.3275	−.1828	.4675	−.2120
44	.382	.941	−.0268	.0486	.0205	.0245	.0427	−.0213	.0955	−.0998	.1744	−.1693	.2769	−.2127	.4092	−.2243
45	.264	0.000	−.0802	.1258	.0002	.0156	.1076	−.0749	.2302	−.1417	.3477	−.1857	.4836	−.2033	.6287	−.2119
46	.264	.295	−.0809	.1232	.0006	.0152	.1067	−.0744	.2101	−.1411	.3200	−.1858	.4525	−.2029	.6226	−.2145
47	.264	.530	−.0913	.0561	−.0269	−.0165	.0469	−.0850	.1373	−.1439	.2651	−.1875	.4270	−.2085	.5963	−.2179
48	.264	.707	−.0975	.0506	−.0424	−.0309	.0395	−.0930	.1419	−.1400	.2599	−.1772	.3918	−.2171	.5463	−.2172
49	.264	.823	−.0287	.0583	.0076	.0130	.0504	−.0244	.1293	−.0742	.2211	−.1276	.3356	−.1743	.4805	−.2019
50	.264	.882	−.0288	.0540	.0122	.0164	.0454	−.0244	.1148	−.0833	.2030	−.1425	.3110	−.1979	.4471	−.2180
51	.264	.941	−.0330	.0433	.0165	.0200	.0363	−.0274	.0878	−.1111	.1675	−.1744	.2685	−.2118	.3955	−.2171
52	.177	0.000	−.2000	−.1099	−.1724	−.1632	−.1197	−.1983	−.0553	−.1773	.0075	−.1844	.0728	−.1976	.1351	−.2104
53	.177	.295	−.1778	−.1176	−.1716	−.1662	−.1249	−.1748	−.0729	−.1789	−.0120	−.1851	.0556	−.1992	.1322	−.2139
54	.177	.530	−.1627	−.1562	−.1383	−.1368	−.1613	−.1583	−.1065	−.1803	−.0289	−.1915	.0509	−.2053	.1182	−.2191
55	.177	.707	−.1743	−.1448	−.1430	−.1420	−.1502	−.1666	−.0988	−.1958	−.0367	−.2006	.0300	−.2150	.0985	−.2196
56	.177	.882	−.0349	.0455	.0070	.0107	.0367	−.0308	.1050	−.0905	.1816	−.1498	.2755	−.2005	.3812	−.2164
57	.118	0.000	−.1824	−.1191	−.1811	−.1728	−.1279	−.1815	−.0646	−.1779	−.0031	−.1855	.0606	−.1986	.1256	−.2127
58	.118	.295	−.1711	−.1276	−.1463	−.1457	−.1339	−.1682	−.0832	−.1800	−.0229	−.1865	.0470	−.1999	.1244	−.2160
59	.118	.530	−.1620	−.1586	−.1348	−.1325	−.1595	−.1574	−.1071	−.1812	−.0298	−.1923	.0461	−.2052	.1152	−.2189
60	.118	.707	−.1683	−.1401	−.1386	−.1361	−.1449	−.1615	−.0961	−.1811	−.0357	−.1904	.0328	−.2125	.1030	−.2228
61	.118	.823	−.1690	−.1433	−.1572	−.1530	−.1495	−.1609	−.0882	−.1773	−.0188	−.1899	.0597	−.2115	.1523	−.2187
62	.118	.941	−.0444	.0345	.0065	.0105	.0269	−.0377	.0794	−.1260	.1400	−.1819	.2108	−.2079	.2883	−.2140
63	.059	0.000	−.1793	−.1224	−.1836	−.1765	−.1311	−.1783	−.0705	−.1787	−.0115	−.1860	.0506	−.1993	.1225	−.2143
64	.059	.295	−.1699	−.1330	−.1428	−.1394	−.1383	−.1672	−.0906	−.1804	−.0308	−.1870	.0432	−.2005	.1225	−.2151
65	.059	.530	−.1654	−.1431	−.1364	−.1337	−.1373	−.1605	−.1080	−.1844	−.0341	−.1942	.0384	−.2066	.1085	−.2197
66	.059	.707	−.1629	−.1356	−.1386	−.1362	−.1376	−.1589	−.0950	−.1786	−.0331	−.1953	.0381	−.2194	.1167	−.2271
67	.059	.882	−.1587	−.1643	−.1440	−.1445	−.1651	−.1546	−.1312	−.1738	−.0660	−.1877	.0060	−.2080	.1058	−.2172
68	.736	−.707	−.0523	.1231	.0217	.0314	.1172	−.0547	.1902	−.1183	.2303	−.1620	.2896	−.2029	.3748	−.2144
69	.288	−.707	−.0918	.0515	−.0370	−.0297	.0434	−.0923	.1456	−.1378	.2612	−.1724	.3913	−.2131	.5463	−.2093

TABLE IX.—Continued
(b) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x'/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	1.5892	−.2254	1.6500	−.2469	1.6878	−.2455	1.7026	−.2469	1.7041	−.2463	1.6947	−.2469	1.6559	−.2438
2	.941	.295	1.5809	−.2311	1.6407	−.2569	1.6813	−.2539	1.6963	−.2551	1.6942	−.2548	1.6826	−.2549	1.6675	−.2506
3	.941	.530	1.5689	−.2256	1.6282	−.2559	1.6675	−.2547	1.6862	−.2564	1.6859	−.2557	1.6840	−.2557	1.6653	−.2511
4	.941	.707	1.5394	−.2160	1.6049	−.2515	1.6485	−.2541	1.6726	−.2556	1.6755	−.2554	1.6754	−.2554	1.6476	−.2509
5	.941	.882	1.3919	−.1962	1.4734	−.2406	1.5382	−.2523	1.5763	−.2553	1.5911	−.2548	1.5958	−.2549	1.5770	−.2502
6	.882	0.000	1.4288	−.2024	1.5283	−.2477	1.6048	−.2518	1.6583	−.2546	1.6919	−.2544	1.7110	−.2547	1.7013	−.2507
7	.882	.295	1.4196	−.1996	1.5161	−.2463	1.5945	−.2521	1.6493	−.2554	1.6809	−.2550	1.7019	−.2552	1.7109	−.2508
8	.882	.530	1.3991	−.1941	1.4945	−.2419	1.5730	−.2520	1.6314	−.2556	1.6647	−.2552	1.6955	−.2552	1.7015	−.2508
9	.882	.707	1.3552	−.1876	1.4498	−.2339	1.5340	−.2505	1.5989	−.2549	1.6380	−.2547	1.6672	−.2549	1.6715	−.2504
10	.882	.823	1.2338	−.1833	1.3313	−.2287	1.4258	−.2503	1.5030	−.2551	1.5525	−.2546	1.5882	−.2547	1.5996	−.2502
11	.882	.941	.8523	−.2348	1.0097	−.2478	1.1200	−.2527	1.2031	−.2555	1.2689	−.2548	1.3221	−.2544	1.3590	−.2498
12	.823	0.000	1.2382	−.1871	1.3713	−.2356	1.4830	−.2501	1.5713	−.2544	1.6345	−.2543	1.6786	−.2547	1.6975	−.2507
13	.823	.295	1.2296	−.1847	1.3575	−.2331	1.4714	−.2501	1.5604	−.2551	1.6231	−.2546	1.6715	−.2548	1.7023	−.2504
14	.823	.530	1.2037	−.1824	1.3251	−.2292	1.4398	−.2503	1.5339	−.2553	1.5998	−.2550	1.6572	−.2552	1.6874	−.2509
15	.823	.707	1.1541	−.1795	1.2625	−.2242	1.3796	−.2498	1.4820	−.2550	1.5541	−.2547	1.6118	−.2549	1.6431	−.2503
16	.823	.882	.5117	−.2430	.7484	−.2475	1.1148	−.2528	1.2348	−.2557	1.3174	−.2545	1.3735	−.2550	1.4152	−.2494
17	.736	0.000	.8116	−.2422	1.1116	−.2424	1.3017	−.2517	1.4216	−.2551	1.5128	−.2550	1.5882	−.2552	1.6408	−.2514
18	.736	.295	.7880	−.2474	1.0928	−.2440	1.2841	−.2529	1.4057	−.2564	1.5014	−.2560	1.5813	−.2560	1.6377	−.2516
19	.736	.530	.6841	−.2480	1.0321	−.2454	1.2395	−.2529	1.3684	−.2560	1.4686	−.2555	1.5548	−.2557	1.6138	−.2515
20	.736	.707	.5556	−.2457	.9094	−.2465	1.1552	−.2519	1.2888	−.2550	1.3939	−.2545	1.4797	−.2544	1.5459	−.2503
21	.736	.823	.5122	−.2416	.8684	−.2459	1.0912	−.2528	1.1978	−.2560	1.2774	−.2554	1.3522	−.2553	1.4148	−.2506
22	.736	.882	.6570	−.2402	.9122	−.2464	1.0339	−.2536	1.1403	−.2566	1.2273	−.2560	1.3006	−.2559	1.3595	−.2510
23	.736	.941	.6060	−.2167	.8155	−.2419	.9411	−.2514	1.0445	−.2553	1.1287	−.2550	1.1981	−.2549	1.2549	−.2500
24	.618	0.000	.9473	−.2321	1.1051	−.2414	1.2279	−.2519	1.3352	−.2559	1.4239	−.2558	1.5037	−.2561	1.5689	−.2522
25	.618	.295	.9278	−.2339	1.0886	−.2414	1.2124	−.2520	1.3212	−.2558	1.4138	−.2555	1.4955	−.2556	1.5628	−.2518
26	.618	.530	.8743	−.2369	1.0416	−.2431	1.1716	−.2529	1.2846	−.2562	1.3800	−.2557	1.4656	−.2560	1.5354	−.2520
27	.618	.707	.8062	−.2390	.9675	−.2435	1.0993	−.2528	1.2133	−.2560	1.3077	−.2556	1.3934	−.2558	1.4677	−.2519
28	.618	.823	.7439	−.2364	.8763	−.2439	.9957	−.2520	1.1008	−.2555	1.1896	−.2550	1.2682	−.2549	1.3379	−.2508
29	.618	.882	.6998	−.2275	.8313	−.2430	.9498	−.2521	1.0525	−.2558	1.1399	−.2553	1.2177	−.2553	1.2861	−.2509
30	.618	.941	.6138	−.2328	.7503	−.2442	.8624	−.2524	.9600	−.2558	1.0430	−.2553	1.1161	−.2553	1.1815	−.2508
31	.500	0.000	.8868	−.2308	1.0340	−.2409	1.1464	−.2519	1.2437	−.2558	1.3278	−.2558	1.4080	−.2563	1.4860	−.2526
32	.500	.295	.8678	−.2324	1.0167	−.2415	1.1328	−.2523	1.2319	−.2562	1.3175	−.2559	1.4012	−.2560	1.4780	−.2522
33	.500	.530	.8168	−.2342	.9739	−.2439	1.0947	−.2524	1.1969	−.2568	1.2863	−.2561	1.3700	−.2561	1.4483	−.2524
34	.500	.707	.7593	−.2344	.9085	−.2437	1.0276	−.2523	1.1313	−.2562	1.2181	−.2557	1.3044	−.2558	1.3840	−.2523
35	.500	.823	.6778	−.2382	.8164	−.2443	.9269	−.2530	1.0246	−.2562	1.1083	−.2556	1.1879	−.2557	1.2636	−.2517
36	.500	.882	.6365	−.2195	.7748	−.2417	.8838	−.2513	.9800	−.2553	1.0621	−.2549	1.1404	−.2549	1.2158	−.2511
37	.500	.941	.5725	−.2376	.6966	−.2459	.8034	−.2538	.8922	−.2570	.9710	−.2562	1.0459	−.2563	1.1172	−.2521
38	.382	0.000	.8352	−.2292	.9637	−.2416	1.0594	−.2514	1.1430	−.2564	1.2188	−.2560	1.2951	−.2561	1.3791	−.2527
39	.382	.295	.8204	−.2311	.9504	−.2426	1.0483	−.2523	1.1332	−.2567	1.2099	−.2562	1.2878	−.2563	1.3716	−.2527
40	.382	.530	.7808	−.2331	.9144	−.2439	1.0153	−.2526	1.1040	−.2567	1.1832	−.2560	1.2626	−.2561	1.3477	−.2530
41	.382	.707	.7212	−.2329	.8544	−.2436	.9563	−.2523	1.0458	−.2564	1.1239	−.2557	1.2064	−.2558	1.2918	−.2528
42	.382	.823	.6408	−.2253	.7662	−.2427	.8614	−.2518	.9465	−.2558	1.0201	−.2553	1.1007	−.2553	1.1848	−.2518
43	.382	.882	.6055	−.2307	.7277	−.2418	.8235	−.2500	.9065	−.2545	.9792	−.2541	1.0586	−.2540	1.1419	−.2510
44	.382	.941	.5349	−.2338	.6524	−.2424	.7446	−.2503	.8254	−.2543	.8939	−.2539	.9720	−.2539	1.0509	−.2505
45	.264	0.000	.7655	−.2287	.8549	−.2416	.9205	−.2517	.9796	−.2557	1.0358	−.2555	1.0983	−.2556	1.1890	−.2527
46	.264	.295	.7543	−.2311	.8441	−.2427	.9116	−.2520	.9709	−.2565	1.0274	−.2555	1.0916	−.2558	1.1811	−.2526
47	.264	.530	.7245	−.2331	.8185	−.2437	.8880	−.2523	.9502	−.2563	1.0090	−.2557	1.0741	−.2560	1.1648	−.2531
48	.264	.707	.6776	−.2325	.7736	−.2427	.8443	−.2510	.9069	−.2552	.9649	−.2549	1.0376	−.2550	1.1322	−.2521
49	.264	.823	.6087	−.2211	.7011	−.2397	.7688	−.2489	.8297	−.2536	.8847	−.2530	.9721	−.2531	1.0794	−.2501
50	.264	.882	.5759	−.2299	.6688	−.2400	.7382	−.2489	.7998	−.2530	.8565	−.2526	.9579	−.2525	1.0617	−.2496
51	.264	.941	.5122	−.2259	.6043	−.2383	.6715	−.2474	.7324	−.2518	.7906	−.2508	.8939	−.2509	.9870	−.2477
52	.177	0.000	.1912	−.2273	.2274	−.2399	.2630	−.2492	.3055	−.2524	.4185	−.2514	.6154	−.2511	.8261	−.2497
53	.177	.295	.1849	−.2303	.2218	−.2415	.2580	−.2499	.3012	−.2548	.4078	−.2538	.6053	−.2540	.8112	−.2516
54	.177	.530	.1737	−.2331	.2099	−.2430	.2465	−.2514	.2914	−.2555	.4124	−.2552	.6046	−.2551	.7987	−.2522
55	.177	.707	.1575	−.2340	.1947	−.2440	.2338	−.2524	.3313	−.2563	.4170	−.2558	.6265	−.2558	.8118	−.2528
56	.177	.882	.4498	−.2256	.5033	−.2384	.5537	−.2478	.6094	−.2519	.6928	−.2510	.8932	−.2512	1.0018	−.2481
57	.118	0.000	.1897	−.2294	.2419	−.2417	.3029	−.2509	.3876	−.2537	.4838	−.2520	.9576	−.2513	1.0298	−.2510
58	.118	.295	.1864	−.2316	.2408	−.2428	.3030	−.2514	.3883	−.2559	.4911	−.2549	.9491	−.2551	1.0197	−.2528
59	.118	.530	.1792	−.2328	.2318	−.2429	.2930	−.2512	.3764	−.2548	.4711	−.2545	.9324	−.2546	1.0103	−.2513
60	.118	.707	.1759	−.2340	.2354	−.2437	.3134	−.2522	.3903	−.2558	.4490	−.2553	.9428	−.2553	1.0110	−.2522
61	.118	.823	.2307	−.2322	.2966	−.2427	.3725	−.2513	.4704	−.2543	.6152	−.2542	.8794	−.2543	.9690	−.2508
62	.118	.941	.3492	−.2248	.4018	−.2388	.4602	−.2486	.5354	−.2527	.6441	−.2518	.8152	−.2517	.9026	−.2483
63	.059	0.000	.1961	−.2305	.2644	−.2425	.3432	−.2518	.4447	−.2545	.5684	−.2521	.8899	−.2513	.9507	−.2517
64	.059	.295	.1936	−.2301	.2604	−.2416	.3381	−.2504	.4411	−.2546	.5837	−.2536	.8887	−.2541	.9495	−.2520
65	.059	.530	.1785	−.2333	.2440	−.2430	.3219	−.2514	.4279	−.2555	.5638	−.2551	.8819	−.2552	.9383	−.2522
66	.059	.707	.1983	−.2330	.2690	−.2441	.3460	−.2521	.4316	−.2556	.7365	−.2552	.8737	−.2554	.9319	−.2523
67	.059	.882	.2026	−.2283	.2837	−.2427	.3368	−.2512	.4388	−.2546	.6196	−.2547	.8107	−.2548	.8808	−.2510
68	.736	−.707	.5630	−.2272	.8849	−.2295	1.1548	−.2341	1.2880	−.2385	1.3964	−.2372	1.4831	−.2370	1.5497	−.2350
69	.288	−.707	.6784	−.2216	.7762	−.2314	.8479	−.2388	.9116	−.2439	.9726	−.2437	1.0445	−.2436	1.1368	−.2419

TABLE IX.—Continued
(c) M = 2.86

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	.1891	.4798	.3174	.3191	.4691	.1886	.6619	.0895	.9156	.0186	1.3228	−.0182	1.4900	−.0471
2	.941	.295	.1920	.4855	.3203	.3234	.4727	.1912	.6646	.0909	.9182	.0192	1.3224	−.0184	1.4879	−.0475
3	.941	.530	.1926	.4872	.3211	.3249	.4741	.1925	.6666	.0918	.9201	.0198	1.3033	−.0212	1.4710	−.0487
4	.941	.707	.1924	.4875	.3214	.3253	.4740	.1914	.6668	.0915	.9223	.0195	1.2664	−.0239	1.4303	−.0488
5	.941	.882	.1922	.4850	.3211	.3242	.4741	.1907	.6673	.0911	.9029	.0188	1.1281	−.0314	1.2736	−.0547
6	.882	0.000	.1847	.4748	.3145	.3154	.4661	.1845	.6574	.0826	.9070	.0094	1.2141	−.0362	1.3372	−.0548
7	.882	.295	.1860	.4775	.3146	.3168	.4673	.1851	.6580	.0831	.9080	.0098	1.2114	−.0366	1.3336	−.0556
8	.882	.530	.1871	.4796	.3159	.3185	.4696	.1863	.6593	.0835	.9087	.0104	1.1928	−.0385	1.3159	−.0579
9	.882	.707	.1868	.4800	.3160	.3196	.4694	.1861	.6607	.0843	.9106	.0107	1.1473	−.0397	1.2680	−.0607
10	.882	.823	.1858	.4753	.3141	.3170	.4670	.1838	.6561	.0830	.8781	.0098	1.0411	−.0431	1.1521	−.0662
11	.882	.941	−.0392	.0520	−.0047	−.0090	.0532	−.0474	.1347	−.0765	.2459	−.0984	.4071	−.1161	.5640	−.1267
12	.823	0.000	.1806	.4680	.3093	.3100	.4604	.1811	.6497	.0787	.8928	.0049	1.1013	−.0444	1.1784	−.0638
13	.823	.295	.1814	.4719	.3101	.3128	.4614	.1818	.6505	.0799	.8931	.0064	1.0997	−.0446	1.1760	−.0646
14	.823	.530	.1825	.4731	.3115	.3132	.4639	.1826	.6513	.0795	.8930	.0063	1.0855	−.0459	1.1617	−.0670
15	.823	.707	.1829	.4744	.3108	.3146	.4641	.1823	.6530	.0806	.8857	.0068	1.0342	−.0473	1.1130	−.0708
16	.823	.882	−.0475	.0527	−.0050	−.0098	.0535	−.0581	.1233	−.0895	.2087	−.1104	.3497	−.1255	.4541	−.1339
17	.736	0.000	−.0296	.1077	.0279	.0262	.1045	−.0335	.2091	−.0762	.3479	−.1033	.4398	−.1205	.5258	−.1290
18	.736	.295	−.0324	.1037	.0238	.0222	.1000	−.0372	.2041	−.0787	.3416	−.1059	.4299	−.1231	.5120	−.1315
19	.736	.530	−.0325	.1049	.0243	.0231	.1013	−.0370	.2041	−.0790	.3414	−.1055	.4183	−.1232	.4916	−.1320
20	.736	.707	−.0318	.1025	.0241	.0221	.0993	−.0375	.2000	−.0784	.3087	−.1041	.3649	−.1217	.4264	−.1315
21	.736	.823	−.0579	.0425	−.0140	−.0183	.0445	−.0654	.1106	−.0961	.1856	−.1161	.2931	−.1300	.3723	−.1309
22	.736	.882	−.0428	.0474	−.0075	−.0133	.0508	−.0510	.1339	−.0829	.2481	−.1057	.3937	−.1222	.5402	−.1269
23	.736	.941	−.0315	.0542	.0094	.0036	.0582	−.0395	.1342	−.0771	.2381	−.0993	.3768	−.1136	.4940	−.1238
24	.618	0.000	−.0468	.0922	.0109	.0091	.0910	−.0511	.1959	−.0900	.3339	−.1148	.4730	−.1283	.6321	−.1321
25	.618	.295	−.0466	.0944	.0117	.0100	.0918	−.0512	.1965	−.0901	.3341	−.1145	.4648	−.1286	.6174	−.1313
26	.618	.530	−.0463	.0948	.0117	.0101	.0919	−.0510	.1965	−.0900	.3274	−.1144	.4318	−.1283	.5633	−.1292
27	.618	.707	−.0537	.0720	−.0017	−.0021	.0681	−.0583	.1454	−.0941	.2176	−.1168	.3120	−.1280	.4449	−.1275
28	.618	.823	−.0526	.0340	−.0184	−.0239	.0376	−.0603	.1132	−.0902	.2156	−.1113	.3351	−.1218	.4872	−.1248
29	.618	.882	−.0408	.0464	−.0017	−.0088	.0526	−.0497	.1316	−.0837	.2322	−.1074	.3396	−.1220	.4416	−.1250
30	.618	.941	−.0262	.0488	.0109	.0051	.0537	−.0401	.1206	−.0563	.2151	−.0896	.3149	−.1165	.4007	−.1266
31	.500	0.000	−.0507	.0889	.0076	.0057	.0877	−.0544	.1918	−.0935	.3268	−.1179	.4701	−.1226	.6335	−.1251
32	.500	.295	−.0497	.0911	.0085	.0070	.0889	−.0542	.1933	−.0928	.3278	−.1173	.4583	−.1213	.6134	−.1243
33	.500	.530	−.0486	.0907	.0095	.0071	.0892	−.0536	.1911	−.0918	.3035	−.1150	.4011	−.1208	.5352	−.1243
34	.500	.707	−.0589	.0488	−.0140	−.0161	.0479	−.0637	.1178	−.0952	.2093	−.1152	.3358	−.1206	.4908	−.1244
35	.500	.823	−.0488	.0375	−.0111	−.0180	.0439	−.0567	.1219	−.0893	.2246	−.1119	.3448	−.1198	.4620	−.1242
36	.500	.882	−.0443	.0434	−.0019	−.0079	.0494	−.0524	.1191	−.0880	.2100	−.1085	.3106	−.1170	.4294	−.1237
37	.500	.941	−.0130	.0412	.0103	.0041	.0471	−.0172	.1060	−.0640	.1870	−.1010	.2762	−.1244	.3824	−.1279
38	.382	0.000	−.0513	.0871	.0071	.0047	.0876	−.0552	.1908	−.0935	.3240	−.1165	.4610	−.1183	.6174	−.1229
39	.382	.295	−.0504	.0895	.0085	.0058	.0892	−.0548	.1924	−.0931	.3234	−.1163	.4417	−.1177	.5876	−.1225
40	.382	.530	−.0502	.0859	.0068	.0039	.0855	−.0558	.1792	−.0935	.2675	−.1164	.3680	−.1178	.5196	−.1229
41	.382	.707	−.0548	.0417	−.0158	−.0200	.0441	−.0610	.1200	−.0922	.2229	−.1123	.3475	−.1185	.4942	−.1234
42	.382	.823	−.0507	.0401	−.0088	−.0147	.0465	−.0573	.1195	−.0912	.2135	−.1143	.3191	−.1195	.4410	−.1241
43	.382	.882	−.0477	.0393	−.0023	−.0082	.0449	−.0557	.1089	−.0711	.1941	−.0880	.2947	−.1097	.4132	−.1217
44	.382	.941	−.0184	.0334	.0090	.0024	.0403	−.0237	.0926	−.0707	.1689	−.1058	.2579	−.1244	.3667	−.1254
45	.264	0.000	−.0540	.0822	.0039	.0007	.0839	−.0580	.1852	−.0958	.3151	−.1122	.4418	−.1165	.5869	−.1221
46	.264	.295	−.0531	.0843	.0051	.0019	.0855	−.0579	.1866	−.0954	.3092	−.1123	.4141	−.1165	.5522	−.1223
47	.264	.530	−.0546	.0757	.0012	−.0020	.0751	−.0591	.1529	−.0959	.2347	−.1121	.3539	−.1168	.5115	−.1225
48	.264	.707	−.0601	.0369	−.0190	−.0235	.0408	−.0642	.1187	−.0948	.2184	−.1100	.3355	−.1175	.4716	−.1230
49	.264	.823	−.0566		−.0120		.0423		.1101		.1945		.3007		.4207	
50	.264	.882	−.0203	.0364	−.0011	−.0074	.0423	−.0302	.1018	−.0593	.1839	−.0903	.2830	−.1111	.3978	−.1183
51	.264	.941	−.0220	.0288	.0079	.0013	.0361	−.0282	.0852	−.0770	.1591	−.1102	.2477	−.1229	.3565	−.1242
52	.177	0.000	−.1007	−.0724	−.0973	−.1019	−.0685	−.1087	−.0232	−.1081	.0449	−.1098	.1200	−.1164	.1923	−.1227
53	.177	.295	−.1035	−.0729	−.1016	−.1027	−.0711	−.1049	−.0250	−.1083	.0354	−.1095	.0997	−.1156	.1729	−.1217
54	.177	.530	−.0927	−.0814	−.0863	−.0899	−.0807	−.0949	−.0502	−.1053	−.0034	−.1094	.0756	−.1161	.1575	−.1222
55	.177	.707	−.0942	−.0922	−.0827	−.0850	−.0880	−.0956	−.0546	−.1082	−.0048	−.1106	.0651	−.1178	.1376	−.1235
56	.177	.882	−.0203	.0275	−.0008	−.0110	.0358	−.0239	.0908	−.0658	.1694	−.0978	.2640	−.1188	.3684	−.1235
57	.118	0.000	−.1005	−.0810	−.1076	−.1082	−.0791	−.1021	−.0322	−.1056	.0364	−.1077	.1093	−.1144	.1807	−.1202
58	.118	.295	−.0987	−.0819	−.0898	−.0938	−.0792	−.1010	−.0334	−.1087	.0244	−.1104	.0881	−.1163	.1639	−.1225
59	.118	.530	−.0917	−.0915	−.0768	−.0803	−.0903	−.0934	−.0589	−.1060	−.0078	−.1101	.0713	−.1166	.1523	−.1220
60	.118	.707	−.0926	−.0939	−.0781	−.0809	−.0898	−.0942	−.0571	−.1074	−.0059	−.1103	.0642	−.1181	.1396	−.1230
61	.118	.823	−.0995	−.0901	−.0838	−.0861	−.0887	−.0988	−.0553	−.1110	−.0005	−.1108	.0764	−.1179	.1603	−.1224
62	.118	.941	−.0286	.0199	.0036	−.0027	.0273	−.0327	.0729	−.0842	.1427	−.1124	.2252	−.1198	.3102	−.1231
63	.059	0.000	−.1015	−.0852	−.1065	−.1081	−.0830	−.1024	−.0364	−.1082	.0319	−.1095	.1011	−.1169	.1717	−.1227
64	.059	.295	−.0982	−.0849	−.0848	−.0889	−.0822	−.1005	−.0369	−.1096	.0168	−.1108	.0798	−.1166	.1580	−.1222
65	.059	.530	−.0921	−.0948	−.0770	−.0811	−.0914	−.0945	−.0626	−.1075	−.0104	−.1106	.0660	−.1165	.1452	−.1215
66	.059	.707	−.0911	−.0902	−.0781	−.0813	−.0872	−.0930	−.0577	−.1070	−.0064	−.1111	.0650	−.1179	.1435	−.1220
67	.059	.882	−.0962	−.1012	−.0843	−.0865	−.0984	−.0994	−.0778	−.1069	−.0343	−.1104	.0341	−.1177	.1120	−.1223
68	.736	−.707	−.0326	.0954	.0231	.0200	.0968	−.0358	.1988	−.0753	.3161	−.0991	.3673	−.1161	.4263	−.1259
69	.288	−.707	−.0589	.0350	−.0198	−.0214	.0386	−.0611	.1154	−.0899	.2162	−.1058	.3329	−.1137	.4706	−.1188

TABLE IX.—Continued
(c) Concluded

			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		59.9	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	1.5897	−.0888	1.6570		1.7145	−.1312	1.7557		1.7593	−.1355	1.7441		1.7208	−.1364
2	.941	.295	1.5857	−.0913	1.6558		1.7144	−.1384	1.7540		1.7593	−.1412	1.7492		1.7232	−.1419
3	.941	.530	1.5741	−.0908	1.6427		1.7031	−.1390	1.7463		1.7577	−.1417	1.7474		1.7294	−.1428
4	.941	.707	1.5383	−.0871	1.6156		1.6775	−.1363	1.7307		1.7500	−.1406	1.7431		1.7284	−.1418
5	.941	.882	1.3893	−.0824	1.4801		1.5605	−.1334	1.6360		1.6754	−.1401	1.6856		1.6711	−.1420
6	.882	0.000	1.4293	−.0839	1.5119		1.6067	−.1365	1.6904		1.7336	−.1408	1.7540		1.7600	−.1429
7	.882	.295	1.4238	−.0840	1.5061		1.6003	−.1364	1.6817		1.7286	−.1406	1.7525		1.7581	−.1423
8	.882	.530	1.4083	−.0847	1.4860		1.5781	−.1360	1.6633		1.7182	−.1405	1.7427		1.7565	−.1425
9	.882	.707	1.3631	−.0843	1.4464		1.5335	−.1320	1.6268		1.6913	−.1395	1.7203		1.7394	−.1418
10	.882	.823	1.2490	−.0867	1.3347		1.4249	−.1317	1.5297		1.6088	−.1394	1.6520		1.6769	−.1418
11	.882	.941	.7421	−.1333	.9277		1.0717	−.1372	1.2154		1.3233	−.1402	1.4001		1.4438	−.1419
12	.823	0.000	1.2498	−.0859	1.3336		1.4630	−.1343	1.5855		1.6640	−.1401	1.7154		1.7490	−.1427
13	.823	.295	1.2455	−.0862	1.3258		1.4518	−.1337	1.5731		1.6564	−.1400	1.7124		1.7453	−.1422
14	.823	.530	1.2332	−.0876	1.3020		1.4180	−.1327	1.5428		1.6358	−.1399	1.6961		1.7356	−.1425
15	.823	.707	1.1866	−.0896	1.2569		1.3545	−.1311	1.4849		1.5887	−.1397	1.6550		1.7021	−.1423
16	.823	.882	.5426	−.1358	.6949		.9010	−.1373	1.1856		1.3423	−.1412	1.4271		1.4852	−.1427
17	.736	0.000	.6692	−.1356	.9428		1.2523	−.1368	1.4201		1.5378	−.1407	1.6212		1.6860	−.1431
18	.736	.295	.6573	−.1379	.9081		1.2259	−.1370	1.4021		1.5233	−.1414	1.6119		1.6779	−.1433
19	.736	.530	.6176	−.1379	.8233		1.1605	−.1372	1.3571		1.4894	−.1411	1.5851		1.6571	−.1429
20	.736	.707	.5160	−.1371	.6924		1.0367	−.1377	1.2752		1.4187	−.1406	1.5214		1.6021	−.1423
21	.736	.823	.4852	−.1316	.5853		.9618	−.1371	1.2152		1.3254	−.1415	1.4088		1.4784	−.1433
22	.736	.882	.6511	−.1297	.7592		.9984	−.1360	1.1512		1.2702	−.1405	1.3587		1.4266	−.1425
23	.736	.941	.5986	−.1291	.7112		.9068	−.1351	1.0595		1.1739	−.1400	1.2595		1.3243	−.1420
24	.618	0.000	.8636	−.1308	1.0464		1.2132	−.1355	1.3488		1.4554	−.1406	1.5387		1.6132	−.1433
25	.618	.295	.8321	−.1294	1.0247		1.1948	−.1350	1.3332		1.4423	−.1406	1.5297		1.6035	−.1426
26	.618	.530	.7360	−.1288	.9613		1.1448	−.1351	1.2917		1.4090	−.1404	1.5013		1.5790	−.1425
27	.618	.707	.6295	−.1293	.8931		1.0730	−.1355	1.2213		1.3427	−.1411	1.4363		1.5181	−.1432
28	.618	.823	.6354	−.1285	.8236		.9856	−.1352	1.1212		1.2358	−.1401	1.3253		1.4015	−.1420
29	.618	.882	.5830	−.1287	.7753		.9430	−.1355	1.0754		1.1871	−.1405	1.2751		1.3504	−.1426
30	.618	.941	.5155	−.1288	.6951		.8606	−.1353	.9883		1.0933	−.1405	1.1775		1.2485	−.1426
31	.500	0.000	.8166	−.1279	.9943		1.1473	−.1353	1.2702		1.3683	−.1411	1.4500		1.5301	−.1435
32	.500	.295	.7897	−.1273	.9743		1.1332	−.1349	1.2581		1.3577	−.1401	1.4415		1.5208	−.1420
33	.500	.530	.7122	−.1275	.9216		1.0927	−.1351	1.2215		1.3284	−.1406	1.4166		1.4981	−.1428
34	.500	.707	.6715	−.1278	.8595		1.0297	−.1352	1.1581		1.2653	−.1406	1.3559		1.4403	−.1427
35	.500	.823	.6114	−.1283	.7874		.9452	−.1355	1.0623		1.1653	−.1406	1.2496		1.3277	−.1426
36	.500	.882	.5701	−.1278	.7426		.8970	−.1351	1.0149		1.1175	−.1405	1.2015		1.2781	−.1426
37	.500	.941	.5108	−.1287	.6718		.8193	−.1358	.9329		1.0276	−.1410	1.1094		1.1827	−.1431
38	.382	0.000	.7844	−.1270	.9524		1.0856	−.1352	1.1870		1.2711	−.1405	1.3463		1.4279	−.1432
39	.382	.295	.7538	−.1270	.9364		1.0740	−.1351	1.1761		1.2623	−.1405	1.3396		1.4186	−.1428
40	.382	.530	.7079	−.1270	.8959		1.0411	−.1351	1.1452		1.2359	−.1403	1.3165		1.3971	−.1423
41	.382	.707	.6553	−.1276	.8382		.9843	−.1351	1.0900		1.1826	−.1405	1.2624		1.3476	−.1424
42	.382	.823	.5853	−.1283	.7608		.8980	−.1357	.9992		1.0863	−.1407	1.1633		1.2457	−.1425
43	.382	.882	.5537	−.1272	.7187		.8558	−.1352	.9558		1.0442	−.1403	1.1192		1.2020	−.1427
44	.382	.941	.4972	−.1272	.6531		.7809	−.1348	.8775		.9617	−.1396	1.0353		1.1146	−.1421
45	.264	0.000	.7412	−.1269	.8821		.9772	−.1350	1.0429		1.1018	−.1401	1.1562		1.2349	−.1425
46	.264	.295	.7245	−.1272	.8730		.9702	−.1352	1.0358		1.0957	−.1399	1.1525		1.2278	−.1423
47	.264	.530	.6914	−.1273	.8448		.9480	−.1351	1.0163		1.0789	−.1403	1.1399		1.2141	−.1422
48	.264	.707	.6285	−.1275	.7955		.9019	−.1357	.9732		1.0379	−.1406	1.0995		1.1821	−.1427
49	.264	.823	.5670		.7276		.8313		.9008		.9634		1.0244		1.1282	
50	.264	.882	.5362	−.1227	.6935		.7987	−.1303	.8708		.9346	−.1342	.9998		1.1130	−.1362
51	.264	.941	.4870	−.1270	.6298		.7349	−.1349	.8050		.8687	−.1391	.9359		1.0442	−.1411
52	.177	0.000	.2593	−.1275	.3196		.3618	−.1359	.3982		.4550	−.1398	.6001		.8384	−.1427
53	.177	.295	.2527	−.1266	.3141		.3570	−.1348	.3948		.4501	−.1389	.5948		.8294	−.1415
54	.177	.530	.2341	−.1266	.3026		.3462	−.1345	.3845		.4402	−.1393	.5914		.8202	−.1414
55	.177	.707	.2205	−.1280	.2877		.3345	−.1360	.3796		.4969	−.1411	.5912		.8359	−.1428
56	.177	.882	.4866	−.1276	.5769		.6430	−.1355	.6937		.7596	−.1400	.8716		1.0511	−.1421
57	.118	0.000	.2517	−.1247	.3238		.3865	−.1323	.4518		.5570	−.1355	.6278		1.1008	−.1377
58	.118	.295	.2473	−.1277	.3204		.3846	−.1359	.4521		.5537	−.1398	.6282		1.0922	−.1420
59	.118	.530	.2323	−.1271	.3123		.3755	−.1348	.4409		.5427	−.1404	.6266		1.0867	−.1424
60	.118	.707	.2284	−.1282	.3142		.3873	−.1357	.4656		.5429	−.1409	.7179		1.0865	−.1426
61	.118	.823	.2647	−.1274	.3626		.4439	−.1353	.5215		.6326	−.1401	.8365		1.0237	−.1417
62	.118	.941	.4010	−.1270	.4789		.5448	−.1349	.6019		.6877	−.1393	.8231		.9639	−.1413
63	.059	0.000	.2498	−.1274	.3339		.4119	−.1361	.4940		.6113	−.1394	.9405		1.0121	−.1424
64	.059	.295	.2460	−.1278	.3284		.4058	−.1360	.4882		.6064	−.1392	.9481		1.0103	−.1421
65	.059	.530	.2279	−.1264	.3142		.3899	−.1345	.4720		.5955	−.1405	.9460		1.0032	−.1423
66	.059	.707	.2368	−.1277	.3346		.4174	−.1345	.4961		.6015	−.1402	.9317		.9993	−.1418
67	.059	.882	.2059	−.1279	.3253		.4171	−.1359	.4788		.6017	−.1404	.8310		.9459	−.1419
68	.736	−.707	.5189	−.1313	.7009		1.0444	−.1330	1.2765		1.4161	−.1351	1.5178		1.5939	−.1369
69	.288	−.707	.6257	−.1235	.7866		.8918	−.1305	.9648		1.0304	−.1344	1.0908		1.1744	−.1366

TABLE IX.—Continued
(d) M = 3.50

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	.1592	.4100	.2685	.2724	.4103	.1643	.5862	.0829	.7952	.0244	1.0782	−.0105	1.4433	−.0147
2	.941	.295	.1589	.4155	.2696	.2748	.4109	.1653	.5888	.0832	.7984	.0231	1.0781	−.0141	1.4361	−.0171
3	.941	.530	.1584	.4160	.2695	.2758	.4117	.1656	.5902	.0833	.8001	.0232	1.0818	−.0151	1.4220	−.0191
4	.941	.707	.1575	.4159	.2689	.2756	.4108	.1653	.5877	.0824	.7984	.0231	1.0797	−.0150	1.3852	−.0222
5	.941	.882	.1580	.4146	.2685	.2745	.4108	.1639	.5868	.0816	.7948	.0225	1.0445	−.0160	1.2443	−.0308
6	.882	0.000	.1512	.4063	.2629	.2682	.4044	.1582	.5810	.0733	.7900	.0126	1.0664	−.0250	1.3172	−.0335
7	.882	.295	.1517	.4081	.2630	.2686	.4042	.1580	.5818	.0736	.7895	.0121	1.0650	−.0257	1.3090	−.0340
8	.882	.530	.1516	.4083	.2631	.2699	.4046	.1589	.5828	.0743	.7900	.0126	1.0663	−.0261	1.2939	−.0360
9	.882	.707	.1510	.4084	.2632	.2708	.4048	.1587	.5817	.0741	.7895	.0132	1.0609	−.0249	1.2529	−.0382
10	.882	.823	.1504	.4054	.2608	.2686	.4018	.1565	.5764	.0729	.7794	.0124	1.0080	−.0261	1.1448	−.0422
11	.882	.941	−.0237	.0556	.0036	.0079	.0537	−.0230	.1241	−.0446	.2154	−.0603	.3423	−.0704	.5169	−.0771
12	.823	0.000	.1470	.3995	.2582	.2643	.3981	.1537	.5739	.0690	.7791	.0079	1.0463	−.0300	1.1871	−.0425
13	.823	.295	.1481	.4020	.2587	.2655	.3990	.1542	.5752	.0700	.7796	.0079	1.0466	−.0303	1.1814	−.0428
14	.823	.530	.1473	.4023	.2587	.2659	.3987	.1545	.5754	.0704	.7796	.0082	1.0453	−.0305	1.1691	−.0444
15	.823	.707	.1471	.4015	.2587	.2669	.3988	.1541	.5739	.0700	.7783	.0085	1.0235	−.0302	1.1250	−.0464
16	.823	.882	−.0272	.0572	.0045	.0073	.0557	−.0275	.1249	−.0516	.2040	−.0675	.3048	−.0763	.4546	−.0820
17	.736	0.000	−.0142	.0910	.0272	.0319	.0883	−.0111	.1765	−.0413	.2986	−.0617	.4552	−.0734	.5361	−.0787
18	.736	.295	−.0181	.0861	.0233	.0268	.0832	−.0150	.1705	−.0446	.2916	−.0642	.4481	−.0755	.5232	−.0809
19	.736	.530	−.0178	.0868	.0231	.0277	.0836	−.0146	.1710	−.0444	.2912	−.0639	.4453	−.0750	.5095	−.0802
20	.736	.707	−.0164	.0859	.0222	.0282	.0819	−.0135	.1687	−.0431	.2850	−.0630	.4006	−.0739	.4521	−.0799
21	.736	.823	−.0362	.0475	−.0041	−.0008	.0464	−.0350	.1143	−.0575	.1894	−.0725	.2775	−.0802	.3883	−.0806
22	.736	.882	−.0303	.0486	−.0033	−.0003	.0473	−.0300	.1183	−.0513	.2109	−.0668	.3393	−.0756	.4856	−.0773
23	.736	.941	−.0213	.0442	.0045	.0061	.0438	−.0206	.1118	−.0453	.2005	−.0625	.3200	−.0720	.4654	−.0761
24	.618	0.000	−.0330	.0732	.0077	.0116	.0706	−.0298	.1602	−.0553	.2819	−.0713	.4387	−.0771	.5838	−.0779
25	.618	.295	−.0332	.0736	.0077	.0114	.0710	−.0299	.1605	−.0558	.2819	−.0714	.4395	−.0761	.5759	−.0770
26	.618	.530	−.0330	.0741	.0073	.0118	.0709	−.0297	.1602	−.0549	.2806	−.0709	.4262	−.0752	.5366	−.0764
27	.618	.707	−.0374	.0633	.0007	.0052	.0587	−.0339	.1378	−.0580	.2272	−.0730	.3072	−.0760	.4177	−.0775
28	.618	.823	−.0374	.0393	−.0112	−.0075	.0380	−.0365	.1049	−.0563	.1888	−.0698	.3038	−.0732	.4281	−.0754
29	.618	.882	−.0296	.0412	−.0041	−.0025	.0406	−.0288	.1110	−.0520	.1998	−.0677	.3106	−.0733	.4200	−.0760
30	.618	.941	−.0245	.0395	.0043	.0058	.0395	−.0235	.1015	−.0456	.1837	−.0611	.2925	−.0726	.3951	−.0760
31	.500	0.000	−.0369	.0701	.0038	.0080	.0672	−.0344	.1560	−.0596	.2758	−.0750	.4298	−.0754	.5782	−.0768
32	.500	.295	−.0372	.0713	.0044	.0083	.0676	−.0333	.1563	−.0583	.2764	−.0721	.4308	−.0725	.5662	−.0749
33	.500	.530	−.0343	.0713	.0035	.0098	.0676	−.0309	.1558	−.0570	.2736	−.0715	.3964	−.0735	.5030	−.0763
34	.500	.707	−.0397	.0510	−.0080	−.0009	.0460	−.0363	.1165	−.0589	.1962	−.0693	.3023	−.0727	.4384	−.0756
35	.500	.823	−.0352	.0372	−.0097	−.0075	.0363	−.0341	.1048	−.0558	.1911	−.0675	.3044	−.0725	.4214	−.0754
36	.500	.882	−.0313	.0379	−.0033	−.0017	.0372	−.0301	.1023	−.0535	.1828	−.0675	.2864	−.0721	.3962	−.0753
37	.500	.941	−.0208	.0350	.0032	.0045	.0349	−.0230	.0924	−.0423	.1666	−.0649	.2618	−.0760	.3589	−.0765
38	.382	0.000	−.0362	.0698	.0022	.0079	.0660	−.0333	.1547	−.0589	.2745	−.0689	.4233	−.0730	.5655	−.0757
39	.382	.295	−.0361	.0704	.0027	.0084	.0665	−.0325	.1553	−.0582	.2753	−.0677	.4197	−.0723	.5448	−.0755
40	.382	.530	−.0365	.0694	.0019	.0075	.0650	−.0331	.1517	−.0583	.2607	−.0660	.3572	−.0713	.4726	−.0744
41	.382	.707	−.0384	.0455	−.0105	−.0044	.0410	−.0361	.1095	−.0577	.1957	−.0655	.3104	−.0712	.4414	−.0749
42	.382	.823	−.0355	.0365	−.0079	−.0060	.0350	−.0339	.1016	−.0563	.1839	−.0656	.2881	−.0719	.4020	−.0754
43	.382	.882	−.0309	.0347	−.0048	−.0010	.0329	−.0309	.0944	−.0536	.1720	−.0651	.2694	−.0689	.3781	−.0746
44	.382	.941	−.0154	.0313	.0015	.0039	.0295	−.0153	.0829	−.0442	.1528	−.0658	.2420	−.0720	.3399	−.0743
45	.264	0.000	−.0385	.0659	−.0004	.0051	.0620	−.0354	.1497	−.0595	.2675	−.0655	.4097	−.0716	.5420	−.0747
46	.264	.295	−.0383	.0666	−.0003	.0049	.0628	−.0352	.1502	−.0595	.2678	−.0655	.3982	−.0716	.5140	−.0747
47	.264	.530	−.0392	.0639	−.0018	.0036	.0594	−.0355	.1416	−.0591	.2340	−.0642	.3234	−.0710	.4576	−.0746
48	.264	.707	−.0395	.0394	−.0141	−.0074	.0347	−.0378	.1036	−.0579	.1917	−.0647	.2984	−.0687	.4241	−.0745
49	.264	.823	−.0356	.0336	−.0107	−.0065	.0311	−.0351	.0944	−.0572	.1740	−.0657	.2681	−.0704	.3845	−.0744
50	.264	.882	−.0320	.0328	−.0058	−.0014	.0299	−.0324	.0883	−.0497	.1641	−.0613	.2575	−.0683	.3679	−.0739
51	.264	.941	−.0185	.0283	.0002	.0027	.0262	−.0171	.0761	−.0480	.1441	−.0680	.2306	−.0706	.3301	−.0739
52	.177	0.000	−.0655	−.0408	−.0657	−.0612	−.0470	−.0660	−.0117	−.0652	.0429	−.0689	.1192	−.0726	.2001	−.0770
53	.177	.295	−.0642	−.0410	−.0648	−.0607	−.0480	−.0637	−.0127	−.0642	.0421	−.0673	.1074	−.0705	.1801	−.0749
54	.177	.530	−.0574	−.0431	−.0547	−.0535	−.0491	−.0572	−.0211	−.0606	.0160	−.0658	.0697	−.0695	.1563	−.0743
55	.177	.707	−.0584	−.0519	−.0540	−.0539	−.0567	−.0573	−.0332	−.0627	.0068	−.0672	.0623	−.0714	.1400	−.0763
56	.177	.882	−.0297	.0261	−.0095	−.0066	.0241	−.0329	.0781	−.0453	.1494	−.0622	.2379	−.0687	.3426	−.0744
57	.118	0.000	−.0602	−.0470	−.0658	−.0633	−.0534	−.0599	−.0205	−.0600	.0341	−.0635	.1102	−.0672	.1891	−.0714
58	.118	.295	−.0617	−.0504	−.0580	−.0572	−.0554	−.0618	−.0224	−.0645	.0323	−.0687	.0953	−.0723	.1686	−.0759
59	.118	.530	−.0566	−.0525	−.0483	−.0483	−.0575	−.0564	−.0323	−.0616	.0065	−.0674	.0643	−.0720	.1501	−.0753
60	.118	.707	−.0572	−.0562	−.0503	−.0498	−.0597	−.0562	−.0377	−.0622	.0026	−.0682	.0598	−.0726	.1396	−.0757
61	.118	.823	−.0563	−.0531	−.0513	−.0512	−.0580	−.0565	−.0356	−.0616	.0066	−.0671	.0695	−.0713	.1540	−.0747
62	.118	.941	−.0224	.0205	−.0042	−.0024	.0190	−.0205	.0652	−.0513	.1307	−.0684	.2104	−.0687	.3028	−.0737
63	.059	0.000	−.0634	−.0547	−.0642	−.0638	−.0593	−.0633	−.0263	−.0643	.0289	−.0686	.1042	−.0732	.1801	−.0765
64	.059	.295	−.0617	−.0531	−.0552	−.0549	−.0579	−.0617	−.0263	−.0646	.0278	−.0691	.0873	−.0728	.1608	−.0762
65	.059	.530	−.0574	−.0549	−.0476	−.0486	−.0588	−.0569	−.0369	−.0624	.0015	−.0682	.0603	−.0711	.1436	−.0751
66	.059	.707	−.0563	−.0520	−.0485	−.0485	−.0555	−.0556	−.0390	−.0616	.0012	−.0674	.0590	−.0713	.1401	−.0739
67	.059	.882	−.0576	−.0598	−.0500	−.0509	−.0642	−.0571	−.0502	−.0616	−.0175	−.0684	.0341	−.0713	.1161	−.0754
68	.736	−.707	−.0084	.0854	.0223	.0324	.0817	−.0071	.1680	−.0352	.2850	−.0542	.4079	−.0628	.4545	−.0684
69	.288	−.707	−.0295	.0397	−.0132	−.0007	.0346	−.0294	.1044	−.0489	.1918	−.0563	.2993	−.0594	.4226	−.0642

TABLE IX.–Continued
(d) Concluded

			α = 30.0		35.0		40.0		45.0		50.0		55.0		59.9	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	1.5840	−.0326	1.6663		1.7403	−.0656	1.8103		1.8343	−.0680	1.8269		1.8112	−.0699
2	.941	.295	1.5795	−.0368	1.6638		1.7409	−.0759	1.8143		1.8394	−.0780	1.8314		1.8106	−.0802
3	.941	.530	1.5661	−.0373	1.6544		1.7303	−.0766	1.8067		1.8323	−.0794	1.8272		1.8144	−.0817
4	.941	.707	1.5319	−.0368	1.6259		1.7057	−.0740	1.7881		1.8202	−.0776	1.8223		1.8074	−.0800
5	.941	.882	1.3828	−.0392	1.4893		1.5829	−.0717	1.6815		1.7421	−.0778	1.7613		1.7542	−.0807
6	.882	0.000	1.4306	−.0406	1.5137		1.6145	−.0749	1.7240		1.7978	−.0786	1.8296		1.8434	−.0816
7	.882	.295	1.4246	−.0412	1.5074		1.6096	−.0747	1.7212		1.7969	−.0785	1.8279		1.8385	−.0813
8	.882	.530	1.4099	−.0421	1.4951		1.5899	−.0737	1.7024		1.7805	−.0783	1.8153		1.8327	−.0812
9	.882	.707	1.3683	−.0438	1.4578		1.5501	−.0711	1.6635		1.7461	−.0768	1.7908		1.8098	−.0798
10	.882	.823	1.2545	−.0474	1.3474		1.4405	−.0717	1.5582		1.6567	−.0777	1.7165		1.7450	−.0804
11	.882	.941	.6836	−.0799	.8709		1.0392	−.0792	1.2054		1.3497	−.0802	1.4440		1.5040	−.0818
12	.823	0.000	1.2628	−.0469	1.3315		1.4501	−.0733	1.6001		1.7141	−.0783	1.7810		1.8238	−.0814
13	.823	.295	1.2593	−.0472	1.3281		1.4421	−.0732	1.5933		1.7091	−.0780	1.7757		1.8175	−.0810
14	.823	.530	1.2458	−.0486	1.3156		1.4127	−.0728	1.5616		1.6822	−.0786	1.7542		1.8042	−.0817
15	.823	.707	1.2038	−.0514	1.2763		1.3619	−.0722	1.5005		1.6279	−.0780	1.7101		1.7651	−.0812
16	.823	.882	.5650	−.0813	.6851		.8605	−.0802	1.1112		1.3472	−.0814	1.4622		1.5360	−.0829
17	.736	0.000	.6497	−.0805	.8435		1.1760	−.0801	1.4144		1.5710	−.0812	1.6729		1.7460	−.0835
18	.736	.295	.6329	−.0827	.8199		1.1468	−.0804	1.3972		1.5573	−.0821	1.6613		1.7370	−.0843
19	.736	.530	.6054	−.0821	.7683		1.0690	−.0799	1.3444		1.5185	−.0815	1.6300		1.7134	−.0835
20	.736	.707	.5293	−.0816	.6642		.9265	−.0799	1.2451		1.4373	−.0811	1.5609		1.6495	−.0830
21	.736	.823	.4740	−.0803	.6250		.7954	−.0807	1.1733		1.3579	−.0826	1.4489		1.5261	−.0848
22	.736	.882	.6221	−.0776	.7509		.9185	−.0791	1.1490		1.2964	−.0811	1.3974		1.4747	−.0833
23	.736	.941	.5859	−.0768	.7034		.8564	−.0778	1.0554		1.1998	−.0800	1.2980		1.3727	−.0824
24	.618	0.000	.7606	−.0777	.9940		1.1806	−.0791	1.3512		1.4910	−.0814	1.5896		1.6658	−.0838
25	.618	.295	.7444	−.0771	.9720		1.1598	−.0783	1.3369		1.4798	−.0812	1.5790		1.6568	−.0835
26	.618	.530	.6850	−.0763	.8887		1.1006	−.0780	1.2911		1.4428	−.0807	1.5471		1.6307	−.0829
27	.618	.707	.5663	−.0777	.7801		1.0228	−.0792	1.2176		1.3716	−.0821	1.4798		1.5674	−.0844
28	.618	.823	.5907	−.0761	.7546		.9494	−.0778	1.1238		1.2649	−.0800	1.3654		1.4457	−.0823
29	.618	.882	.5439	−.0767	.7109		.9098	−.0784	1.0796		1.2176	−.0809	1.3158		1.3955	−.0834
30	.618	.941	.4956	−.0766	.6419		.8268	−.0781	.9964		1.1256	−.0808	1.2187		1.2939	−.0834
31	.500	0.000	.7489	−.0774	.9395		1.1281	−.0796	1.2797		1.4073	−.0826	1.5019		1.5776	−.0850
32	.500	.295	.7270	−.0751	.9134		1.1102	−.0777	1.2685		1.3982	−.0804	1.4932		1.5703	−.0825
33	.500	.530	.6477	−.0778	.8491		1.0602	−.0793	1.2284		1.3648	−.0808	1.4618		1.5446	−.0837
34	.500	.707	.6005	−.0768	.7932		.9990	−.0785	1.1648		1.3009	−.0809	1.3986		1.4840	−.0832
35	.500	.823	.5622	−.0763	.7276		.9200	−.0784	1.0722		1.2001	−.0808	1.2926		1.3708	−.0829
36	.500	.882	.5273	−.0763	.6916		.8759	−.0782	1.0266		1.1526	−.0808	1.2446		1.3223	−.0830
37	.500	.941	.4782	−.0770	.6312		.8070	−.0790	.9452		1.0640	−.0818	1.1527		1.2267	−.0841
38	.382	0.000	.7298	−.0767	.9115		1.0791	−.0792	1.2058		1.3135	−.0815	1.3979		1.4688	−.0842
39	.382	.295	.6977	−.0765	.8867		1.0651	−.0788	1.1968		1.3075	−.0811	1.3908		1.4622	−.0835
40	.382	.530	.6348	−.0757	.8399		1.0276	−.0779	1.1650		1.2808	−.0806	1.3657		1.4403	−.0825
41	.382	.707	.5949	−.0759	.7836		.9703	−.0780	1.1089		1.2260	−.0808	1.3114		1.3889	−.0827
42	.382	.823	.5389	−.0763	.7115		.8887	−.0786	1.0186		1.1288	−.0809	1.2108		1.2848	−.0828
43	.382	.882	.5118	−.0751	.6764		.8478	−.0780	.9763		1.0846	−.0817	1.1640		1.2384	−.0835
44	.382	.941	.4625	−.0743	.6163		.7751	−.0773	.8973		1.0033	−.0808	1.0796		1.1514	−.0823
45	.264	0.000	.6964	−.0761	.8636		.9907	−.0783	1.0777		1.1531	−.0803	1.2132		1.2697	−.0829
46	.264	.295	.6648	−.0759	.8483		.9822	−.0784	1.0736		1.1494	−.0804	1.2083		1.2648	−.0826
47	.264	.530	.6219	−.0759	.8153		.9581	−.0779	1.0535		1.1322	−.0806	1.1921		1.2522	−.0825
48	.264	.707	.5744	−.0750	.7670		.9097	−.0780	1.0095		1.0890	−.0818	1.1499		1.2135	−.0835
49	.264	.823	.5225	−.0750	.6976		.8411	−.0789	.9367		1.0150	−.0824	1.0743		1.1470	−.0833
50	.264	.882	.4990	−.0744	.6628		.8092	−.0777	.9065		.9866	−.0810	1.0483		1.1316	−.0823
51	.264	.941	.4551	−.0750	.6029		.7432	−.0778	.8403		.9201	−.0802	.9825		1.0667	−.0812
52	.177	0.000	.2771	−.0776	.3473		.4007	−.0805	.4464		.5001	−.0831	.6184		.8033	−.0849
53	.177	.295	.2611	−.0757	.3398		.3968	−.0782	.4436		.4972	−.0806	.6168		.7966	−.0826
54	.177	.530	.2422	−.0745	.3245		.3855	−.0774	.4346		.4903	−.0806	.6134		.7913	−.0821
55	.177	.707	.2222	−.0764	.3056		.3733	−.0795	.4256		.5052	−.0828	.6338		.8043	−.0842
56	.177	.882	.4641	−.0749	.5882		.6738	−.0782	.7420		.8086	−.0816	.8945		1.0546	−.0829
57	.118	0.000	.2671	−.0714	.3455		.4166	−.0745	.4866		.5812	−.0764	.7030		1.0870	−.0784
58	.118	.295	.2537	−.0768	.3401		.4147	−.0798	.4849		.5791	−.0813	.6975		1.0790	−.0831
59	.118	.530	.2375	−.0760	.3273		.4048	−.0781	.4769		.5681	−.0819	.6892		1.0461	−.0835
60	.118	.707	.2272	−.0766	.3213		.4135	−.0787	.4937		.5947	−.0822	.6636		1.0728	−.0836
61	.118	.823	.2524	−.0751	.3625		.4631	−.0776	.5475		.6549	−.0806	.7955		1.0375	−.0819
62	.118	.941	.4010	−.0748	.4962		.5772	−.0773	.6436		.7219	−.0806	.8274		.9823	−.0819
63	.059	0.000	.2600	−.0771	.3478		.4323	−.0793	.5173		.6288	−.0819	.7812		1.0489	−.0841
64	.059	.295	.2496	−.0769	.3420		.4267	−.0795	.5097		.6212	−.0812	.7736		1.0477	−.0835
65	.059	.530	.2312	−.0753	.3246		.4101	−.0772	.4945		.6061	−.0812	.7549		1.0442	−.0832
66	.059	.707	.2322	−.0751	.3358		.4340	−.0770	.5190		.6259	−.0804	.8652		1.0402	−.0823
67	.059	.882	.1999	−.0756	.3121		.4231	−.0778	.5032		.6208	−.0804	.7863		.9662	−.0825
68	.736	−.707	.5319	−.0700	.6699		.9265	−.0696	1.2413		1.4313	−.0702	1.5497		1.6371	−.0720
69	.288	−.707	.5727	−.0647	.7615		.9014	−.0674	.9967		1.0748	−.0702	1.1363		1.1959	−.0721

TABLE IX.–Continued
(e) M = 4.60

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	.1491	.3785	.2379	.2438	.3717	.1457	.5364	.0817	.7297	.0443	.9536	.0195	1.3284	.0082
2	.941	.295	.1423	.3841	.2342	.2463	.3688	.1452	.5332	.0778	.7261	.0373	.9549	.0105	1.3343	−.0022
3	.941	.530	.1409	.3850	.2349	.2452	.3705	.1433	.5365	.0770	.7282	.0359	.9609	.0092	1.3285	−.0037
4	.941	.707	.1424	.3857	.2358	.2457	.3712	.1438	.5394	.0771	.7305	.0368	.9632	.0105	1.3078	−.0028
5	.941	.882	.1411	.3868	.2354	.2457	.3704	.1428	.5385	.0763	.7299	.0353	.9569	.0092	1.2160	−.0036
6	.882	0.000	.1328	.3732	.2290	.2370	.3644	.1347	.5293	.0658	.7235	.0256	.9457	.0008	1.2774	−.0125
7	.882	.295	.1306	.3763	.2270	.2382	.3608	.1348	.5248	.0655	.7175	.0246	.9436	−.0001	1.2776	−.0127
8	.882	.530	.1306	.3777	.2280	.2380	.3626	.1337	.5280	.0653	.7196	.0240	.9491	−.0006	1.2689	−.0126
9	.882	.707	.1330	.3791	.2287	.2391	.3640	.1350	.5314	.0665	.7216	.0264	.9518	.0021	1.2380	−.0110
10	.882	.823	.1311	.3770	.2274	.2377	.3610	.1333	.5277	.0655	.7166	.0245	.9394	.0002	1.1518	−.0123
11	.882	.941	.0052	.0647	.0181	.0271	.0586	.0055	.1239	−.0096	.2060	−.0183	.3118	−.0240	.4683	−.0273
12	.823	0.000	.1272	.3669	.2239	.2315	.3579	.1297	.5216	.0600	.7145	.0200	.9330	−.0039	1.2090	−.0159
13	.823	.295	.1259	.3688	.2219	.2330	.3550	.1304	.5182	.0606	.7092	.0197	.9317	−.0041	1.2091	−.0164
14	.823	.530	.1259	.3703	.2231	.2328	.3563	.1293	.5211	.0606	.7108	.0197	.9362	−.0045	1.1999	−.0163
15	.823	.707	.1270	.3727	.2238	.2333	.3576	.1302	.5232	.0606	.7125	.0196	.9369	−.0039	1.1571	−.0161
16	.823	.882	.0028	.0654	.0194	.0257	.0614	.0021	.1264	−.0131	.2075	−.0214	.2977	−.0275	.4326	−.0295
17	.736	0.000	.0124	.0890	.0368	.0434	.0860	.0143	.1606	−.0059	.2655	−.0186	.4027	−.0264	.5590	−.0296
18	.736	.295	.0080	.0845	.0323	.0382	.0803	.0099	.1525	−.0101	.2563	−.0213	.3938	−.0282	.5484	−.0311
19	.736	.530	.0088	.0849	.0322	.0385	.0804	.0108	.1538	−.0089	.2569	−.0205	.3948	−.0271	.5404	−.0304
20	.736	.707	.0129	.0845	.0304	.0397	.0778	.0122	.1525	−.0077	.2549	−.0188	.3875	−.0262	.4893	−.0291
21	.736	.823	−.0053	.0550	.0092	.0171	.0505	−.0050	.1147	−.0195	.1944	−.0271	.2788	−.0318	.3884	−.0326
22	.736	.882	−.0047	.0545	.0083	.0166	.0490	−.0041	.1153	−.0168	.1973	−.0241	.3034	−.0287	.4542	−.0297
23	.736	.941	.0013	.0460	.0112	.0156	.0415	.0004	.1011	−.0129	.1810	−.0203	.2845	−.0256	.4298	−.0274
24	.618	0.000	−.0066	.0661	.0130	.0214	.0619	−.0033	.1394	−.0180	.2450	−.0255	.3826	−.0294	.5498	−.0300
25	.618	.295	−.0067	.0667	.0125	.0206	.0613	−.0036	.1380	−.0184	.2440	−.0257	.3822	−.0284	.5463	−.0290
26	.618	.530	−.0059	.0667	.0120	.0215	.0605	−.0030	.1386	−.0173	.2439	−.0250	.3811	−.0275	.5244	−.0285
27	.618	.707	−.0094	.0609	.0085	.0178	.0541	−.0064	.1274	−.0206	.2198	−.0274	.3175	−.0294	.4094	−.0306
28	.618	.823	−.0092	.0464	.0017	.0108	.0403	−.0082	.1043	−.0191	.1818	−.0245	.2787	−.0261	.4058	−.0276
29	.618	.882	−.0065	.0456	.0044	.0110	.0404	−.0063	.1031	−.0179	.1823	−.0243	.2825	−.0273	.4048	−.0288
30	.618	.941	−.0034	.0397	.0087	.0126	.0357	−.0029	.0918	−.0157	.1678	−.0230	.2656	−.0271	.3876	−.0287
31	.500	0.000	−.0113	.0624	.0084	.0163	.0574	−.0089	.1342	−.0235	.2394	−.0298	.3760	−.0306	.5378	−.0317
32	.500	.295	−.0108	.0630	.0086	.0173	.0574	−.0070	.1343	−.0195	.2393	−.0251	.3764	−.0271	.5330	−.0285
33	.500	.530	−.0061	.0632	.0062	.0185	.0542	−.0058	.1338	−.0204	.2389	−.0258	.3720	−.0287	.4896	−.0298
34	.500	.707	−.0087	.0529	.0009	.0141	.0429	−.0081	.1129	−.0210	.1958	−.0247	.2866	−.0271	.4113	−.0289
35	.500	.823	−.0100	.0433	.0004	.0086	.0379	−.0093	.0999	−.0200	.1771	−.0243	.2737	−.0271	.3939	−.0288
36	.500	.882	−.0075	.0404	.0035	.0096	.0348	−.0066	.0942	−.0191	.1694	−.0238	.2631	−.0266	.3788	−.0283
37	.500	.941	−.0057	.0352	.0070	.0101	.0320	−.0059	.0849	−.0175	.1572	−.0254	.2466	−.0287	.3521	−.0300
38	.382	0.000	−.0090	.0608	.0042	.0168	.0524	−.0082	.1320	−.0220	.2376	−.0261	.3735	−.0290	.5253	−.0299
39	.382	.295	−.0083	.0613	.0043	.0170	.0524	−.0074	.1324	−.0218	.2384	−.0254	.3742	−.0282	.5141	−.0297
40	.382	.530	−.0084	.0607	.0045	.0170	.0522	−.0072	.1309	−.0206	.2344	−.0237	.3544	−.0266	.4502	−.0281
41	.382	.707	−.0098	.0494	−.0007	.0122	.0393	−.0090	.1057	−.0207	.1870	−.0234	.2843	−.0264	.4080	−.0280
42	.382	.823	−.0104	.0403	.0004	.0080	.0350	−.0094	.0944	−.0203	.1696	−.0235	.2622	−.0269	.3756	−.0288
43	.382	.882	−.0060	.0367	.0007	.0116	.0290	−.0070	.0847	−.0200	.1585	−.0243	.2495	−.0273	.3613	−.0282
44	.382	.941	.0015	.0325	.0060	.0135	.0277	−.0026	.0769	−.0157	.1455	−.0234	.2303	−.0258	.3323	−.0275
45	.264	0.000	−.0104	.0574	.0020	.0149	.0490	−.0087	.1275	−.0218	.2313	−.0242	.3617	−.0272	.5043	−.0288
46	.264	.295	−.0104	.0576	.0025	.0148	.0492	−.0089	.1280	−.0211	.2327	−.0241	.3619	−.0271	.4859	−.0284
47	.264	.530	−.0104	.0564	.0015	.0140	.0478	−.0091	.1245	−.0198	.2236	−.0231	.3205	−.0266	.4218	−.0282
48	.264	.707	−.0101	.0436	−.0041	.0116	.0325	−.0101	.0967	−.0209	.1775	−.0245	.2726	−.0276	.3905	−.0283
49	.264	.823	−.0091	.0367	−.0025	.0099	.0283	−.0096	.0857	−.0208	.1594	−.0248	.2490	−.0273	.3599	−.0299
50	.264	.882	−.0058	.0339	.0001	.0115	.0264	−.0069	.0794	−.0193	.1513	−.0234	.2400	−.0255	.3484	−.0289
51	.264	.941	.0009	.0297	.0045	.0124	.0247	−.0006	.0713	−.0154	.1374	−.0232	.2204	−.0251	.3187	−.0282
52	.177	0.000	−.0280	−.0119	−.0287	−.0211	−.0186	−.0289	.0074	−.0294	.0479	−.0303	.1142	−.0321	.2040	−.0333
53	.177	.295	−.0260	−.0106	−.0272	−.0191	−.0172	−.0248	.0074	−.0264	.0480	−.0273	.1127	−.0283	.1878	−.0310
54	.177	.530	−.0213	−.0110	−.0241	−.0181	−.0171	−.0197	.0055	−.0221	.0391	−.0258	.0836	−.0273	.1564	−.0306
55	.177	.707	−.0237	−.0170	−.0261	−.0209	−.0224	−.0235	−.0062	−.0254	.0225	−.0277	.0704	−.0300	.1423	−.0327
56	.177	.882	−.0087	.0284	−.0035	.0077	.0224	−.0101	.0718	−.0193	.1396	−.0240	.2228	−.0266	.3220	−.0288
57	.118	0.000	−.0199	−.0121	−.0233	−.0181	−.0174	−.0194	.0017	−.0202	.0392	−.0214	.1038	−.0229	.1925	−.0259
58	.118	.295	−.0264	−.0189	−.0285	−.0228	−.0245	−.0256	−.0047	−.0271	.0360	−.0291	.1011	−.0302	.1741	−.0331
59	.118	.530	−.0216	−.0183	−.0215	−.0172	−.0231	−.0205	−.0079	−.0252	.0250	−.0280	.0724	−.0296	.1482	−.0324
60	.118	.707	−.0217	−.0208	−.0221	−.0173	−.0251	−.0216	−.0132	−.0249	.0156	−.0280	.0649	−.0296	.1393	−.0329
61	.118	.823	−.0198	−.0176	−.0212	−.0162	−.0226	−.0201	−.0099	−.0232	.0189	−.0254	.0718	−.0276	.1511	−.0303
62	.118	.941	−.0011	.0247	.0002	.0086	.0195	−.0022	.0618	−.0163	.1239	−.0235	.2028	−.0254	.2926	−.0280
63	.059	0.000	−.0266	−.0221	−.0292	−.0248	−.0273	−.0261	−.0100	−.0278	.0308	−.0294	.0966	−.0305	.1845	−.0336
64	.059	.295	−.0251	−.0225	−.0267	−.0217	−.0266	−.0253	−.0097	−.0277	.0310	−.0293	.0944	−.0308	.1654	−.0341
65	.059	.530	−.0215	−.0213	−.0202	−.0162	−.0241	−.0208	−.0118	−.0256	.0193	−.0276	.0663	−.0293	.1420	−.0326
66	.059	.707	−.0192	−.0202	−.0197	−.0158	−.0233	−.0195	−.0148	−.0231	.0132	−.0256	.0624	−.0267	.1382	−.0313
67	.059	.882	−.0197	−.0220	−.0205	−.0170	−.0248	−.0200	−.0184	−.0242	.0034	−.0261	.0461	−.0277	.1199	−.0318
68	.736	−.707	.0271	.0851	.0356	.0479	.0766	.0234	.1510	.0065	.2536	−.0022	.3878	−.0087	.4936	−.0116
69	.288	−.707	.0065	.0462	.0077	.0221	.0361	.0048	.0953	−.0048	.1789	−.0075	.2760	−.0102	.3914	−.0111

TABLE IX.—Concluded
(e) Concluded

			α =													
			30 0		35 0		40 0		45 0		50.0		55 0		60 0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.941	0.000	1.5601	.0102	1.6639		1.7358	−.0050	1.7913		1.8258	−.0088	1.8280		1.8193	−.0101
2	.941	.295	1.5608	.0019	1.6668		1.7422	−.0189	1.7945		1.8280	−.0235	1.8392		1.8305	−.0251
3	.941	.530	1.5452	.0002	1.6575		1.7341	−.0208	1.7857		1.8248	−.0252	1.8438		1.8382	−.0273
4	.941	.707	1.5083	.0002	1.6287		1.7138	−.0182	1.7682		1.8162	−.0232	1.8402		1.8375	−.0249
5	.941	.882	1.3662	−.0043	1.4900		1.5914	−.0176	1.6662		1.7320	−.0237	1.7773		1.7921	−.0255
6	.882	0.000	1.4237	−.0083	1.5183		1.6024	−.0217	1.6992		1.7804	−.0258	1.8240		1.8494	−.0283
7	.882	.295	1.4209	−.0086	1.5160		1.6013	−.0215	1.6945		1.7749	−.0258	1.8271		1.8524	−.0274
8	.882	.530	1.4050	−.0088	1.5039		1.5892	−.0207	1.6762		1.7613	−.0250	1.8210		1.8518	−.0267
9	.882	.707	1.3639	−.0096	1.4677		1.5572	−.0191	1.6405		1.7309	−.0233	1.7981		1.8335	−.0258
10	.882	.823	1.2545	−.0126	1.3567		1.4505	−.0206	1.5387		1.6373	−.0250	1.7198		1.7712	−.0263
11	.882	.941	.6445	−.0290	.8233		.9993	−.0281	1.1569		1.3138	−.0275	1.4394		1.5229	−.0280
12	.823	0.000	1.2732	−.0136	1.3430		1.4272	−.0222	1.5654		1.6893	−.0259	1.7697		1.8256	−.0277
13	.823	.295	1.2731	−.0141	1.3431		1.4251	−.0219	1.5578		1.6813	−.0256	1.7704		1.8262	−.0277
14	.823	.530	1.2599	−.0146	1.3318		1.4085	−.0225	1.5278		1.6561	−.0265	1.7542		1.8179	−.0279
15	.823	.707	1.2190	−.0161	1.2950		1.3720	−.0222	1.4720		1.6040	−.0258	1.7116		1.7816	−.0275
16	.823	.882	.5784	−.0306	.7101		.8748	−.0298	1.0847		1.2952	−.0290	1.4478		1.5484	−.0294
17	.736	0.000	.6510	−.0307	.8187		1.1038	−.0296	1.3682		1.5394	−.0292	1.6581		1.7457	−.0305
18	.736	.295	.6391	−.0322	.8001		1.0735	−.0311	1.3482		1.5237	−.0308	1.6516		1.7419	−.0311
19	.736	.530	.6220	−.0317	.7603		1.0024	−.0297	1.2915		1.4837	−.0296	1.6226		1.7223	−.0304
20	.736	.707	.5528	−.0302	.6580		.8655	−.0290	1.1809		1.3990	−.0288	1.5503		1.6592	−.0290
21	.736	.823	.4998	−.0325	.6044		.7200	−.0315	1.0265		1.3134	−.0316	1.4430		1.5368	−.0322
22	.736	.882	.5883	−.0295	.7243		.8697	−.0288	1.0973		1.2704	−.0292	1.3929		1.4875	−.0303
23	.736	.941	.5684	−.0276	.6935		.8258	−.0274	1.0180		1.1777	−.0277	1.2974		1.3876	−.0283
24	.618	0.000	.7142	−.0303	.9162		1.1323	−.0293	1.3245		1.4681	−.0295	1.5789		1.6674	−.0310
25	.618	.295	.7044	−.0294	.8984		1.1099	−.0289	1.3088		1.4548	−.0293	1.5728		1.6631	−.0298
26	.618	.530	.6607	−.0290	.8315		1.0441	−.0276	1.2593		1.4185	−.0285	1.5434		1.6418	−.0296
27	.618	.707	.5462	−.0302	.7242		.9595	−.0295	1.1834		1.3497	−.0304	1.4771		1.5788	−.0313
28	.618	.823	.5396	−.0276	.7106		.9048	−.0272	1.0984		1.2468	−.0275	1.3654		1.4602	−.0283
29	.618	.882	.5202	−.0288	.6706		.8645	−.0284	1.0600		1.2033	−.0289	1.3179		1.4110	−.0299
30	.618	.941	.4924	−.0287	.6187		.7928	−.0286	.9776		1.1138	−.0292	1.2239		1.3111	−.0298
31	.500	0.000	.7006	−.0319	.8912		1.0923	−.0312	1.2672		1.3933	−.0319	1.4956		1.5816	−.0328
32	.500	.295	.6862	−.0283	.8673		1.0719	−.0275	1.2540		1.3836	−.0279	1.4904		1.5796	−.0287
33	.500	.530	.6188	−.0303	.7935		1.0140	−.0299	1.2117		1.3498	−.0302	1.4623		1.5583	−.0311
34	.500	.707	.5589	−.0291	.7398		.9566	−.0287	1.1510		1.2889	−.0294	1.4022		1.4985	−.0299
35	.500	.823	.5281	−.0290	.6847		.8866	−.0283	1.0648		1.1919	−.0289	1.2982		1.3881	−.0299
36	.500	.882	.5039	−.0282	.6576		.8513	−.0281	1.0214		1.1471	−.0288	1.2524		1.3410	−.0297
37	.500	.941	.4635	−.0302	.6048		.7833	−.0298	.9457		1.0599	−.0305	1.1624		1.2468	−.0313
38	.382	0.000	.6824	−.0303	.8728		1.0574	−.0298	1.2057		1.3095	−.0305	1.3960		1.4758	−.0314
39	.382	.295	.6597	−.0300	.8443		1.0394	−.0295	1.1963		1.3018	−.0299	1.3930		1.4745	−.0312
40	.382	.530	.5937	−.0284	.7901		.9969	−.0282	1.1635		1.2768	−.0287	1.3718		1.4588	−.0293
41	.382	.707	.5542	−.0282	.7408		.9430	−.0281	1.1101		1.2244	−.0288	1.3206		1.4088	−.0295
42	.382	.823	.5100	−.0289	.6826		.8676	−.0285	1.0248		1.1317	−.0288	1.2228		1.3054	−.0298
43	.382	.882	.4890	−.0286	.6542		.8267	−.0262	.9824		1.0874	−.0261	1.1786		1.2607	−.0283
44	.382	.941	.4466	−.0268	.6002		.7626	−.0249	.9041		1.0067	−.0246	1.0943		1.1737	−.0269
45	.264	0.000	.6566	−.0292	.8338		.9853	−.0286	1.0877		1.1582	−.0289	1.2183		1.2791	−.0302
46	.264	.295	.6280	−.0288	.8068		.9745	−.0284	1.0831		1.1528	−.0287	1.2178		1.2805	−.0294
47	.264	.530	.5777	−.0285	.7664		.9449	−.0278	1.0633		1.1390	−.0286	1.2066		1.2729	−.0290
48	.264	.707	.5374	−.0273	.7234		.8977	−.0260	1.0216		1.0988	−.0259	1.1680		1.2369	−.0284
49	.264	.823	.4973	−.0289	.6720		.8327	−.0259	.9538		1.0277	−.0257	1.0944		1.1669	−.0284
50	.264	.882	.4796	−.0279	.6433		.8016	−.0244	.9247		1.0002	−.0245	1.0690		1.1488	−.0272
51	.264	.941	.4419	−.0276	.5953		.7368	−.0244	.8595		.9335	−.0240	1.0020		1.0840	−.0261
52	.177	0.000	.2902	−.0333	.3700		.4364	−.0291	.4900		.5333	−.0292	.6282		.8116	−.0305
53	.177	.295	.2714	−.0296	.3605		.4310	−.0258	.4878		.5314	−.0248	.6177		.8052	−.0270
54	.177	.530	.2485	−.0287	.3438		.4204	−.0246	.4803		.5256	−.0241	.6090		.7962	−.0268
55	.177	.707	.2317	−.0311	.3292		.4075	−.0276	.4735		.5305	−.0271	.6578		.8107	−.0296
56	.177	.882	.4520	−.0287	.5849		.6970	−.0256	.7773		.8313	−.0249	.9086		1.0464	−.0277
57	.118	0.000	.2798	−.0237	.3638		.4459	−.0192	.5257		.6027	−.0182	.7239		.9194	−.0208
58	.118	.295	.2611	−.0322	.3542		.4418	−.0272	.5232		.6029	−.0258	.7206		.8982	−.0287
59	.118	.530	.2419	−.0309	.3405		.4308	−.0264	.5151		.5910	−.0263	.7118		.8720	−.0287
60	.118	.707	.2348	−.0312	.3359		.4357	−.0273	.5295		.6155	−.0265	.7155		.9190	−.0295
61	.118	.823	.2557	−.0287	.3646		.4767	−.0257	.5760		.6659	−.0245	.7881		1.0078	−.0272
62	.118	.941	.4047	−.0276	.5086		.6024	−.0244	.6811		.7403	−.0239	.8322		.9818	−.0265
63	.059	0.000	.2714	−.0315	.3588		.4528	−.0283	.5448		.6406	−.0268	.7754		1.0583	−.0293
64	.059	.295	.2545	−.0315	.3500		.4460	−.0285	.5380		.6357	−.0267	.7693		1.0620	−.0292
65	.059	.530	.2351	−.0293	.3337		.4296	−.0258	.5229		.6184	−.0259	.7580		1.0636	−.0279
66	.059	.707	.2363	−.0279	.3392		.4459	−.0261	.5453		.6422	−.0245	.7661		1.0625	−.0268
67	.059	.882	.2152	−.0286	.3116		.4257	−.0266	.5326		.6341	−.0245	.7695		.9652	−.0271
68	.736	−.707	.5543	−.0127	.6627		.8738	−.0122	1.1822		1.3929	−.0121	1.5414		1.6508	−.0124
69	.288	−.707	.5339	−.0097	.7157		.8882	−.0093	1.0106		1.0858	−.0085	1.1558		1.2256	−.0109

TABLE X.–PRESSURE COEFFICIENTS FOR MODEL 1
(a) M = 1.60

			α =													
			−4.8		.3		5.3		10.3		15.2		20.3		25.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.3070	.7117	.4976	.4561	.7632	.2772	1.0259	.1593	1.2070	.0454	1.3489	−.0898	1.4608	−.2308
2	.868	0.000	.3026	.7016	.4959	.4552	.7431	.2749	.9274	.1457	1.0696	.0306	1.2021	−.0782	1.3322	−.1952
3	.802	0.000	.3003	.6706	.4900	.4486	.7020	.2710	.8270	.1374	.9316	.0159	1.0471	−.0825	1.1920	−.1875
4	.688	0.000	−.0646	.1409	.0532	.0340	.1515	−.0866	.2458	−.1779	.3870	−.2533	.7116	−.3143	.9377	−.3722
5	.688	.066	−.1368	0.0000	−.0538	−.0677	.0102	−.1557	.1097	−.2259	.2302	−.2870	.5366	−.3392	.8222	−.3788
6	.732	.143	.3198	.6575	.5158	.4748	.6789	.2842	.7721	.1265	.8575	−.0513	.9656	−.2242	1.1173	−.3502
7	.790	.156	.3425	.7411	.5588	.5119	.7749	.3049	.9121	.0981	1.0268	−.0983	1.1444	−.2739	1.2755	−.4257
8	.850	.170	.3881	.8478	.6392	.5888	.8934	.3339	1.0698	.0549	1.1981	−.1711	1.3116	−.3704	1.4134	−.4408
9	.625	0.000	−.0781	.1216	.0341	.0139	.1387	−.0999	.2634	−.1878	.4491	−.2604	.7517	−.3174	.9317	−.3739
10	.625	.077	−.1314	.0643	−.0264	−.0487	.0799	−.1498	.1842	−.2284	.2801	−.2941	.7783	−.3452	.9431	−.3838
11	.625	.128	−.1374	.0066	−.0546	−.0701	.0176	−.1556	.1476	−.2289	.2498	−.2921	.6279	−.3423	.9292	−.4399
12	.625	.179	−.1333	−.0103	−.0558	−.0707	−.0037	−.1530	.0629	−.2279	.2278	−.3048	.5315	−.3983	.8126	−.4481
13	.669	.268	.3494	.6650	.5522	.5075	.6862	.3094	.7731	.0979	.8542	−.0905	.9621	−.2424	1.1034	−.3835
14	.728	.281	.3721	.7684	.6070	.5621	.8002	.3221	.9223	.0782	1.0271	−.1051	1.1395	−.2739	1.2620	−.4387
15	.787	.295	.3923	.8914	.6891	.6394	.9335	.3132	1.0871	.0345	1.2013	−.1819	1.3054	−.3887	1.4000	−.4416
16	.500	0.000	−.0824	.1267	.0293	.0059	.1455	−.1021	.2898	−.1906	.4878	−.2651	.7330	−.3266	.8706	−.3806
17	.500	.151	−.1345	.0768	−.0253	−.0522	.0989	−.1537	.2321	−.2330	.5378	−.2983	.7434	−.3442	.8754	−.4414
18	.500	.251	−.1360	.0230	−.0484	−.0676	.0404	−.1558	.1867	−.2379	.2758	−.3306	.7721	−.4061	.8887	−.4541
19	.500	.351	−.1341	.0057	−.0506	−.0650	.0190	−.1522	.1113	−.2510	.2460	−.3398	.6581	−.4096	.9087	−.4599
20	.500	.452	−.1203	−.0154	−.0505	−.0585	−.0082	−.1361	.0401	−.2426	.1898	−.3315	.5255	−.4040	.7655	−.4379
21	.544	.518	.3822	.6814	.5898	.5597	.7064	.3328	.7865	.0957	.8590	−.0854	.9608	−.2373	1.0801	−.3710
22	.603	.531	.3865	.7962	.6626	.6140	.8318	.3285	.9401	.0788	1.0319	−.1102	1.1378	−.2742	1.2414	−.4299
23	.662	.545	.3726	.9278	.7452	.6803	.9722	.2879	1.1029	.0153	1.2036	−.2029	1.2992	−.3959	1.3774	−.4582
24	.375	0.000	−.0818	.1281	.0282	.0046	.1491	−.1023	.3009	−.1926	.5054	−.2668	.6940	−.3282	.7970	−.3798
25	.375	.225	−.1377	.0869	−.0241	−.0511	.1123	−.1565	.2542	−.2366	.5397	−.3030	.7033	−.3740	.8037	−.4386
26	.375	.374	−.1370	.0415	−.0422	−.0615	.0633	−.1558	.2138	−.2515	.5563	−.3392	.7088	−.4069	.8103	−.4279
27	.375	.524	−.1264	.0263	−.0413	−.0569	.0441	−.1458	.1538	−.2481	.2981	−.3348	.7381	−.4062	.8294	−.4187
28	.375	.674	−.1161	−.0105	−.0492	−.0535	−.0035	−.1348	.0568	−.2406	.1792	−.3308	.4305	−.4060	.6848	−.4200
29	.419	.768	.3856	.6659	.5881	.5738	.6828	.3362	.7545	.0982	.8205	−.0908	.9026	−.2400	.9922	−.3592
30	.478	.781	.3857	.7924	.6714	.6423	.8174	.3419	.9143	.0827	.9990	−.1138	1.0869	−.2688	1.1680	−.4030
31	.537	.795	.3525	.9338	.7653	.7127	.9700	.2855	1.0878	.0046	1.1781	−.2060	1.2582	−.3814	1.3207	−.4669
32	.381	.843	.3649	.6009	.5379	.5262	.6144	.3141	.6739	.0849	.7344	−.0984	.8039	−.2435	.8760	−.3599
33	.440	.856	.3789	.7488	.6449	.6203	.7700	.3265	.8549	.0728	.9340	−.1144	1.0120	−.2685	1.0816	−.3942
34	.500	.870	.3546	.9138	.7569	.7098	.9394	.2942	1.0491	.0164	1.1351	−.1951	1.2069	−.3677	1.2618	−.4666
35	.375	.958	−.0284	.0924	.0311	.0213	.0972	−.0530	.1769	−.2013	.2686	−.3167	.3804	−.4012	.5496	−.4519
36	.250	0.000	−.1014		−.0176		.1041		.2465		.4215		.5207		.5829	
37	.250	.250	−.1474	.0660	−.0433	−.0685	.0905	−.1651	.3169	−.2453	.4634	−.3071	.5417	−.3642	.5963	−.4230
38	.250	.417	−.1519	.0303	−.0584	−.0798	.0545	−.1703	.2100	−.2622	.4838	−.3440	.5456	−.3943	.5999	−.4208
39	.250	.583	−.1376	.0287	−.0512	−.0669	.0485	−.1548	.1756	−.2556	.4935	−.3394	.5572	−.4002	.6143	−.4147
40	.250	.750	−.1304	−.0054	−.0656	−.0744	.0045	−.1512	.0979	−.2539	.2331	−.3415	.5128	−.3977	.5798	−.4173
41	.250	.833	−.2318	−.1621	−.1941	−.2009	−.1542	−.2418	−.0943	−.3105	−.0018	−.3748	.3504	−.4084	.4309	−.4271
42	.250	.875	−.1861	−.1386	−.1448	−.1516	−.1344	−.2014	−.0762	−.2617	−.0022	−.3304	.1718	−.3936	.4720	−.4273
43	.250	.917	−.0910	−.0241	−.0645	−.0895	−.0223	−.0895	.0354	−.2180	.1098	−.3187	.3722	−.3899	.5951	−.4286
44	.250	.958	.0496	.1051	.1328	.1293	.0986	.0242	.1300	−.1153	.1884	−.2338	.3234	−.3395	.4986	−.4225
45	.188	0.000	−.3324	−.2252	−.2744	−.2885	−.2105	−.3431	−.1309	−.3867	−.0452	−.4000	−.0176	−.3829	.0134	−.4026
46	.188	.250	−.3651	−.2357	−.2943	−.2931	−.2163	−.3738	−.1308	−.3884	−.0520	−.4021	−.0190	−.4095	.0117	−.4301
47	.188	.417	−.3650	−.2684	−.2914	−.2721	−.2506	−.3703	−.1518	−.3570	−.0522	−.3655	−.0188	−.3873	.0140	−.4193
48	.188	.583	−.3638	−.2737	−.3154	−.2848	−.2596	−.3690	−.1805	−.3458	−.0446	−.3643	−.0226	−.3886	.0106	−.4134
49	.188	.750	−.3697	−.3008	−.3345	−.3257	−.2923	−.3785	−.2325	−.3549	−.1448	−.3669	−.0614	−.3868	−.0218	−.4177
50	.125	0.000	−.3487	−.2391	−.2907	−.3048	−.2232	−.3594	−.1429	−.3980	−.0613	−.3928	−.0172	−.3838	.0304	−.4017
51	.125	.250	−.3351	−.2325	−.2596	−.2635	−.2159	−.3396	−.1344	−.3679	−.0572	−.3824	−.0114	−.3854	.0359	−.4080
52	.125	.417	−.3243	−.2642	−.2570	−.2597	−.2476	−.3330	−.1450	−.3565	−.0549	−.3654	−.0115	−.3872	.0391	−.4202
53	.125	.583	−.3197	−.2747	−.2721	−.2609	−.2611	−.3267	−.1790	−.3447	−.0525	−.3646	−.0196	−.3876	.0345	−.4138
54	.125	.750	−.3324	−.3104	−.3069	−.2872	−.3047	−.3371	−.2451	−.3556	−.1354	−.3729	−.0726	−.3883	−.0066	−.4189
55	.125	.958	.0008	.0064	.0291	.0346	.0020	−.0142	.0275	−.1371	.0995	−.2726	.2252	−.3754	.2653	−.4461
56	.063	0.000	−.3485	−.2440	−.2935	−.3067	−.2283	−.3552	−.1504	−.3691	−.0627	−.3901	−.0070	−.3852	.0505	−.4034
57	.063	.250	−.3068	−.2014	−.2433	−.2579	−.1964	−.3130	−.1344	−.3350	−.0590	−.3545	−.0037	−.3701	.0563	−.3903
58	.063	.417	−.3058	−.2405	−.2545	−.2588	−.2394	−.3125	−.1378	−.3471	−.0600	−.3632	−.0066	−.3776	.0577	−.4159
59	.063	.583	−.3099	−.2754	−.2618	−.2596	−.2629	−.3164	−.1782	−.3444	−.0604	−.3652	−.0187	−.3880	.0515	−.4141
60	.063	.750	−.3205	−.2965	−.2892	−.2823	−.3038	−.3263	−.2558	−.3498	−.1280	−.3814	−.0771	−.3934	.0243	−.4210
61	.063	.875	−.2939	−.2606	−.2371	−.2517	−.2607	−.3035	−.1959	−.3476	−.0827	−.3805	.0351	−.4016	.1169	−.4273
62	.375	.674	−.1107	−.0113	−.0427	−.0557	.0007	−.1341	.0584	−.2390	.1761	−.3287	.4497	−.4005	.6853	−.4128
63	.250	.833	−.2242	−.1622	−.1882	−.2003	−.1489	−.2408	−.0916	−.3062	−.0046	−.3698	.3709	−.3926	.4224	−.4206

TABLE X.–Continued
(a) Concluded

			α =													
			30.3		35.3		40.3		45.3		50.3		55.3		60.3	
Tube	x′/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	1.5309	−.3584	1.5695	−.4466	1.5857	−.4224	1.5825	−.4157	1.5715	−.4066	1.5393		1.5026	
2	.868	0.000	1.4296	−.3080	1.4977	−.4330	1.5451	−.4275	1.5756	−.4209	1.5937	−.4132	1.5914		1.5782	
3	.802	0.000	1.3106	−.2883	1.4016	−.3700	1.4724	−.4290	1.5280	−.4222	1.5710	−.4140	1.5917		1.5957	
4	.688	0.000	1.0908	−.4256	1.2151	−.4740	1.3188	−.4349	1.4015	−.4262	1.4748	−.4152	1.5295		1.5671	
5	.688	.066	1.0312	−.4058	1.1934	−.4628	1.3076	−.4353	1.3970	−.4276	1.4742	−.4144	1.5303		1.5694	
6	.732	.143	1.2394	−.4516	1.3374	−.4620	1.4173	−.4345	1.4825	−.4274	1.5351	−.4139	1.5649		1.5811	
7	.790	.156	1.3739	−.4923	1.4427	−.4644	1.4996	−.4336	1.5383	−.4259	1.5665	−.4127	1.5751		1.5735	
8	.850	.170	1.4810	−.4976	1.5179	−.4633	1.5465	−.4324	1.5516	−.4248	1.5520	−.4115	1.5333		1.5121	
9	.625	0.000	1.0636	−.4249	1.1741	−.4624	1.2740	−.4364	1.3567	−.4279	1.4324	−.4160	1.4925		1.5396	
10	.625	.077	1.0586	−.4117	1.1630	−.4670	1.2541	−.4383	1.3424	−.4300	1.4177	−.4157	1.4796		1.5242	
11	.625	.128	1.0527	−.4781	1.1631	−.4722	1.2579	−.4389	1.3474	−.4305	1.4224	−.4154	1.4838		1.5271	
12	.625	.179	1.0176	−.4683	1.1539	−.4755	1.2557	−.4393	1.3493	−.4310	1.4248	−.4150	1.4867		1.5297	
13	.669	.268	1.2204	−.4801	1.3131	−.4737	1.3911	−.4366	1.4565	−.4284	1.5087	−.4127	1.5437		1.5677	
14	.728	.281	1.3550	−.4885	1.4230	−.4705	1.4773	−.4351	1.5177	−.4270	1.5447	−.4115	1.5569		1.5629	
15	.787	.295	1.4652	−.4887	1.5012	−.4683	1.5249	−.4339	1.5341	−.4250	1.5313	−.4103	1.5168		1.5029	
16	.500	0.000	.9782	−.4265	1.0712	−.4510	1.1570	−.4407	1.2414	−.4325	1.3226	−.4188	1.3936		1.4514	
17	.500	.151	.9832	−.4688	1.0766	−.4809	1.1612	−.4419	1.2468	−.4343	1.3281	−.4183	1.3974		1.4561	
18	.500	.251	.9906	−.4640	1.0861	−.4818	1.1704	−.4405	1.2574	−.4333	1.3358	−.4161	1.4057		1.4618	
19	.500	.351	.9971	−.4580	1.0957	−.4696	1.1813	−.4372	1.2695	−.4289	1.3437	−.4137	1.4150		1.4702	
20	.500	.452	.9442	−.4477	1.0762	−.4582	1.1767	−.4325	1.2739	−.4257	1.3508	−.4132	1.4247		1.4779	
21	.544	.518	1.1811	−.4704	1.2663	−.4556	1.3378	−.4298	1.4043	−.4245	1.4533	−.4134	1.4970		1.5286	
22	.603	.531	1.3208	−.4902	1.3838	−.4542	1.4340	−.4270	1.4740	−.4216	1.5005	−.4120	1.5195		1.5343	
23	.662	.545	1.4314	−.4934	1.4649	−.4529	1.4882	−.4251	1.4992	−.4192	1.4969	−.4103	1.4886		1.4829	
24	.375	0.000	.8811	−.4206	.9585	−.4509	1.0308	−.4427	1.1103	−.4357	1.1931	−.4213	1.2754		1.3460	
25	.375	.225	.8889	−.4613	.9646	−.4831	1.0385	−.4429	1.1193	−.4363	1.2020	−.4197	1.2834		1.3526	
26	.375	.374	.8983	−.4523	.9768	−.4696	1.0509	−.4385	1.1323	−.4307	1.2138	−.4154	1.2959		1.3630	
27	.375	.524	.9099	−.4441	.9911	−.4566	1.0663	−.4354	1.1506	−.4307	1.2316	−.4185	1.3122		1.3757	
28	.375	.674	.8701	−.4459	.9755	−.4560	1.0568	−.4391	1.1523	−.4365	1.2396	−.4241	1.3170		1.3754	
29	.419	.768	1.0739	−.4583	1.1507	−.4593	1.2206	−.4413	1.2890	−.4383	1.3509	−.4245	1.3984		1.4357	
30	.478	.781	1.2354	−.4884	1.2924	−.4589	1.3426	−.4406	1.3854	−.4373	1.4219	−.4237	1.4439		1.4599	
31	.537	.795	1.3638	−.4991	1.3949	−.4583	1.4210	−.4392	1.4333	−.4357	1.4397	−.4217	1.4343		1.4284	
32	.381	.843	.9439	−.4552	1.0152	−.4628	1.0842	−.4468	1.1620	−.4412	1.2336	−.4260	1.2894		1.3357	
33	.440	.856	1.1419	−.4859	1.1978	−.4615	1.2491	−.4444	1.2977	−.4393	1.3414	−.4242	1.3692		1.3908	
34	.500	.870	1.3027	−.5005	1.3354	−.4610	1.3604	−.4427	1.3766	−.4371	1.3877	−.4220	1.3872		1.3843	
35	.375	.958	.7334	−.4913	.8042	−.4604	.8524	−.4425	.9261	−.4353	.9917	−.4202	1.0432		1.0917	
36	.250	0.000	.6343		.6788		.7207		.7770		.8641		.9666		1.0688	
37	.250	.250	.6460	−.4611	.6873	−.4746	.7315	−.4440	.7859	−.4367	.8757	−.4207	.9833		1.0832	
38	.250	.417	.6490	−.4502	.6919	−.4684	.7343	−.4394	.7933	−.4313	.8855	−.4161	.9990		1.0972	
39	.250	.583	.6619	−.4448	.7071	−.4584	.7517	−.4417	.8149	−.4378	.9115	−.4249	1.0238		1.1182	
40	.250	.750	.6325	−.4493	.6855	−.4625	.7367	−.4494	.8115	−.4447	.9171	−.4300	1.0265		1.1192	
41	.250	.833	.5319	−.4560	.6090	−.4656	.6594	−.4531	.7662	−.4454	.8866	−.4290	.9932		1.0830	
42	.250	.875	.6435	−.4657	.6710	−.4660	.7026	−.4530	.8419	−.4448	.9494	−.4282	1.0380		1.1141	
43	.250	.917	.6199	−.4694	.6457	−.4656	.7025	−.4517	.8524	−.4433	.9448	−.4269	1.0196		1.0874	
44	.250	.958	.5460	−.4776	.5969	−.4657	.6659	−.4504	.7964	−.4413	.8756	−.4249	.9415		1.0003	
45	.188	0.000	.0498	−.4290	.0941	−.4405	.1941	−.4493	.3928	−.4396	.6904	−.4247	.8874		1.0106	
46	.188	.250	.0490	−.4570	.0937	−.4652	.2045	−.4404	.4328	−.4358	.6391	−.4215	.8118		.9616	
47	.188	.417	.0543	−.4486	.1026	−.4619	.2226	−.4326	.4574	−.4239	.6661	−.4125	.8423		.9878	
48	.188	.583	.0549	−.4446	.1078	−.4577	.2427	−.4388	.4824	−.4352	.6879	−.4231	.8664		1.0211	
49	.188	.750	.0322	−.4504	.1225	−.4639	.2524	−.4504	.5114	−.4459	.7195	−.4311	.8905		1.0356	
50	.125	0.000	.0900	−.4309	.1719	−.4465	.2682	−.4464	.7459	−.4386	.8353	−.4246	.9170		.9935	
51	.125	.250	.0980	−.4504	.1843	−.4555	.2820	−.4386	.7961	−.4362	.8464	−.4226	.9246		.9978	
52	.125	.417	.1058	−.4482	.1969	−.4577	.2979	−.4293	.8095	−.4207	.8567	−.4115	.9353		1.0070	
53	.125	.583	.1078	−.4453	.2059	−.4564	.3054	−.4358	.8092	−.4336	.8579	−.4216	.9392		1.0082	
54	.125	.750	.0993	−.4516	.2109	−.4643	.2961	−.4496	.7990	−.4461	.8526	−.4317	.9319		1.0016	
55	.125	.958	.3160	−.4815	.3974	−.4706	.5604	−.4562	.6821	−.4455	.7628	−.4273	.8342		.9000	
56	.063	0.000	.1284	−.4333	.2301	−.4420	.3742	−.4403	.7073	−.4377	.7647	−.4253	.8321		.8954	
57	.063	.250	.1367	−.4440	.2432	−.4460	.3892	−.4398	.7151	−.4367	.7728	−.4230	.8388		.9007	
58	.063	.417	.1425	−.4448	.2558	−.4534	.4167	−.4299	.7129	−.4206	.7708	−.4118	.8396		.9022	
59	.063	.583	.1436	−.4457	.2652	−.4548	.4765	−.4349	.7143	−.4328	.7739	−.4202	.8436		.9061	
60	.063	.750	.1484	−.4518	.2738	−.4638	.6700	−.4486	.7039	−.4455	.7647	−.4316	.8319		.8950	
61	.063	.875	.2232	−.4556	.3601	−.4702	.5965	−.4560	.6686	−.4473	.7394	−.4301	.8039		.8679	
62	.375	−.674	.8656	−.4415	.9683	−.4469	1.0498	−.4300	1.1439	−.4271	1.2306	−.4145	1.3092		1.3721	
63	.250	−.833	.5369	−.4508	.5998	−.4564	.6545	−.4447	.7607	−.4374	.8794	−.4209	.9900		1.0827	

TABLE X.—Continued
(b) M = 2.16

			α =													
			−3.7		1.3		6.3		11.3		16.3		21.3		26.3	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.2223	.4610	.3552	.3038	.5245	.1733	.7275	.0663	.9911	−.0097	1.2478	−.0510	1.4243	−.0823
2	.868	0.000	.2135	.4593	.3493	.3005	.5184	.1689	.7217	.0606	.9757	−.0156	1.1647	−.0646	1.2986	−.1003
3	.802	0.000	.2104	.4568	.3465	.2971	.5133	.1659	.7169	.0582	.9476	−.0175	1.0702	−.0699	1.1641	−.1109
4	.688	0.000	−.0393	.1112	.0436	.0105	.1513	−.0669	.2783	−.1289	.4015	−.1695	.5171	−.1975	.7051	−.2196
5	.688	.066	−.0693	.0613	.0030	−.0252	.0952	−.0935	.1929	−.1477	.2784	−.1825	.3955	−.2086	.5354	−.2287
6	.732	.143	.2456	.5060	.3943	.3408	.5601	.1945	.7546	.0653	.9265	−.0313	1.0125	−.1041	1.0920	−.1593
7	.790	.156	.2561	.5470	.4234	.3616	.6051	.2025	.8039	.0693	1.0236	−.0276	1.1568	−.1002	1.2607	−.1650
8	.850	.170	.2635	.5873	.4406	.3725	.6732	.2088	.8983	.0763	1.1408	−.0175	1.3104	−.1068	1.4253	−.1962
9	.625	0.000	−.0514	.0958	.0297	−.0026	.1346	−.0789	.2585	−.1393	.3837	−.1777	.5302	−.2041	.7431	−.2254
10	.625	.077	−.0741	.0620	.0022	−.0278	.0977	−.0989	.2157	−.1528	.3398	−.1883	.4618	−.2143	.7373	−.2359
11	.625	.128	−.0674	.0661	.0091	−.0211	.0995	−.0934	.1997	−.1500	.2878	−.1905	.4306	−.2240	.5722	−.2431
12	.625	.179	−.0550	.0773	.0223	−.0095	.1098	−.0836	.2016	−.1435	.2643	−.1887	.3534	−.2232	.5324	−.2454
13	.669	.268	.2523	.5537	.4270	.3574	.6135	.1979	.8002	.0677	.9288	−.0288	1.0131	−.0996	1.0900	−.1600
14	.728	.281	.2545	.5748	.4293	.3601	.6518	.2001	.8612	.0705	1.0497	−.0239	1.1688	−.0980	1.2652	−.1666
15	.787	.295	.2602	.5880	.4360	.3666	.6843	.2057	.9511	.0768	1.1860	−.0177	1.3320	−.1159	1.4320	−.2058
16	.500	0.000	−.0535	.0914	.0290	−.0044	.1288	−.0813	.2572	−.1401	.3838	−.1795	.5421	−.2071	.7587	−.2284
17	.500	.151	−.0721	.0610	.0036	−.0276	.0971	−.0985	.2200	−.1549	.3593	−.1945	.5317	−.2240	.7825	−.2323
18	.500	.251	−.0584	.0758	.0215	−.0118	.1094	−.0882	.2150	−.1510	.3229	−.1943	.4848	−.2271	.8493	−.2395
19	.500	.351	−.0578	.0949	.0350	−.0029	.1278	−.0860	.2160	−.1473	.3012	−.1916	.4280	−.2241	.5659	−.2463
20	.500	.452	−.0502	.1147	.0435	.0049	.1512	−.0780	.2087	−.1376	.2515	−.1839	.3187	−.2169	.5511	−.2412
21	.544	.518	.2496	.5688	.4264	.3576	.6605	.1966	.8411	.0690	.9443	−.0221	1.0222	−.0938	1.0969	−.1578
22	.603	.531	.2515	.5701	.4285	.3597	.6730	.1988	.9200	.0713	1.0782	−.0174	1.1834	−.0968	1.2730	−.1696
23	.662	.545	.2563	.5706	.4331	.3630	.6791	.2027	1.0135	.0768	1.2218	−.0196	1.3457	−.1264	1.4343	−.2158
24	.375	0.000	−.0522	.0925	.0298	−.0043	.1302	−.0805	.2569	−.1393	.3855	−.1790	.5477	−.2073	.7604	−.2266
25	.375	.225	−.0690	.0648	.0082	−.0238	.1017	−.0953	.2246	−.1549	.3770	−.1973	.5560	−.2162	.7835	−.2297
26	.375	.374	−.0609	.0848	.0288	−.0070	.1217	−.0888	.2274	−.1525	.3546	−.1956	.5338	−.2261	.8156	−.2370
27	.375	.524	−.0583	.1029	.0339	−.0044	.1418	−.0873	.2328	−.1486	.3403	−.1913	.4905	−.2228	.8831	−.2437
28	.375	.674	−.0517	.1123	.0406	.0020	.1559	−.0816	.2140	−.1389	.2721	−.1838	.3663	−.2161	.5500	−.2409
29	.419	.768	.2520	.5574	.4237	.3541	.6555	.1964	.8390	.0700	.9311	−.0204	1.0010	−.0941	1.0688	−.1596
30	.478	.781	.2541	.5632	.4274	.3573	.6655	.1985	.9339	.0732	1.0759	−.0156	1.1675	−.0972	1.2469	−.1709
31	.537	.795	.2569	.5723	.4324	.3617	.6750	.2021	1.0408	.0805	1.2296	−.0203	1.3355	−.1291	1.4134	−.2173
32	.381	.843	.2463	.5543	.4196	.3496	.6470	.1934	.7999	.0677	.8735	−.0231	.9326	−.0976	.9905	−.1623
33	.440	.856	.2509	.5650	.4257	.3569	.6625	.1986	.9158	.0729	1.0349	−.0163	1.1193	−.0987	1.1883	−.1712
34	.500	.870	.2573	.5750	.4308	.3630	.6756	.2040	1.0361	.0806	1.2095	−.0199	1.3054	−.1273	1.3743	−.2134
35	.375	.958	−.0385	.0760	.0222	.0019	.1208	−.0615	.2498	−.1185	.3451	−.1640	.4474	−.2064	.5559	−.2390
36	.250	0.000	−.0445		−.0047		.0827		.2157		.3427		.4867		.6544	
37	.250	.250	−.0813	.0470	−.0078	−.0371	.0835	−.1057	.2074	−.1632	.3544	−.1933	.5439	−.2065	.6930	−.2287
38	.250	.417	−.0734	.0677	.0117	−.0216	.1034	−.1009	.2115	−.1620	.3434	−.1949	.5207	−.2092	.7109	−.2256
39	.250	.583	−.0688	.0881	.0201	−.0179	.1238	−.0977	.2252	−.1578	.3515	−.1924	.5150	−.2112	.7362	−.2248
40	.250	.750	−.0657	.0931	.0254	−.0139	.1371	−.0941	.2158	−.1530	.3130	−.1920	.4468	−.2146	.7153	−.2264
41	.250	.833	−.0955	.0255	−.0228	−.0539	.0563	−.1195	.0844	−.1679	.1400	−.2014	.2316	−.2197	.5047	−.2279
42	.250	.875	−.0872	.0219	−.0217	−.0499	.0484	−.1083	.0689	−.1564	.1217	−.1918	.2017	−.2172	.3303	−.2288
43	.250	.917	−.0507	.0626	.0094	−.0098	.0996	−.0741	.1516	−.1304	.2072	−.1736	.2922	−.2072	.4383	−.2276
44	.250	.958	−.0327	.0924	.0423	.0177	.1296	−.0480	.2178	−.0791	.2560	−.1357	.3615	−.1851	.4631	−.2247
45	.188	0.000	−.1926	−.1314	−.1627	−.1770	−.1132	−.1778	−.0488	−.1807	.0248	−.1889	.1146	−.2061	.2015	−.2245
46	.188	.250	−.1626	−.1499	−.1692	−.1508	−.1284	−.1706	−.0526	−.1841	.0294	−.1895	.1138	−.2061	.1873	−.2296
47	.188	.417	−.1473	−.1428	−.1695	−.1413	−.1241	−.1567	−.0583	−.1774	.0204	−.1887	.1210	−.2065	.1910	−.2237
48	.188	.583	−.1424	−.1334	−.1678	−.1383	−.1151	−.1511	−.0526	−.1707	.0222	−.1851	.1169	−.2058	.1935	−.2227
49	.188	.750	−.1419	−.1333	−.1678	−.1405	−.1113	−.1513	−.0628	−.1732	−.0027	−.1884	.0808	−.2065	.1641	−.2236
50	.125	0.000	−.1756	−.1433	−.1746	−.1845	−.1243	−.1752	−.0590	−.1803	.0155	−.1896	.1046	−.2060	.1892	−.2241
51	.125	.250	−.1590	−.1513	−.1426	−.1444	−.1294	−.1684	−.0547	−.1835	.0256	−.1893	.1101	−.2067	.1932	−.2299
52	.125	.417	−.1454	−.1484	−.1378	−.1333	−.1292	−.1554	−.0627	−.1771	.0204	−.1887	.1189	−.2069	.1949	−.2237
53	.125	.583	−.1403	−.1387	−.1451	−.1308	−.1201	−.1497	−.0571	−.1711	.0191	−.1856	.1148	−.2066	.1940	−.2231
54	.125	.750	−.1412	−.1415	−.1441	−.1317	−.1204	−.1512	−.0745	−.1739	−.0145	−.1890	.0667	−.2072	.1495	−.2237
55	.125	.958	.0075	.0714	.0399	.0324	.0900	−.0197	.1210	−.1010	.1877	−.1628	.2728	−.2077	.3944	−.2350
56	.063	0.000	−.1717	−.1466	−.1752	−.1763	−.1272	−.1706	−.0632	−.1798	.0118	−.1898	.0984	−.2068	.1928	−.2237
57	.063	.250	−.1588	−.1390	−.1390	−.1438	−.1276	−.1680	−.0554	−.1837	.0232	−.1896	.1099	−.2071	.1949	−.2264
58	.063	.417	−.1450	−.1443	−.1317	−.1321	−.1323	−.1559	−.0657	−.1779	.0215	−.1892	.1171	−.2077	.1953	−.2239
59	.063	.583	−.1400	−.1403	−.1322	−.1300	−.1230	−.1496	−.0601	−.1714	.0153	−.1858	.1121	−.2073	.1923	−.2232
60	.063	.750	−.1416	−.1456	−.1344	−.1309	−.1309	−.1519	−.0890	−.1750	−.0295	−.1897	.0509	−.2080	.1345	−.2239
61	.063	.875	−.1464	−.1347	−.1353	−.1329	−.1301	−.1578	−.0773	−.1769	−.0023	−.1916	.1034	−.2110	.2234	−.2253
62	.375	−.674	−.0376	.1127	.0506	.0035	.1623	−.0785	.2203	−.1339	.2759	−.1748	.3703	−.2049	.5585	−.2273
63	.250	−.833	−.0826	.0286	−.0133	−.0507	.0643	−.1155	.0920	−.1622	.1472	−.1919	.2329	−.2077	.4858	−.2169

TABLE X.–Continued
(b) Concluded

			α = 31.3		36.3		41.3		46.3		51.3		56.3		61.3	
Tube	x'/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	1.5583	−.1348	1.6551	−.2202	1.6989	−.2405	1.7095	−.2452	1.7067	−.2442	1.6835	−.2430	1.6461	−.2403
2	.868	0.000	1.4271	−.1373	1.5532	−.1895	1.6325	−.2470	1.6821	−.2557	1.7164	−.2551	1.7263	−.2535	1.7145	−.2504
3	.802	0.000	1.2873	−.1433	1.4339	−.1823	1.5413	−.2355	1.6187	−.2548	1.6793	−.2556	1.7165	−.2549	1.7279	−.2519
4	.688	0.000	1.0167	−.2378	1.2231	−.2559	1.3613	−.2638	1.4696	−.2590	1.5635	−.2576	1.6388	−.2569	1.6878	−.2537
5	.688	.066	.8940	−.2587	1.1698	−.2629	1.3454	−.2557	1.4623	−.2588	1.5605	−.2584	1.6385	−.2577	1.6891	−.2539
6	.732	.143	1.2226	−.2148	1.3763	−.2511	1.4867	−.2540	1.5708	−.2581	1.6366	−.2585	1.6838	−.2579	1.7108	−.2536
7	.790	.156	1.3839	−.2333	1.5057	−.2561	1.5866	−.2549	1.6426	−.2585	1.6798	−.2581	1.6995	−.2572	1.7077	−.2526
8	.850	.170	1.5278	−.2530	1.6095	−.2583	1.6525	−.2554	1.6740	−.2582	1.6804	−.2580	1.6659	−.2569	1.6494	−.2519
9	.625	0.000	1.0248	−.2423	1.2009	−.2597	1.3235	−.2580	1.4250	−.2588	1.5191	−.2583	1.5997	−.2580	1.6563	−.2548
10	.625	.077	1.0474	−.2506	1.1954	−.2583	1.3155	−.2546	1.4174	−.2570	1.5064	−.2584	1.5830	−.2579	1.6399	−.2537
11	.625	.128	1.0303	−.2406	1.1916	−.2556	1.3186	−.2548	1.4218	−.2572	1.5112	−.2591	1.5881	−.2586	1.6433	−.2539
12	.625	.179	.9030	−.2399	1.1649	−.2533	1.3159	−.2542	1.4233	−.2571	1.5140	−.2589	1.5912	−.2586	1.6464	−.2540
13	.669	.268	1.2257	−.2206	1.3683	−.2537	1.4698	−.2551	1.5485	−.2590	1.6114	−.2597	1.6638	−.2596	1.6877	−.2552
14	.728	.281	1.3850	−.2385	1.4976	−.2554	1.5714	−.2550	1.6225	−.2591	1.6584	−.2594	1.6854	−.2593	1.6865	−.2546
15	.787	.295	1.5258	−.2594	1.6000	−.2573	1.6369	−.2554	1.6547	−.2588	1.6574	−.2592	1.6529	−.2585	1.6304	−.2534
16	.500	0.000	.9951	−.2414	1.1298	−.2527	1.2326	−.2535	1.3235	−.2573	1.4108	−.2592	1.4944	−.2593	1.5636	−.2555
17	.500	.151	1.0040	−.2364	1.1351	−.2546	1.2386	−.2548	1.3283	−.2575	1.4156	−.2600	1.4990	−.2601	1.5660	−.2558
18	.500	.251	1.0220	−.2361	1.1468	−.2529	1.2518	−.2544	1.3405	−.2575	1.4267	−.2600	1.5089	−.2604	1.5723	−.2561
19	.500	.351	1.0429	−.2370	1.1586	−.2523	1.2654	−.2540	1.3558	−.2571	1.4401	−.2595	1.5207	−.2596	1.5818	−.2553
20	.500	.452	.9175	−.2403	1.1253	−.2529	1.2588	−.2530	1.3619	−.2560	1.4512	−.2574	1.5311	−.2569	1.5930	−.2527
21	.544	.518	1.2305	−.2210	1.3496	−.2531	1.4357	−.2534	1.5090	−.2566	1.5702	−.2565	1.6172	−.2563	1.6513	−.2536
22	.603	.531	1.3855	−.2381	1.4797	−.2527	1.5428	−.2525	1.5927	−.2550	1.6280	−.2549	1.6481	−.2548	1.6580	−.2520
23	.662	.545	1.5180	−.2632	1.5795	−.2560	1.6103	−.2532	1.6288	−.2553	1.6349	−.2549	1.6244	−.2539	1.6080	−.2507
24	.375	0.000	.9490	−.2361	1.0468	−.2472	1.1279	−.2536	1.2032	−.2574	1.2853	−.2597	1.3762	−.2603	1.4554	−.2557
25	.375	.225	.9588	−.2355	1.0568	−.2533	1.1379	−.2550	1.2125	−.2579	1.2945	−.2608	1.3847	−.2612	1.4624	−.2567
26	.375	.374	.9708	−.2353	1.0711	−.2522	1.1536	−.2536	1.2279	−.2570	1.3087	−.2593	1.3991	−.2594	1.4748	−.2543
27	.375	.524	.9974	−.2361	1.0888	−.2516	1.1745	−.2526	1.2513	−.2545	1.3326	−.2563	1.4183	−.2561	1.4942	−.2524
28	.375	.674	.8886	−.2379	1.0727	−.2509	1.1715	−.2521	1.2584	−.2537	1.3465	−.2560	1.4336	−.2571	1.5083	−.2549
29	.419	.768	1.1728	−.2206	1.2643	−.2544	1.3371	−.2543	1.4049	−.2569	1.4722	−.2575	1.5345	−.2587	1.5750	−.2563
30	.478	.781	1.3383	−.2382	1.4115	−.2548	1.4645	−.2543	1.5114	−.2565	1.5541	−.2572	1.5893	−.2582	1.6025	−.2556
31	.537	.795	1.4808	−.2628	1.5250	−.2570	1.5502	−.2542	1.5681	−.2564	1.5821	−.2565	1.5886	−.2575	1.5715	−.2544
32	.381	.843	1.0723	−.2210	1.1441	−.2547	1.2092	−.2549	1.2757	−.2574	1.3542	−.2577	1.4246	−.2588	1.4750	−.2561
33	.440	.856	1.2646	−.2361	1.3286	−.2553	1.3773	−.2548	1.4240	−.2573	1.4754	−.2576	1.5170	−.2582	1.5360	−.2553
34	.500	.870	1.4340	−.2621	1.4735	−.2575	1.4968	−.2548	1.5151	−.2569	1.5358	−.2570	1.5449	−.2578	1.5304	−.2542
35	.375	.958	.6940	−.2577	.9188	−.2552	1.0104	−.2531	1.0495	−.2543	1.1264	−.2553	1.1908	−.2554	1.2396	−.2512
36	.250	0.000	.7594		.8163		.8622		.9055		.9675		1.0669		1.1771	
37	.250	.250	.7799	−.2350	.8321	−.2526	.8740	−.2546	.9153	−.2576	.9753	−.2605	1.0825	−.2612	1.1921	−.2569
38	.250	.417	.7874	−.2349	.8383	−.2519	.8818	−.2526	.9230	−.2560	.9849	−.2570	1.0975	−.2558	1.2105	−.2457
39	.250	.583	.8067	−.2348	.8553	−.2515	.9008	−.2526	.9452	−.2545	1.0126	−.2571	1.1262	−.2581	1.2385	−.2553
40	.250	.750	.7784	−.2363	.8293	−.2532	.8850	−.2542	.9353	−.2569	1.0176	−.2587	1.1367	−.2593	1.2452	−.2566
41	.250	.833	.6238	−.2384	.7063	−.2530	.7960	−.2545	.8561	−.2557	.9715	−.2568	1.1043	−.2574	1.2117	−.2548
42	.250	.875	.6025	−.2433	.8180	−.2559	.8456	−.2554	.8924	−.2567	1.0470	−.2580	1.1606	−.2585	1.2464	−.2551
43	.250	.917	.7793	−.2446	.8065	−.2549	.8413	−.2549	.9058	−.2562	1.0572	−.2571	1.1517	−.2577	1.2264	−.2546
44	.250	.958	.6866	−.2494	.7387	−.2556	.7956	−.2552	.8736	−.2558	1.0018	−.2571	1.0839	−.2575	1.1471	−.2540
45	.188	0.000	.2380	−.2336	.2739	−.2456	.3202	−.2582	.4315	−.2579	.6253	−.2596	.9001	−.2604	1.1066	−.2551
46	.188	.250	.2339	−.2350	.2709	−.2522	.3182	−.2555	.4416	−.2579	.6723	−.2604	.8855	−.2610	1.0568	−.2549
47	.188	.417	.2357	−.2342	.2768	−.2505	.3282	−.2519	.4591	−.2563	.7017	−.2550	.9157	−.2526	1.0938	−.2436
48	.188	.583	.2340	−.2344	.2799	−.2504	.3370	−.2517	.4790	−.2533	.7252	−.2550	.9438	−.2569	1.1305	−.2541
49	.188	.750	.2029	−.2358	.2586	−.2526	.3370	−.2541	.4891	−.2568	.7601	−.2583	.9662	−.2591	1.1536	−.2567
50	.125	0.000	.2552	−.2351	.3135	−.2497	.3979	−.2543	.4982	−.2567	.9393	−.2589	1.0350	−.2598	1.1154	−.2548
51	.125	.250	.2555	−.2346	.3159	−.2516	.4053	−.2552	.5131	−.2578	.9872	−.2603	1.0454	−.2606	1.1243	−.2526
52	.125	.417	.2571	−.2342	.3249	−.2504	.4199	−.2520	.5293	−.2571	.9982	−.2546	1.0569	−.2521	1.1355	−.2421
53	.125	.583	.2559	−.2345	.3302	−.2504	.4334	−.2509	.5334	−.2528	.9983	−.2543	1.0606	−.2563	1.1400	−.2528
54	.125	.750	.2145	−.2361	.3189	−.2526	.4445	−.2536	.5346	−.2566	.9954	−.2583	1.0593	−.2590	1.1371	−.2563
55	.125	.958	.4492	−.2486	.5117	−.2565	.6067	−.2558	.7653	−.2566	.8906	−.2572	.9759	−.2576	1.0459	−.2539
56	.063	0.000	.2699	−.2302	.3446	−.2423	.4497	−.2481	.6157	−.2552	.8920	−.2584	.9613	−.2593	1.0290	−.2549
57	.063	.250	.2705	−.2335	.3485	−.2507	.4586	−.2546	.6286	−.2575	.9010	−.2599	.9687	−.2601	1.0356	−.2513
58	.063	.417	.2711	−.2345	.3566	−.2504	.4732	−.2527	.6505	−.2577	.9003	−.2551	.9708	−.2530	1.0388	−.2431
59	.063	.583	.2693	−.2345	.3621	−.2504	.4874	−.2506	.7380	−.2528	.9051	−.2544	.9763	−.2561	1.0465	−.2523
60	.063	.750	.2284	−.2359	.3619	−.2523	.5026	−.2533	.8663	−.2565	.9015	−.2583	.9710	−.2590	1.0411	−.2559
61	.063	.875	.3251	−.2395	.4339	−.2556	.5823	−.2555	.7883	−.2565	.8730	−.2575	.9522	−.2582	1.0174	−.2543
62	.375	−.674	.8917	−.2249	1.0712	−.2355	1.1675	−.2386	1.2520	−.2398	1.3422	−.2413	1.4289	−.2422	1.5034	−.2404
63	.250	−.833	.6149	−.2266	.6998	−.2386	.7910	−.2418	.8527	−.2431	.9703	−.2436	1.1002	−.2442	1.2076	−.2419

TABLE X.–Continued
(c) M = 2.86

			α =													
			−5.7		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.1613	.3920	.2573	.2586	.3870	.1479	.5406	.0632	.7272	.0026	.9410	−.0414	1.2128	−.0697
2	.868	0.000	.1559	.3882	.2517	.2548	.3819	.1445	.5366	.0595	.7223	−.0020	.9386	−.0472	1.1903	−.0762
3	.802	0.000	.1544	.3853	.2508	.2522	.3813	.1427	.5353	.0579	.7204	−.0031	.9361	−.0485	1.1512	−.0776
4	.688	0.000	−.0306	.0943	.0189	.0197	.0934	−.0367	.1873	−.0772	.3079	−.1034	.4556	−.1206	.5737	−.1252
5	.688	.066	−.0418	.0732	.0044	.0048	.0727	−.0472	.1579	−.0845	.2638	−.1087	.3826	−.1247	.4604	−.1279
6	.732	.143	.1768	.4389	.2895	.2897	.4393	.1640	.5996	.0668	.7736	−.0033	.9691	−.0546	1.1065	−.0839
7	.790	.156	.1794	.4508	.2942	.2940	.4485	.1664	.6315	.0687	.8226	−.0013	1.0245	−.0510	1.2185	−.0753
8	.850	.170	.1856	.4593	.3002	.3006	.4546	.1716	.6446	.0734	.8950	.0031	1.1162	−.0401	1.3388	−.0628
9	.625	0.000	−.0408	.0828	.0081	.0094	.0819	−.0461	.1749	−.0857	.2944	−.1113	.4416	−.1245	.5676	−.1206
10	.625	.077	−.0486	.0675	−.0020	−.0019	.0667	−.0536	.1530	−.0904	.2643	−.1133	.4020	−.1248	.5344	−.1212
11	.625	.128	−.0413	.0801	.0088	.0089	.0800	−.0467	.1662	−.0867	.2705	−.1116	.3869	−.1266	.4845	−.1220
12	.625	.179	−.0349	.0969	.0189	.0190	.0972	−.0406	.1846	−.0819	.2833	−.1069	.3855	−.1238	.4535	−.1258
13	.669	.268	.1768	.4489	.2918	.2917	.4483	.1636	.6313	.0669	.8297	−.0026	1.0044	−.0523	1.1027	−.0763
14	.728	.281	.1787	.4512	.2931	.2933	.4494	.1651	.6346	.0684	.8713	−.0014	1.0790	−.0478	1.2366	−.0688
15	.787	.295	.1831	.4578	.2981	.2988	.4548	.1695	.6416	.0724	.9116	.0032	1.1742	−.0340	1.3740	−.0635
16	.500	0.000	−.0424	.0796	.0064	.0068	.0797	−.0479	.1714	−.0869	.2903	−.1115	.4367	−.1153	.5751	−.1178
17	.500	.151	−.0463	.0730	.0029	.0027	.0737	−.0518	.1587	−.0907	.2667	−.1150	.4059	−.1159	.5627	−.1175
18	.500	.251	−.0410	.0922	.0115	.0116	.0930	−.0484	.1843	−.0891	.2854	−.1142	.4050	−.1201	.5377	−.1191
19	.500	.351	−.0410	.0966	.0129	.0139	.0958	−.0466	.1991	−.0876	.3060	−.1123	.4038	−.1262	.5125	−.1229
20	.500	.452	−.0314	.1063	.0219	.0233	.1049	−.0370	.2100	−.0789	.3279	−.1048	.3791	−.1218	.4326	−.1308
21	.544	.518	.1785	.4473	.2895	.2910	.4476	.1638	.6340	.0666	.8805	−.0029	1.0246	−.0486	1.1046	−.0700
22	.603	.531	.1798	.4496	.2907	.2931	.4494	.1648	.6376	.0680	.8991	−.0015	1.1241	−.0417	1.2506	−.0644
23	.662	.545	.1835	.4553	.2939	.2976	.4513	.1686	.6416	.0719	.9123	.0029	1.2279	−.0253	1.3927	−.0660
24	.375	0.000	−.0428	.0795	.0065	.0066	.0806	−.0481	.1724	−.0873	.2916	−.1119	.4337	−.1135	.5744	−.1173
25	.375	.225	−.0461	.0788	.0064	.0063	.0808	−.0513	.1661	−.0919	.2740	−.1168	.4120	−.1150	.5779	−.1175
26	.375	.374	−.0450	.0927	.0091	.0100	.0919	−.0503	.1946	−.0917	.3000	−.1170	.4208	−.1165	.5723	−.1186
27	.375	.524	−.0421	.0949	.0112	.0118	.0945	−.0483	.1996	−.0897	.3212	−.1153	.4244	−.1224	.5627	−.1209
28	.375	.674	−.0339	.1013	.0183	.0189	.1009	−.0407	.2061	−.0812	.3356	−.1061	.3919	−.1213	.4706	−.1297
29	.419	.768	.1777	.4442	.2882	.2894	.4449	.1625	.6325	.0664	.8841	−.0032	1.0206	−.0458	1.0909	−.0678
30	.478	.781	.1802	.4466	.2907	.2918	.4475	.1641	.6364	.0681	.9010	−.0013	1.1333	−.0380	1.2431	−.0626
31	.537	.795	.1837	.4508	.2938	.2957	.4507	.1676	.6412	.0716	.9131	.0024	1.2487	−.0221	1.3953	−.0673
32	.381	.843	.1760	.4408	.2854	.2876	.4419	.1608	.6269	.0648	.8755	−.0044	.9788	−.0461	1.0355	−.0689
33	.440	.856	.1797	.4467	.2894	.2924	.4469	.1649	.6344	.0682	.8990	−.0015	1.1101	−.0375	1.2066	−.0630
34	.500	.870	.1849	.4525	.2955	.2976	.4534	.1693	.6420	.0723	.9154	.0027	1.2421	−.0212	1.3760	−.0669
35	.375	.958	−.0303	.0724	.0065	.0051	.0738	−.0390	.1633	−.0752	.2900	−.1001	.4283	−.1125	.5363	−.1234
36	.250	0.000														
37	.250	.250	−.0544	.0656	−.0041	−.0047	.0673	−.0594	.1504	−.0978	.2552	−.1094	.3891	−.1136	.5420	−.1176
38	.250	.417	−.0530	.0789	−.0015	−.0010	.0786	−.0588	.1776	−.0968	.2803	−.1066	.3999	−.1128	.5484	−.1178
39	.250	.583	−.0494	.0816	.0019	.0011	.0823	−.0561	.1844	−.0945	.3039	−.1041	.4183	−.1112	.5664	−.1169
40	.250	.750	−.0470	.0858	.0055	.0054	.0859	−.0534	.1890	−.0928	.3172	−.1095	.4095	−.1152	.5336	−.1183
41	.250	.833	−.0562	.0577	−.0123	−.0108	.0566	−.0617	.1400	−.0966	.2291	−.1135	.2643	−.1190	.3445	−.1214
42	.250	.875	−.0532	.0563	−.0089	−.0098	.0576	−.0603	.1358	−.0954	.2139	−.1147	.2371	−.1205	.3111	−.1220
43	.250	.917	−.0389	.0658	−.0002	−.0019	.0679	−.0461	.1558	−.0821	.2641	−.1049	.3088	−.1167	.3870	−.1215
44	.250	.958	−.0254	.0672	.0150	.0126	.0704	−.0330	.1555	−.0731	.2802	−.0983	.3730	−.1122	.4524	−.1212
45	.188	0.000	−.1000	−.0782	−.1044	−.1047	−.0797	−.1052	−.0386	−.1042	.0184	−.1057	.0931	−.1115	.1804	−.1165
46	.188	.250	−.0940	−.0818	−.1020	−.1015	−.0826	−.0968	−.0425	−.1049	.0186	−.1073	.1033	−.1125	.1901	−.1169
47	.188	.417	−.0829	−.0746	−.0915	−.0930	−.0758	−.0856	−.0296	−.0965	.0288	−.1038	.1049	−.1114	.1927	−.1169
48	.188	.583	−.0788	−.0749	−.0893	−.0900	−.0755	−.0820	−.0269	−.0929	.0387	−.1006	.1144	−.1094	.1995	−.1157
49	.188	.750	−.0794	−.0753	−.0931	−.0943	−.0765	−.0819	−.0274	−.0935	.0424	−.1032	.1052	−.1117	.1807	−.1169
50	.125	0.000	−.0969	−.0863	−.1097	−.1113	−.0873	−.1008	−.0461	−.1018	.0117	−.1046	.0861	−.1109	.1739	−.1158
51	.125	.250	−.0891	−.0882	−.0850	−.0852	−.0866	−.0938	−.0475	−.1031	.0158	−.1069	.0985	−.1117	.1847	−.1161
52	.125	.417	−.0809	−.0811	−.0786	−.0792	−.0809	−.0842	−.0360	−.0957	.0219	−.1040	.0984	−.1114	.1888	−.1169
53	.125	.583	−.0753	−.0792	−.0754	−.0764	−.0784	−.0792	−.0306	−.0908	.0338	−.0991	.1098	−.1074	.1950	−.1133
54	.125	.750	−.0780	−.0817	−.0784	−.0789	−.0819	−.0809	−.0342	−.0934	.0327	−.1036	.0925	−.1120	.1659	−.1173
55	.125	.958	−.0238	.0572	.0131	.0098	.0600	−.0343	.1337	−.0593	.2191	−.0932	.2732	−.1147	.3590	−.1211
56	.063	0.000	−.0947	−.0888	−.1057	−.1080	−.0895	−.0979	−.0492	−.0999	.0080	−.1046	.0811	−.1115	.1680	−.1166
57	.063	.250	−.0913	−.0891	−.0840	−.0840	−.0881	−.0947	−.0493	−.1042	.0150	−.1080	.0950	−.1124	.1808	−.1170
58	.063	.417	−.0807	−.0825	−.0770	−.0775	−.0817	−.0838	−.0394	−.0954	.0182	−.1041	.0943	−.1108	.1853	−.1162
59	.063	.583	−.0775	−.0817	−.0761	−.0766	−.0814	−.0804	−.0340	−.0923	.0294	−.1013	.1042	−.1097	.1888	−.1159
60	.063	.750	−.0769	−.0833	−.0756	−.0762	−.0827	−.0803	−.0391	−.0917	.0227	−.1024	.0774	−.1101	.1485	−.1151
61	.063	.875														
62	.375	−.674	−.0304	.0943	.0174	.0172	.0987	−.0376	.2031	−.0756	.3313	−.0988	.3880	−.1140	.4716	−.1214
63	.250	−.833	−.0524	.0524	−.0120	−.0137	.0563	−.0616	.1395	−.0940	.2292	−.1094	.2685	−.1155	.3500	−.1176

TABLE X.—Continued
(c) Concluded

			α = 30.0		35.0		40.0		45.0		50.0		55.0		59.9	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	1.4283	−.0715	1.5715	−.0860	1.6807	−.1122	1.7469		1.7575	−.1300	1.7471		1.7126	−.1343
2	.868	0.000	1.3421	−.0843	1.4577	−.0920	1.5794	−.1043	1.6816		1.7324	−.1330	1.7584		1.7597	−.1391
3	.802	0.000	1.2427	−.0896	1.3288	−.1000	1.4653	−.1042	1.5944		1.6742	−.1332	1.7282		1.7566	−.1396
4	.688	0.000	.7277	−.1305	.9604	−.1419	1.2441	−.1441	1.4198		1.5343	−.1405	1.6242		1.6953	−.1409
5	.688	.066	.6137	−.1271	.8371	−.1350	1.1855	−.1380	1.4032		1.5279	−.1399	1.6227		1.6967	−.1406
6	.732	.143	1.1825	−.1030	1.2626	−.1276	1.4151	−.1308	1.5484		1.6303	−.1387	1.6948		1.7329	−.1403
7	.790	.156	1.3322	−.0987	1.4264	−.1313	1.5456	−.1319	1.6423		1.6938	−.1390	1.7307		1.7423	−.1404
8	.850	.170	1.4751	−.1045	1.5666	−.1432	1.6507	−.1331	1.7039		1.7187	−.1394	1.7225		1.7027	−.1405
9	.625	0.000	.7482	−.1244	.9857	−.1336	1.2368	−.1396	1.3894		1.4961	−.1404	1.5830		1.6596	−.1412
10	.625	.077	.6571	−.1235	1.0281	−.1318	1.2478	−.1355	1.3890		1.4957	−.1395	1.5853		1.6593	−.1404
11	.625	.128	.6536	−.1239	.9001	−.1317	1.2329	−.1350	1.3929		1.5001	−.1393	1.5905		1.6629	−.1404
12	.625	.179	.6027	−.1260	.8510	−.1323	1.2007	−.1351	1.3905		1.5040	−.1391	1.5956		1.6689	−.1402
13	.669	.268	1.1814	−.0987	1.2640	−.1284	1.4152	−.1313	1.5373		1.6175	−.1392	1.6766		1.7209	−.1405
14	.728	.281	1.3410	−.0976	1.4286	−.1332	1.5444	−.1322	1.6307		1.6821	−.1395	1.7162		1.7326	−.1407
15	.787	.295	1.4917	−.1098	1.5698	−.1454	1.6455	−.1344	1.6907		1.7059	−.1394	1.7067		1.6962	−.1404
16	.500	0.000	.7584	−.1226	.9926	−.1316	1.1976	−.1355	1.3168		1.4092	−.1396	1.4935		1.5755	−.1408
17	.500	.151	.7663	−.1220	1.0064	−.1307	1.2036	−.1341	1.3240		1.4150	−.1389	1.5013		1.5828	−.1398
18	.500	.251	.7251	−.1225	1.0453	−.1304	1.2162	−.1343	1.3377		1.4300	−.1394	1.5156		1.5951	−.1403
19	.500	.351	.6708	−.1234	.9487	−.1297	1.2284	−.1344	1.3541		1.4486	−.1387	1.5326		1.6117	−.1397
20	.500	.452	.6019	−.1325	.9061	−.1316	1.1958	−.1362	1.3522		1.4569	−.1388	1.5475		1.6251	−.1399
21	.544	.518	1.1836	−.0959	1.2760	−.1287	1.4155	−.1310	1.5172		1.5873	−.1381	1.6464		1.6898	−.1402
22	.603	.531	1.3482	−.0976	1.4367	−.1354	1.5425	−.1317	1.6164		1.6608	−.1380	1.6939		1.7114	−.1400
23	.662	.545	1.4959	−.1150	1.5694	−.1472	1.6385	−.1342	1.6748		1.6876	−.1380	1.6915		1.6809	−.1399
24	.375	0.000	.7604	−.1223	.9922	−.1303	1.1398	−.1343	1.2246		1.2973	−.1395	1.3732		1.4645	−.1403
25	.375	.225	.7849	−.1224	1.0044	−.1304	1.1499	−.1354	1.2357		1.3095	−.1399	1.3862		1.4783	−.1405
26	.375	.374	.7906	−.1226	1.0210	−.1297	1.1620	−.1349	1.2523		1.3299	−.1394	1.4055		1.4977	−.1402
27	.375	.524	.7488	−.1238	1.0626	−.1303	1.1795	−.1349	1.2755		1.3537	−.1388	1.4328		1.5193	−.1407
28	.375	.674	.6279	−.1298	.9302	−.1319	1.1620	−.1347	1.2789		1.3661	−.1378	1.4489		1.5344	−.1400
29	.419	.768	1.1636	−.0957	1.2481	−.1288	1.3568	−.1323	1.4390		1.5063	−.1388	1.5627		1.6139	−.1411
30	.478	.781	1.3332	−.0974	1.4124	−.1357	1.4987	−.1324	1.5595		1.6032	−.1382	1.6346		1.6569	−.1405
31	.537	.795	1.4871	−.1159	1.5521	−.1476	1.6072	−.1348	1.6386		1.6520	−.1388	1.6527		1.6442	−.1406
32	.381	.843	1.0972	−.0969	1.1638	−.1295	1.2459	−.1329	1.3205		1.3863	−.1387	1.4518		1.5159	−.1407
33	.440	.856	1.2872	−.0979	1.3546	−.1354	1.4249	−.1333	1.4809		1.5256	−.1389	1.5630		1.5927	−.1410
34	.500	.870	1.4618	−.1151	1.5189	−.1466	1.5632	−.1356	1.5921		1.6049	−.1390	1.6108		1.6075	−.1407
35	.375	.958	.6499	−.1320	.7770	−.1364	.9725	−.1345	1.0980		1.1593	−.1362	1.2328		1.3008	−.1374
36	.250	0.000														
37	.250	.250	.7441	−.1231	.8702	−.1308	.9398	−.1362	.9815		1.0211	−.1402	1.0758		1.1934	−.1408
38	.250	.417	.7679	−.1225	.8815	−.1294	.9448	−.1349	.9885		1.0305	−.1387	1.0888		1.2114	−.1392
39	.250	.583	.7978	−.1225	.9006	−.1294	.9589	−.1344	1.0083		1.0518	−.1381	1.1177		1.2397	−.1406
40	.250	.750	.7353	−.1229	.8790	−.1304	.9363	−.1348	.9954		1.0476	−.1391	1.1245		1.2509	−.1409
41	.250	.833	.4915	−.1253	.7158	−.1337	.8106	−.1351	.9036		.9693	−.1393	1.0760		1.2194	−.1409
42	.250	.875	.4140	−.1261	.6203	−.1348	.9099	−.1367	.9604		1.0084	−.1393	1.1516		1.2717	−.1408
43	.250	.917	.5130	−.1272	.7773	−.1380	.9249	−.1364	.9627		1.0262	−.1398	1.1650		1.2657	−.1412
44	.250	.958	.5446	−.1269	.7350	−.1365	.8467	−.1358	.9129		.9901	−.1389	1.1102		1.1967	−.1402
45	.188	0.000	.2846	−.1232	.3619	−.1337	.4046	−.1376	.4481		.5707	−.1408	.7688		1.0053	−.1410
46	.188	.250	.2782	−.1228	.3537	−.1313	.3993	−.1362	.4474		.5743	−.1408	.7889		1.0266	−.1410
47	.188	.417	.2848	−.1227	.3534	−.1301	.4020	−.1336	.4565		.5928	−.1377	.8218		1.0556	−.1385
48	.188	.583	.2908	−.1224	.3515	−.1298	.4030	−.1336	.4662		.6075	−.1377	.8509		1.0858	−.1402
49	.188	.750	.2751	−.1229	.3192	−.1314	.3794	−.1346	.4606		.6225	−.1397	.8831		1.1088	−.1414
50	.125	0.000	.2771	−.1230	.3748	−.1313	.4427	−.1359	.5229		.6303	−.1395	1.0677		1.1500	−.1401
51	.125	.250	.2786	−.1215	.3726	−.1305	.4425	−.1350	.5285		.6457	−.1393	1.0793		1.1556	−.1394
52	.125	.417	.2836	−.1227	.3711	−.1304	.4468	−.1337	.5441		.6613	−.1369	1.0942		1.1681	−.1381
53	.125	.583	.2891	−.1196	.3686	−.1267	.4521	−.1301	.5587		.6881	−.1331	1.0996		1.1748	−.1357
54	.125	.750	.2523	−.1231	.3229	−.1316	.4264	−.1345	.5630		.6552	−.1394	1.1033		1.1754	−.1412
55	.125	.958	.4633	−.1259	.5481	−.1358	.6213	−.1366	.7210		.8600	−.1395	1.0015		1.0919	−.1409
56	.063	0.000	.2690	−.1234	.3815	−.1283	.4586	−.1309	.5616		.7076	−.1390	.9816		1.0571	−.1409
57	.063	.250	.2773	−.1214	.3834	−.1316	.4661	−.1360	.5734		.7333	−.1407	.9978		1.0742	−.1407
58	.063	.417	.2818	−.1221	.3814	−.1294	.4718	−.1336	.5905		.7682	−.1367	.9992		1.0788	−.1372
59	.063	.583	.2843	−.1225	.3773	−.1302	.4763	−.1341	.6041		.8104	−.1376	1.0085		1.0881	−.1398
60	.063	.750	.2334	−.1207	.3271	−.1298	.4636	−.1313	.6148		.9479	−.1364	1.0086		1.0861	−.1379
61	.063	.875														
62	.375	−.674	.6258	−.1238	.9421	−.1270	1.1645	−.1269	1.2757		1.3574	−.1313	1.4382		1.5263	−.1332
63	.250	−.833	.4864	−.1221	.6987	−.1307	.7883	−.1296	.8729		.9441	−.1352	1.0543		1.2009	−.1366

TABLE X.–Continued
(d) M = 3.50

Tube	x/l	y/b/2	α = −5.0		0.0		5.0		10.0		15.0		20.0		25.0	
			Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.1318	.3417	.2265	.2243	.3463	.1297	.4962	.0586	.6667	.0078	.8643	−.0262	1.0903	−.0447
2	.868	0.000	.1243	.3373	.2189	.2201	.3381	.1251	.4888	.0530	.6593	.0002	.8584	−.0349	1.0843	−.0544
3	.802	0.000	.1227	.3344	.2176	.2179	.3371	.1229	.4867	.0512	.6576	−.0012	.8562	−.0363	1.0795	−.0561
4	.688	0.000	−.0200	.0772	.0191	.0195	.0787	−.0222	.1621	−.0497	.2687	−.0682	.4061	−.0797	.5628	−.0779
5	.688	.066	−.0251	.0660	.0115	.0124	.0675	−.0271	.1446	−.0530	.2423	−.0711	.3629	−.0821	.4881	−.0806
6	.732	.143	.1381	.3767	.2459	.2445	.3803	.1377	.5483	.0577	.7208	−.0008	.9015	−.0392	1.0962	−.0583
7	.790	.156	.1404	.3809	.2485	.2473	.3843	.1399	.5575	.0596	.7579	.0009	.9505	−.0371	1.1588	−.0536
8	.850	.170	.1460	.3880	.2542	.2532	.3903	.1449	.5656	.0642	.7746	.0052	1.0286	−.0315	1.2508	−.0413
9	.625	0.000	−.0313	.0650	.0071	.0081	.0658	−.0330	.1482	−.0595	.2542	−.0767	.3905	−.0794	.5476	−.0784
10	.625	.077	−.0333	.0576	.0006	.0042	.0580	−.0344	.1367	−.0595	.2358	−.0756	.3627	−.0788	.5094	−.0779
11	.625	.128	−.0288	.0708	.0100	.0127	.0716	−.0294	.1528	−.0564	.2500	−.0739	.3689	−.0807	.4924	−.0789
12	.625	.179	−.0237	.0811	.0168	.0196	.0813	−.0238	.1708	−.0516	.2700	−.0701	.3816	−.0808	.4854	−.0804
13	.669	.268	.1373	.3779	.2454	.2452	.3816	.1374	.5520	.0577	.7548	−.0013	.9519	−.0392	1.1141	−.0542
14	.728	.281	.1391	.3797	.2468	.2465	.3822	.1386	.5551	.0592	.7608	.0003	.9993	−.0377	1.2049	−.0486
15	.787	.295	.1436	.3845	.2511	.2516	.3871	.1431	.5609	.0639	.7692	.0047	1.0561	−.0311	1.3070	−.0336
16	.500	0.000	−.0330	.0620	.0034	.0059	.0625	−.0344	.1445	−.0600	.2495	−.0761	.3855	−.0759	.5416	−.0763
17	.500	.151	−.0334	.0632	.0028	.0068	.0642	−.0344	.1432	−.0602	.2396	−.0765	.3641	−.0754	.5147	−.0754
18	.500	.251	−.0313	.0721	.0071	.0098	.0722	−.0328	.1633	−.0594	.2678	−.0760	.3831	−.0765	.5133	−.0764
19	.500	.351	−.0294	.0750	.0095	.0125	.0756	−.0304	.1664	−.0572	.2847	−.0744	.4004	−.0781	.5088	−.0775
20	.500	.452	−.0195	.0865	.0219	.0240	.0872	−.0204	.1778	−.0489	.2963	−.0677	.4170	−.0797	.4687	−.0831
21	.544	.518	.1380	.3766	.2447	.2444	.3812	.1365	.5517	.0568	.7527	−.0011	1.0011	−.0397	1.1169	−.0483
22	.603	.531	.1394	.3782	.2461	.2463	.3824	.1379	.5532	.0585	.7559	.0001	1.0375	−.0376	1.2333	−.0408
23	.662	.545	.1426	.3833	.2493	.2511	.3854	.1419	.5573	.0624	.7614	.0044	1.0734	−.0313	1.3489	−.0270
24	.375	0.000	−.0335	.0617	.0032	.0054	.0627	−.0352	.1439	−.0607	.2498	−.0722	.3855	−.0738	.5359	−.0753
25	.375	.225	−.0350	.0670	.0037	.0063	.0684	−.0363	.1500	−.0628	.2473	−.0740	.3700	−.0743	.5210	−.0754
26	.375	.374	−.0344	.0705	.0051	.0076	.0710	−.0356	.1610	−.0626	.2779	−.0756	.3959	−.0748	.5321	−.0761
27	.375	.524	−.0329	.0725	.0074	.0097	.0733	−.0342	.1650	−.0612	.2849	−.0775	.4149	−.0763	.5362	−.0774
28	.375	.674	−.0230	.0816	.0149	.0203	.0809	−.0232	.1736	−.0506	.2918	−.0690	.4260	−.0793	.4892	−.0821
29	.419	.768	.1378	.3760	.2440	.2443	.3802	.1363	.5498	.0563	.7515	−.0017	1.0145	−.0403	1.1091	−.0456
30	.478	.781	.1393	.3778	.2457	.2462	.3828	.1380	.5535	.0580	.7558	0.0000	1.0489	−.0379	1.2353	−.0376
31	.537	.795	.1433	.3818	.2496	.2497	.3863	.1419	.5578	.0616	.7609	.0041	1.0794	−.0320	1.3607	−.0257
32	.381	.843	.1359	.3736	.2419	.2415	.3781	.1345	.5474	.0549	.7457	−.0029	1.0049	−.0410	1.0655	−.0458
33	.440	.856	.1391	.3783	.2456	.2452	.3818	.1380	.5528	.0578	.7544	−.0002	1.0471	−.0385	1.2099	−.0378
34	.500	.870	.1440	.3833	.2509	.2499	.3881	.1424	.5600	.0621	.7634	.0039	1.0799	−.0323	1.3516	−.0256
35	.375	.958	−.0220	.0605	.0062	.0074	.0625	−.0263	.1424	−.0499	.2443	−.0659	.3916	−.0759	.5243	−.0778
36	.250	0.000														
37	.250	.250	−.0404	.0562	−.0047	−.0027	.0572	−.0429	.1355	−.0668	.2283	−.0707	.3456	−.0741	.4900	−.0758
38	.250	.417	−.0401	.0598	−.0037	−.0014	.0599	−.0426	.1466	−.0656	.2594	−.0696	.3718	−.0732	.5049	−.0755
39	.250	.583	−.0380	.0618	−.0012	.0009	.0629	−.0407	.1509	−.0639	.2680	−.0681	.3961	−.0724	.5270	−.0751
40	.250	.750	−.0355	.0658	.0030	.0049	.0669	−.0376	.1555	−.0626	.2730	−.0707	.4074	−.0738	.5165	−.0761
41	.250	.833	−.0383	.0509	−.0092	−.0041	.0486	−.0392	.1265	−.0633	.2235	−.0744	.3121	−.0768	.3634	−.0788
42	.250	.875	−.0375	.0494	−.0040	−.0040	.0519	−.0413	.1259	−.0648	.2146	−.0754	.2873	−.0766	.3267	−.0789
43	.250	.917	−.0312	.0545	−.0014	−.0005	.0557	−.0333	.1340	−.0575	.2347	−.0720	.3425	−.0770	.3900	−.0799
44	.250	.958	−.0218	.0511	.0071	.0052	.0526	−.0243	.1258	−.0511	.2260	−.0687	.3676	−.0758	.4515	−.0797
45	.188	0.000	−.0619	−.0505	−.0621	−.0659	−.0502	−.0715	−.0230	−.0713	.0233	−.0708	.0886	−.0736	.1723	−.0762
46	.188	.250	−.0589	−.0527	−.0629	−.0680	−.0516	−.0666	−.0242	−.0690	.0234	−.0717	.0949	−.0747	.1857	−.0764
47	.188	.417	−.0530	−.0506	−.0578	−.0636	−.0500	−.0611	−.0182	−.0645	.0379	−.0689	.1069	−.0736	.1910	−.0760
48	.188	.583	−.0506	−.0510	−.0563	−.0625	−.0493	−.0587	−.0180	−.0616	.0420	−.0670	.1180	−.0721	.2032	−.0750
49	.188	.750	−.0527	−.0519	−.0606	−.0667	−.0512	−.0604	−.0180	−.0629	.0407	−.0683	.1207	−.0737	.1942	−.0765
50	.125	0.000	−.0599	−.0601	−.0671	−.0738	−.0575	−.0714	−.0317	−.0690	.0150	−.0696	.0808	−.0731	.1645	−.0752
51	.125	.250	−.0549	−.0596	−.0537	−.0587	−.0545	−.0643	−.0299	−.0680	.0168	−.0701	.0897	−.0731	.1784	−.0748
52	.125	.417	−.0511	−.0583	−.0501	−.0551	−.0537	−.0587	−.0248	−.0638	.0301	−.0690	.0984	−.0734	.1829	−.0758
53	.125	.583	−.0452	−.0546	−.0447	−.0505	−.0491	−.0531	−.0197	−.0577	.0374	−.0629	.1118	−.0674	.1969	−.0702
54	.125	.750	−.0503	−.0591	−.0507	−.0560	−.0544	−.0575	−.0249	−.0624	.0333	−.0683	.1098	−.0736	.1803	−.0766
55	.125	.958	−.0256	.0420	.0030	.0017	.0434	−.0285	.1094	−.0522	.2006	−.0668	.2876	−.0752	.3559	−.0781
56	.063	0.000	−.0593	−.0635	−.0649	−.0725	−.0595	−.0702	−.0347	−.0690	.0115	−.0702	.0764	−.0739	.1593	−.0760
57	.063	.250	−.0564	−.0621	−.0536	−.0582	−.0566	−.0654	−.0342	−.0698	.0143	−.0717	.0867	−.0748	.1733	−.0766
58	.063	.417	−.0511	−.0593	−.0489	−.0536	−.0538	−.0584	−.0261	−.0638	.0260	−.0687	.0930	−.0727	.1770	−.0750
59	.063	.583	−.0498	−.0592	−.0484	−.0531	−.0540	−.0567	−.0262	−.0621	.0332	−.0673	.1058	−.0725	.1892	−.0753
60	.063	.750	−.0458	−.0584	−.0454	−.0527	−.0502	−.0555	−.0269	−.0598	.0287	−.0653	.0991	−.0700	.1639	−.0727
61	.063	.875														
62	.375	−.674	−.0144	.0817	.0157	.0263	.0804	−.0138	.1739	−.0399	.2922	−.0570	.4202	−.0678	.4859	−.0705
63	.250	−.833	−.0301	.0507	−.0080	−.0011	.0469	−.0345	.1277	−.0569	.2242	−.0678	.3129	−.0711	.3692	−.0726

TABLE X.—Continued
(d) Concluded

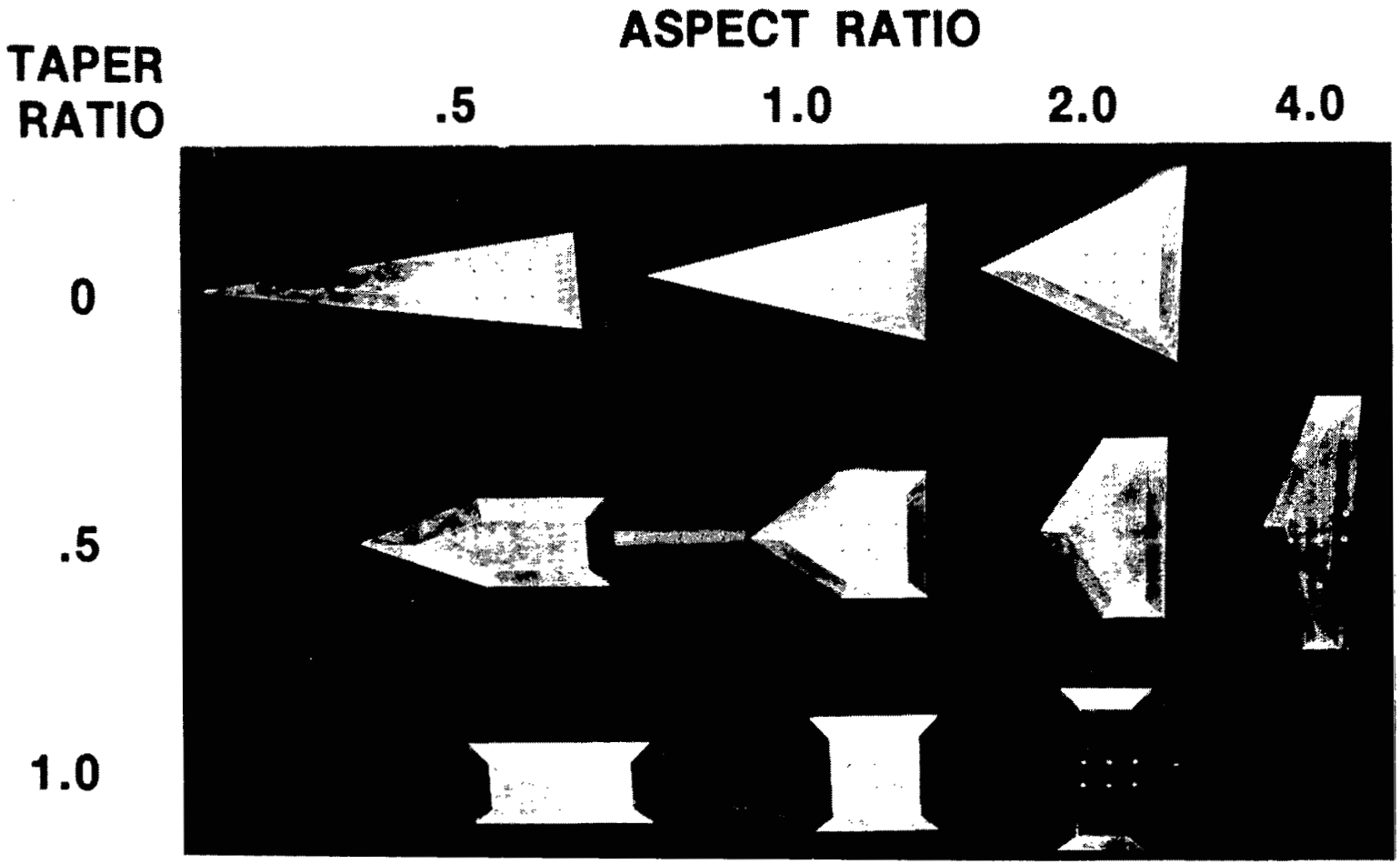
			α =													
			30.0		35.0		40.0		45.0		50.0		55.0		59.8	
Tube.	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	1.3564	−.0544	1.5380	−.0503	1.6743	−.0544	1.7951		1.8366	−.0726	1.8306		1.8063	−.0759
2	.868	0.000	1.3177	−.0646	1.4466	−.0630	1.5666	−.0620	1.7086		1.7927	−.0808	1.8290		1.8406	−.0835
3	.802	0.000	1.2619	−.0672	1.3375	−.0675	1.4398	−.0669	1.6047		1.7203	−.0819	1.7872		1.8256	−.0844
4	.688	0.000	.6828	−.0781	.8659	−.0800	1.1273	−.0860	1.4003		1.5627	−.0856	1.6651		1.7387	−.0855
5	.688	.066	.5703	−.0792	.7475	−.0797	1.0419	−.0837	1.3699		1.5535	−.0852	1.6626		1.7400	−.0852
6	.732	.143	1.2023	−.0662	1.2693	−.0737	1.3777	−.0823	1.5561		1.6774	−.0849	1.7494		1.7980	−.0849
7	.790	.156	1.3269	−.0588	1.4246	−.0710	1.5333	−.0846	1.6723		1.7552	−.0855	1.7959		1.8188	−.0854
8	.850	.170	1.4506	−.0515	1.5635	−.0739	1.6604	−.0883	1.7587		1.7969	−.0868	1.7980		1.7911	−.0857
9	.625	0.000	.6834	−.0786	.8791	−.0794	1.1390	−.0839	1.3808		1.5275	−.0862	1.6247		1.7001	−.0860
10	.625	.077	.6553	−.0777	.8095	−.0783	1.1588	−.0819	1.3789		1.5254	−.0847	1.6255		1.7006	−.0851
11	.625	.128	.6076	−.0779	.7987	−.0786	1.1036	−.0818	1.3791		1.5306	−.0847	1.6305		1.7061	−.0849
12	.625	.179	.5671	−.0794	.7466	−.0793	1.0608	−.0816	1.3694		1.5324	−.0843	1.6357		1.7120	−.0846
13	.669	.268	1.1946	−.0600	1.2661	−.0711	1.3826	−.0819	1.5537		1.6652	−.0850	1.7328		1.7790	−.0850
14	.728	.281	1.3371	−.0544	1.4288	−.0708	1.5359	−.0838	1.6681		1.7433	−.0854	1.7810		1.8027	−.0852
15	.787	.295	1.4752	−.0524	1.5720	−.0767	1.6600	−.0875	1.7515		1.7814	−.0861	1.7831		1.7750	−.0855
16	.500	0.000	.6905	−.0769	.8859	−.0781	1.1378	−.0813	1.3256		1.4461	−.0848	1.5338		1.6094	−.0849
17	.500	.151	.6874	−.0760	.8995	−.0770	1.1481	−.0807	1.3324		1.4540	−.0838	1.5416		1.6176	−.0841
18	.500	.251	.6699	−.0767	.8840	−.0777	1.1624	−.0807	1.3461		1.4686	−.0841	1.5552		1.6314	−.0842
19	.500	.351	.6446	−.0774	.8241	−.0777	1.1586	−.0803	1.3608		1.4861	−.0835	1.5723		1.6480	−.0839
20	.500	.452	.5484	−.0839	.7662	−.0815	1.1050	−.0819	1.3480		1.4923	−.0842	1.5851		1.6630	−.0843
21	.544	.518	1.1942	−.0555	1.2662	−.0697	1.3943	−.0809	1.5426		1.6394	−.0841	1.6996		1.7461	−.0846
22	.603	.531	1.3467	−.0517	1.4326	−.0709	1.5394	−.0821	1.6576		1.7226	−.0841	1.7568		1.7792	−.0846
23	.662	.545	1.4887	−.0548	1.5741	−.0789	1.6546	−.0851	1.7361		1.7613	−.0849	1.7640		1.7573	−.0848
24	.375	0.000	.6903	−.0760	.8889	−.0773	1.1228	−.0811	1.2542		1.3445	−.0843	1.4170		1.4914	−.0845
25	.375	.225	.6991	−.0762	.9079	−.0774	1.1350	−.0815	1.2649		1.3571	−.0848	1.4292		1.5060	−.0848
26	.375	.374	.7060	−.0767	.9343	−.0778	1.1472	−.0810	1.2794		1.3749	−.0845	1.4465		1.5255	−.0846
27	.375	.524	.7031	−.0782	.9396	−.0790	1.1620	−.0820	1.2976		1.3985	−.0848	1.4718		1.5511	−.0856
28	.375	.674	.6030	−.0813	.8111	−.0801	1.1216	−.0812	1.2933		1.4066	−.0833	1.4877		1.5705	−.0843
29	.419	.768	1.1811	−.0546	1.2487	−.0704	1.3570	−.0814	1.4707		1.5568	−.0846	1.6160		1.6721	−.0853
30	.478	.781	1.3383	−.0513	1.4184	−.0713	1.5096	−.0821	1.6014		1.6622	−.0843	1.6981		1.7268	−.0850
31	.537	.795	1.4864	−.0559	1.5646	−.0801	1.6321	−.0851	1.6942		1.7202	−.0851	1.7265		1.7256	−.0852
32	.381	.843	1.1241	−.0553	1.1816	−.0710	1.2634	−.0814	1.3534		1.4336	−.0844	1.4981		1.5655	−.0852
33	.440	.856	1.2993	−.0517	1.3720	−.0721	1.4478	−.0824	1.5248		1.5823	−.0847	1.6229		1.6598	−.0850
34	.500	.870	1.4650	−.0559	1.5386	−.0800	1.5962	−.0852	1.6487		1.6745	−.0850	1.6827		1.6871	−.0854
35	.375	.958	.6351	−.0807	.7498	−.0801	.9020	−.0797	1.0870		1.1970	−.0805	1.2701		1.3464	−.0806
36	.250	0.000														
37	.250	.250	.6502	−.0767	.8464	−.0781	.9700	−.0819	1.0312		1.0774	−.0852	1.1173		1.1974	−.0849
38	.250	.417	.6676	−.0765	.8650	−.0777	.9761	−.0811	1.0367		1.0849	−.0841	1.1249		1.2132	−.0840
39	.250	.583	.6923	−.0764	.8924	−.0777	.9842	−.0809	1.0517		1.1054	−.0837	1.1482		1.2434	−.0847
40	.250	.750	.6653	−.0764	.8779	−.0779	.9542	−.0809	1.0309		1.0960	−.0837	1.1468		1.2570	−.0847
41	.250	.833	.4701	−.0791	.6508	−.0805	.8066	−.0825	.9140		1.0021	−.0853	1.0754		1.2211	−.0860
42	.250	.875	.4153	−.0790	.5613	−.0807	.7800	−.0827	.9744		1.0466	−.0849	1.1373		1.2865	−.0853
43	.250	.917	.4868	−.0806	.6526	−.0826	.9398	−.0842	1.0128		1.0650	−.0864	1.1681		1.2933	−.0864
44	.250	.958	.5361	−.0799	.6610	−.0816	.8511	−.0829	.9418		1.0232	−.0850	1.1256		1.2309	−.0850
45	.188	0.000	.2726	−.0773	.3776	−.0792	.4571	−.0828	.4979		.5611	−.0862	.7205		.9678	−.0860
46	.188	.250	.2780	−.0775	.3671	−.0791	.4445	−.0830	.4912		.5631	−.0865	.7285		.9883	−.0864
47	.188	.417	.2849	−.0774	.3696	−.0790	.4416	−.0816	.4943		.5791	−.0848	.7526		1.0216	−.0846
48	.188	.583	.2942	−.0765	.3746	−.0783	.4411	−.0813	.4974		.5956	−.0841	.7769		1.0534	−.0852
49	.188	.750	.2796	−.0776	.3525	−.0796	.4101	−.0823	.4780		.6107	−.0858	.8109		1.0798	−.0865
50	.125	0.000	.2663	−.0760	.3718	−.0783	.4794	−.0819	.5448		.6560	−.0850	.7659		1.1882	−.0850
51	.125	.250	.2735	−.0757	.3726	−.0772	.4738	−.0813	.5462		.6667	−.0846	.7908		1.1931	−.0842
52	.125	.417	.2793	−.0769	.3746	−.0788	.4710	−.0816	.5539		.6867	−.0840	.8468		1.2039	−.0841
53	.125	.583	.2884	−.0717	.3780	−.0732	.4708	−.0758	.5628		.7072	−.0783	.9305		1.2078	−.0793
54	.125	.750	.2616	−.0773	.3388	−.0795	.4292	−.0818	.5495		.7124	−.0850	1.0352		1.2098	−.0858
55	.125	.958	.4517	−.0792	.5511	−.0814	.6323	−.0838	.7290		.8495	−.0861	1.0134		1.1245	−.0864
56	.063	0.000	.2603	−.0771	.3666	−.0790	.4847	−.0830	.5629		.6992	−.0858	1.0169		1.0848	−.0861
57	.063	.250	.2701	−.0771	.3748	−.0791	.4873	−.0829	.5742		.7155	−.0862	1.0364		1.1018	−.0857
58	.063	.417	.2746	−.0759	.3766	−.0777	.4856	−.0811	.5842		.7365	−.0830	1.0412		1.1047	−.0832
59	.063	.583	.2810	−.0772	.3773	−.0787	.4828	−.0815	.5937		.7578	−.0844	1.0432		1.1135	−.0851
60	.063	.750	.2425	−.0737	.3270	−.0755	.4463	−.0774	.5894		.7737	−.0803	1.0448		1.1155	−.0811
61	.063	.875														
62	.375	−.674	.6051	−.0709	.8116	−.0705	1.1278	−.0709	1.2886		1.3986	−.0734	1.4738		1.5517	−.0739
63	.250	−.833	.4759	−.0736	.6654	−.0745	.7889	−.0760	.8893		.9738	−.0795	1.0455		1.1920	−.0796

TABLE X.—Continued
(e) M = 4.60

			α =													
			−5.0		0.0		5.0		10.0		15.0		20.0		25.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	.1292	.3263	.1985	.2117	.3204	.1281	.4625	.0654	.6256	.0272	.8048	.0036	1.0186	−.0094
2	.868	0.000	.1123	.3211	.1893	.2039	.3085	.1175	.4517	.0528	.6164	.0137	.8003	−.0115	1.0126	−.0244
3	.802	0.000	.1104	.3183	.1879	.2020	.3071	.1152	.4501	.0509	.6151	.0116	.7989	−.0136	1.0091	−.0267
4	.688	0.000	.0139	.0789	.0306	.0336	.0758	.0048	.1446	−.0156	.2399	−.0272	.3622	−.0336	.5168	−.0336
5	.688	.066	.0118	.0745	.0268	.0308	.0699	.0026	.1355	−.0178	.2257	−.0290	.3386	−.0349	.4715	−.0353
6	.732	.143	.1195	.3499	.2064	.2213	.3365	.1246	.4949	.0542	.6765	.0116	.8547	−.0148	1.0391	−.0275
7	.790	.156	.1214	.3537	.2099	.2246	.3404	.1268	.4993	.0561	.6879	.0128	.8970	−.0139	1.0908	−.0260
8	.850	.170	.1267	.3619	.2156	.2307	.3471	.1321	.5070	.0612	.6966	.0172	.9229	−.0097	1.1715	−.0200
9	.625	0.000	.0012	.0639	.0160	.0190	.0584	−.0088	.1279	−.0258	.2226	−.0346	.3445	−.0364	.4970	−.0357
10	.625	.077	.0046	.0600	.0142	.0212	.0556	−.0044	.1227	−.0224	.2141	−.0322	.3285	−.0348	.4702	−.0348
11	.625	.128	.0079	.0717	.0190	.0269	.0653	−.0007	.1395	−.0204	.2324	−.0307	.3445	−.0350	.4741	−.0348
12	.625	.179	.0137	.0802	.0256	.0350	.0739	.0062	.1503	−.0154	.2536	−.0273	.3650	−.0336	.4867	−.0342
13	.669	.268	.1186	.3498	.2067	.2200	.3360	.1229	.4967	.0532	.6832	.0106	.8986	−.0155	1.0815	−.0267
14	.728	.281	.1190	.3523	.2087	.2217	.3377	.1236	.4986	.0543	.6861	.0112	.9094	−.0145	1.1398	−.0247
15	.787	.295	.1239	.3580	.2134	.2267	.3426	.1289	.5042	.0593	.6933	.0163	.9214	−.0100	1.2120	−.0180
16	.500	0.000	.0021	.0583	.0114	.0175	.0533	−.0077	.1224	−.0242	.2172	−.0324	.3394	−.0334	.4913	−.0336
17	.500	.151	.0043	.0619	.0136	.0205	.0566	−.0056	.1288	−.0231	.2201	−.0313	.3316	−.0324	.4708	−.0326
18	.500	.251	.0053	.0663	.0149	.0219	.0604	−.0048	.1379	−.0223	.2439	−.0316	.3613	−.0324	.4885	−.0324
19	.500	.351	.0071	.0706	.0185	.0248	.0643	−.0025	.1420	−.0208	.2482	−.0302	.3826	−.0327	.5038	−.0328
20	.500	.452	.0147	.0881	.0320	.0385	.0811	.0077	.1581	−.0139	.2630	−.0268	.3993	−.0333	.5100	−.0344
21	.544	.518	.1174	.3475	.2076	.2182	.3352	.1208	.4958	.0521	.6814	.0095	.9013	−.0156	1.1213	−.0253
22	.603	.531	.1189	.3504	.2091	.2203	.3367	.1226	.4980	.0534	.6841	.0109	.9079	−.0148	1.1871	−.0232
23	.662	.545	.1230	.3571	.2140	.2265	.3419	.1275	.5026	.0585	.6883	.0153	.9154	−.0105	1.2546	−.0149
24	.375	0.000	.0010	.0570	.0111	.0158	.0522	−.0091	.1213	−.0253	.2166	−.0307	.3406	−.0319	.4899	−.0326
25	.375	.225	.0002	.0620	.0118	.0173	.0561	−.0099	.1332	−.0259	.2287	−.0311	.3386	−.0323	.4759	−.0329
26	.375	.374	0.0000	.0640	.0124	.0171	.0572	−.0099	.1353	−.0262	.2419	−.0318	.3725	−.0326	.5009	−.0333
27	.375	.524	.0008	.0670	.0142	.0197	.0601	−.0082	.1389	−.0256	.2460	−.0340	.3845	−.0347	.5199	−.0353
28	.375	.674	.0153	.0795	.0253	.0355	.0727	.0078	.1507	−.0143	.2585	−.0260	.3966	−.0322	.5203	−.0336
29	.419	.768	.1179	.3492	.2081	.2188	.3373	.1205	.4988	.0507	.6884	.0084	.9073	−.0167	1.1332	−.0252
30	.478	.781	.1203	.3524	.2107	.2217	.3404	.1228	.5025	.0527	.6925	.0103	.9158	−.0148	1.2102	−.0219
31	.537	.795	.1244	.3574	.2154	.2262	.3451	.1274	.5073	.0577	.6976	.0154	.9245	−.0104	1.2829	−.0125
32	.381	.843	.1167	.3481	.2062	.2176	.3348	.1191	.4961	.0493	.6854	.0074	.9019	−.0170	1.1104	−.0248
33	.440	.856	.1194	.3537	.2101	.2219	.3395	.1226	.5011	.0526	.6921	.0101	.9154	−.0151	1.2042	−.0217
34	.500	.870	.1248	.3597	.2154	.2272	.3454	.1276	.5086	.0571	.7003	.0145	.9278	−.0110	1.2861	−.0122
35	.375	.958	.0167	.0616	.0238	.0246	.0597	.0021	.1266	−.0135	.2224	−.0219	.3417	−.0263	.5098	−.0283
36	.250	0.000														
37	.250	.250	−.0034	.0519	.0070	.0091	.0468	−.0153	.1191	−.0279	.2106	−.0308	.3141	−.0324	.4432	−.0333
38	.250	.417	−.0029	.0534	.0074	.0092	.0477	−.0152	.1223	−.0269	.2243	−.0302	.3489	−.0320	.4695	−.0330
39	.250	.583	−.0020	.0566	.0097	.0119	.0516	−.0138	.1262	−.0264	.2297	−.0298	.3639	−.0318	.4971	−.0328
40	.250	.750	.0030	.0620	.0131	.0165	.0566	−.0094	.1323	−.0249	.2375	−.0300	.3728	−.0317	.5085	−.0328
41	.250	.833	.0030	.0517	.0091	.0159	.0471	−.0082	.1134	−.0257	.2068	−.0328	.3187	−.0352	.3962	−.0363
42	.250	.875	−.0007	.0523	.0109	.0119	.0492	−.0128	.1149	−.0267	.2030	−.0329	.3033	−.0341	.3584	−.0350
43	.250	.917	.0036	.0541	.0111	.0170	.0507	−.0073	.1177	−.0247	.2119	−.0330	.3266	−.0361	.4124	−.0376
44	.250	.958	.0074	.0499	.0148	.0170	.0473	−.0034	.1081	−.0208	.1962	−.0300	.3133	−.0342	.4539	−.0359
45	.188	0.000	−.0176	−.0202	−.0189	−.0269	−.0117	−.0327	.0048	−.0342	.0321	−.0344	.0835	−.0355	.1617	−.0361
46	.188	.250	−.0185	−.0229	−.0215	−.0301	−.0150	−.0330	.0037	−.0346	.0342	−.0351	.0895	−.0366	.1743	−.0372
47	.188	.417	−.0156	−.0223	−.0194	−.0293	−.0147	−.0301	.0042	−.0312	.0402	−.0330	.1049	−.0348	.1881	−.0359
48	.188	.583	−.0153	−.0219	−.0197	−.0296	−.0141	−.0297	.0054	−.0306	.0413	−.0320	.1128	−.0344	.2032	−.0356
49	.188	.750	−.0188	−.0232	−.0226	−.0307	−.0163	−.0321	.0036	−.0327	.0420	−.0341	.1126	−.0359	.2055	−.0373
50	.125	0.000	−.0181	−.0274	−.0218	−.0327	−.0188	−.0330	−.0050	−.0333	.0226	−.0331	.0745	−.0344	.1534	−.0350
51	.125	.250	−.0140	−.0250	−.0160	−.0278	−.0166	−.0290	−.0020	−.0311	.0270	−.0321	.0812	−.0334	.1659	−.0337
52	.125	.417	−.0125	−.0256	−.0142	−.0267	−.0181	−.0277	−.0033	−.0306	.0323	−.0326	.0955	−.0343	.1768	−.0352
53	.125	.583	−.0054	−.0182	−.0073	−.0192	−.0100	−.0195	.0054	−.0217	.0399	−.0237	.1073	−.0255	.1942	−.0264
54	.125	.750	−.0137	−.0265	−.0162	−.0288	−.0187	−.0285	−.0034	−.0306	.0329	−.0325	.1037	−.0345	.1909	−.0360
55	.125	.958	.0035	.0390	.0110	.0123	.0379	−.0078	.0914	−.0238	.1756	−.0308	.2796	−.0348	.3619	−.0365
56	.063	0.000	−.0181	−.0300	−.0209	−.0327	−.0215	−.0332	−.0093	−.0339	.0185	−.0343	.0704	−.0356	.1493	−.0360
57	.063	.250	−.0156	−.0286	−.0168	−.0286	−.0195	−.0309	−.0075	−.0335	.0214	−.0345	.0777	−.0356	.1606	−.0363
58	.063	.417	−.0122	−.0270	−.0135	−.0252	−.0179	−.0271	−.0045	−.0303	.0306	−.0321	.0907	−.0328	.1695	−.0339
59	.063	.583	−.0130	−.0276	−.0146	−.0264	−.0186	−.0276	−.0051	−.0304	.0298	−.0325	.1018	−.0343	.1857	−.0355
60	.063	.750	−.0007	−.0211	−.0029	−.0206	−.0065	−.0212	.0030	−.0239	.0306	−.0255	.0973	−.0269	.1770	−.0284
61	.063	.875														
62	.375	−.674	.0318	.0787	.0378	.0506	.0776	.0252	.1497	.0048	.2585	−.0075	.3977	−.0138	.5159	−.0156
63	.250	−.833	.0188	.0503	.0221	.0238	.0537	.0015	.1120	−.0142	.2068	−.0217	.3210	−.0239	.4030	−.0250

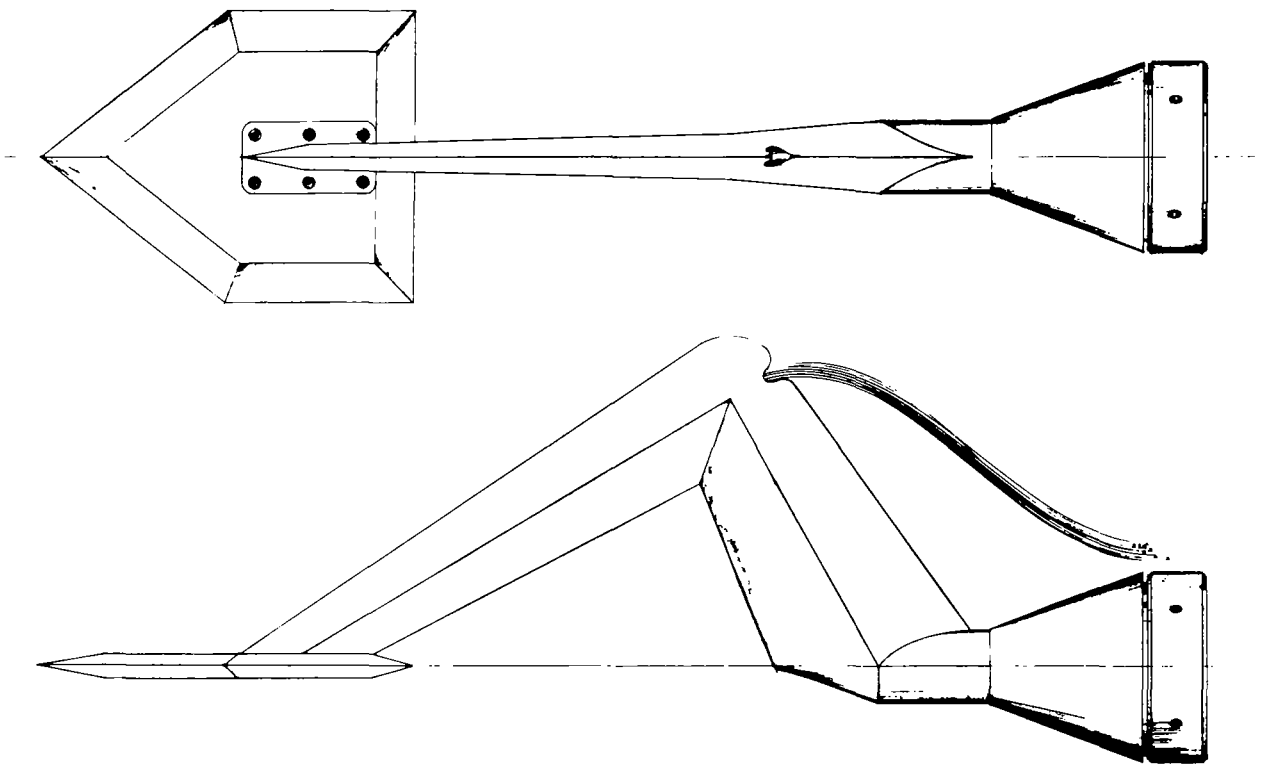
TABLE X.- Concluded
(e) Concluded

			α = 30.0		35.0		40.0		45.0		50.0		55.0		60.0	
Tube	x/l	y/b/2	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	.934	0.000	1.2589	−.0145	1.4972		1.6449	−.0126	1.7502		1.8224	−.0174	1.8376		1.8308	−.0185
2	.868	0.000	1.2541	−.0297	1.4385		1.5524	−.0277	1.6620		1.7704	−.0311	1.8269		1.8578	−.0311
3	.802	0.000	1.2442	−.0316	1.3578		1.4342	−.0305	1.5518		1.6924	−.0331	1.7786		1.8371	−.0330
4	.688	0.000	.6800	−.0331	.8183		1.0412	−.0338	1.3215		1.5249	−.0345	1.6521		1.7457	−.0336
5	.688	.066	.5961	−.0346	.7156		.9540	−.0337	1.2817		1.5117	−.0345	1.6498		1.7454	−.0334
6	.732	.143	1.2207	−.0308	1.2908		1.3662	−.0337	1.5040		1.6508	−.0341	1.7474		1.8069	−.0329
7	.790	.156	1.3047	−.0273	1.4303		1.5242	−.0333	1.6311		1.7375	−.0344	1.8001		1.8329	−.0333
8	.850	.170	1.4013	−.0183	1.5589		1.6537	−.0318	1.7285		1.7889	−.0338	1.8121		1.8105	−.0330
9	.625	0.000	.6598	−.0354	.8235		1.0456	−.0351	1.3180		1.4956	−.0360	1.6141		1.7075	−.0347
10	.625	.077	.6254	−.0344	.7998		1.0200	−.0335	1.3147		1.4943	−.0342	1.6146		1.7053	−.0334
11	.625	.128	.6027	−.0345	.7617		1.0057	−.0334	1.3118		1.4978	−.0342	1.6222		1.7116	−.0332
12	.625	.179	.5900	−.0341	.7108		.9635	−.0330	1.2973		1.4990	−.0335	1.6286		1.7192	−.0324
13	.669	.268	1.2110	−.0272	1.2839		1.3644	−.0324	1.5128		1.6470	−.0336	1.7371		1.7975	−.0324
14	.728	.281	1.3266	−.0231	1.4351		1.5265	−.0322	1.6358		1.7325	−.0337	1.7913		1.8248	−.0331
15	.787	.295	1.4429	−.0149	1.5726		1.6584	−.0323	1.7284		1.7813	−.0337	1.8013		1.8026	−.0328
16	.500	0.000	.6512	−.0335	.8232		1.0498	−.0328	1.2952		1.4292	−.0337	1.5289		1.6186	−.0330
17	.500	.151	.6341	−.0324	.8266		1.0580	−.0317	1.3004		1.4360	−.0328	1.5405		1.6277	−.0317
18	.500	.251	.6336	−.0326	.8234		1.0667	−.0316	1.3135		1.4519	−.0328	1.5583		1.6450	−.0320
19	.500	.351	.6294	−.0332	.8035		1.0638	−.0319	1.3266		1.4691	−.0328	1.5768		1.6653	−.0317
20	.500	.452	.5716	−.0358	.7145		1.0070	−.0338	1.3087		1.4724	−.0338	1.5898		1.6819	−.0327
21	.544	.518	1.2072	−.0235	1.2815		1.3735	−.0314	1.5210		1.6285	−.0329	1.7108		1.7700	−.0322
22	.603	.531	1.3422	−.0198	1.4406		1.5327	−.0313	1.6400		1.7166	−.0327	1.7708		1.8038	−.0318
23	.662	.545	1.4698	−.0129	1.5800		1.6601	−.0322	1.7260		1.7638	−.0332	1.7820		1.7844	−.0322
24	.375	0.000	.6422	−.0330	.8292		1.0530	−.0319	1.2525		1.3420	−.0332	1.4200		1.5021	−.0322
25	.375	.225	.6405	−.0328	.8336		1.0645	−.0322	1.2595		1.3532	−.0337	1.4378		1.5185	−.0329
26	.375	.374	.6572	−.0337	.8522		1.0804	−.0325	1.2720		1.3712	−.0339	1.4580		1.5426	−.0328
27	.375	.524	.6681	−.0355	.8638		1.1030	−.0349	1.2889		1.3918	−.0356	1.4818		1.5684	−.0347
28	.375	.674	.6082	−.0350	.7730		1.0535	−.0330	1.2798		1.3958	−.0328	1.4962		1.5890	−.0319
29	.419	.768	1.2009	−.0226	1.2673		1.3525	−.0317	1.4700		1.5520	−.0334	1.6302		1.6978	−.0329
30	.478	.781	1.3434	−.0179	1.4305		1.5134	−.0315	1.6031		1.6600	−.0329	1.7139		1.7555	−.0322
31	.537	.795	1.4790	−.0121	1.5749		1.6451	−.0322	1.7000		1.7256	−.0329	1.7465		1.7559	−.0322
32	.381	.843	1.1549	−.0223	1.2080		1.2745	−.0316	1.3648		1.4350	−.0332	1.5124		1.5899	−.0324
33	.440	.856	1.3144	−.0177	1.3899		1.4606	−.0312	1.5359		1.5876	−.0327	1.6420		1.6901	−.0324
34	.500	.870	1.4659	−.0121	1.5521		1.6142	−.0324	1.6630		1.6857	−.0332	1.7098		1.7220	−.0322
35	.375	.958	.6305	−.0285	.7449		.8760	−.0270	1.0524		1.1861	−.0267	1.2819		1.3702	−.0255
36	.250	0.000														
37	.250	.250	.5949	−.0333	.7705		.9485	−.0325	1.0469		1.0889	−.0340	1.1365		1.2038	−.0331
38	.250	.417	.6163	−.0333	.7903		.9583	−.0325	1.0510		1.0966	−.0334	1.1460		1.2204	−.0321
39	.250	.583	.6473	−.0329	.8224		.9759	−.0325	1.0638		1.1132	−.0334	1.1666		1.2492	−.0327
40	.250	.750	.6416	−.0331	.8106		.9550	−.0323	1.0416		1.0998	−.0331	1.1623		1.2608	−.0324
41	.250	.833	.4785	−.0370	.6249		.7881	−.0350	.9194		1.0056	−.0358	1.0851		1.2214	−.0347
42	.250	.875	.4327	−.0354	.5397		.7217	−.0340	.9345		1.0406	−.0348	1.1267		1.2904	−.0336
43	.250	.917	.4866	−.0383	.6177		.8261	−.0366	1.0357		1.0821	−.0374	1.1670		1.3051	−.0361
44	.250	.958	.5376	−.0368	.6407		.8085	−.0350	.9545		1.0310	−.0353	1.1293		1.2505	−.0339
45	.188	0.000	.2598	−.0360	.3760		.4793	−.0349	.5539		.5938	−.0362	.7322		.9700	−.0351
46	.188	.250	.2711	−.0367	.3784		.4694	−.0355	.5405		.5912	−.0371	.7372		.9880	−.0358
47	.188	.417	.2794	−.0359	.3818		.4703	−.0347	.5382		.6004	−.0357	.7562		1.0161	−.0345
48	.188	.583	.2956	−.0354	.3907		.4708	−.0343	.5370		.6098	−.0352	.7732		1.0504	−.0341
49	.188	.750	.2888	−.0367	.3768		.4399	−.0359	.5104		.6081	−.0370	.7936		1.0784	−.0362
50	.125	0.000	.2513	−.0344	.3680		.4825	−.0333	.5850		.6632	−.0349	.7984		1.0901	−.0334
51	.125	.250	.2631	−.0329	.3739		.4812	−.0319	.5826		.6735	−.0337	.8099		1.1271	−.0322
52	.125	.417	.2699	−.0352	.3791		.4837	−.0342	.5841		.6886	−.0348	.8322		1.1591	−.0335
53	.125	.583	.2865	−.0260	.3867		.4853	−.0253	.5868		.7038	−.0258	.8603		1.1783	−.0245
54	.125	.750	.2707	−.0356	.3570		.4412	−.0347	.5551		.7073	−.0354	.8680		1.1913	−.0350
55	.125	.958	.4484	−.0370	.5503		.6429	−.0359	.7415		.8536	−.0369	1.0018		1.1459	−.0356
56	.063	0.000	.2456	−.0355	.3598		.4774	−.0349	.5865		.6914	−.0362	.8584		1.1040	−.0346
57	.063	.250	.2583	−.0357	.3699		.4853	−.0346	.5963		.7094	−.0361	.8815		1.1197	−.0349
58	.063	.417	.2637	−.0340	.3755		.4878	−.0333	.6013		.7257	−.0336	.9184		1.1239	−.0320
59	.063	.583	.2763	−.0352	.3805		.4874	−.0343	.6035		.7400	−.0353	.9604		1.1302	−.0340
60	.063	.750	.2524	−.0280	.3402		.4426	−.0270	.5809		.7481	−.0279	1.0188		1.1348	−.0267
61	.063	.875														
62	.375	−.674	.6041	−.0162	.7726		1.0564	−.0154	1.2815		1.3961	−.0154	1.4914		1.5794	−.0144
63	.250	−.833	.4859	−.0252	.6270		.7809	−.0238	.9003		.9855	−.0248	1.0658		1.2004	−.0236



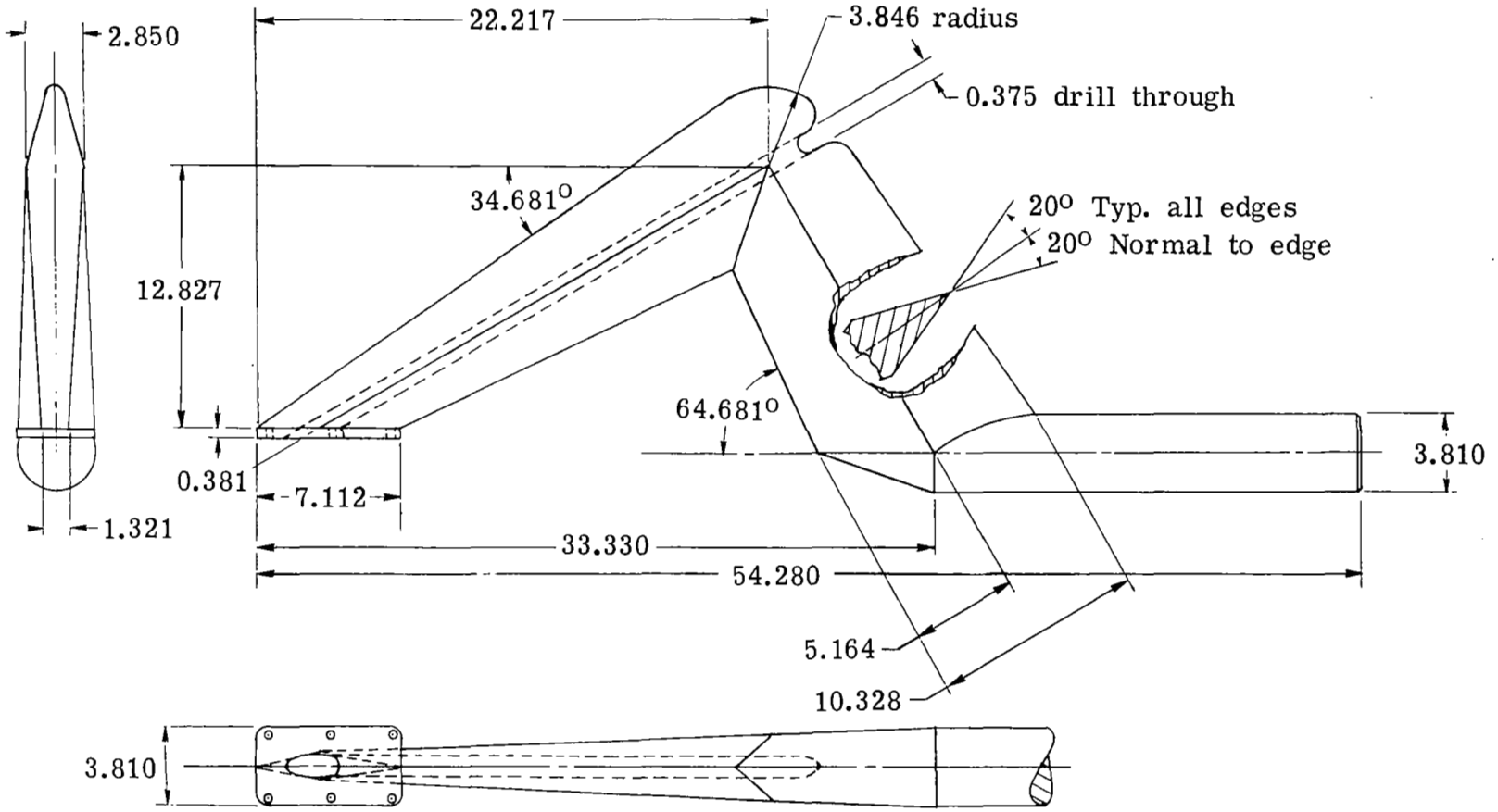
(a) Photograph of models.

Figure 1.- Models and sting assembly.



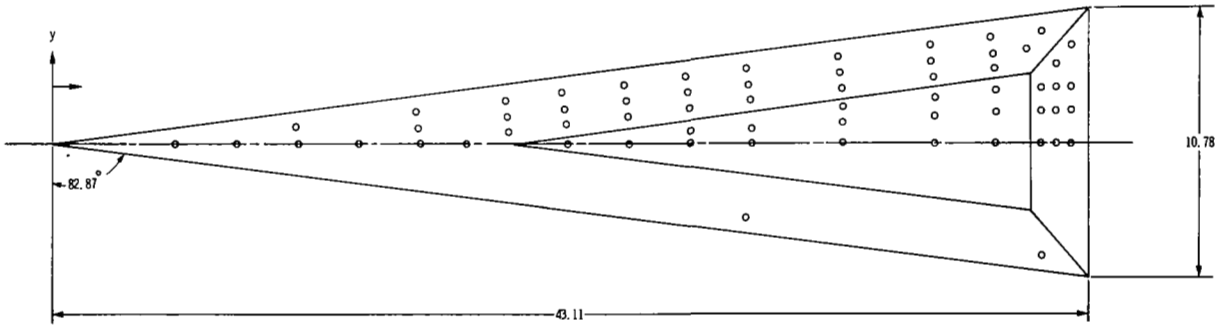
(b) Typical assembly.

Figure 1.- Continued.

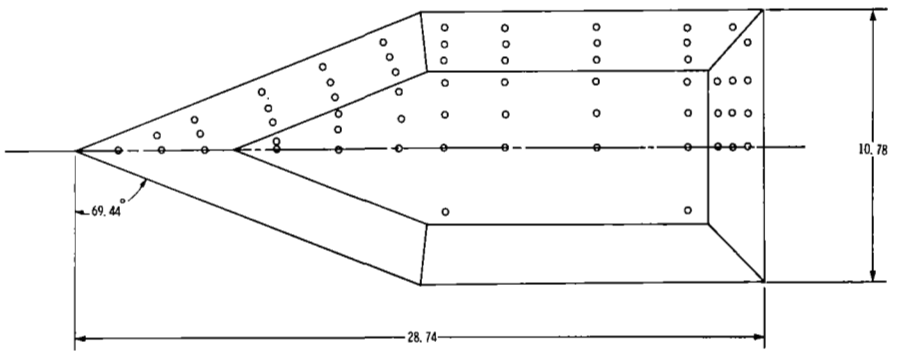


(c) Basic sting dimensions. All dimensions in centimeters unless otherwise indicated.

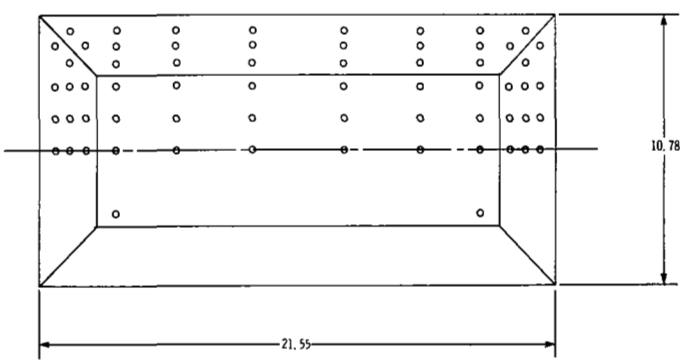
Figure 1.- Concluded.



Model 1
$\lambda = 0$
$\frac{x_{c,w}}{L} = 0.67$
$\frac{y_{c,w}}{b/2} = 0.33$
$\hat{c} = 28.74$



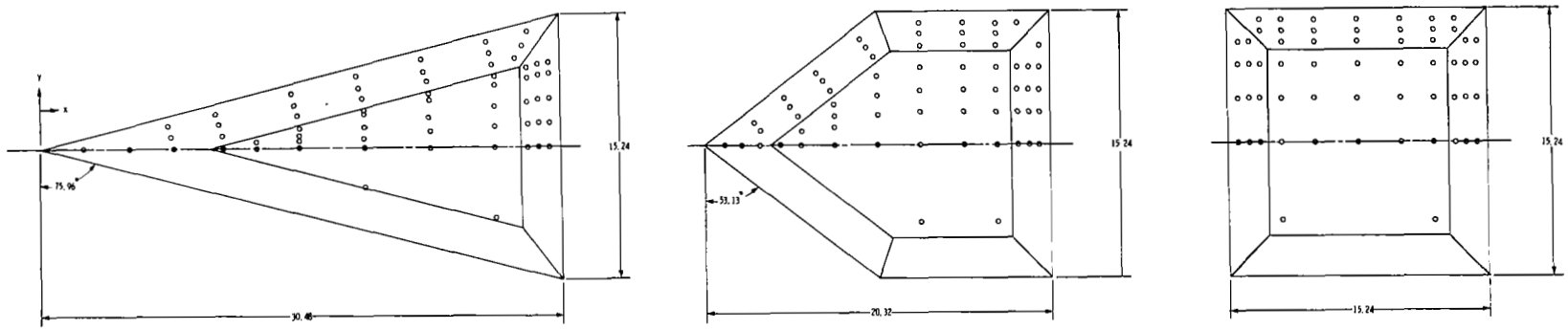
Model 2
$\lambda = 0.5$
$\frac{x_{c,w}}{L} = 0.61$
$\frac{y_{c,w}}{b/2} = 0.44$
$\hat{c} = 22.35$



Model 3
$\lambda = 1.0$
$\frac{x_{c,w}}{L} = 0.50$
$\frac{y_{c,w}}{b/2} = 0.50$
$\hat{c} = 21.55$

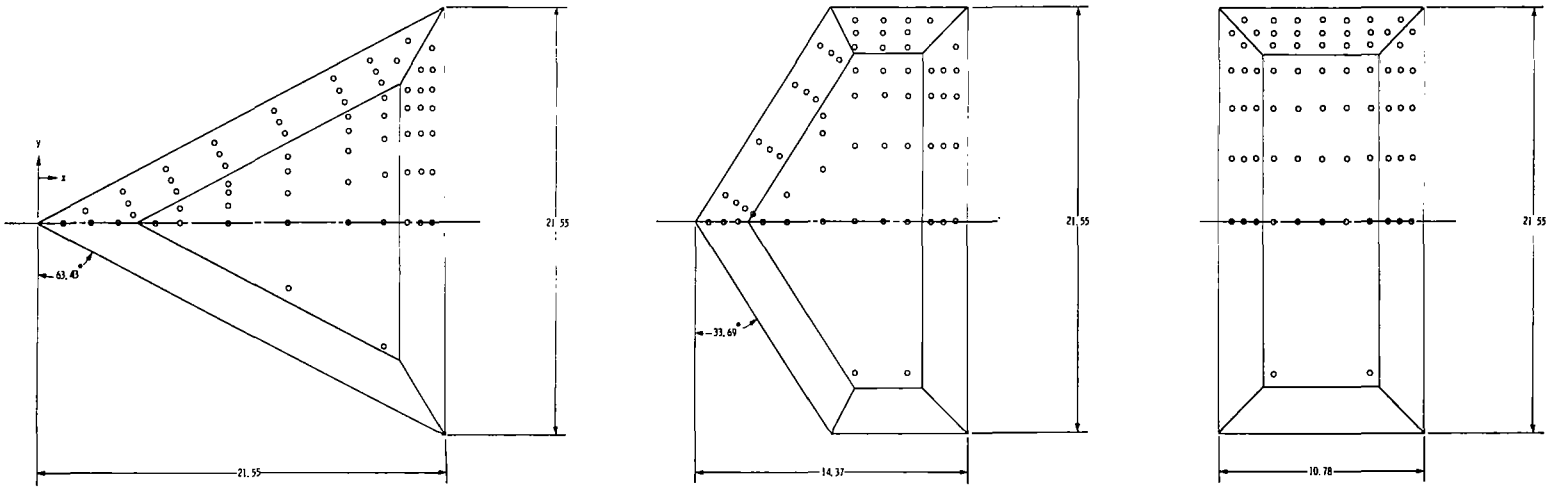
(a) $\mathcal{R} = 0.5$.

Figure 2.- Details of models. All linear dimensions are in centimeters.



(b) $\mathcal{R}$ = 1.0.

Figure 2.- Continued.



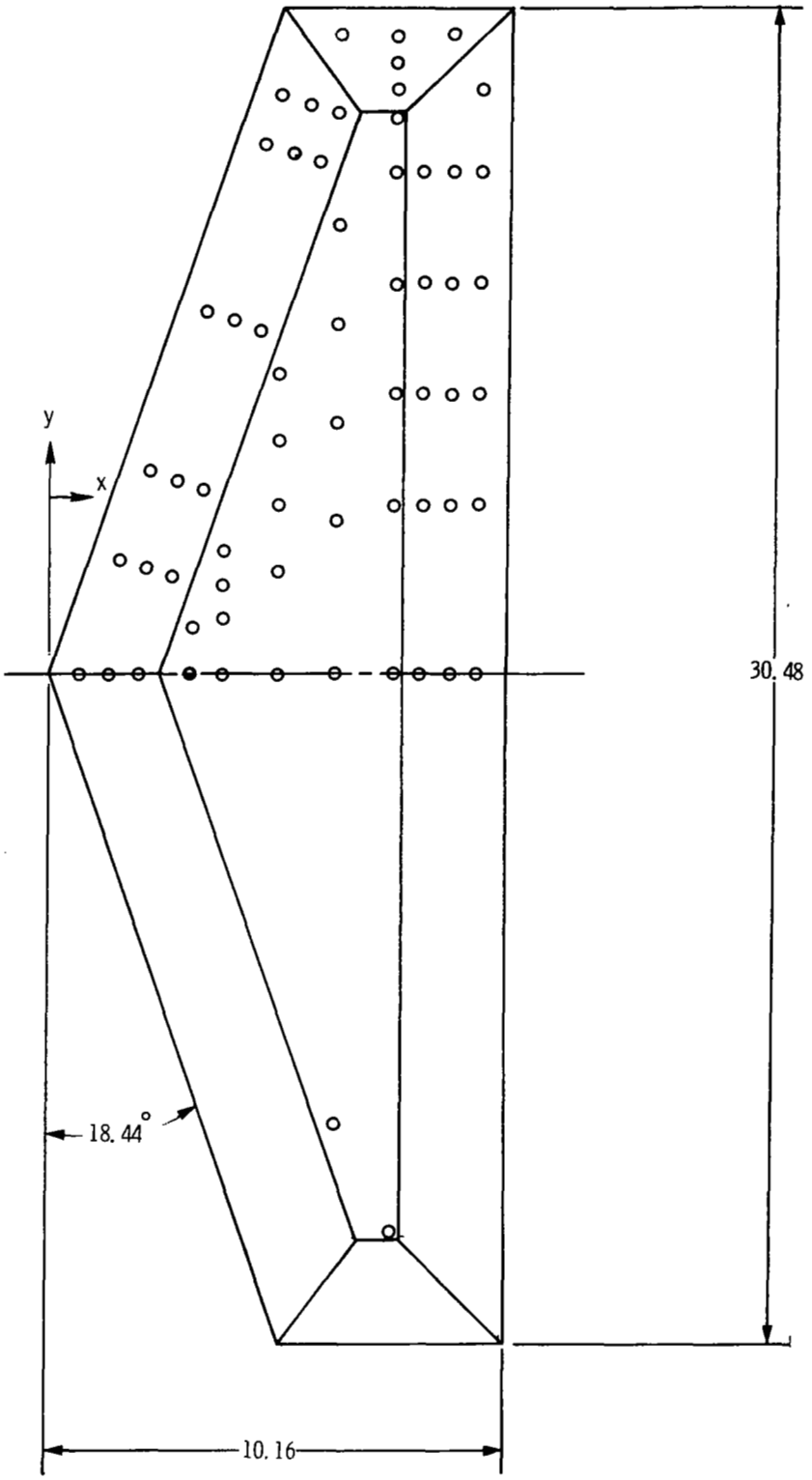
Model 7
$\lambda = 0$
$\frac{x_{c.w}}{L} = 0.67$
$\frac{y_{c.w}}{b/2} = 0.33$
$\bar{c} = 14.37$

Model 8
$\lambda = 0.5$
$\frac{x_{c.w}}{L} = 0.61$
$\frac{y_{c.w}}{b/2} = 0.44$
$\bar{c} = 11.18$

Model 9
$\lambda = 1.0$
$\frac{x_{c.w}}{L} = 0.50$
$\frac{y_{c.w}}{b/2} = 0.50$
$\bar{c} = 10.78$

(c) $\mathcal{R} = 2.0$.

Figure 2.- Continued.



Model 10

$\lambda = 0.5$

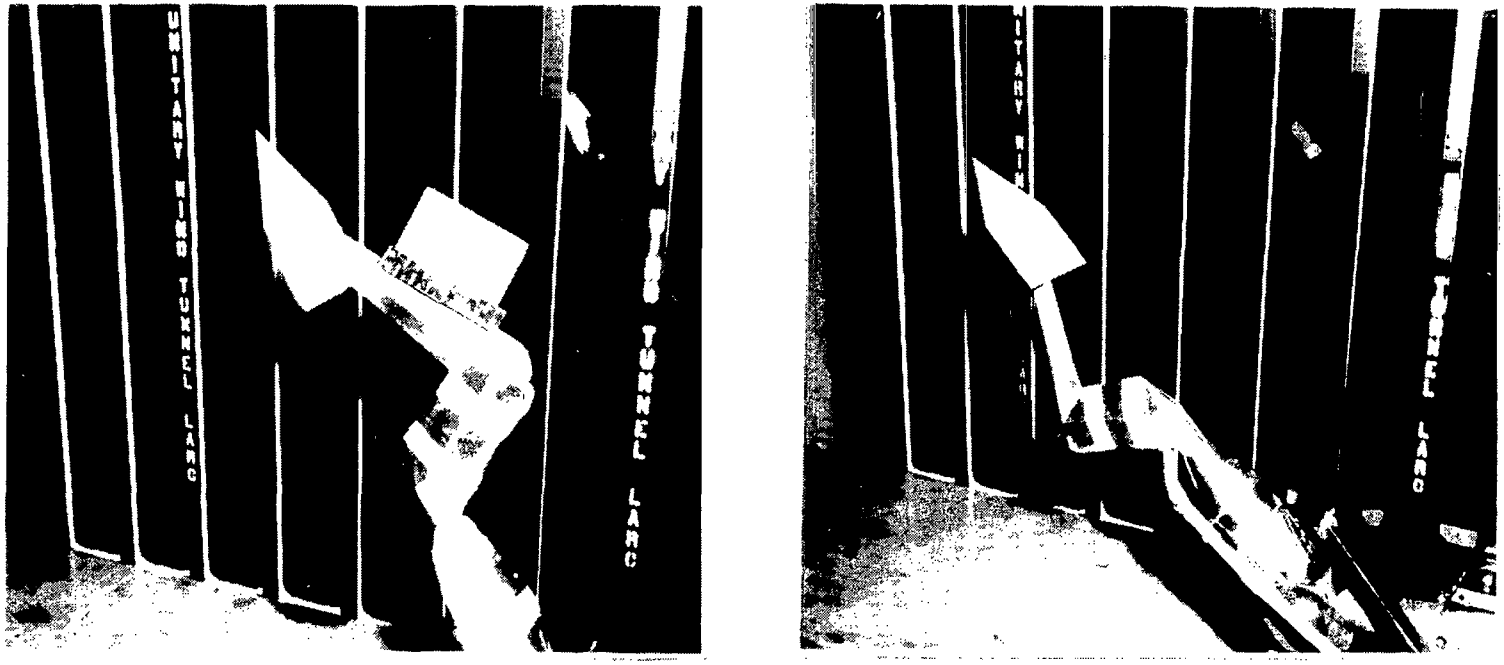
$\frac{x_{c,w}}{L} = 0.61$

$\frac{y_{c,w}}{b/2} = 0.44$

$\bar{c} = 7.90$

(d) $AR = 4.0$.

Figure 2.- Concluded.



(a) Pressure instrumentation windward.

(b) Pressure instrumentation leeward.

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Figure 3.- Model installation photographs.

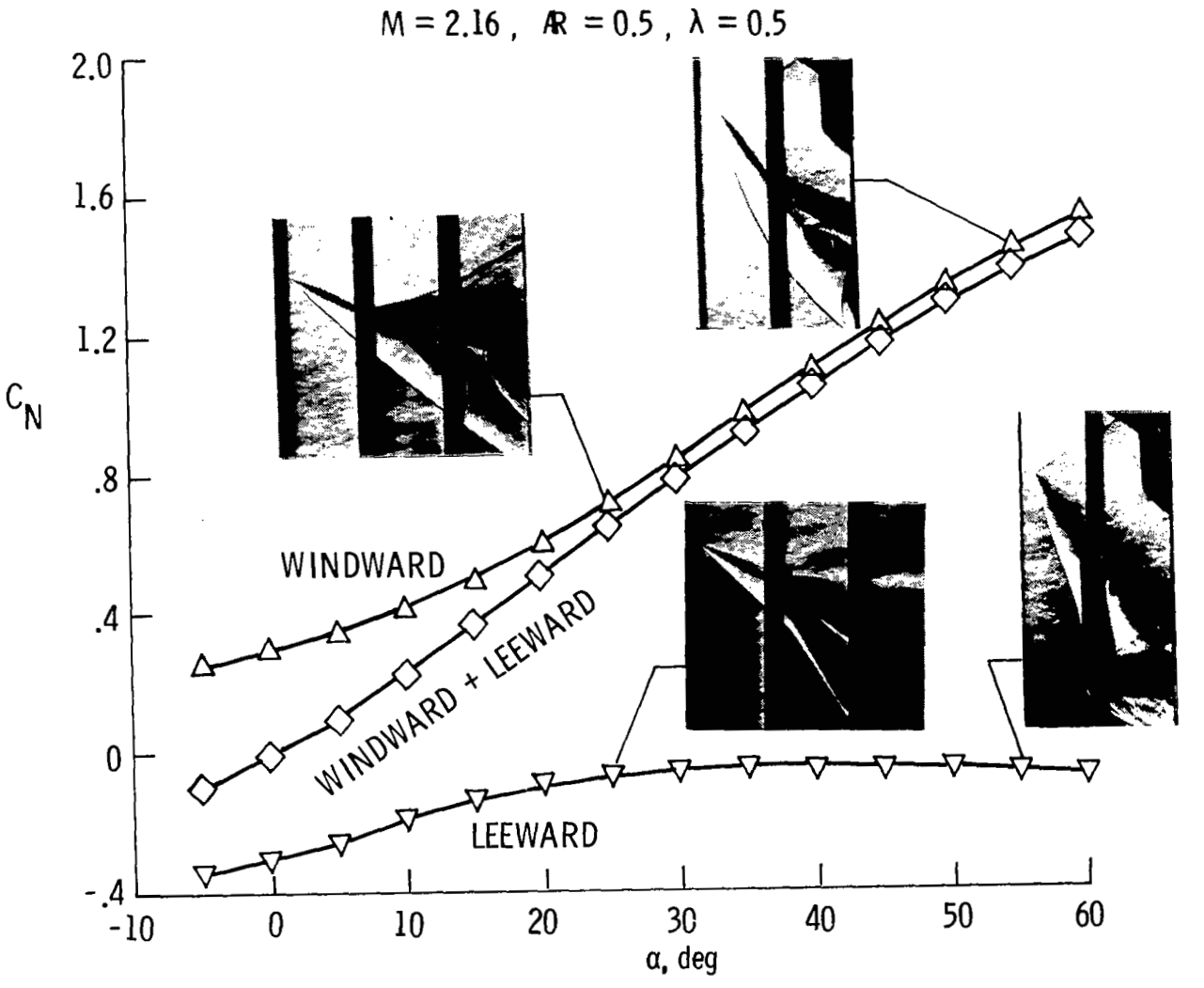


Figure 4.- Typical force data from integrated pressures.

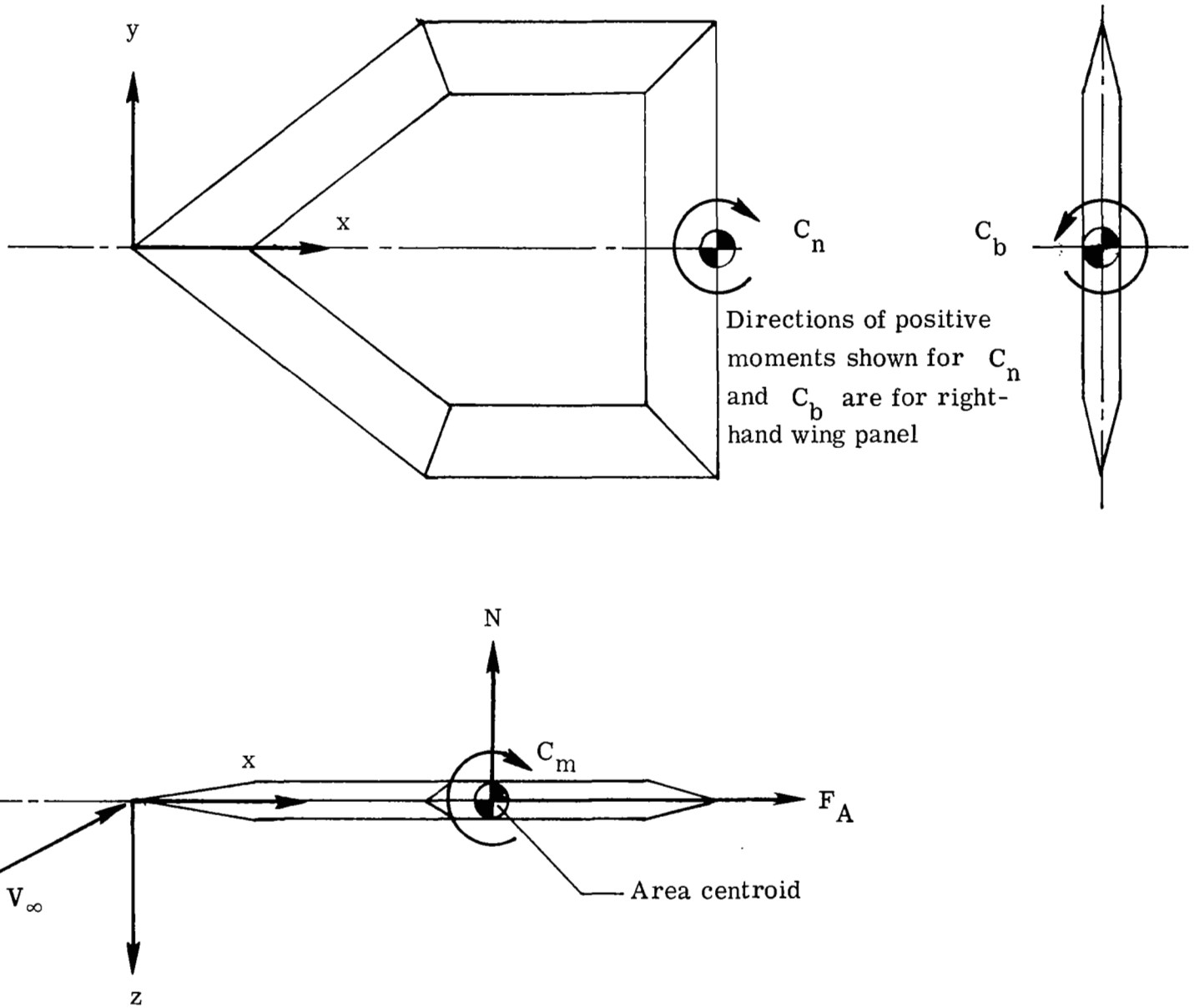
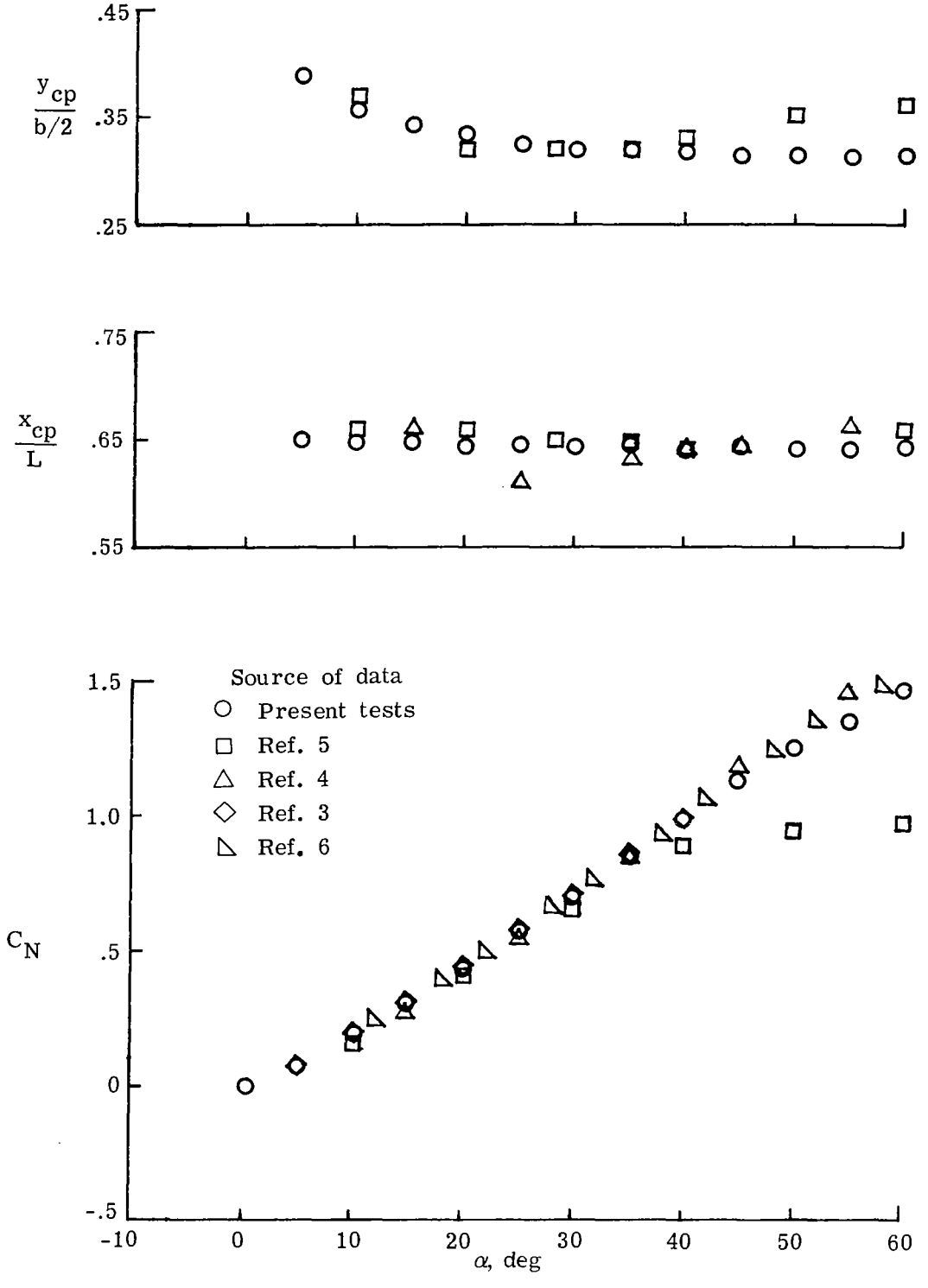
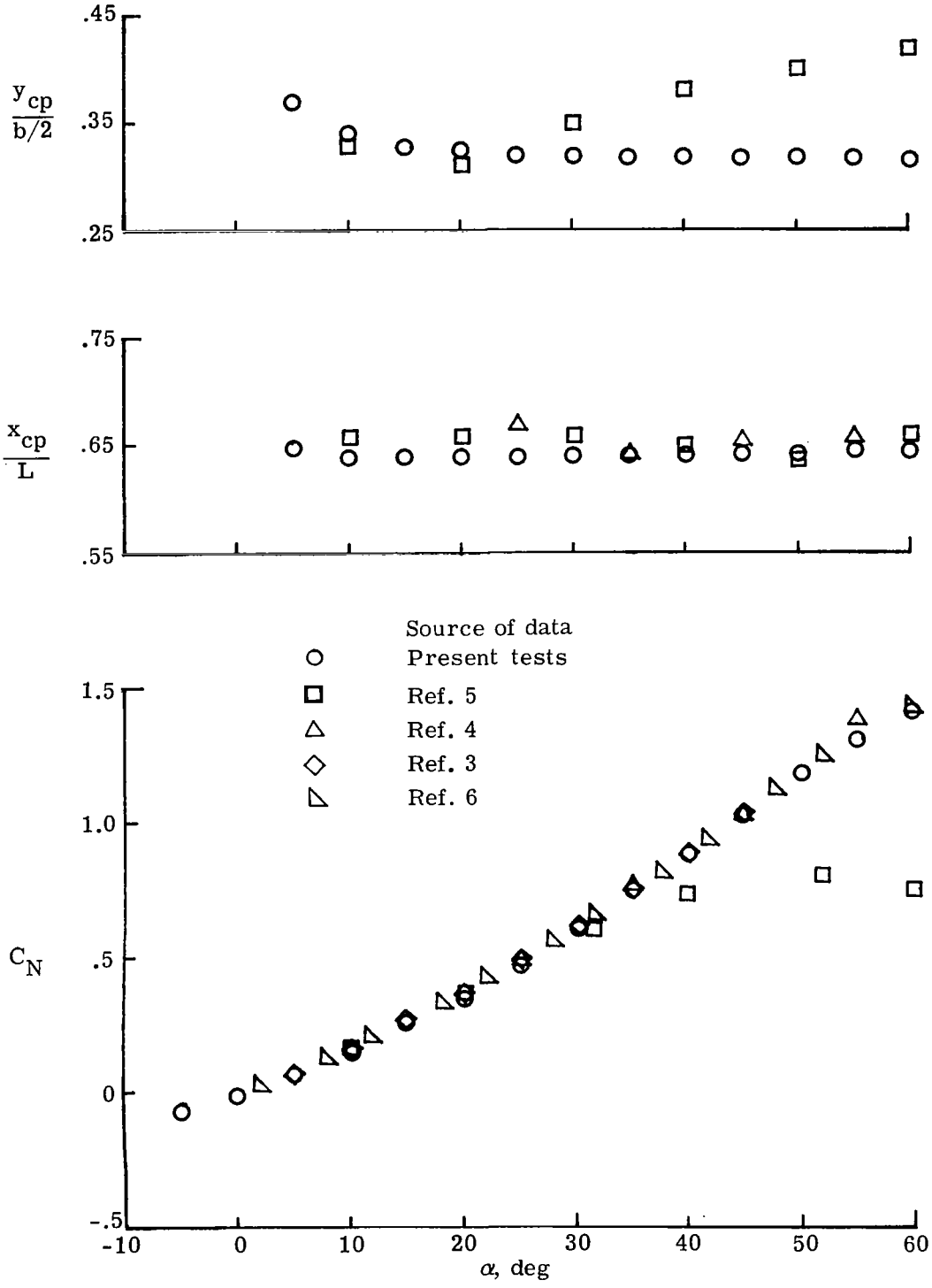


Figure 5.- Moment-center location and sign conventions.



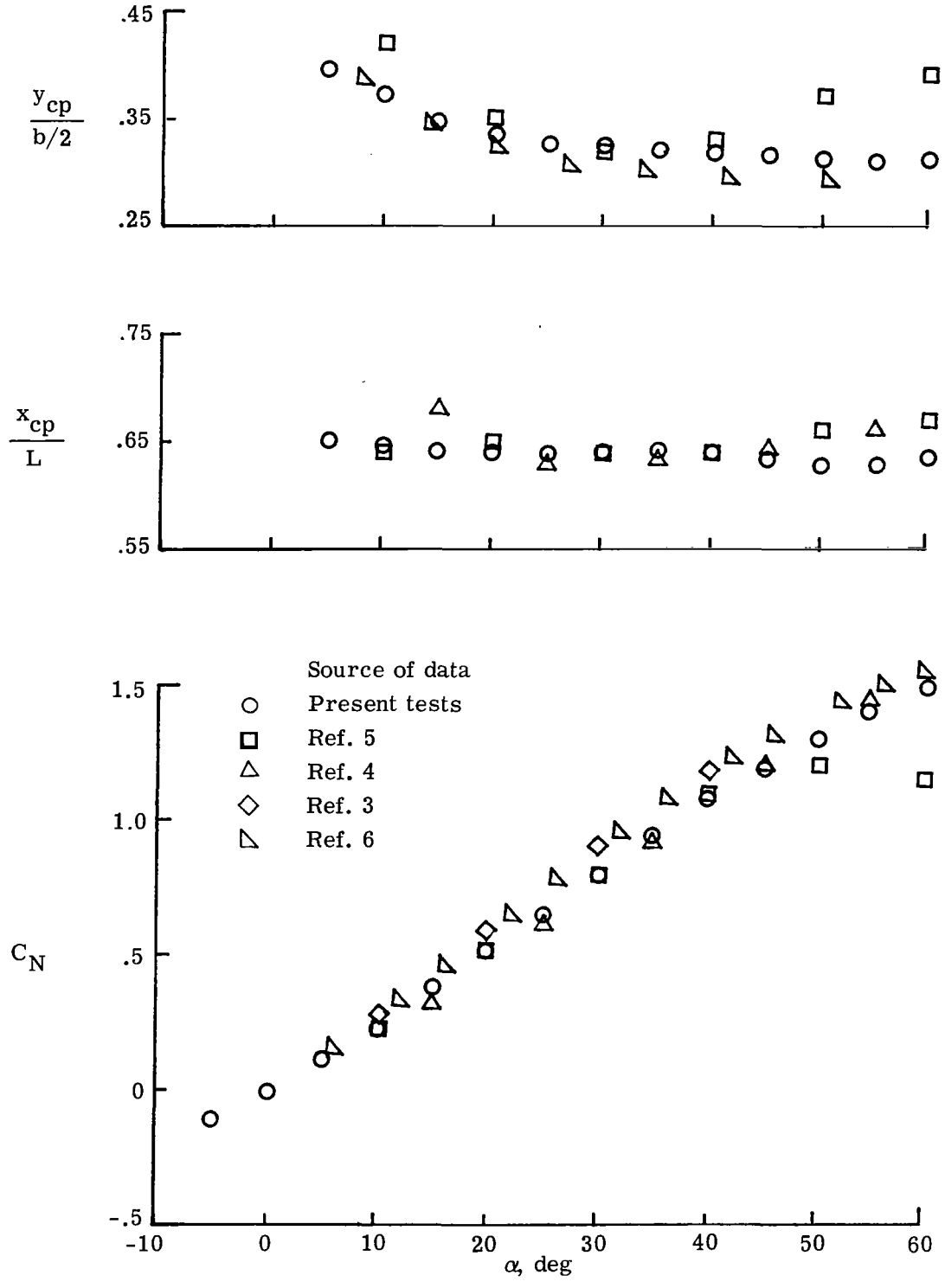
(a) $\lambda = 0$; $R = 0.5$; $M_{nom} = 2.00$.

Figure 6.- Comparison of present data with previously published data.



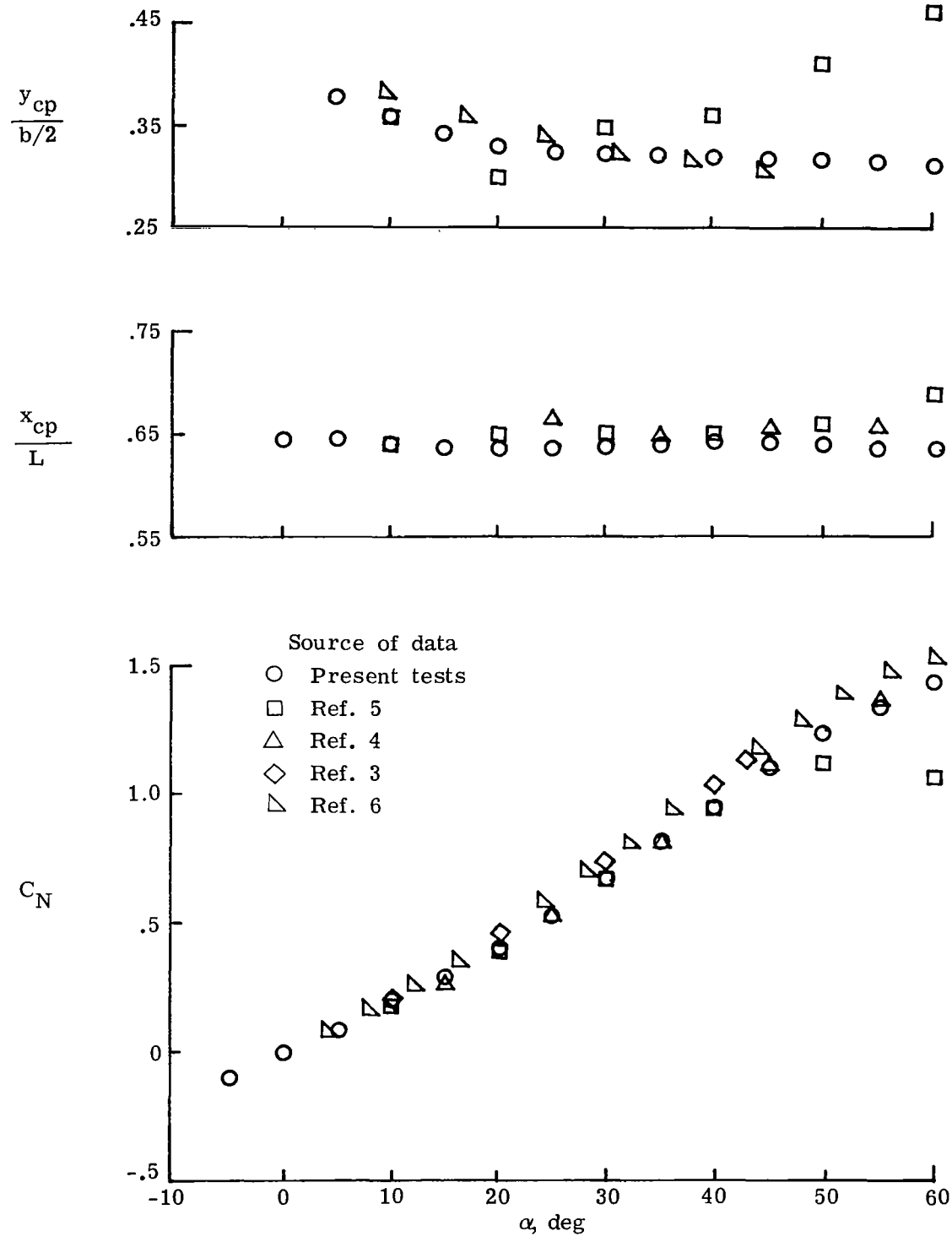
(b) $\lambda = 0$; $\mathcal{R} = 0.5$; $M_{nom} = 3.00$.

Figure 6.- Continued.



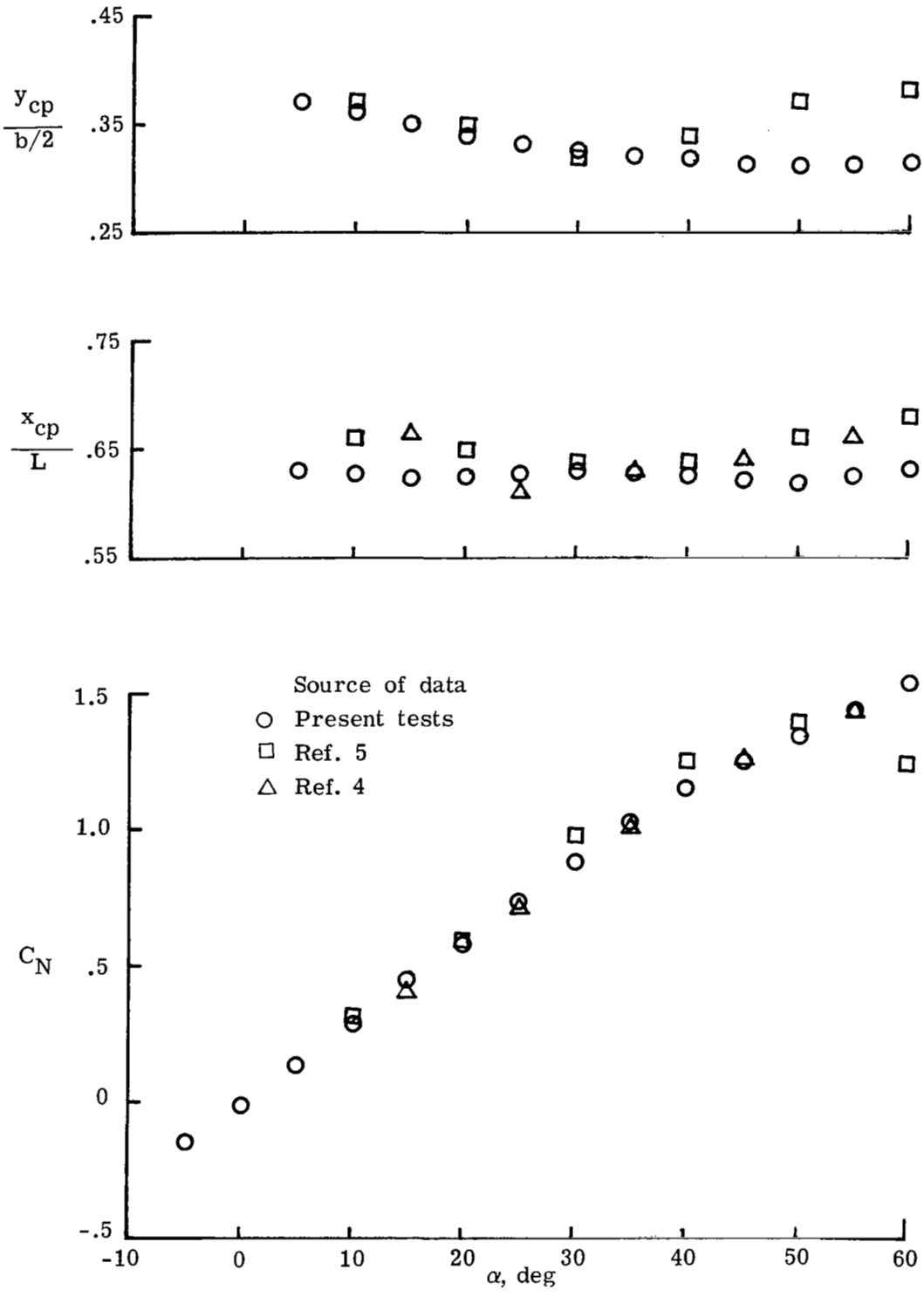
(c) $\lambda = 0$; $\mathcal{R} = 1.0$; $M_{nom} = 2.00$.

Figure 6.- Continued.



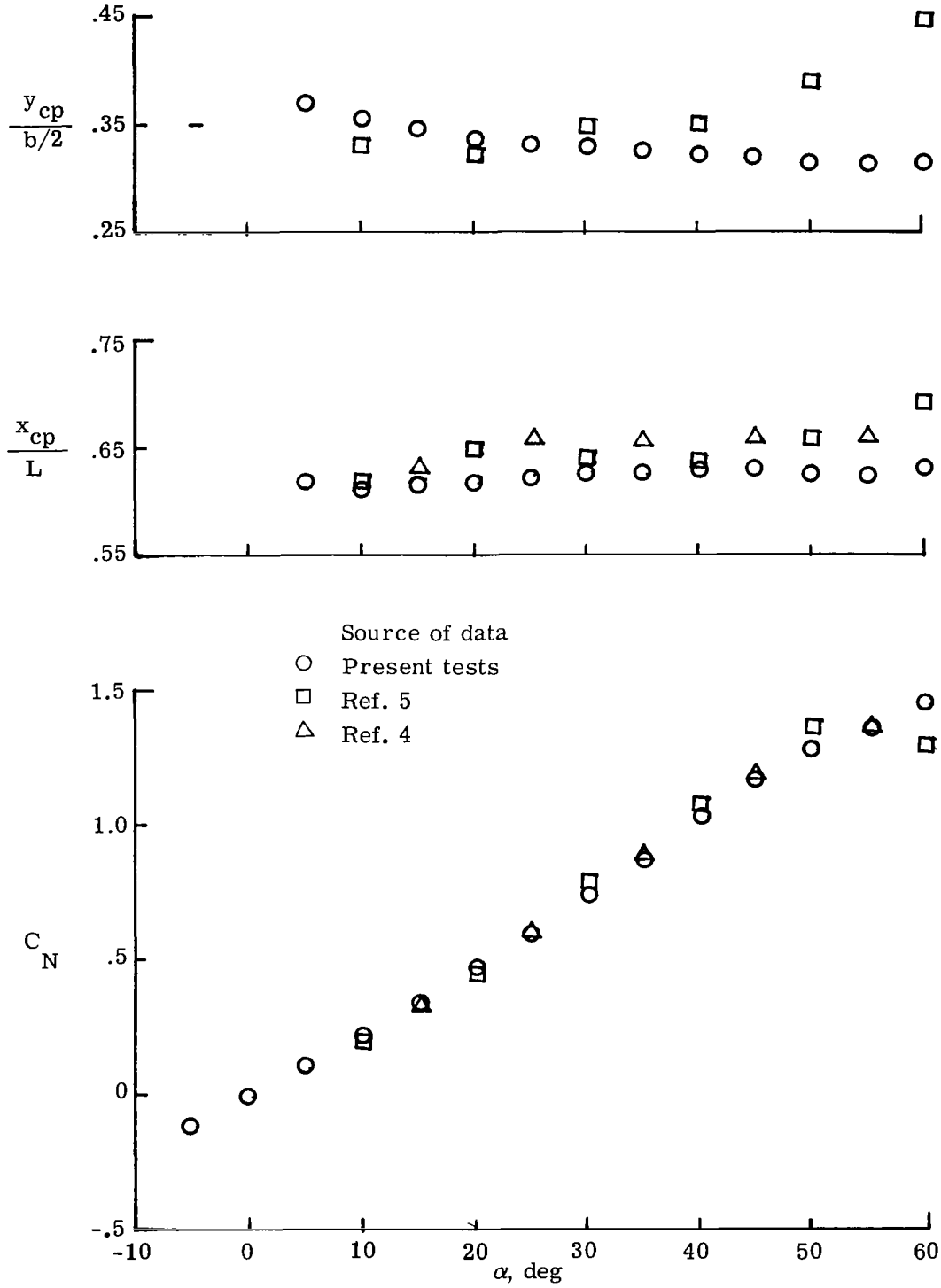
(d) $\lambda = 0$; $\mathcal{R} = 1.0$; $M_{nom} = 3.00$.

Figure 6.- Continued.



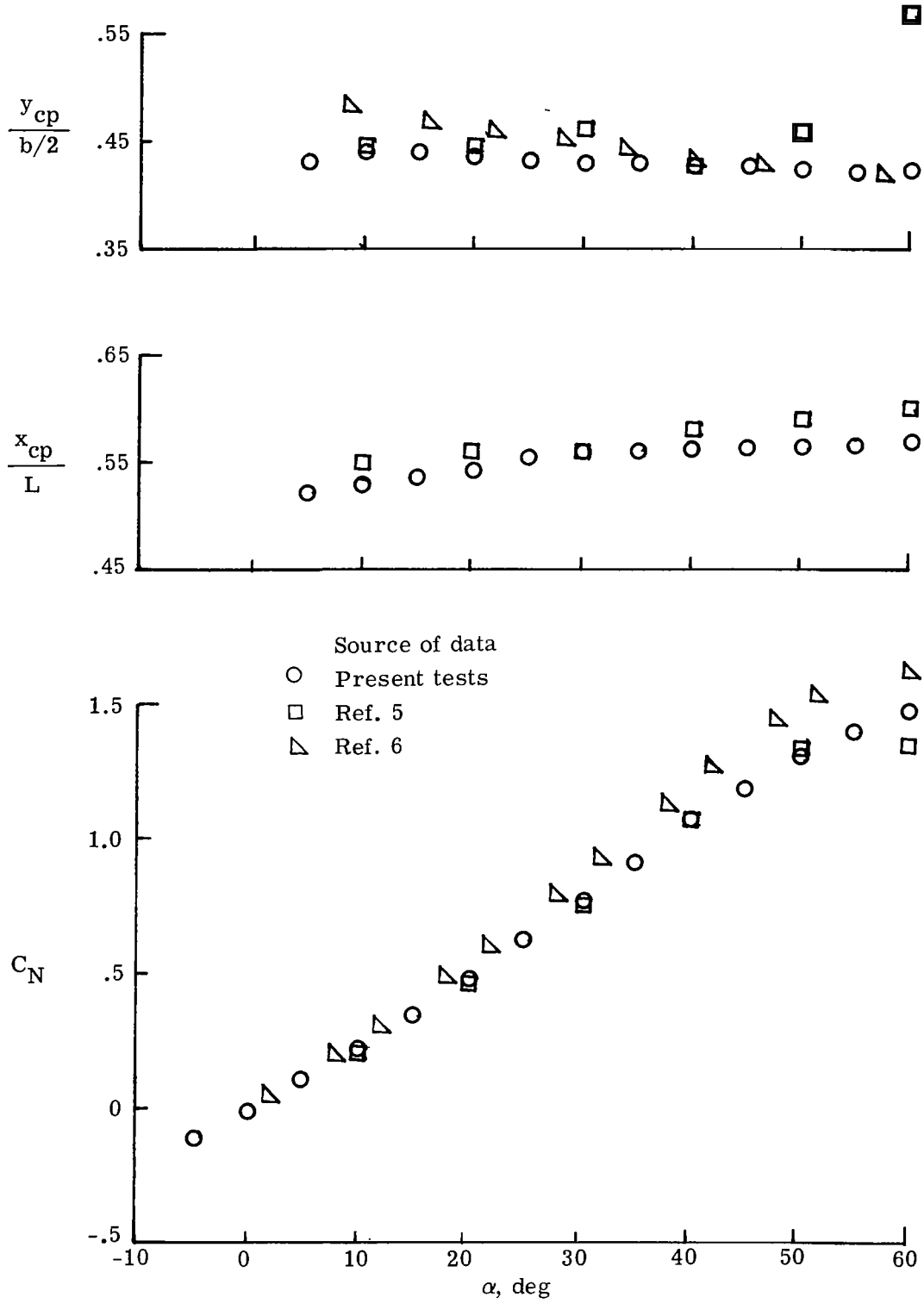
(e) $\lambda = 0$; $\mathcal{R} = 2.0$; $M_{nom} = 2.00$.

Figure 6.- Continued.



(f) $\lambda = 0$; $\mathcal{R} = 2.0$; $M_{nom} = 3.00$.

Figure 6.- Continued.



(g) $\lambda = 0$; $\mathcal{R} = 0.5$; $\mathcal{R} = 1.0$; $M_{nom} = 3.00$.

Figure 6.- Concluded.

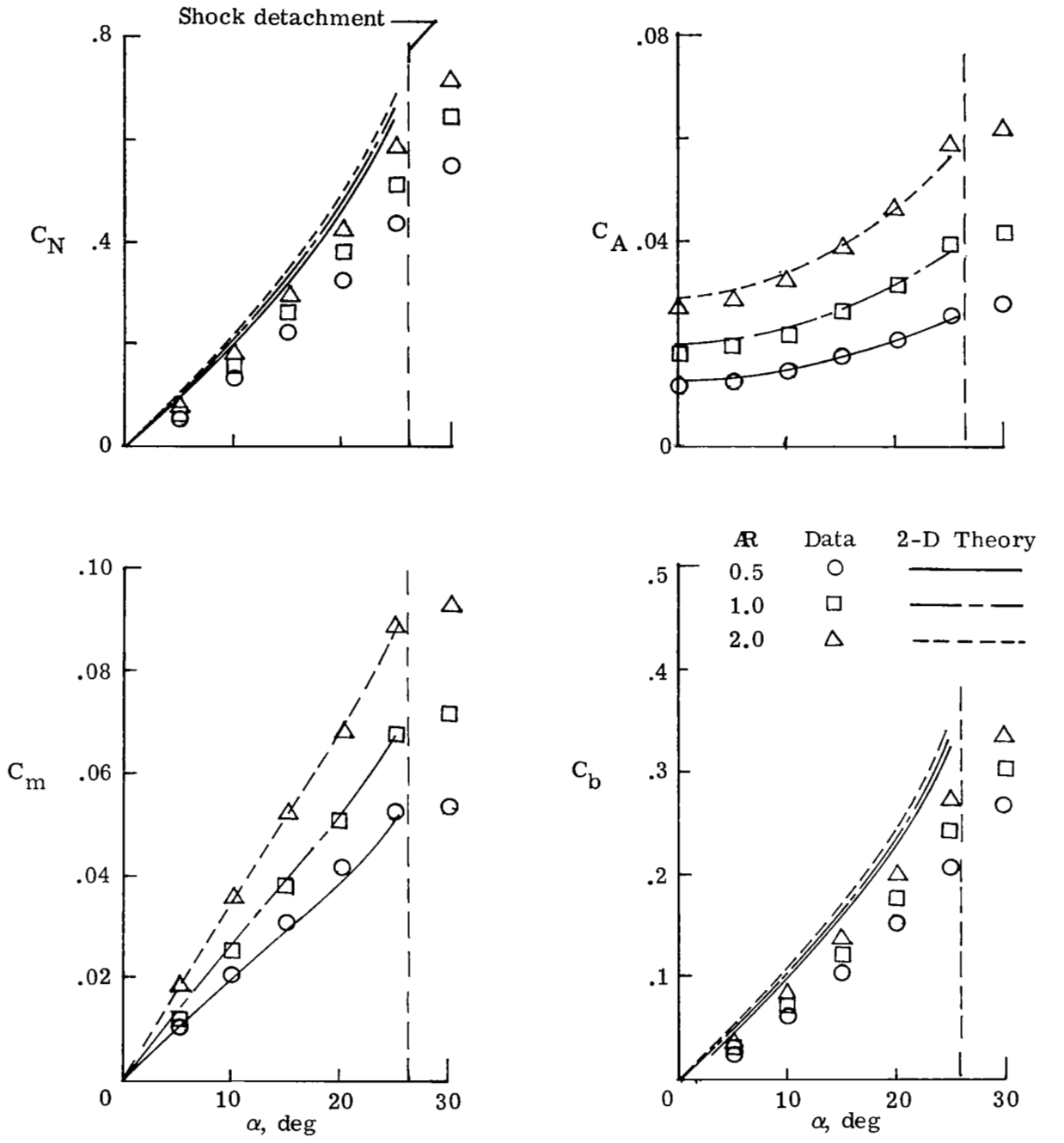
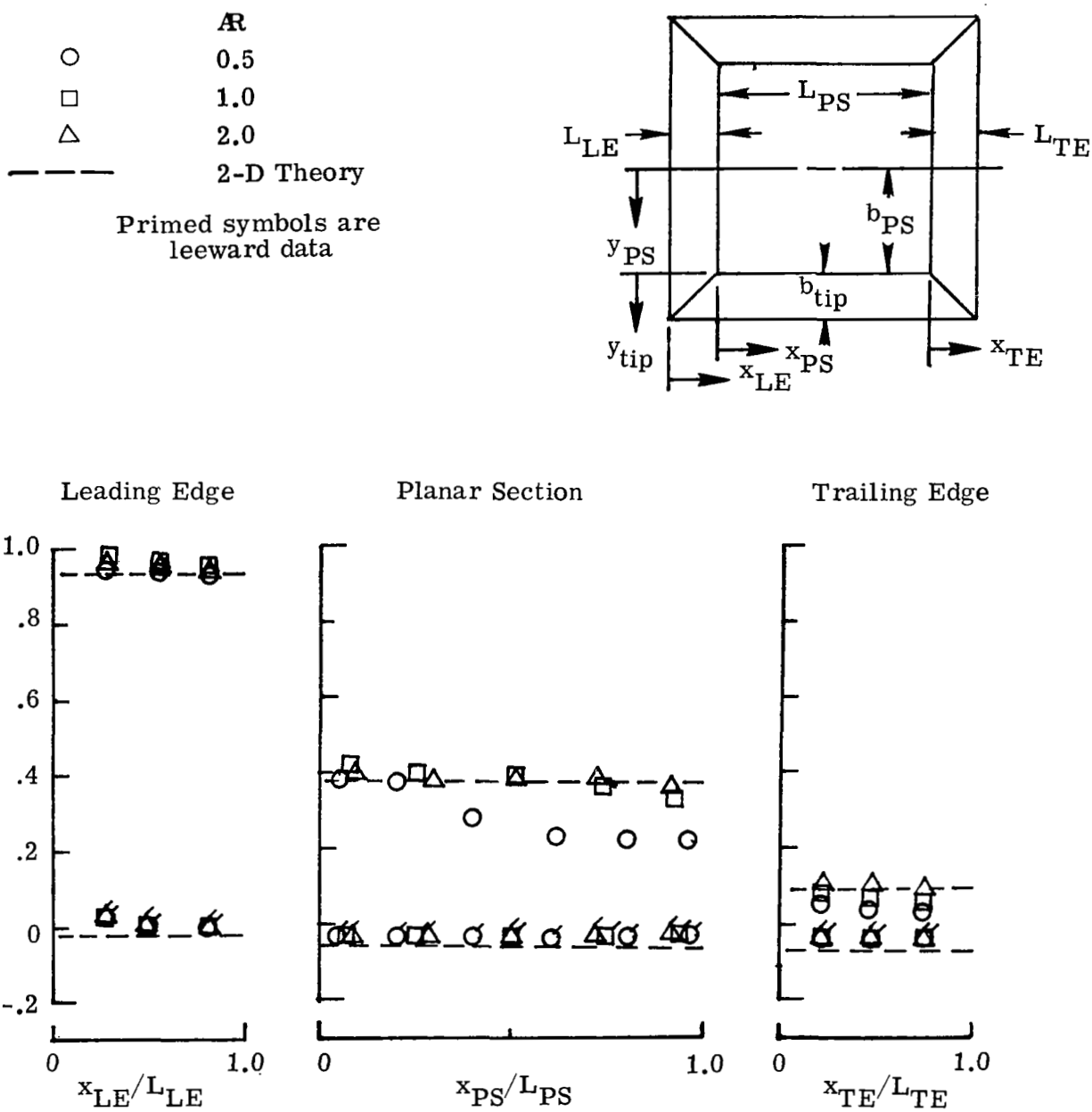


Figure 7.- Comparison of present data from rectangular wings (λ = 1.0) with theoretical calculations based on oblique shock and Prandtl-Meyer-expansion equations. M = 4.60.

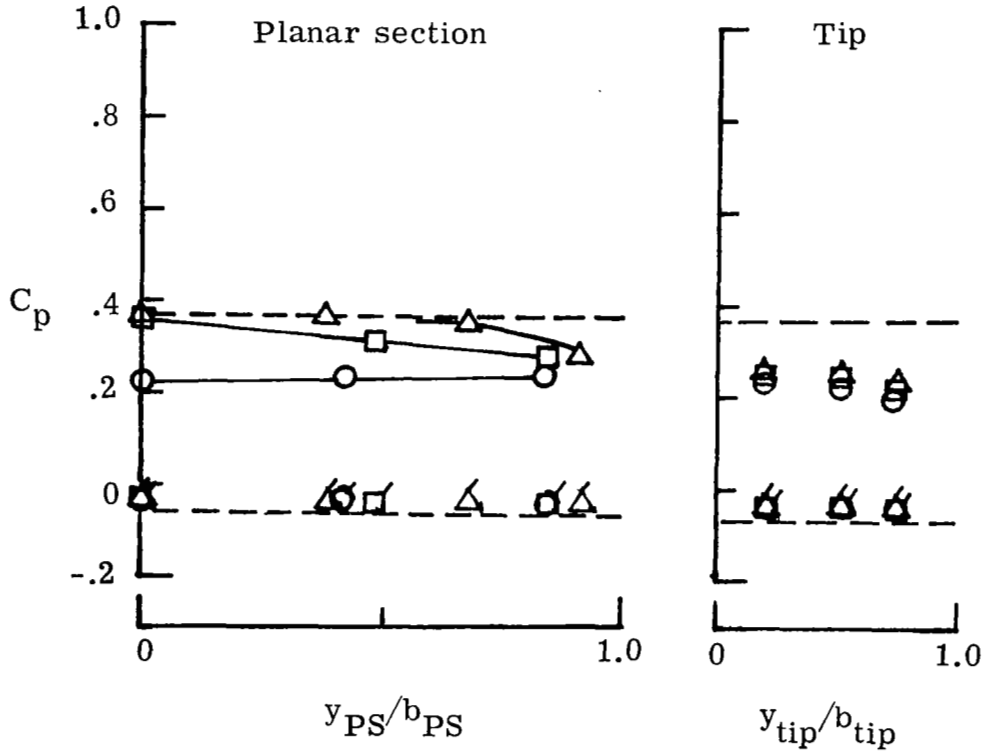


(a) Centerline pressure distributions.

Figure 8.- Effects of aspect ratio on pressure distributions.
M = 4.60; $\alpha = 20^{\circ}$; $\lambda = 1.0$.

	AR	x_{PS}/L_{PS}
○	0.5	.613
□	1.0	.742
△	2.0	.711
– – –	2-D Theory	

Primed symbols are leeward data



(b) Spanwise pressure distributions.

Figure 8.- Concluded.

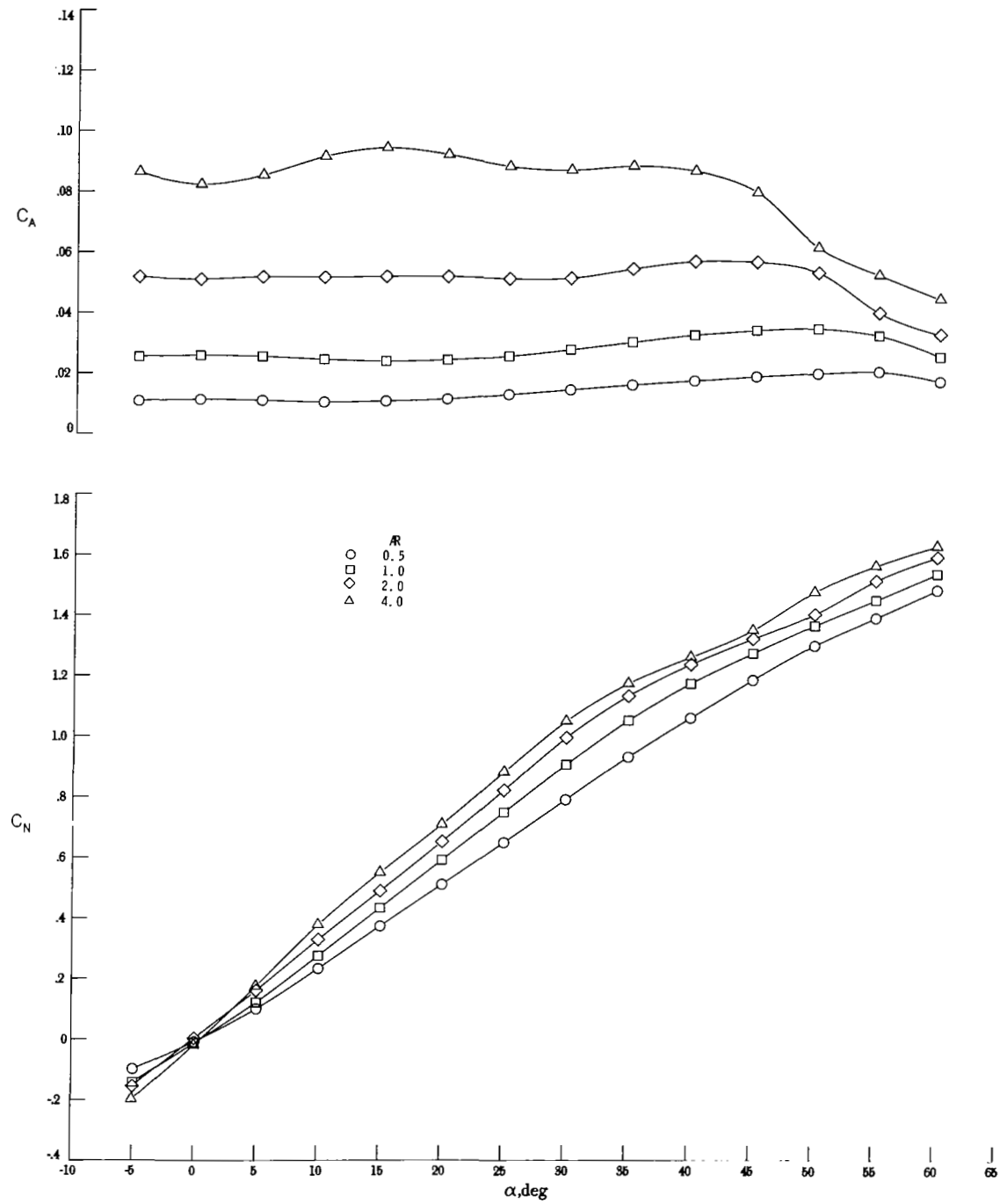


Figure 9.- Effects of aspect ratio on wing aerodynamic characteristics. $\lambda = 0.5$; $M = 2.16$.

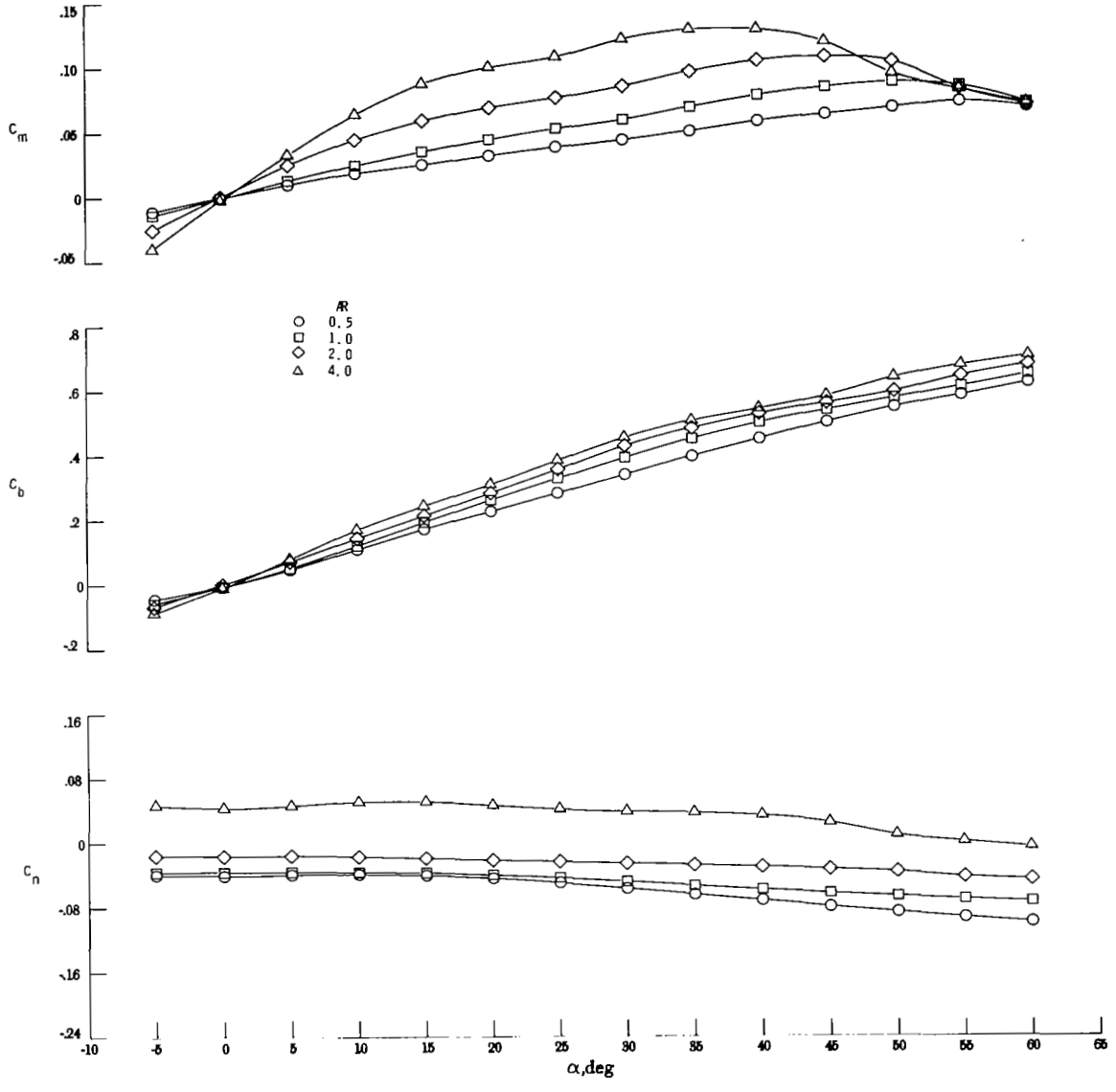


Figure 9.- Continued.

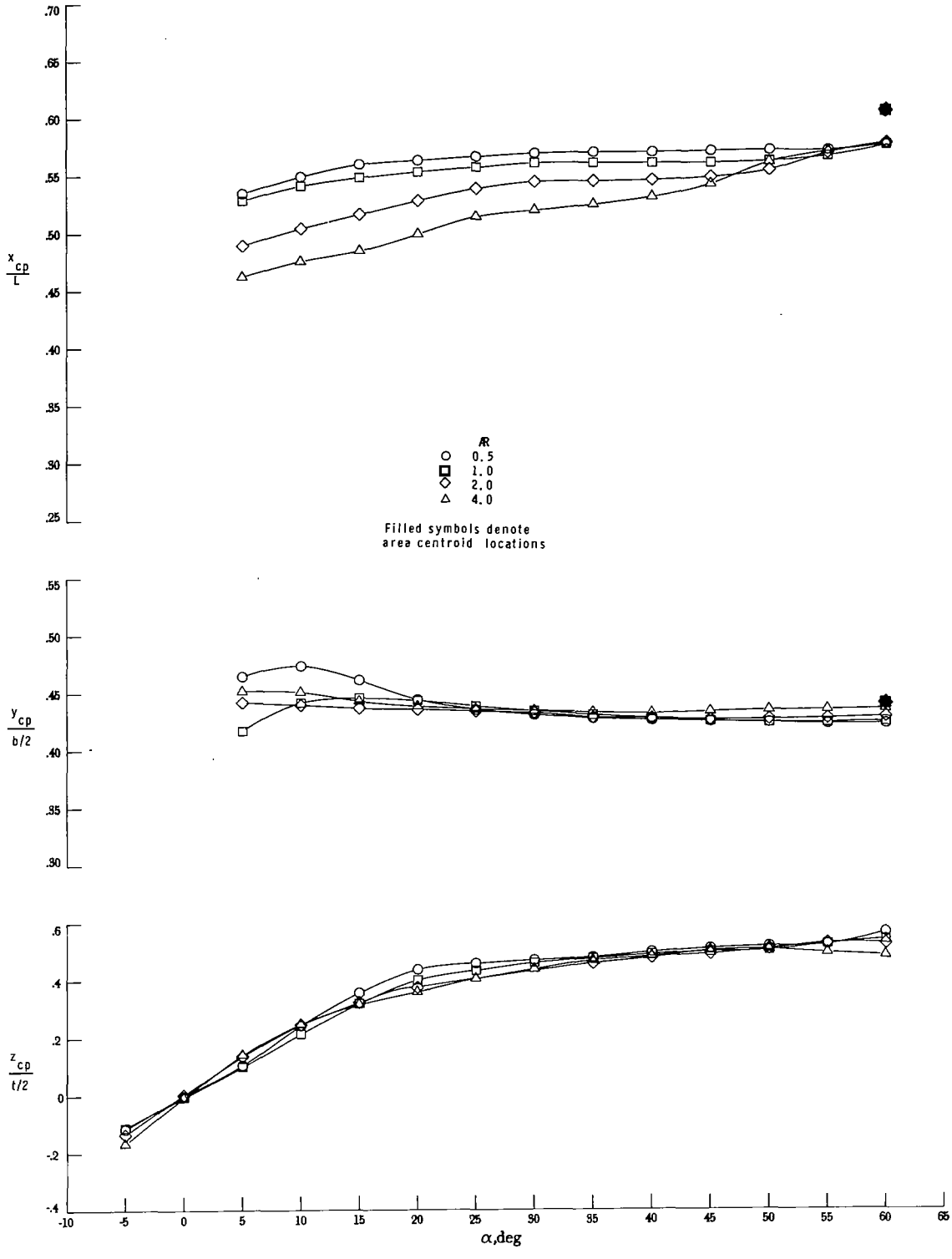


Figure 9.- Concluded.

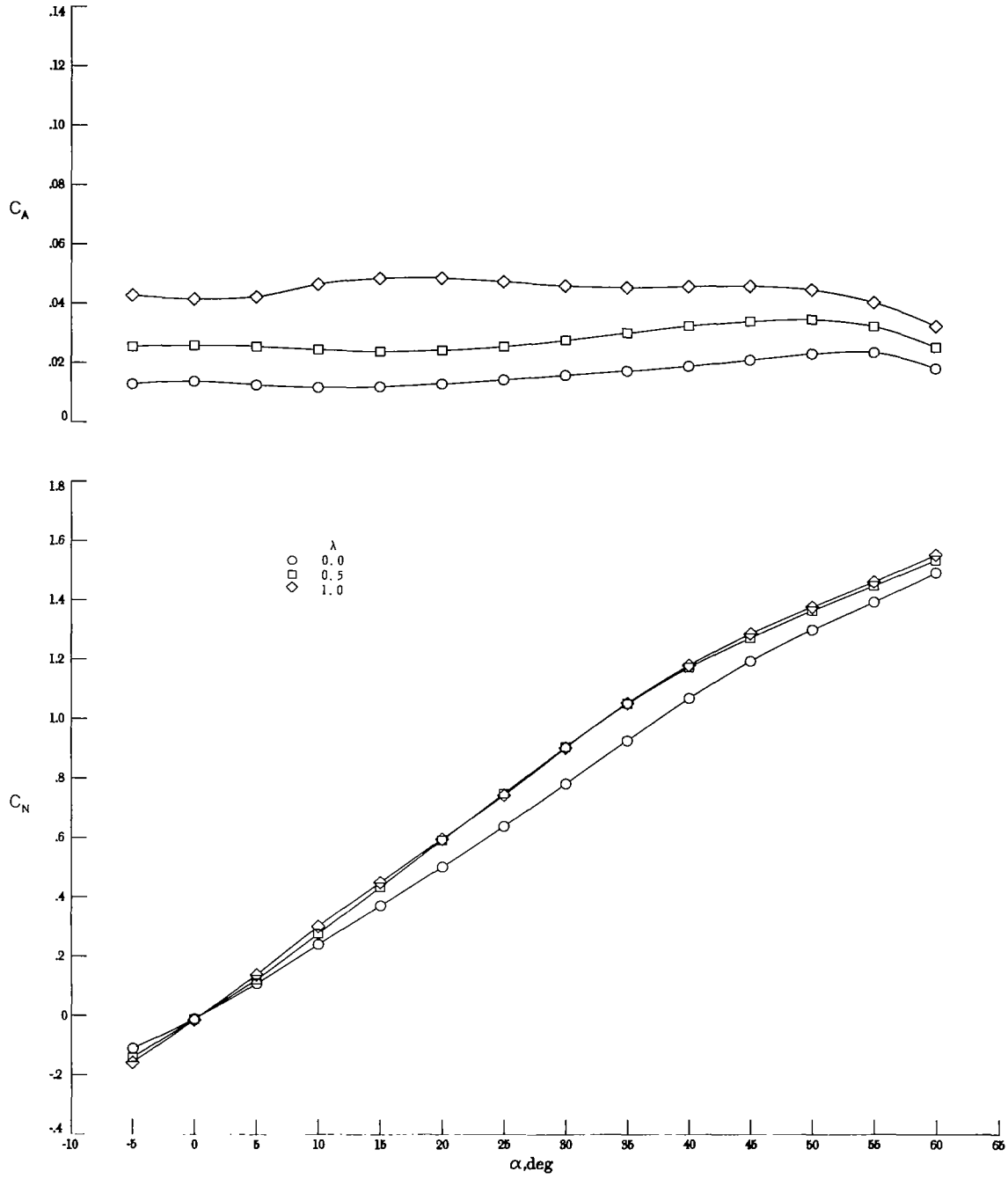


Figure 10.- Effects of taper ratio on wing aerodynamic characteristics. $\mathcal{R}$ = 1.0; M = 2.16.

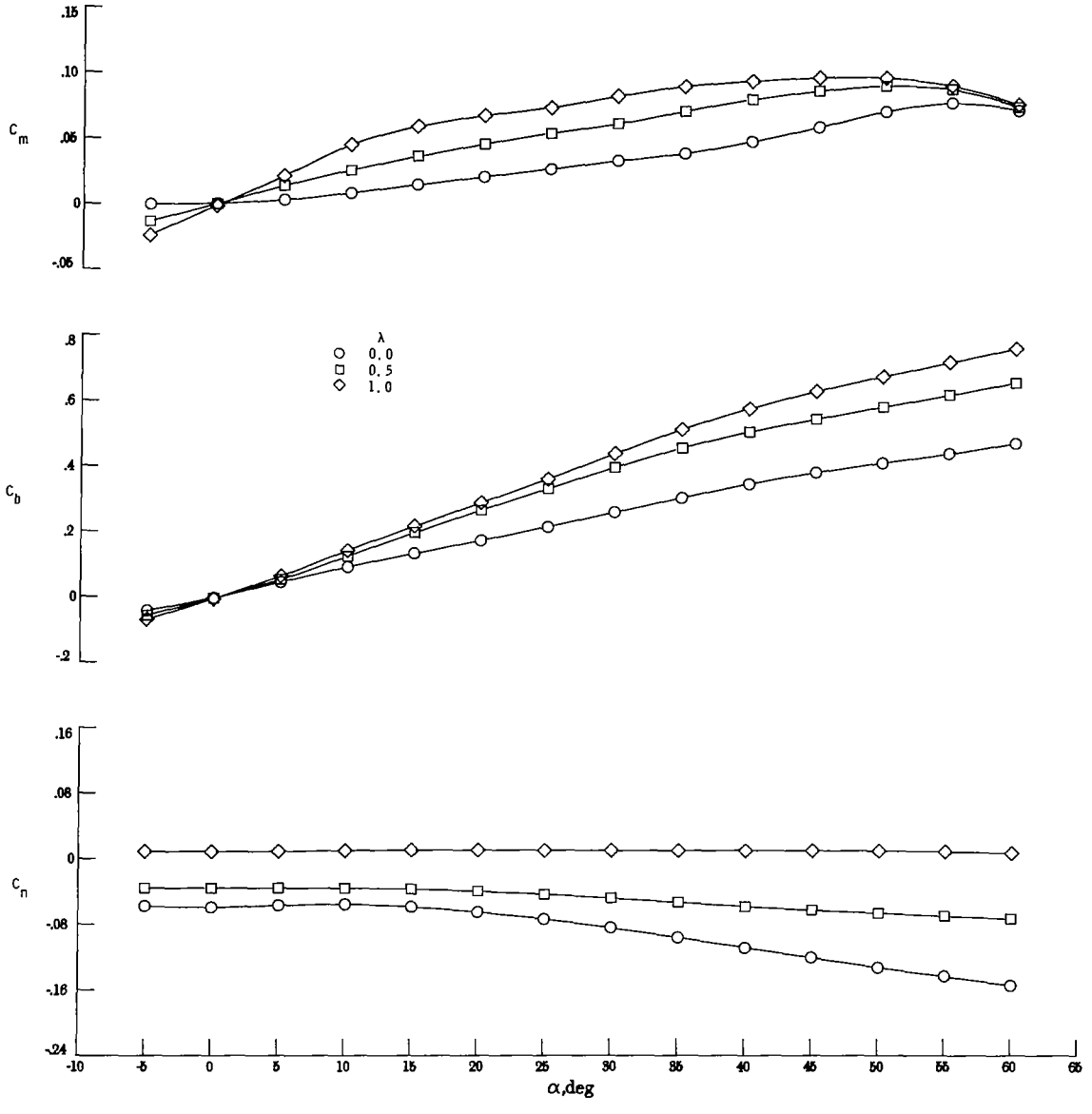


Figure 10.- Continued.

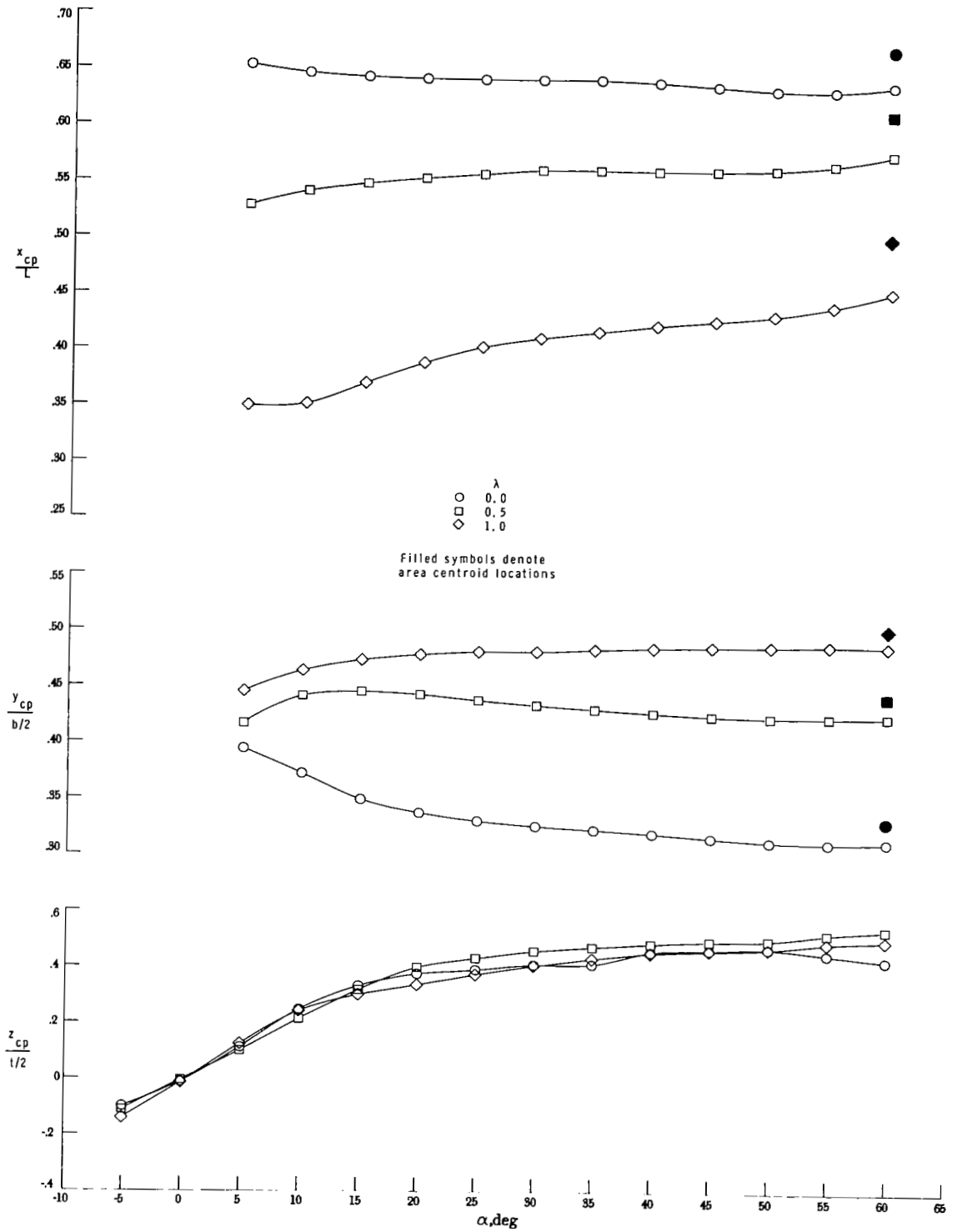


Figure 10.- Concluded.

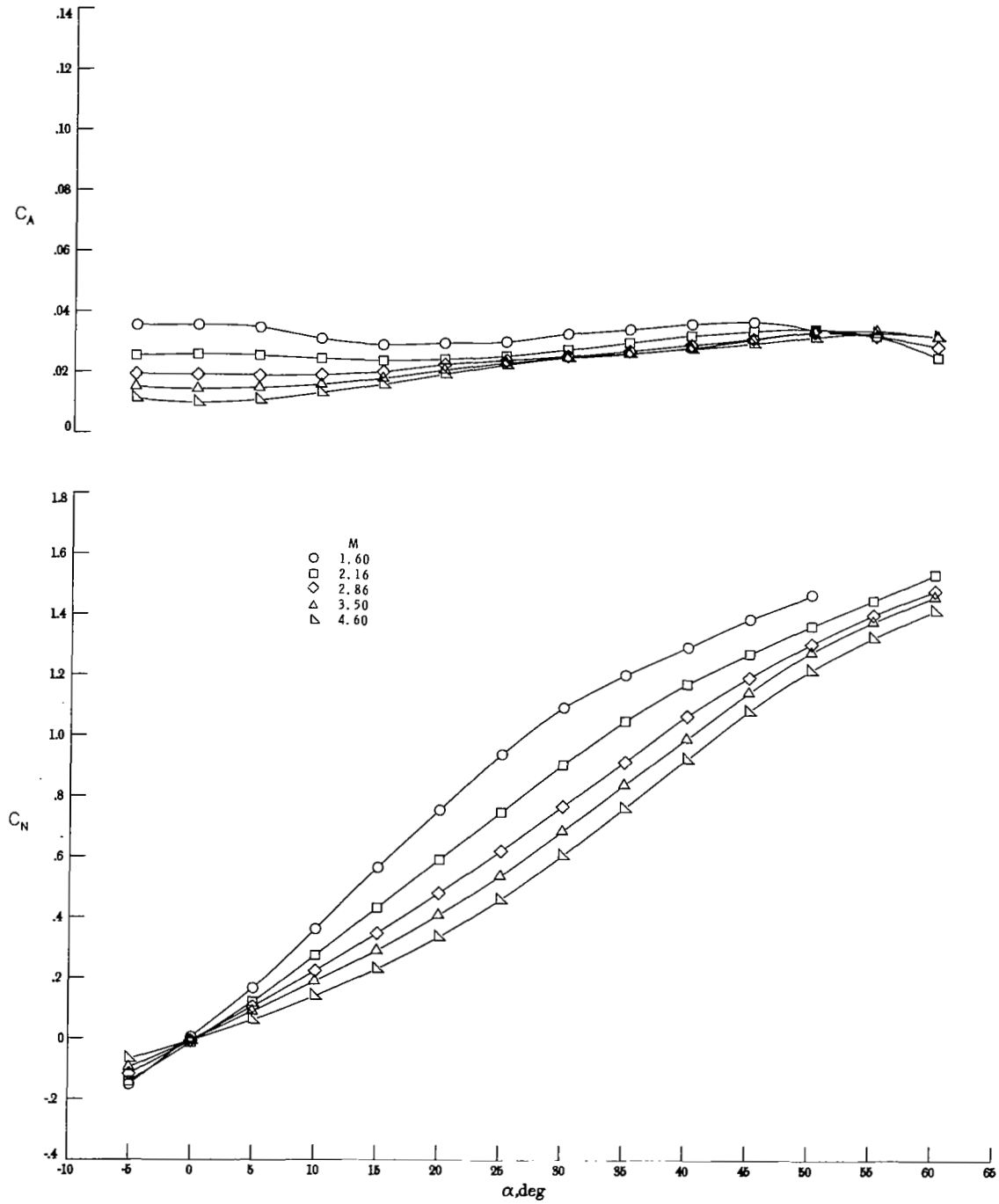


Figure 11.- Effects of Mach number on wing aerodynamic characteristics. $\mathcal{R} = 1.0$; $\lambda = 0.5$.

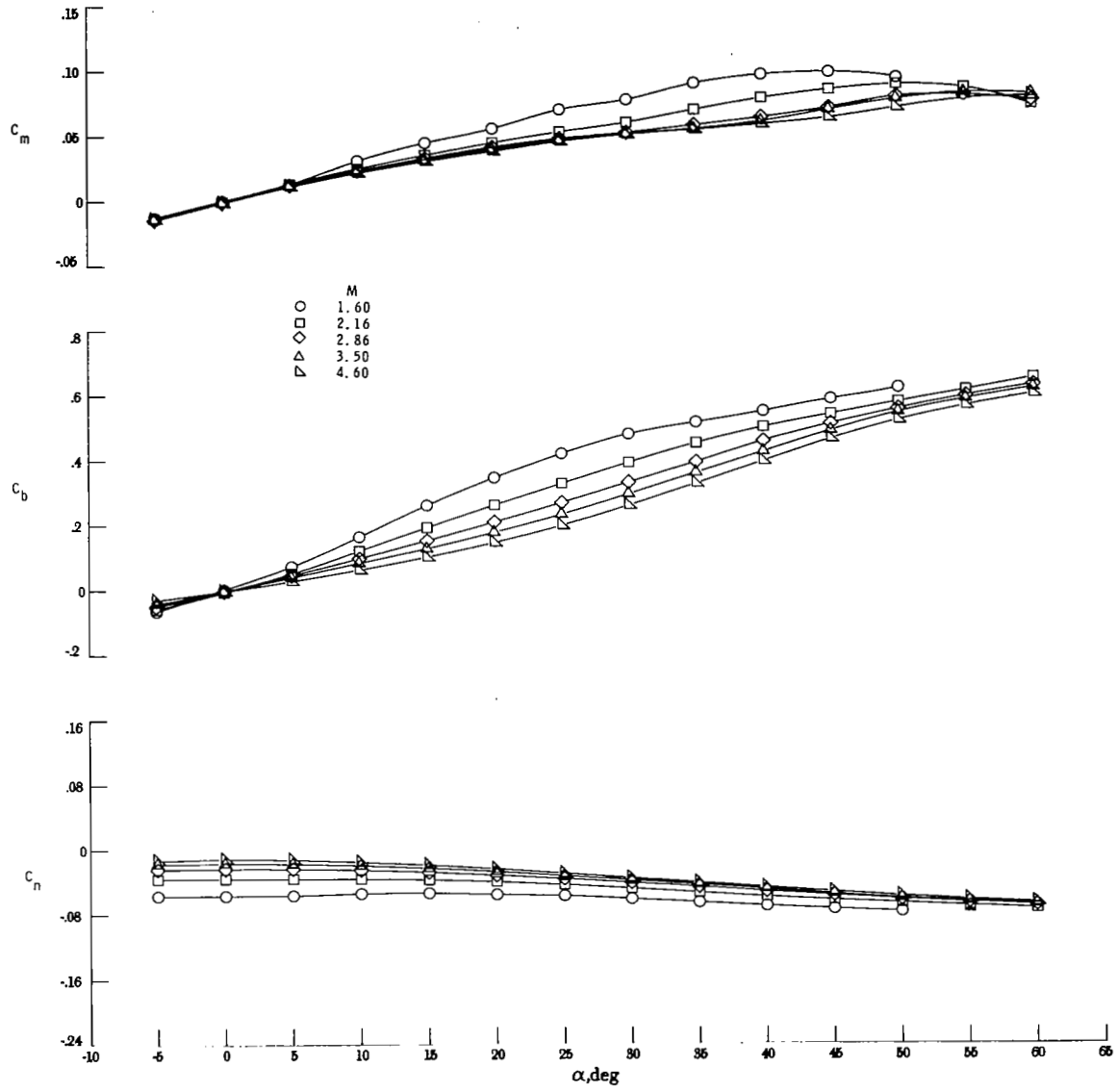


Figure 11.- Continued.

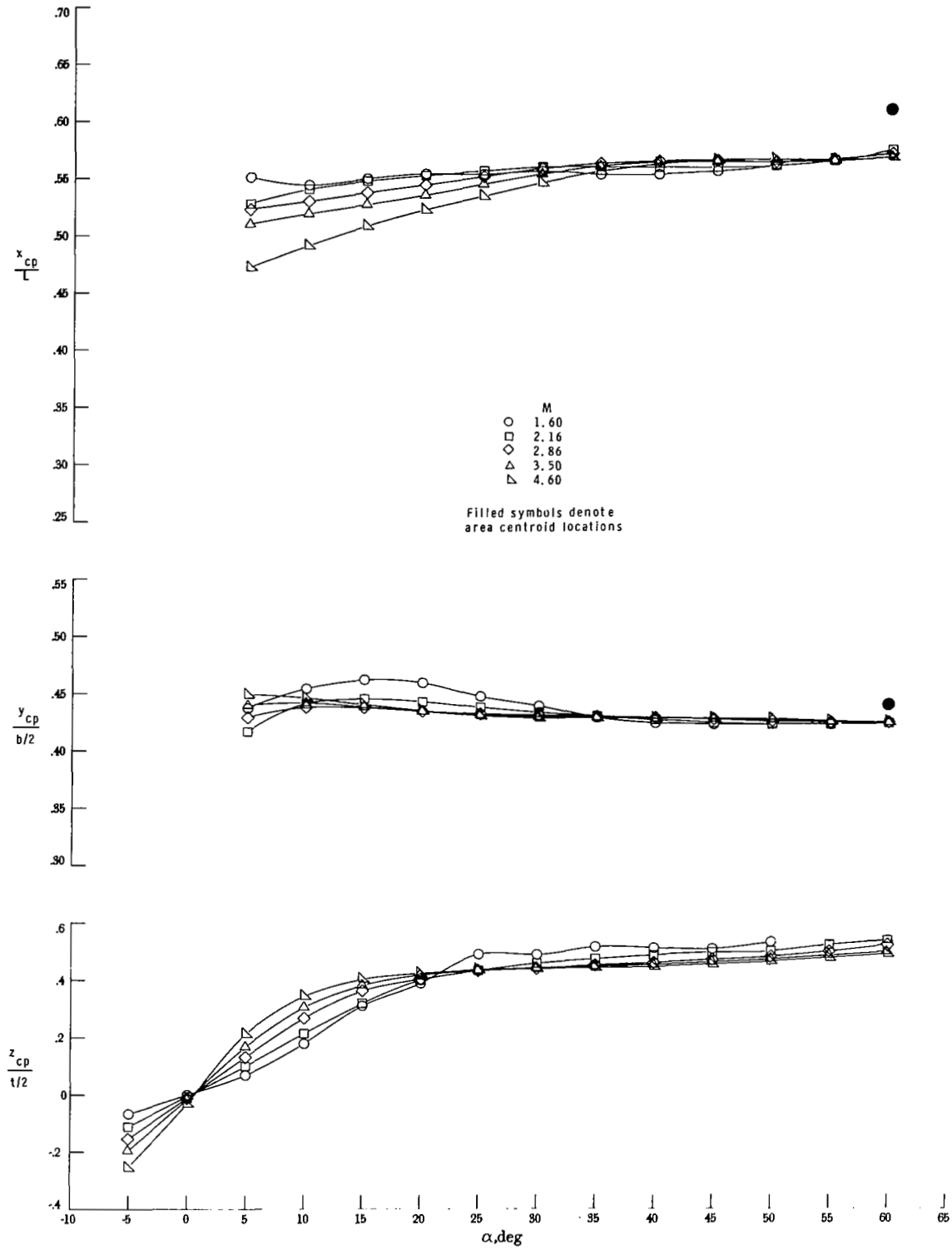
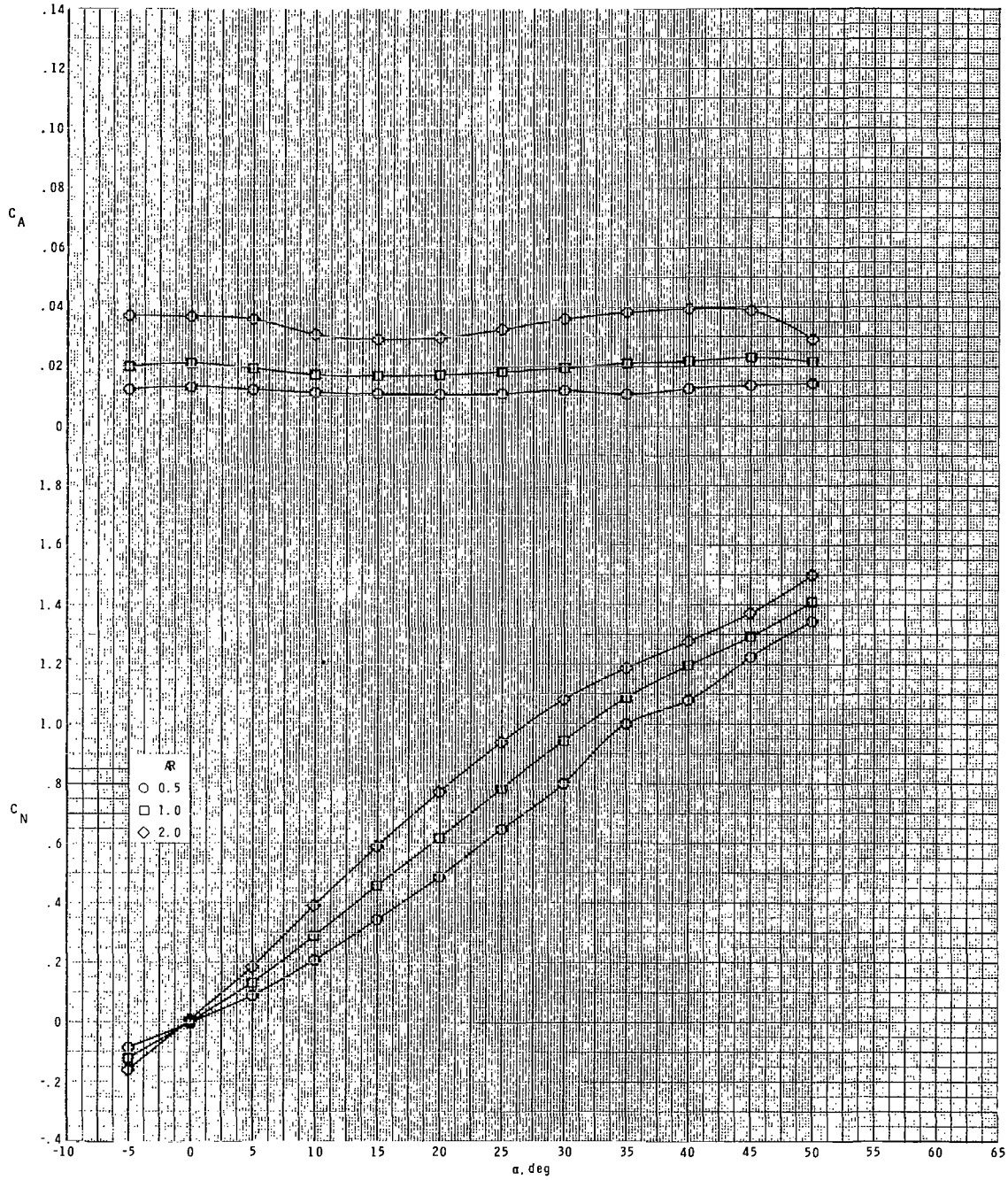
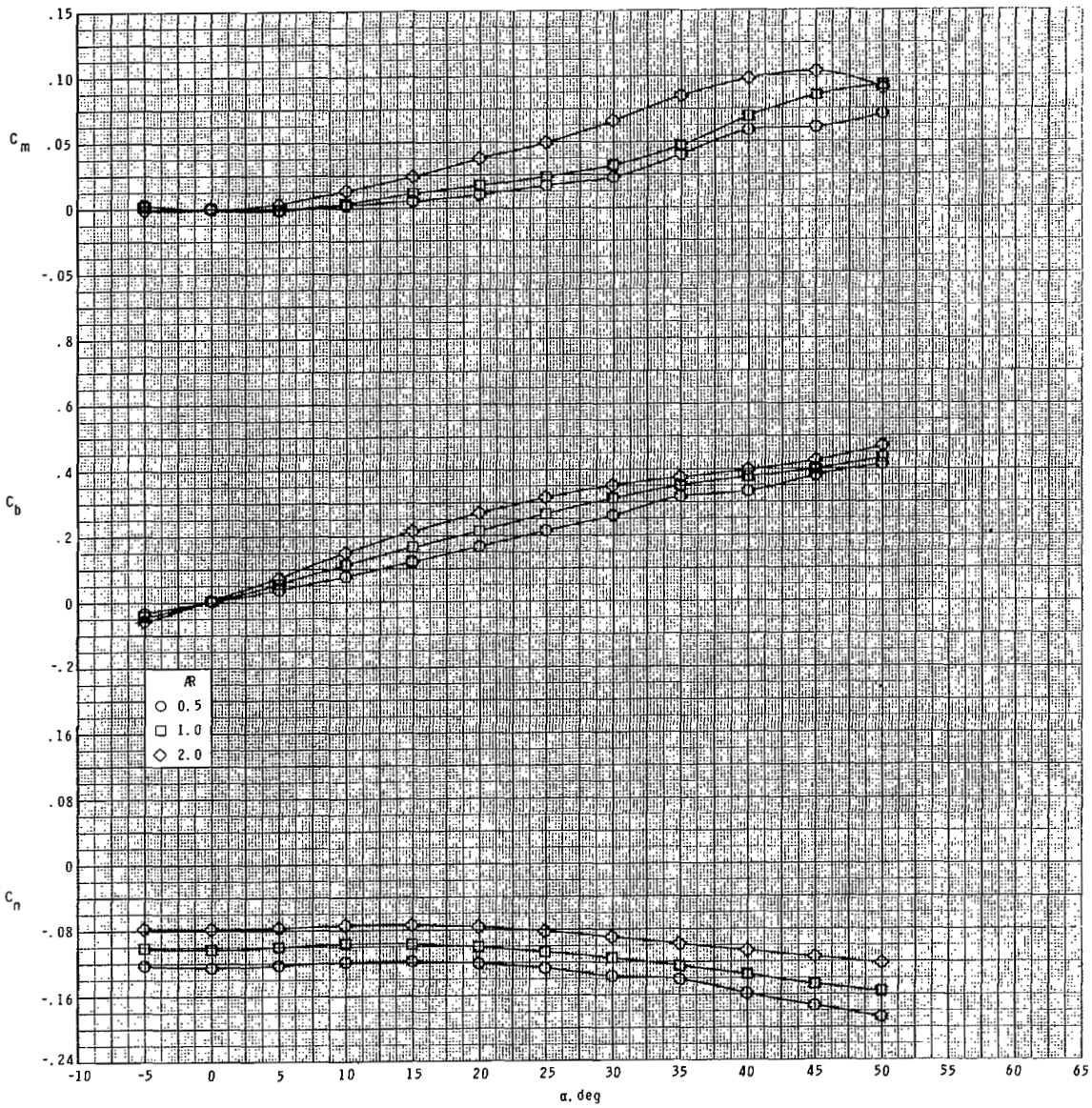


Figure 11.- Concluded.



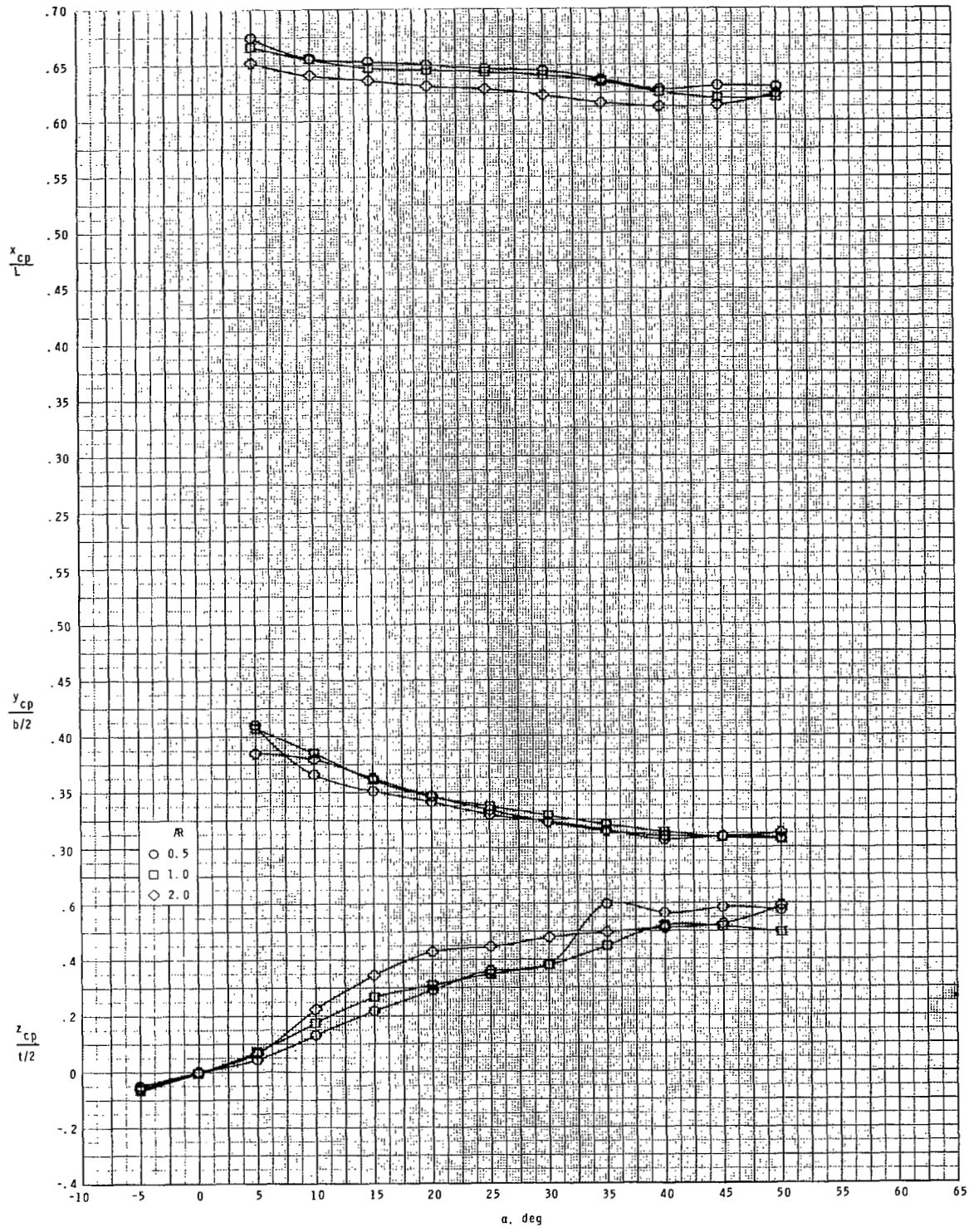
(a) M = 1.60.

Figure 12.- Effects of aspect ratio on wing aerodynamic characteristics. $\lambda = 0$.



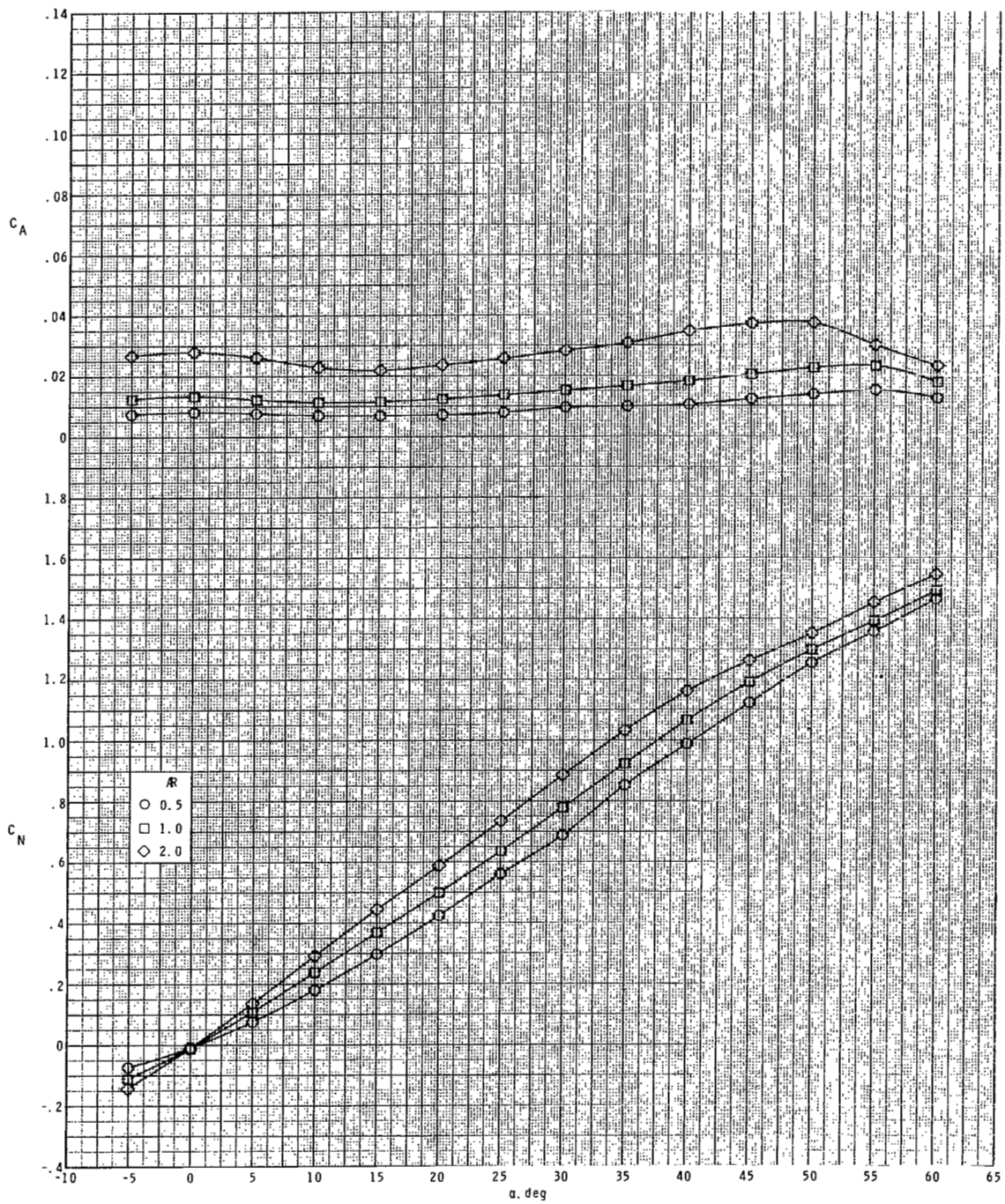
(a) Continued.

Figure 12.- Continued.



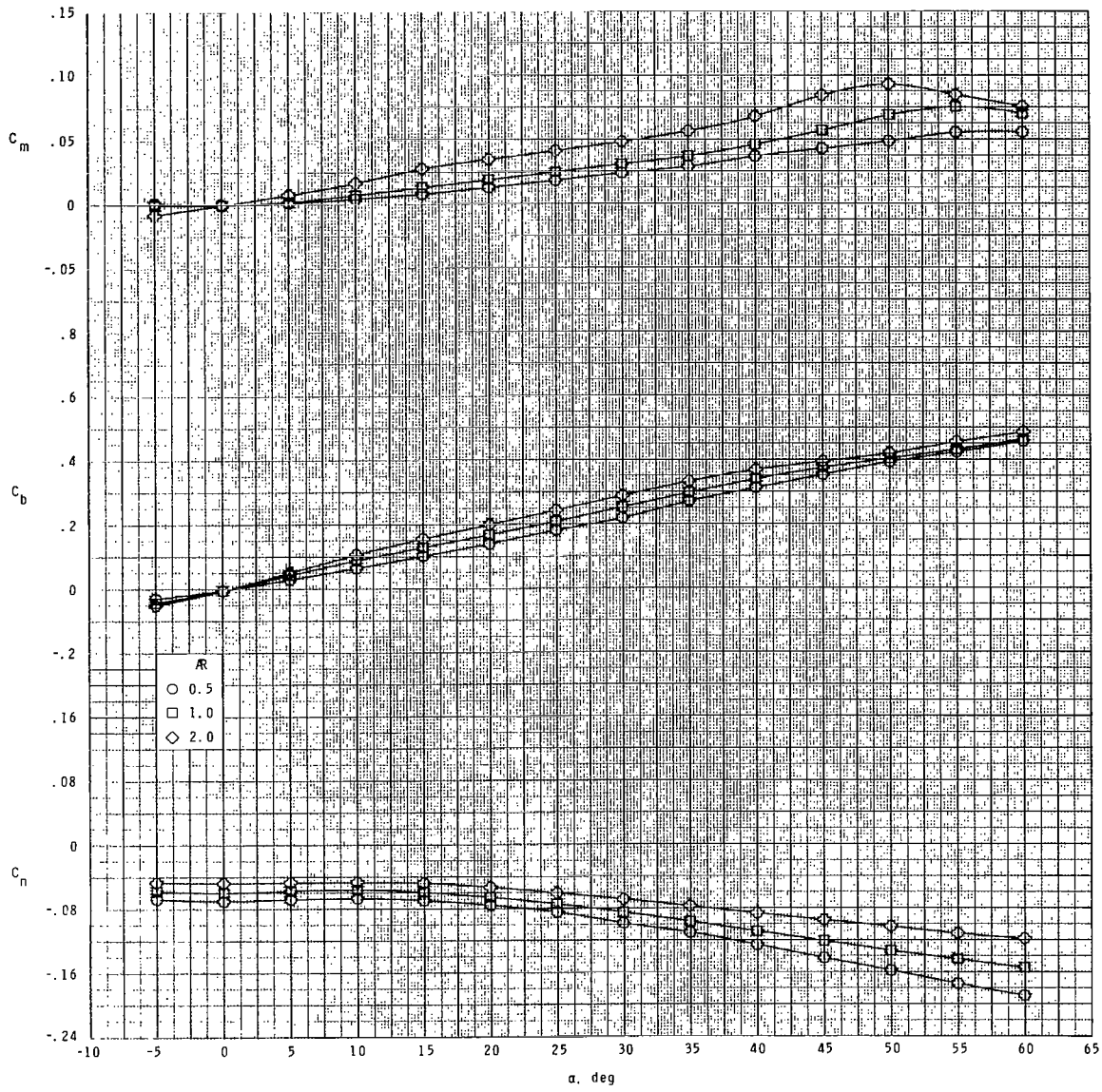
(a) Concluded.

Figure 12.- Continued.



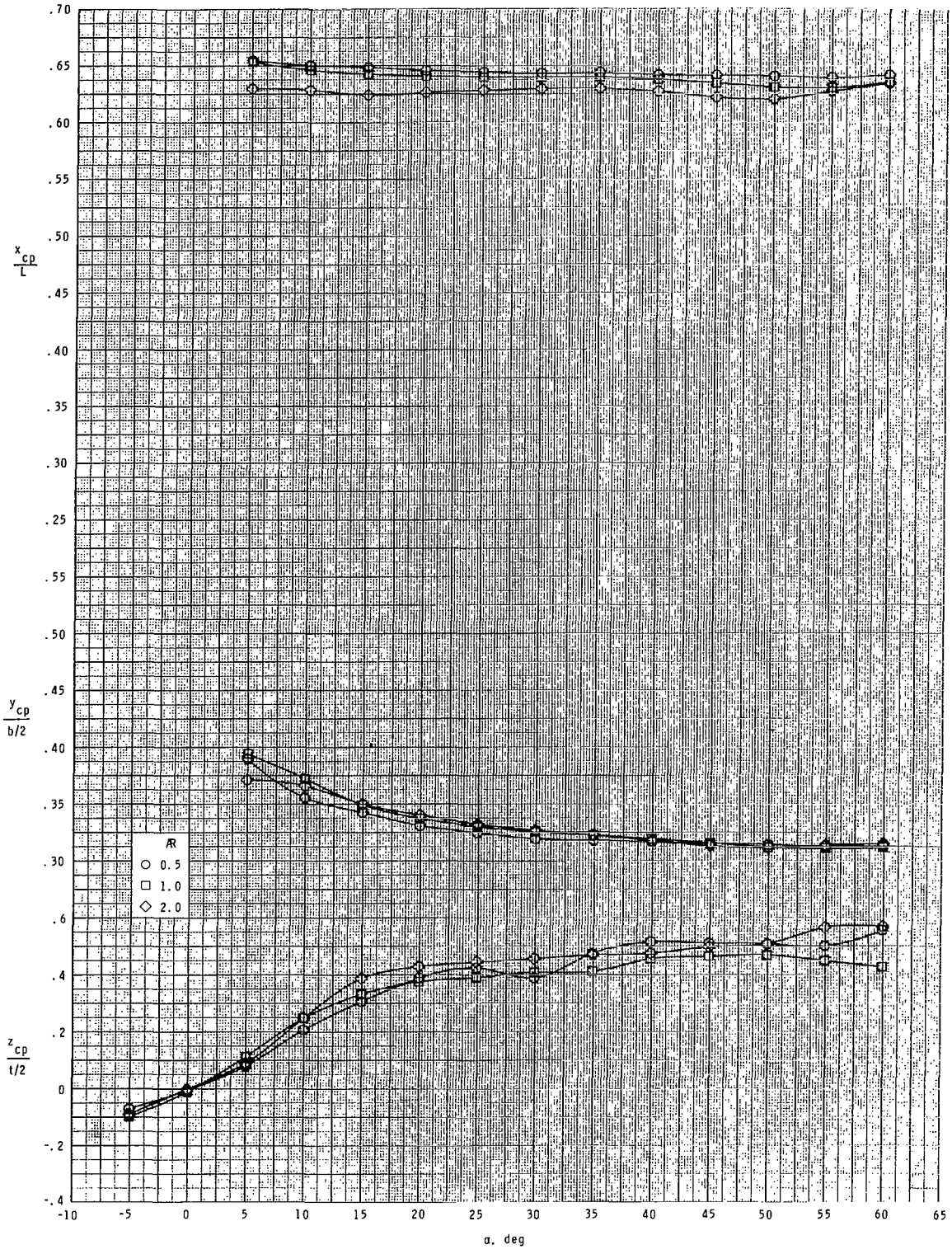
(b) M = 2.16.

Figure 12.- Continued.



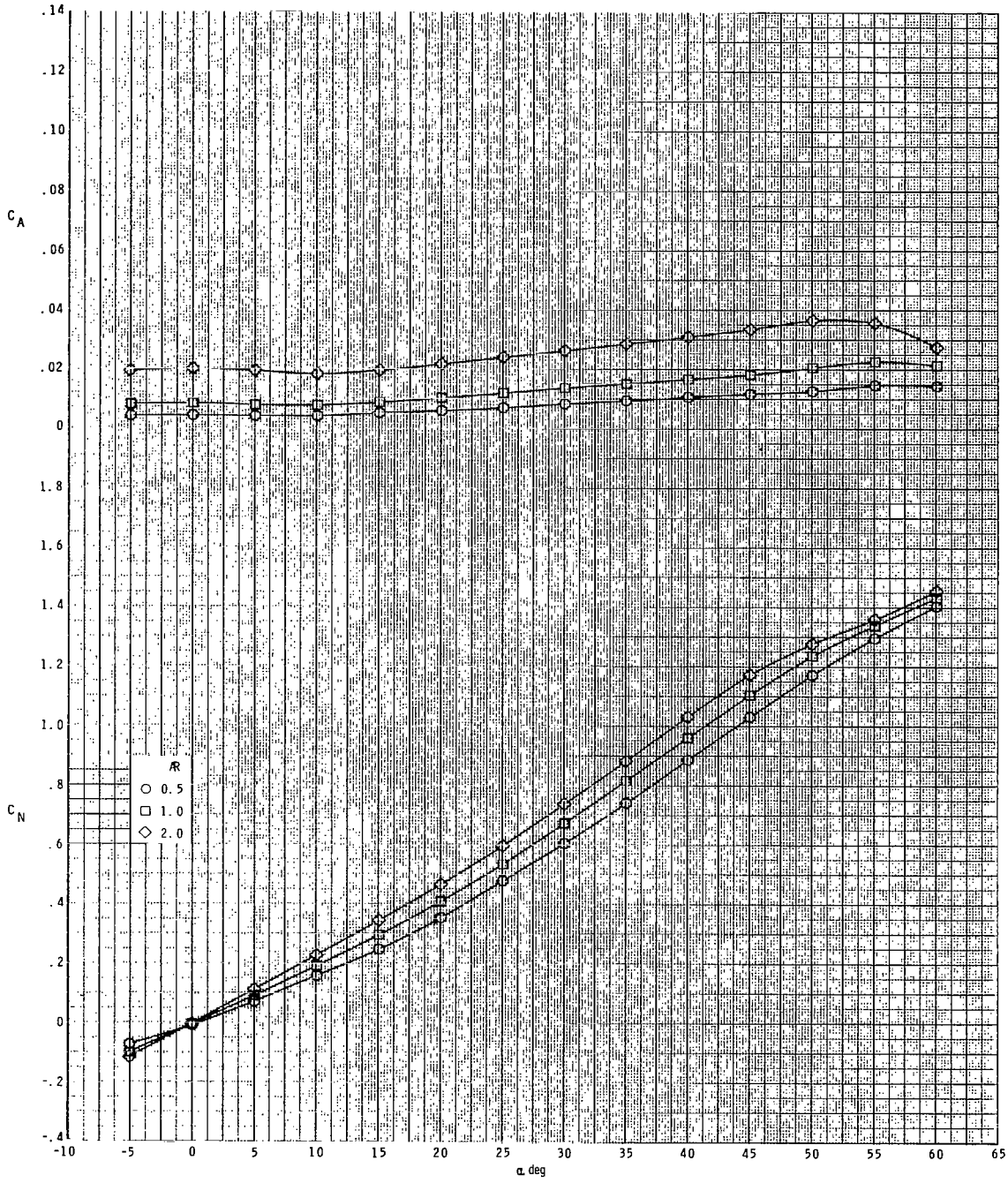
(b) Continued.

Figure 12.- Continued.



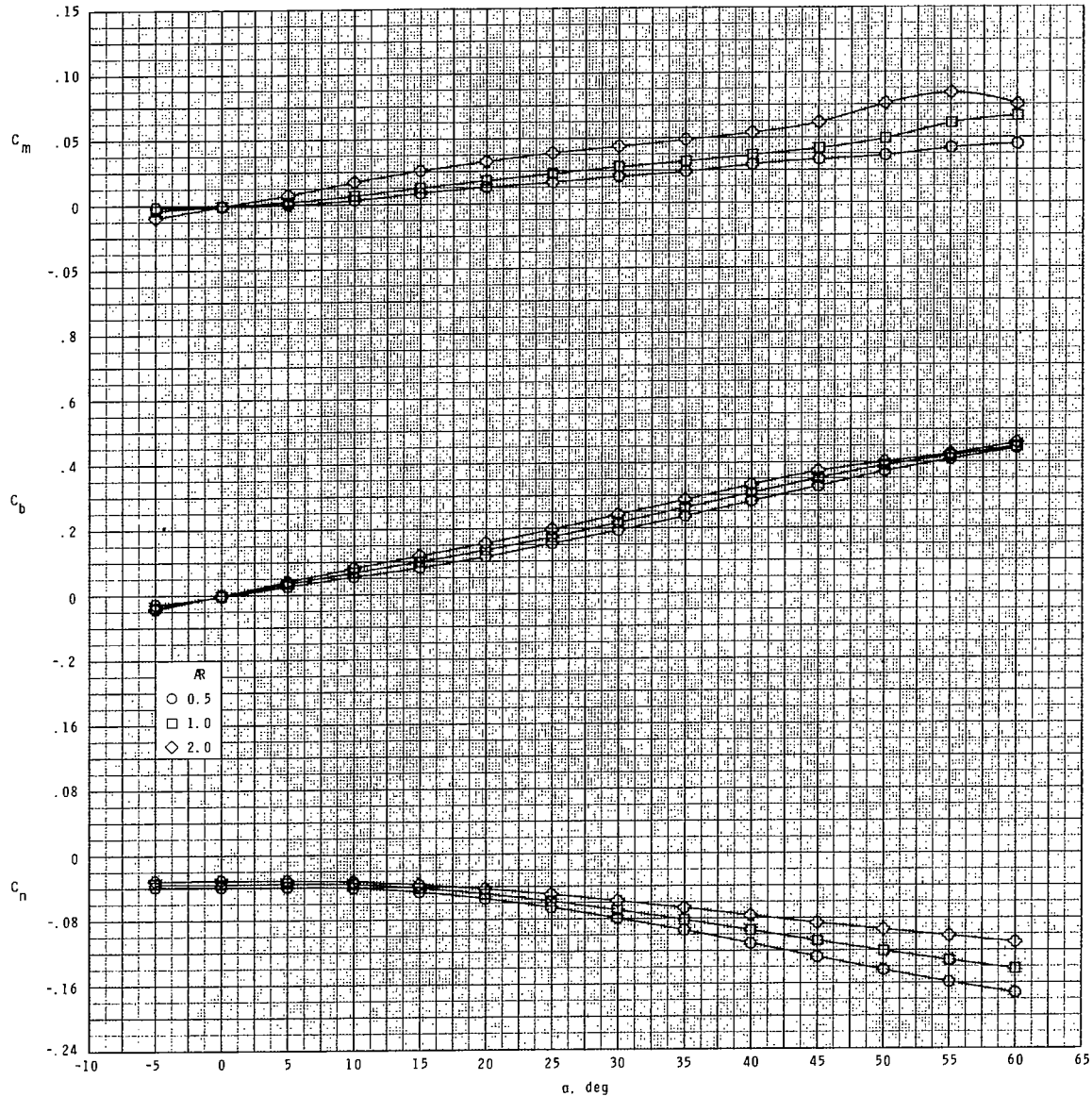
(b) Concluded.

Figure 12.- Continued.



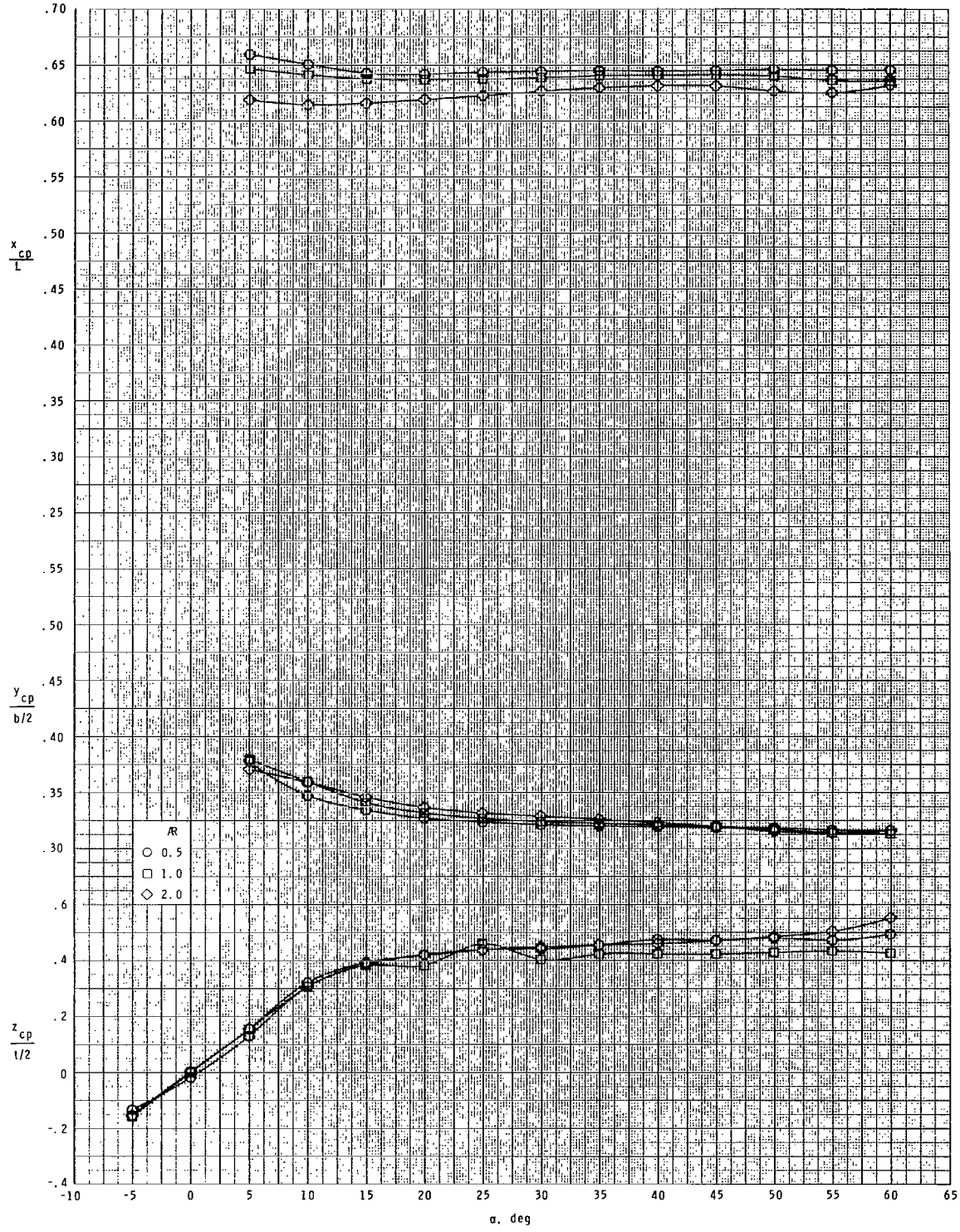
(c) M = 2.86.

Figure 12.- Continued.



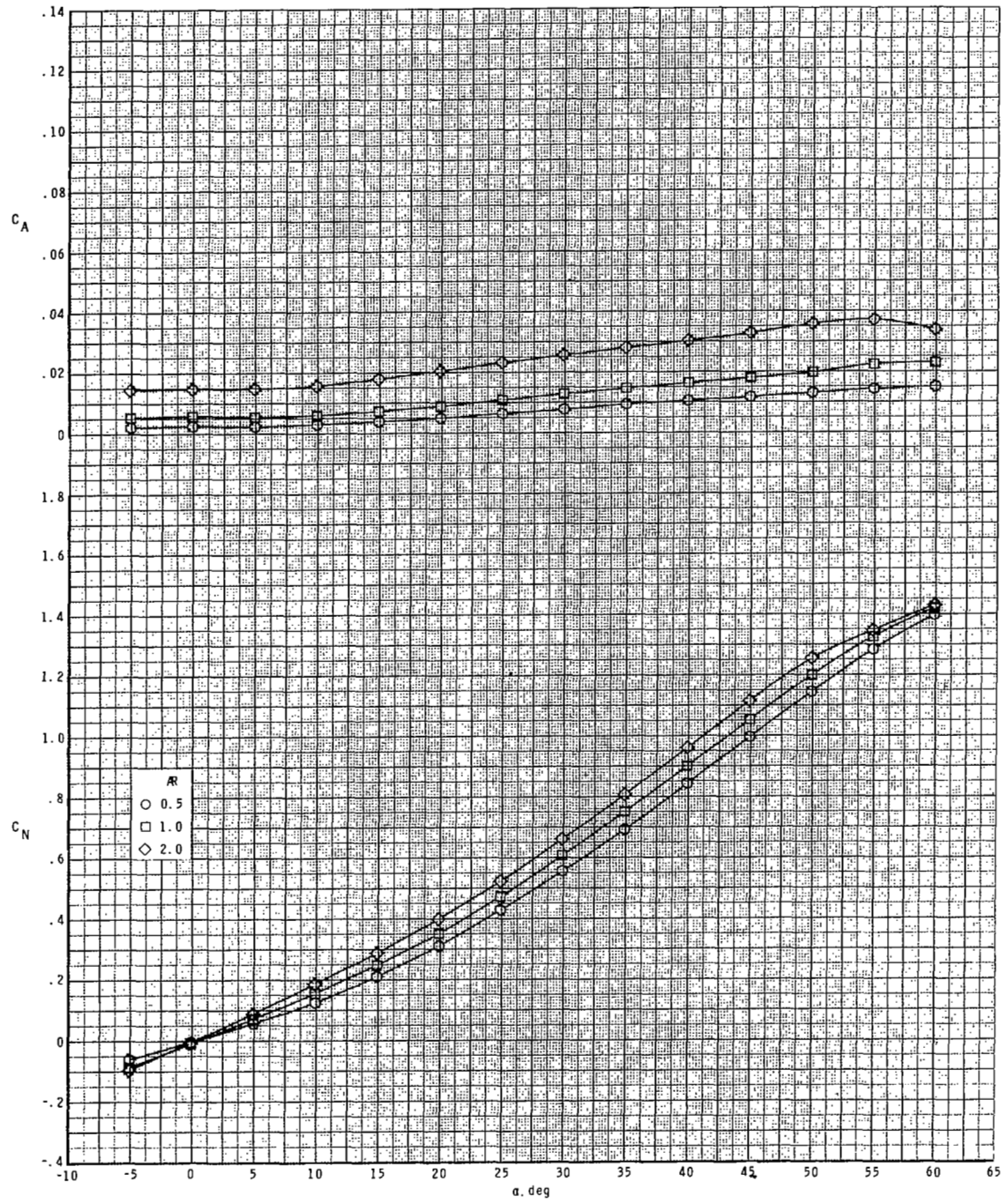
(c) Continued.

Figure 12.- Continued.



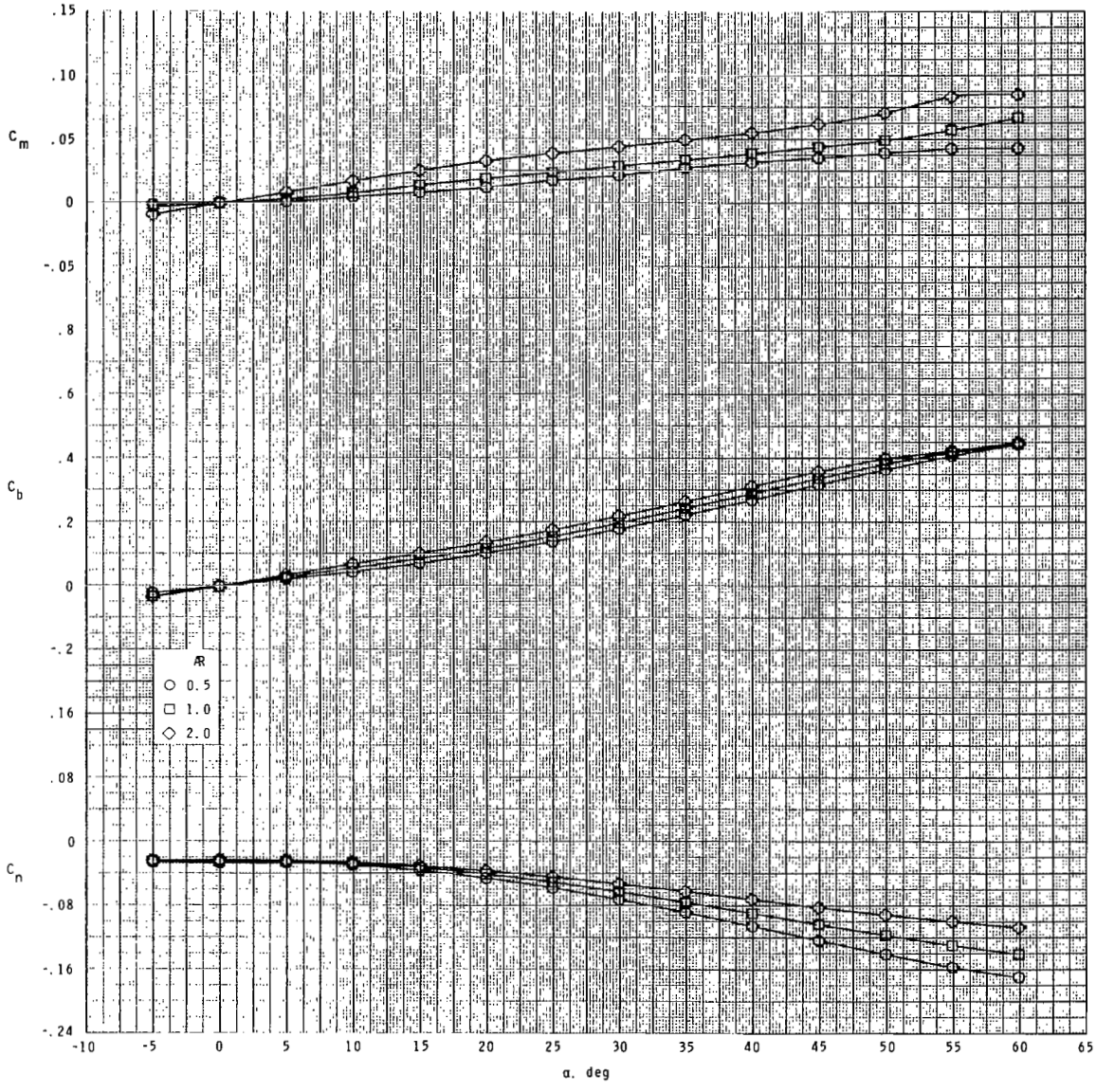
(c) Concluded.

Figure 12.- Continued.



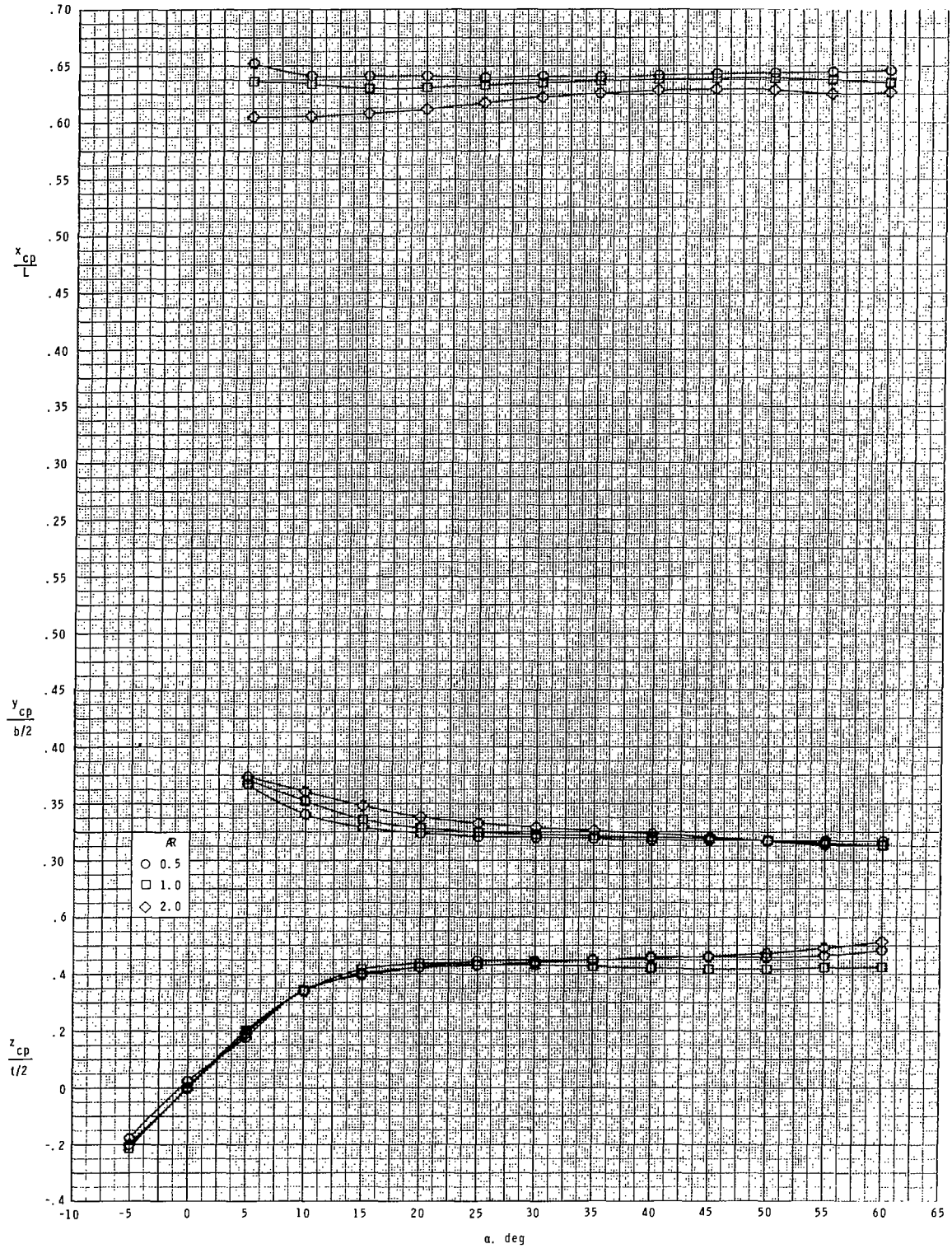
(d) M = 3.50.

Figure 12.- Continued.



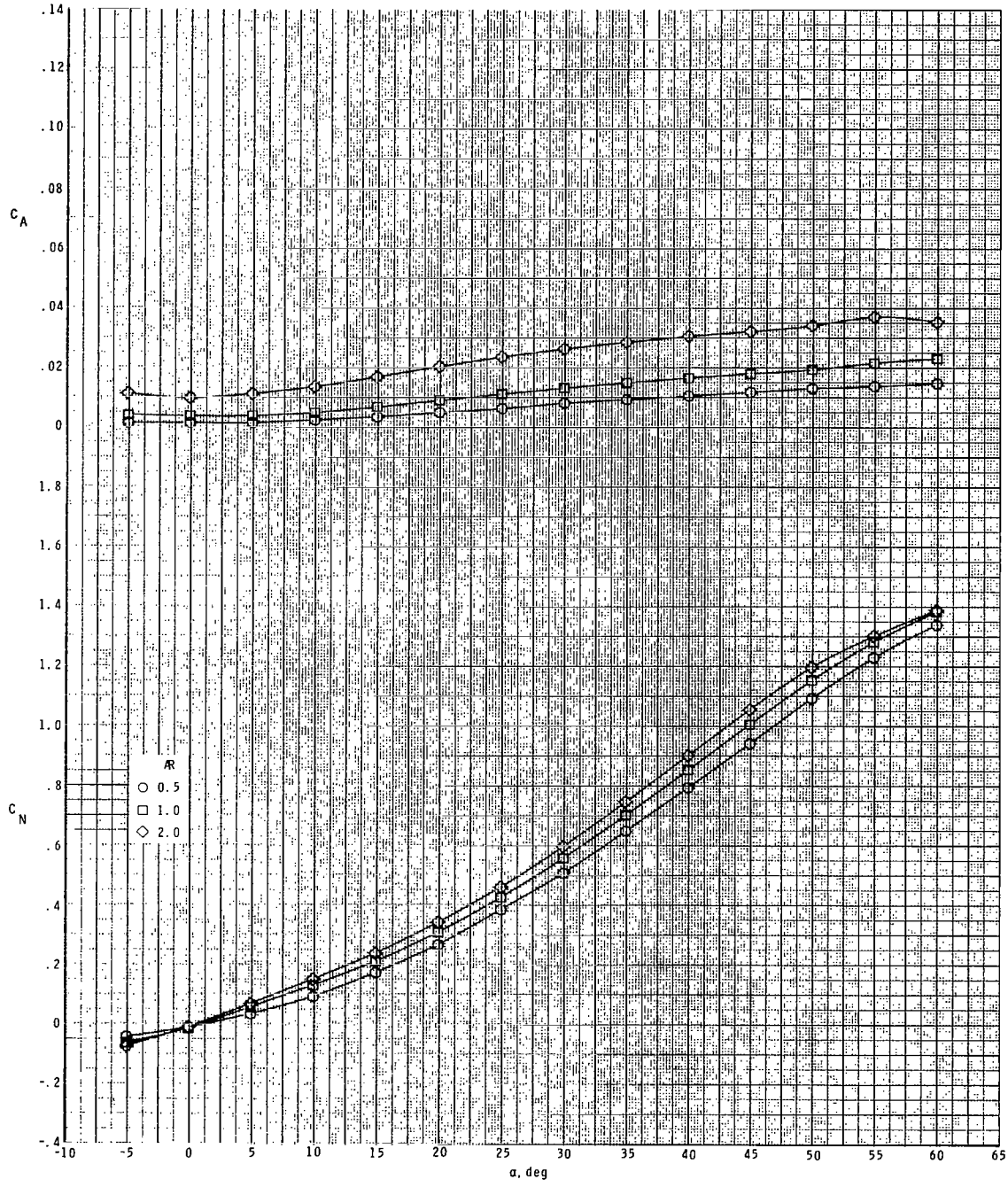
(d) Continued.

Figure 12.- Continued.



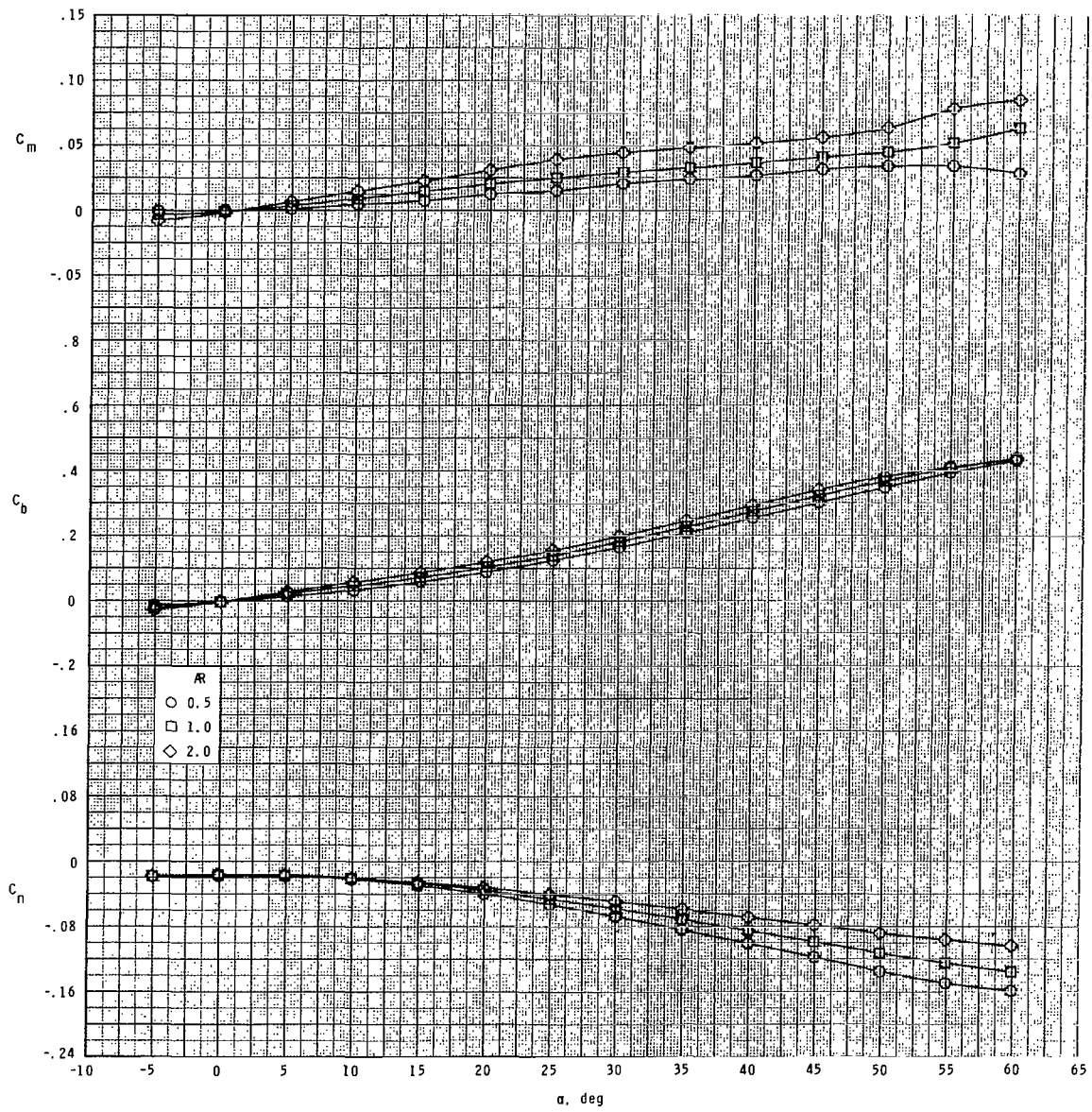
(d) Concluded.

Figure 12.- Continued.



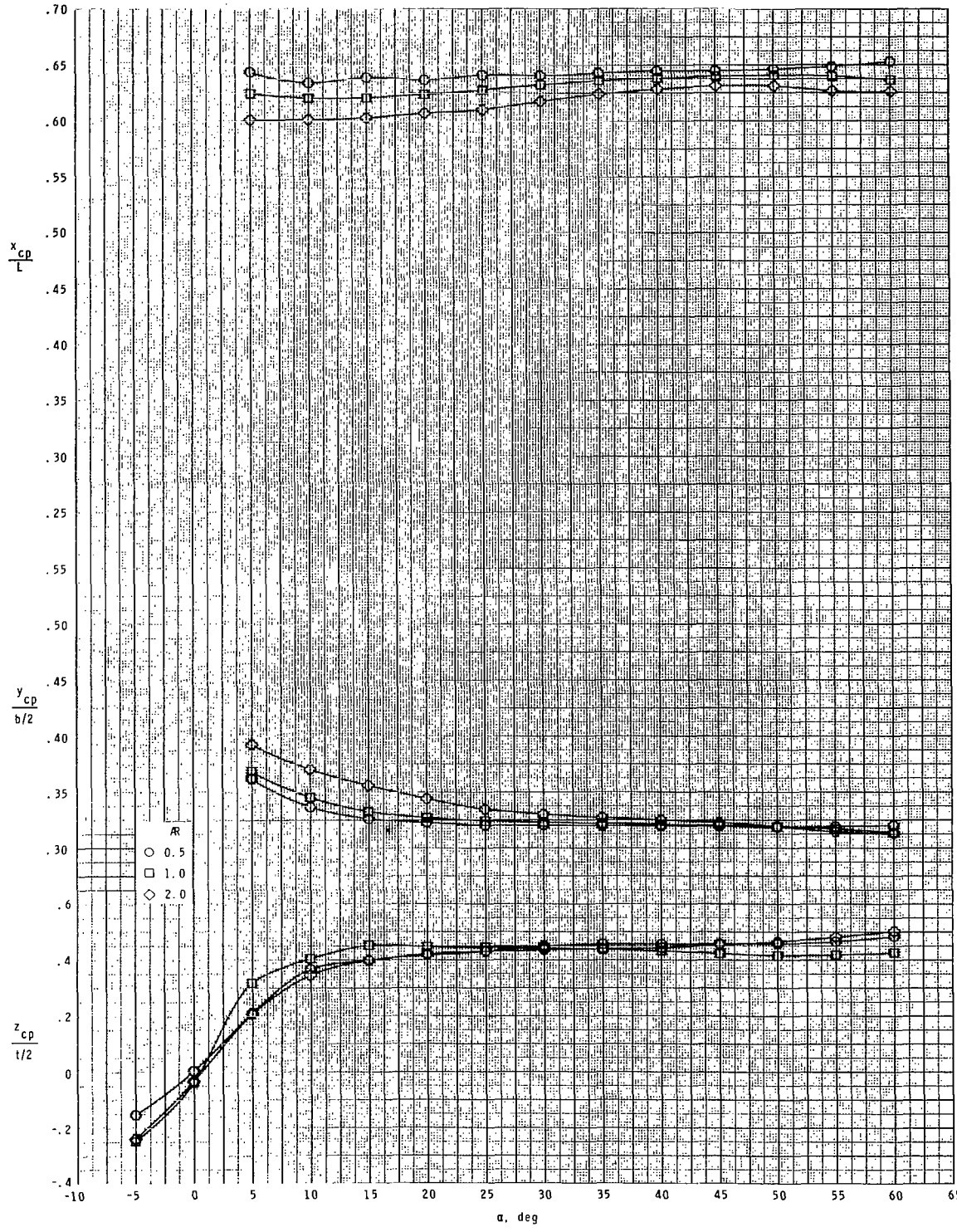
(e) M = 4.60.

Figure 12.- Continued.



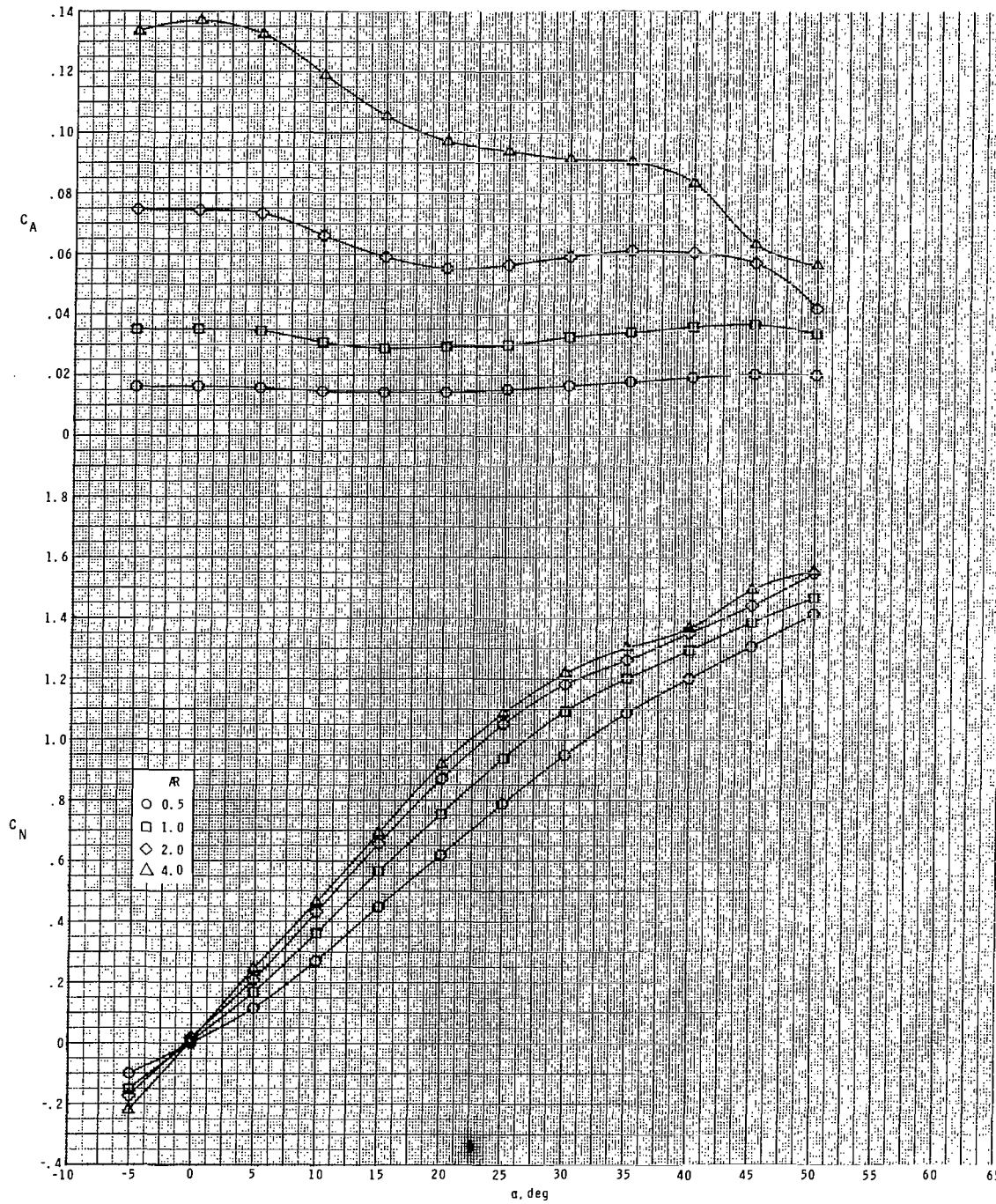
(e) Continued.

Figure 12.- Continued.



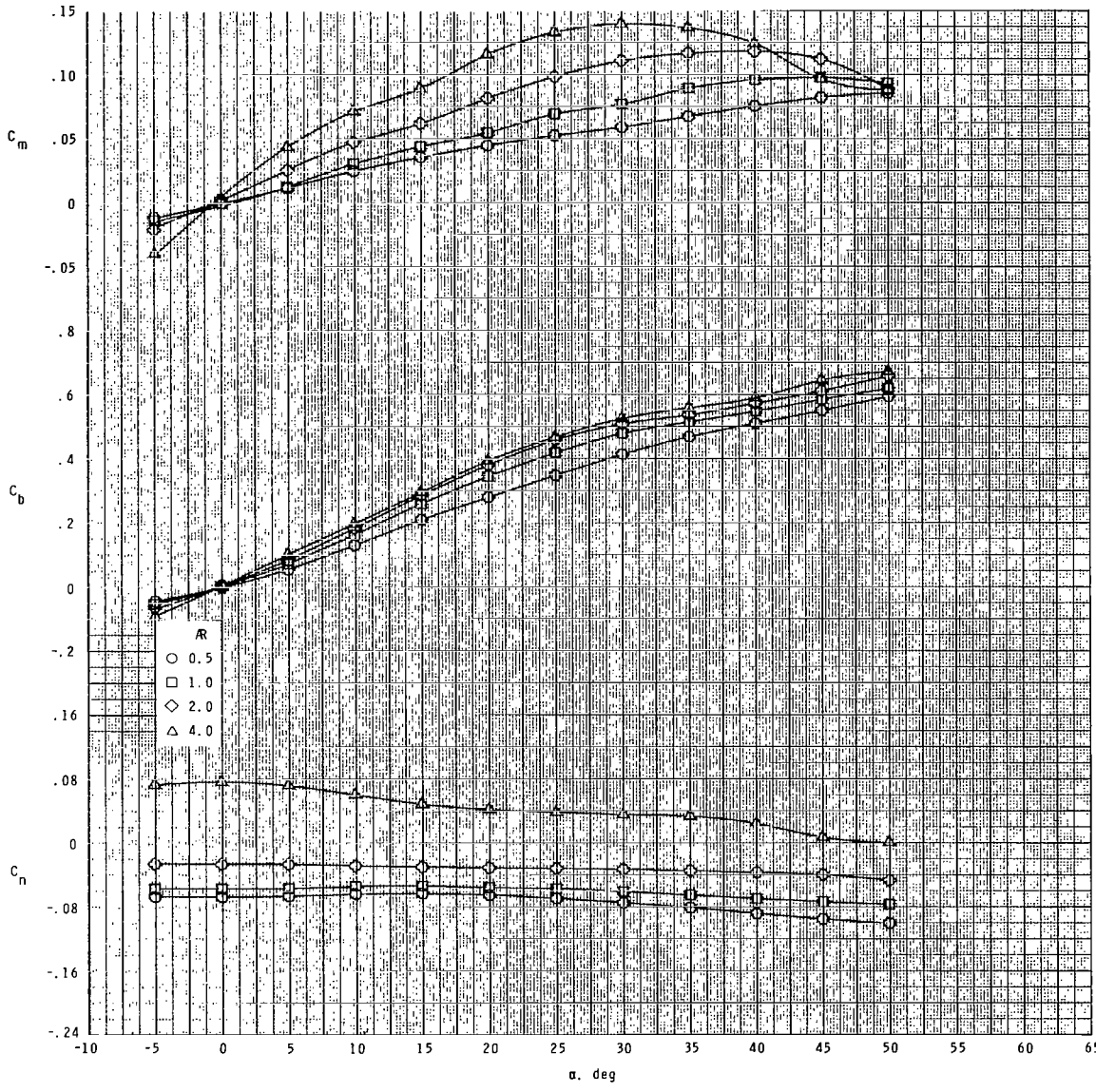
(e) Concluded.

Figure 12.- Concluded.



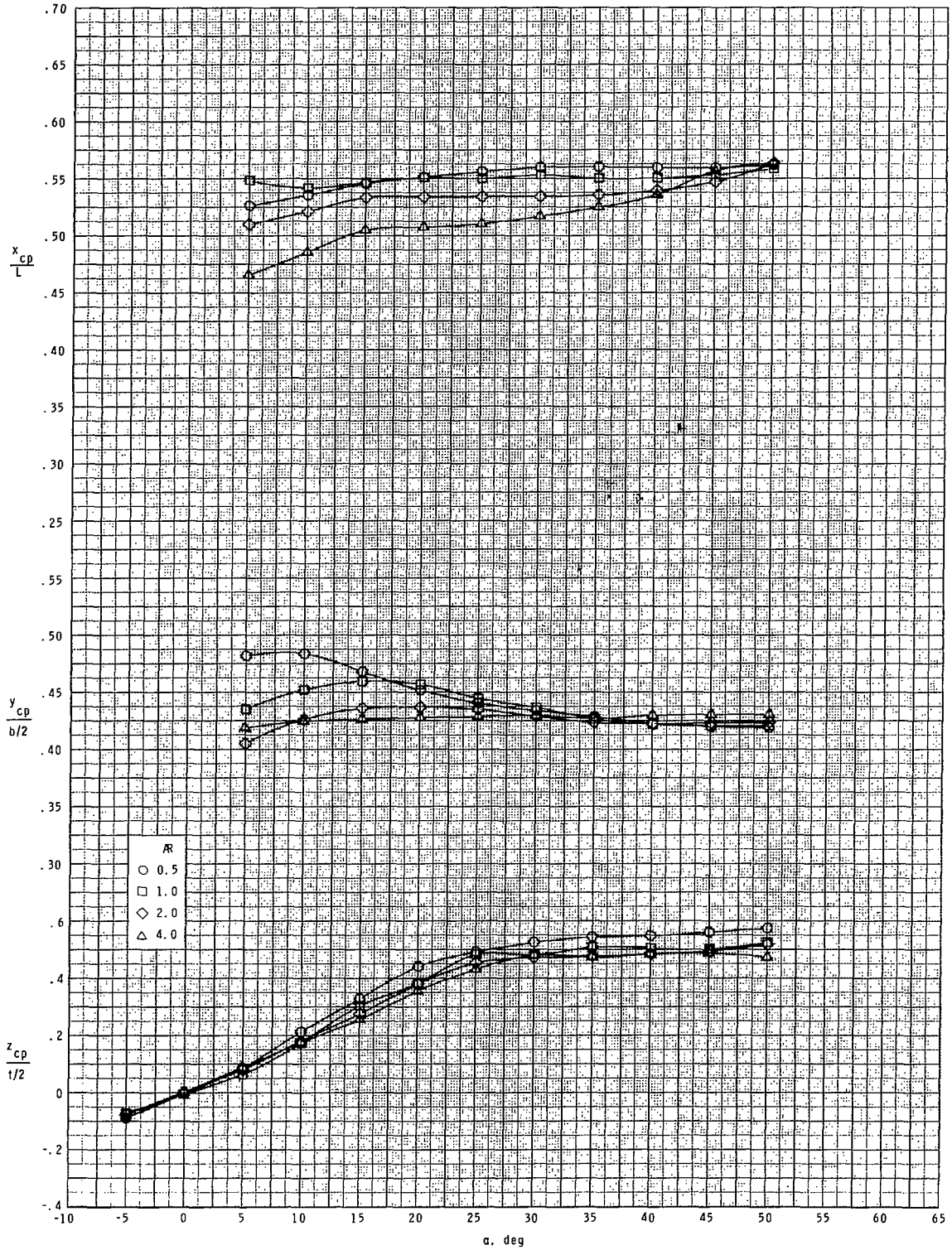
(a) M = 1.60.

Figure 13.- Effects of aspect ratio on wing aerodynamic characteristics. λ = 0.5.



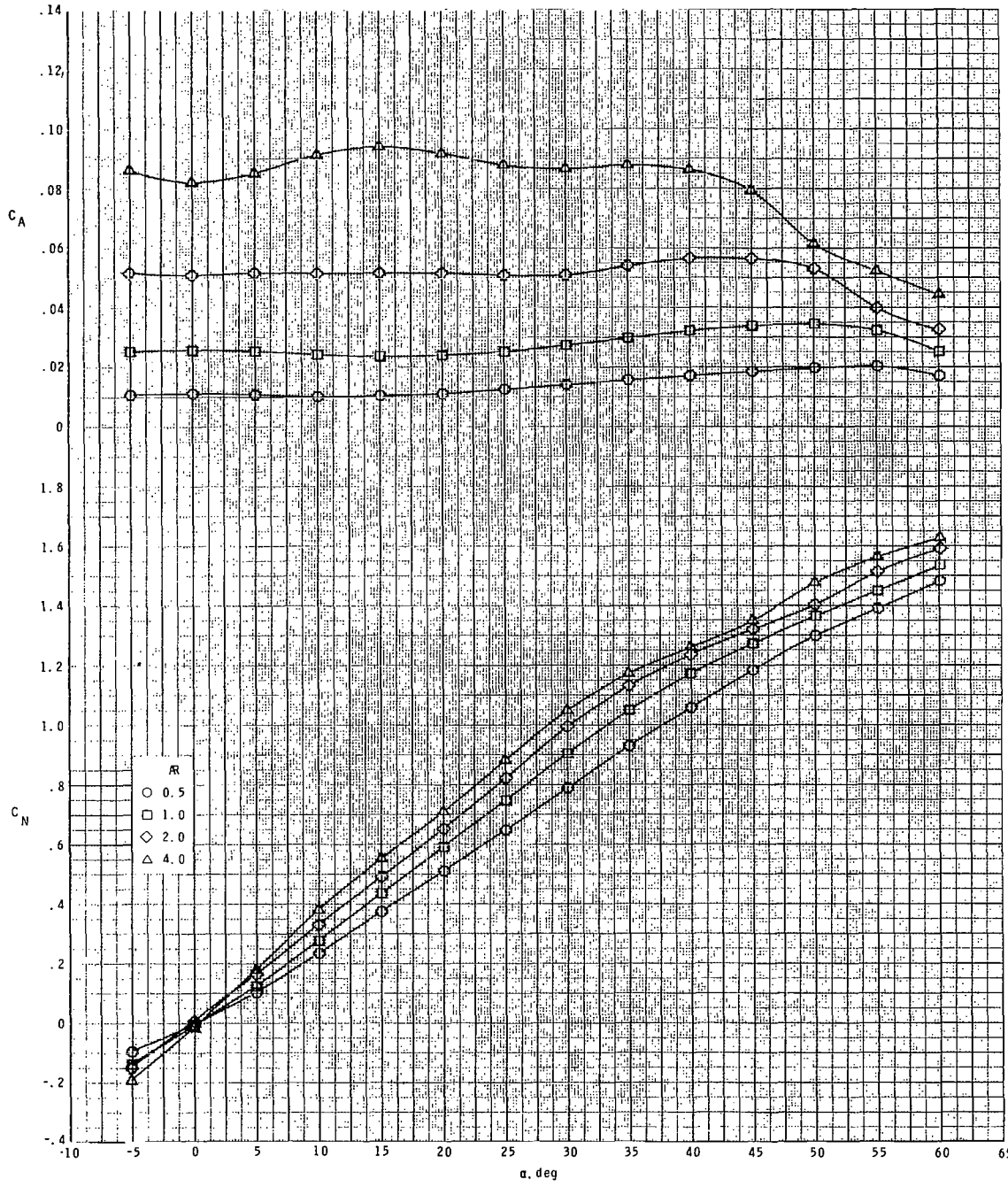
(a) Continued.

Figure 13.- Continued.



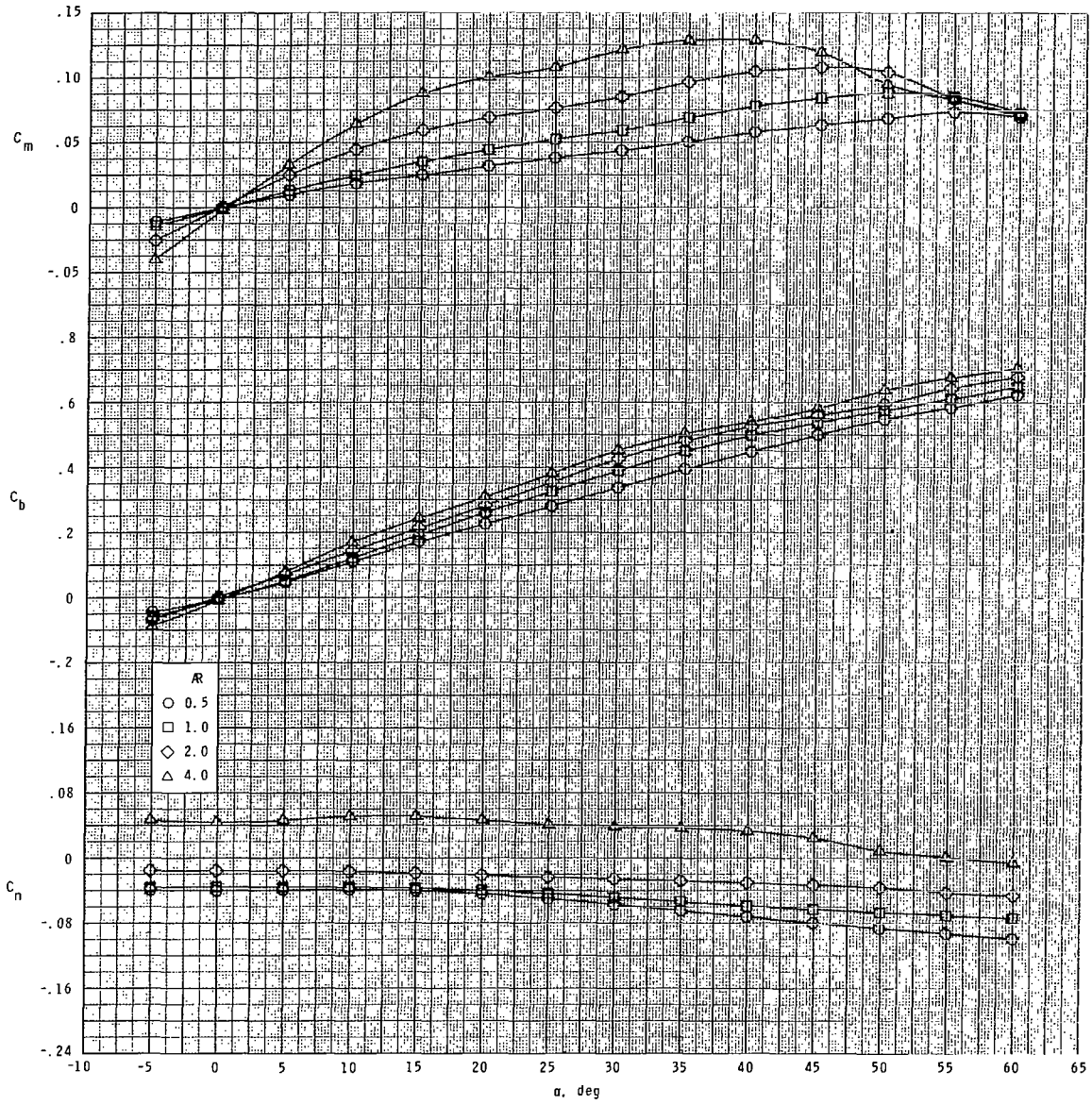
(a) Concluded.

Figure 13.- Continued.



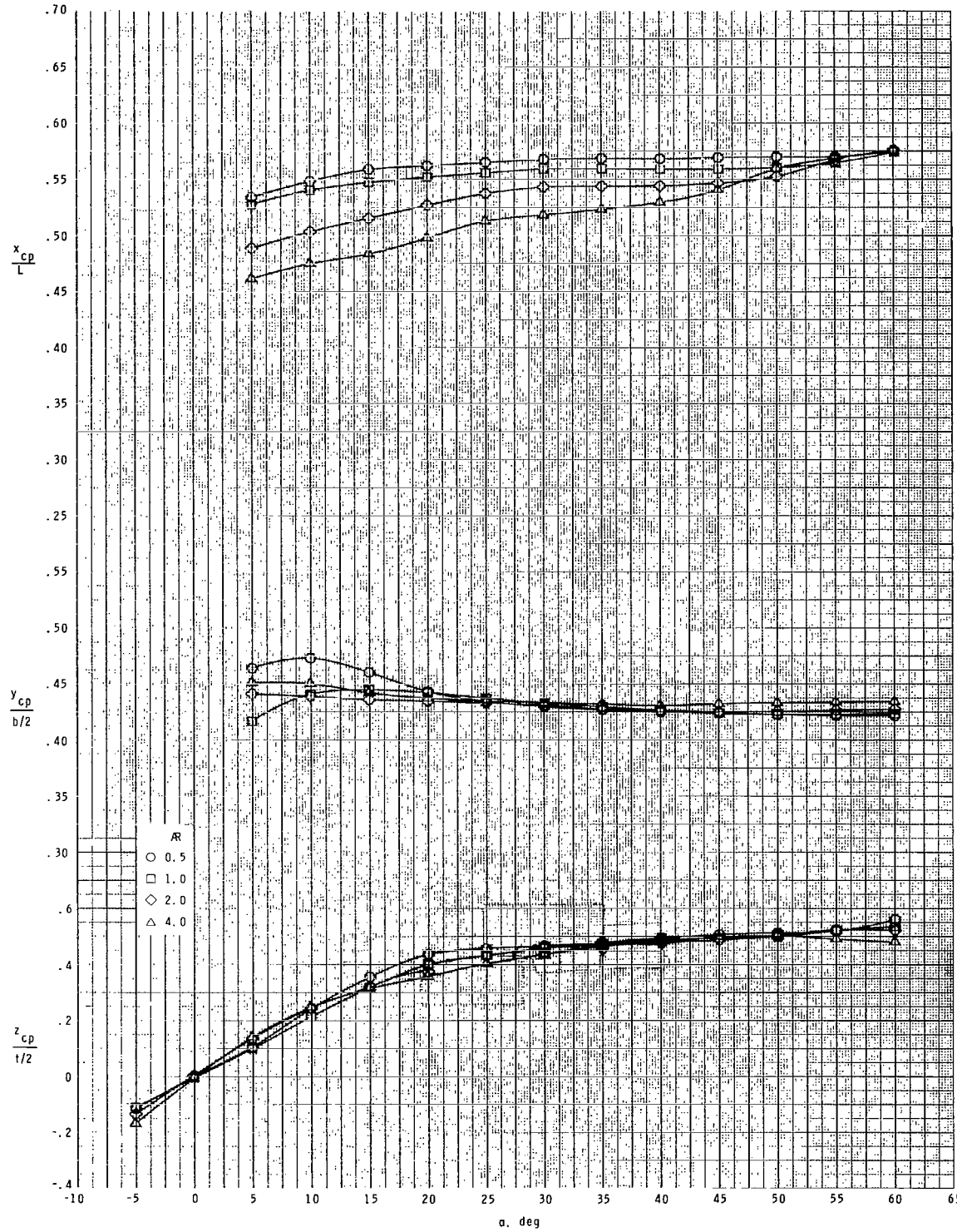
(b) M = 2.16.

Figure 13.- Continued.



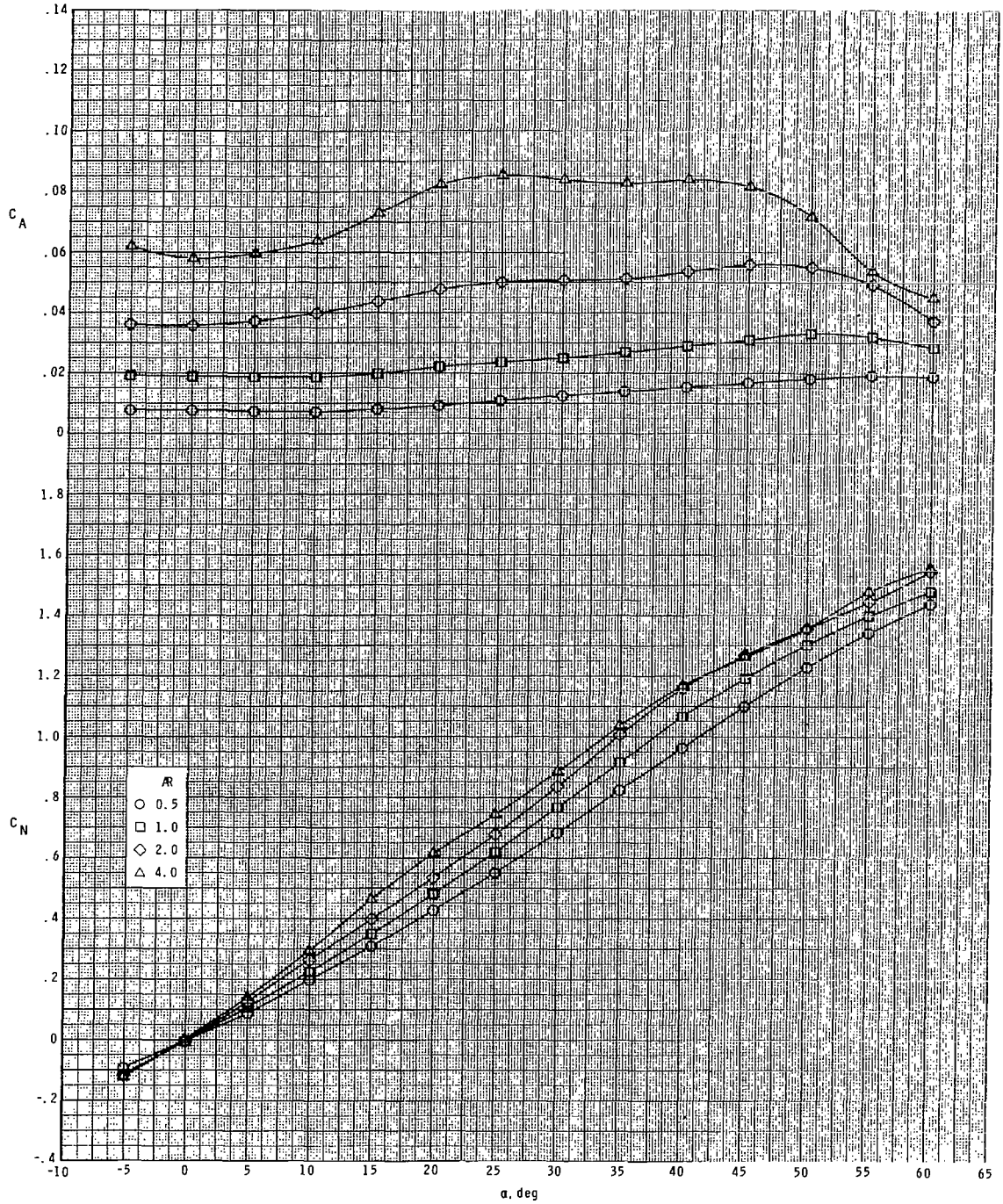
(b) Continued.

Figure 13.- Continued.



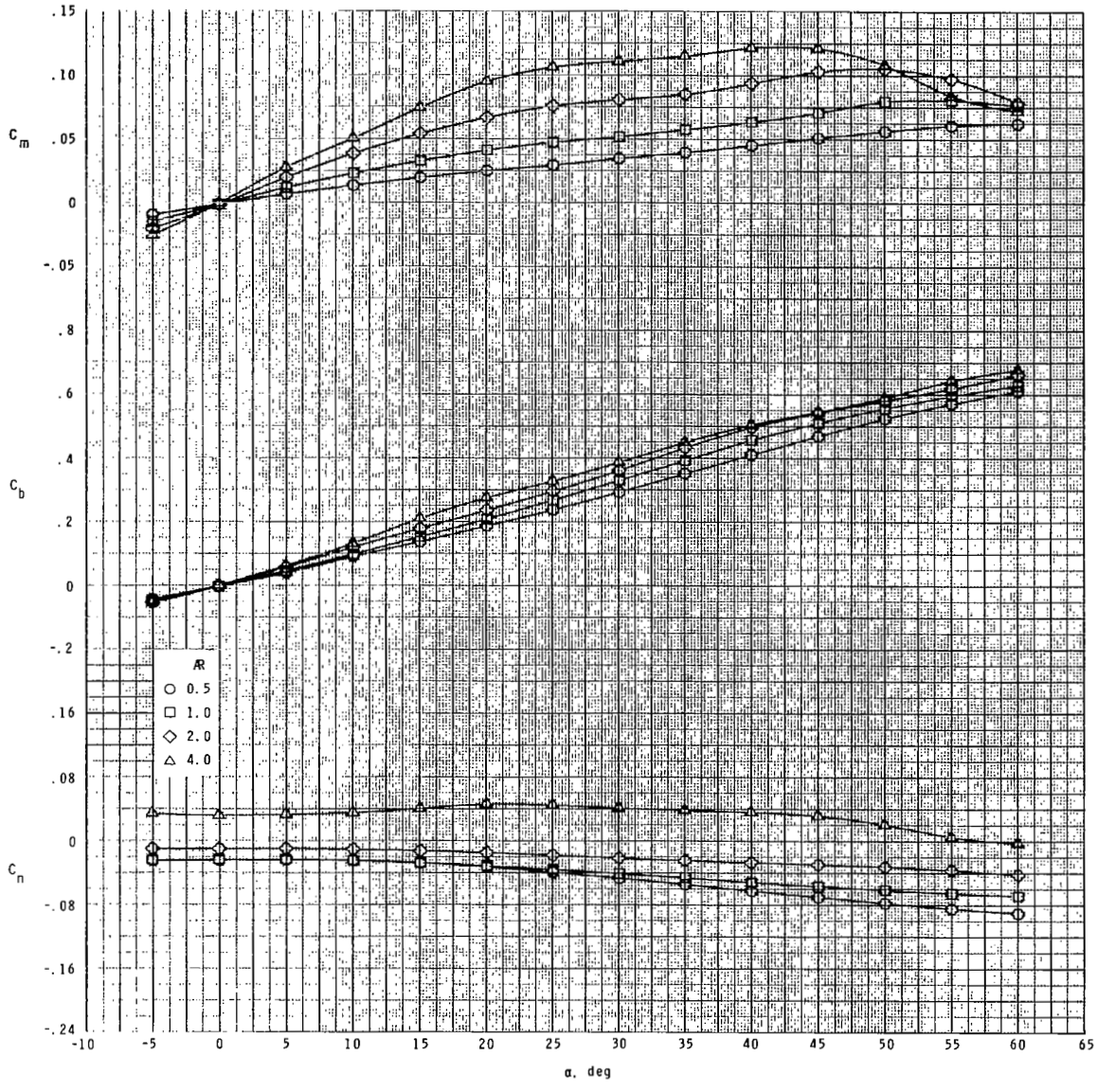
(b) Concluded.

Figure 13.- Continued.



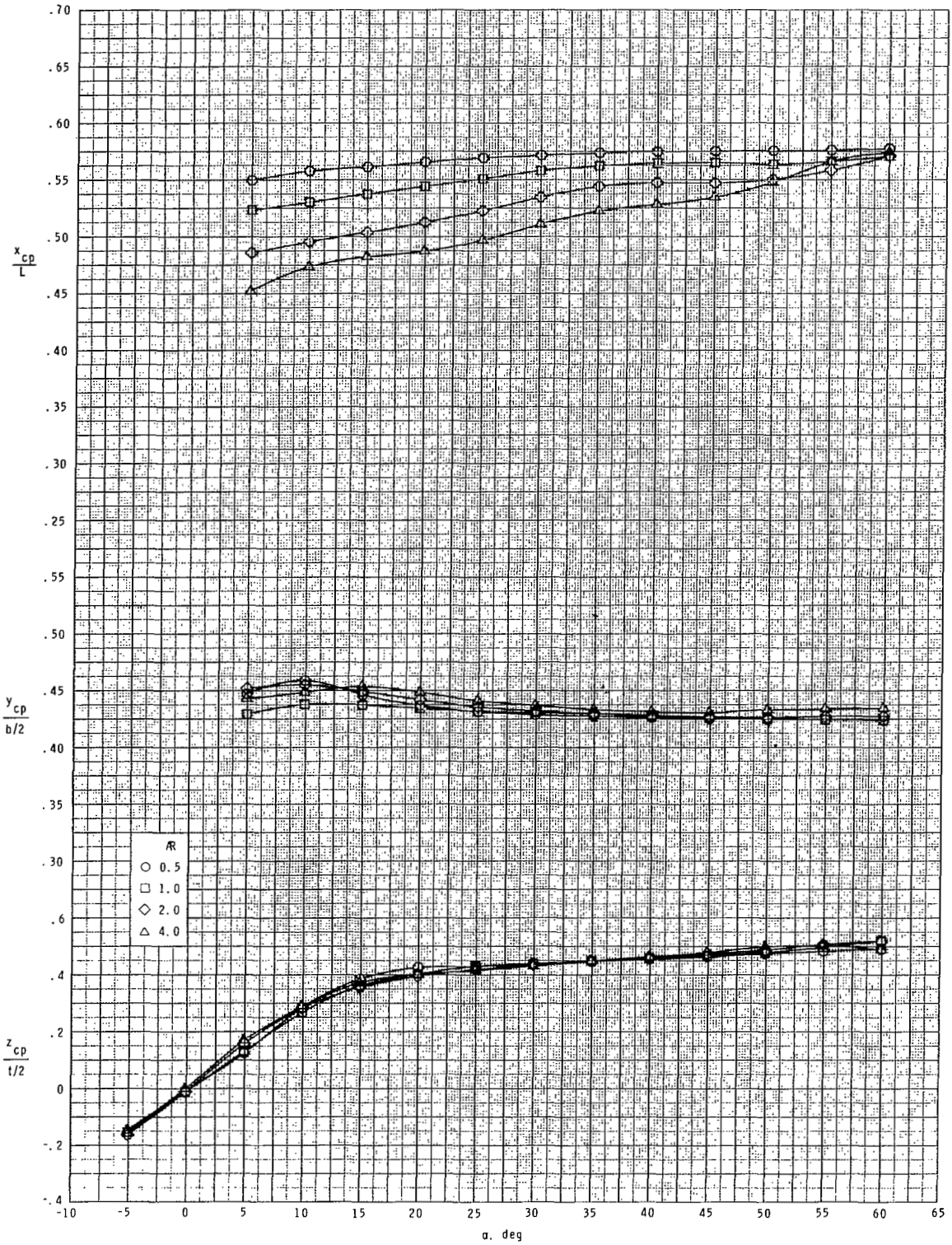
(c) M = 2.86.

Figure 13.- Continued.



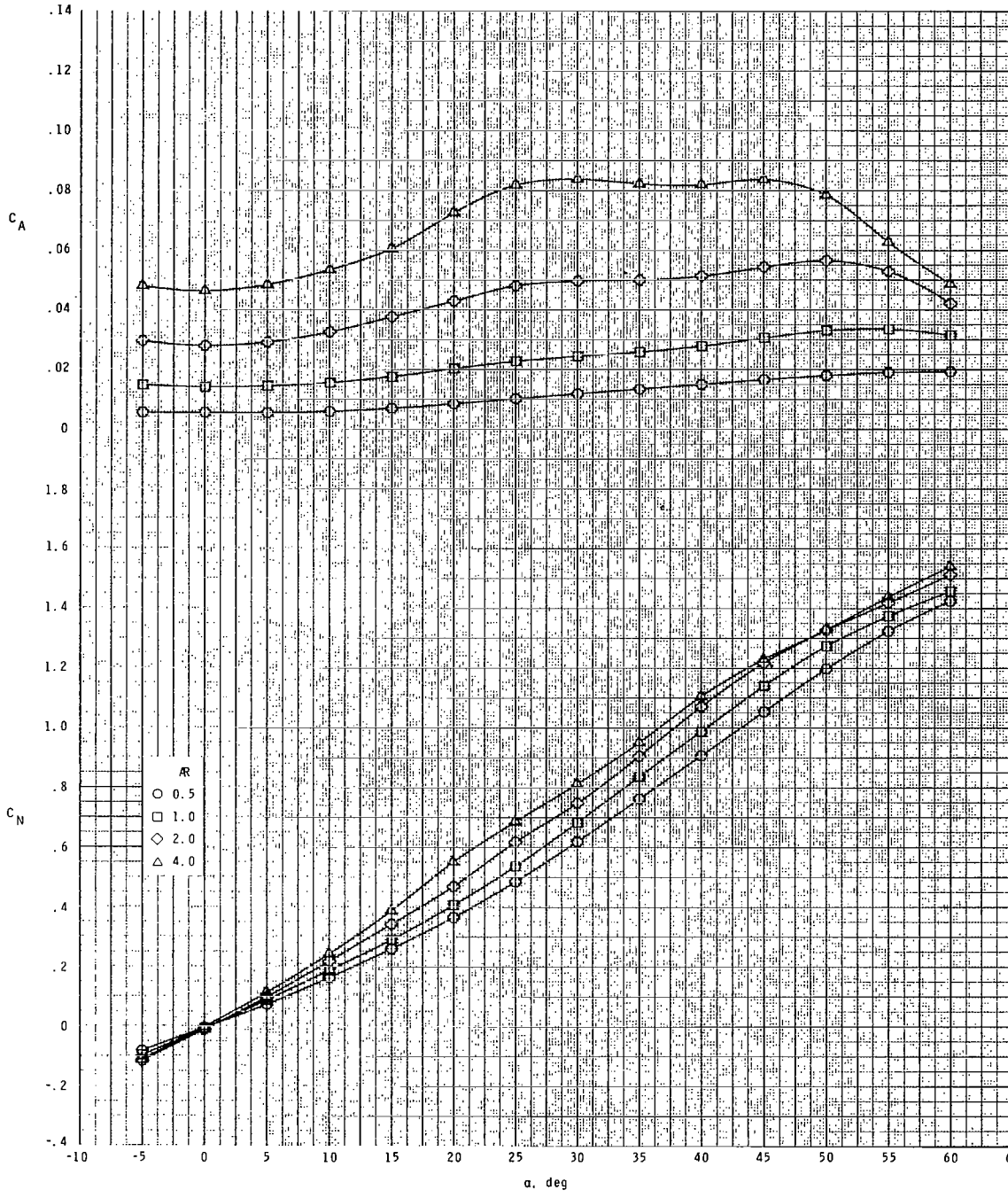
(c) Continued.

Figure 13.- Continued.



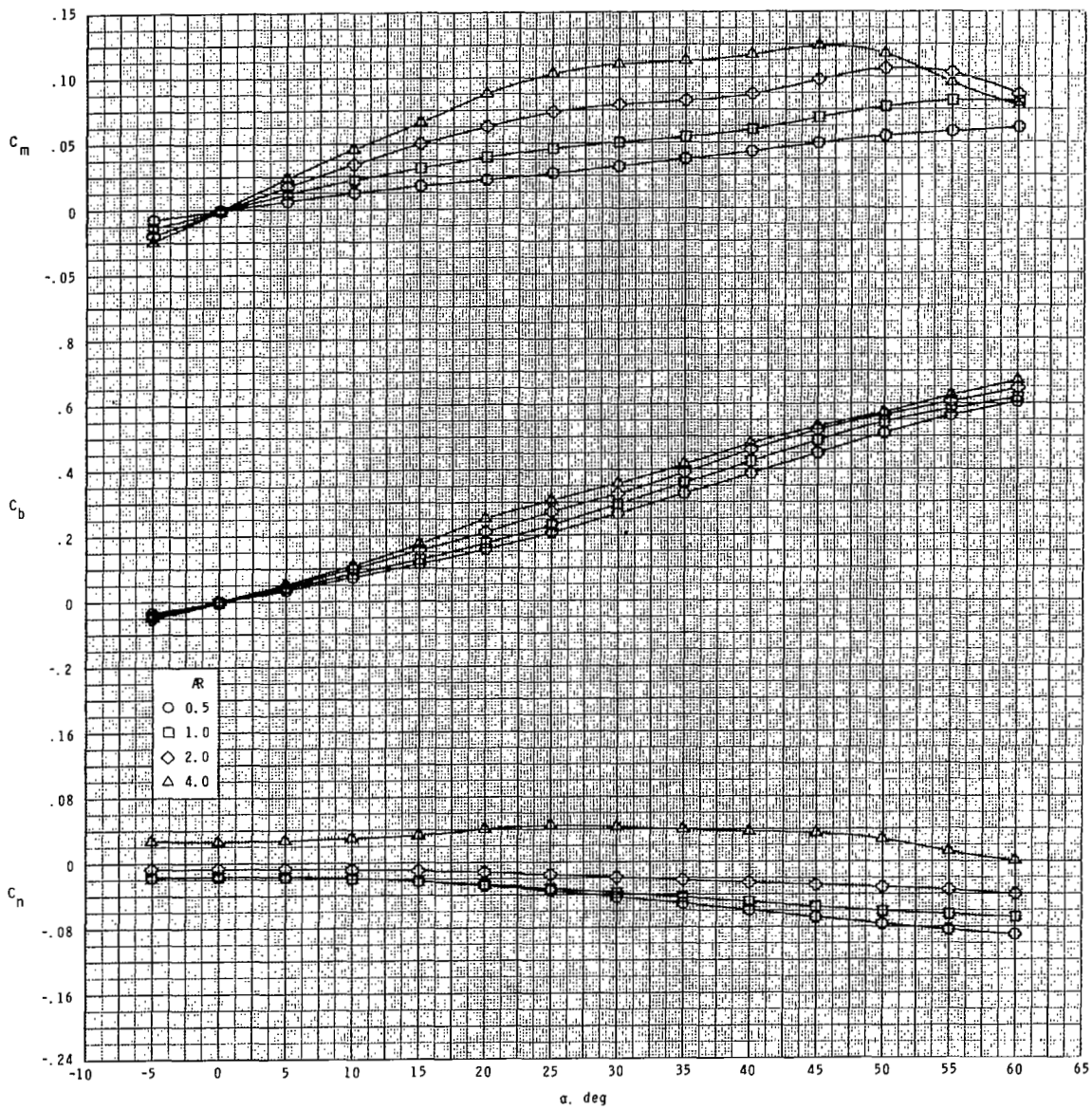
(c) Concluded.

Figure 13.- Continued.



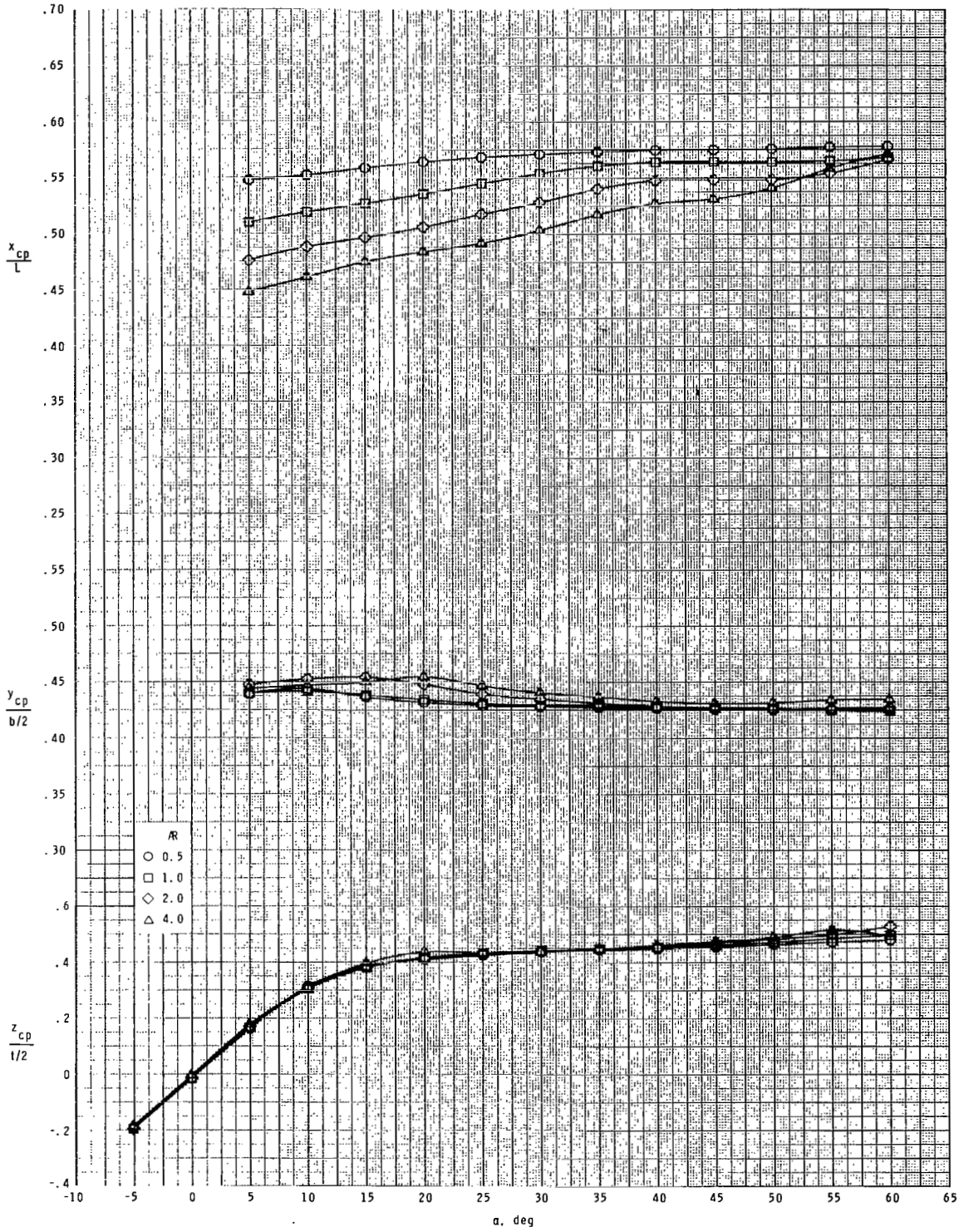
(d) M = 3.50.

Figure 13.- Continued.



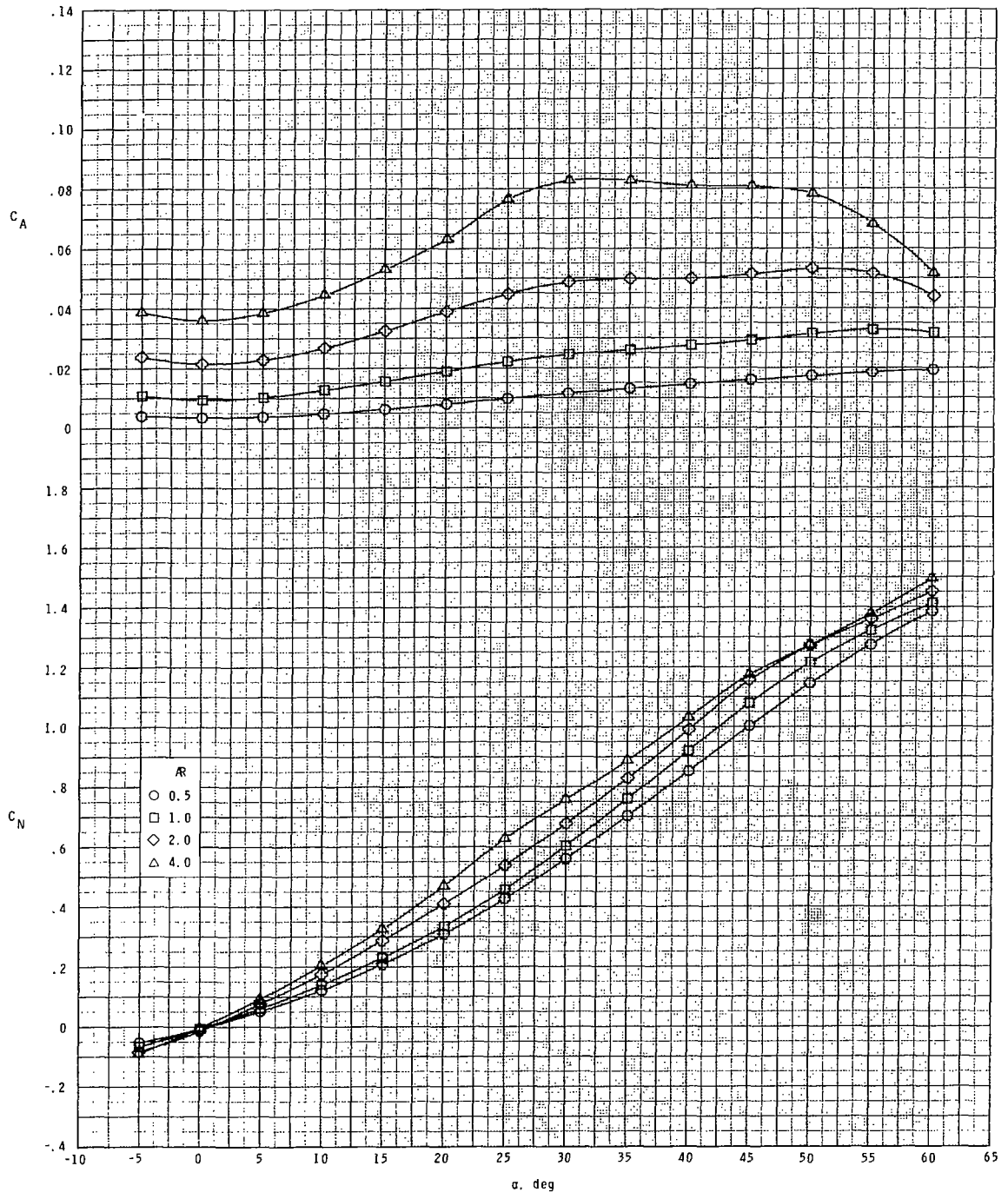
(d) Continued.

Figure 13.- Continued.



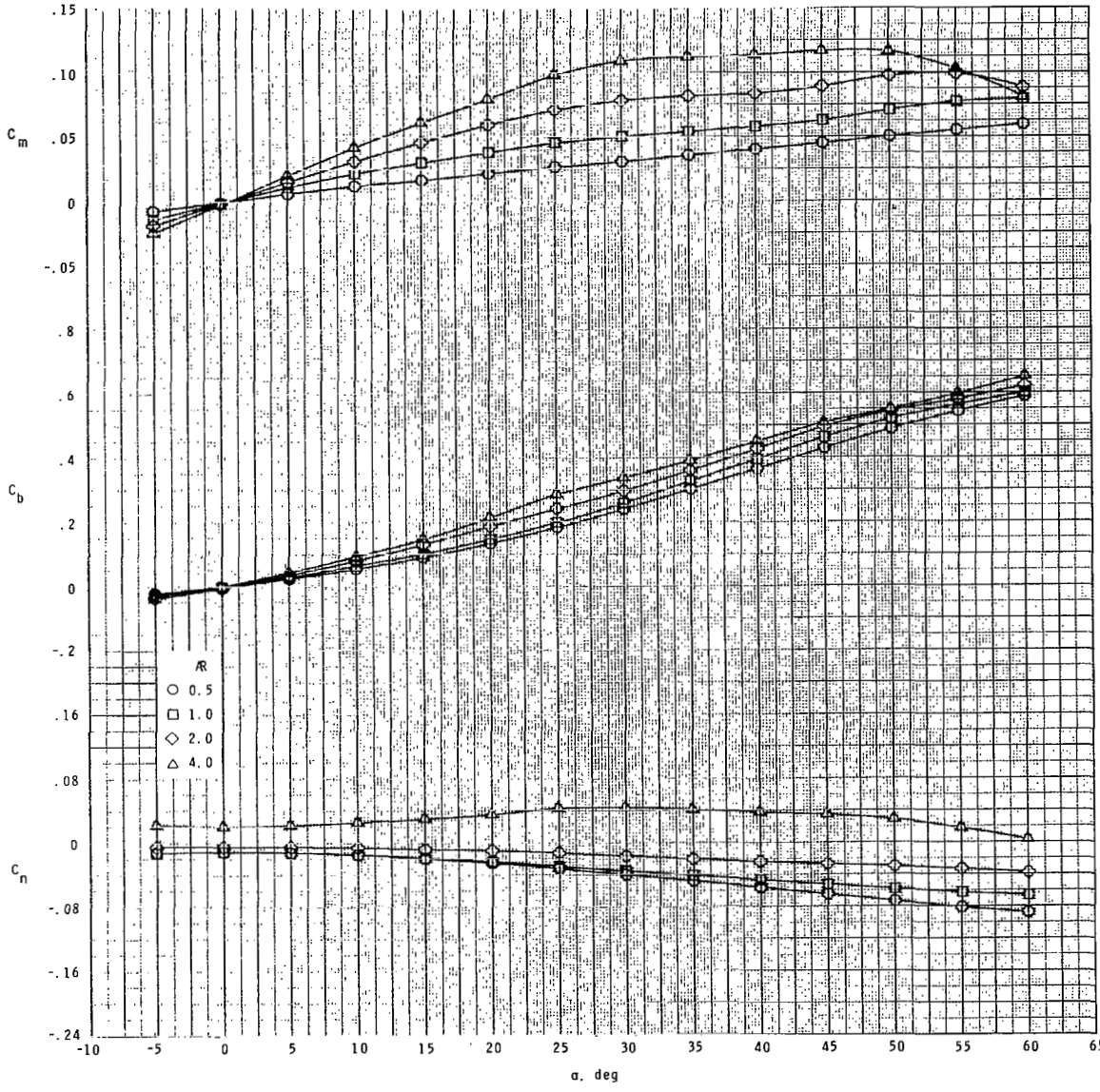
(d) Concluded.

Figure 13.- Continued.



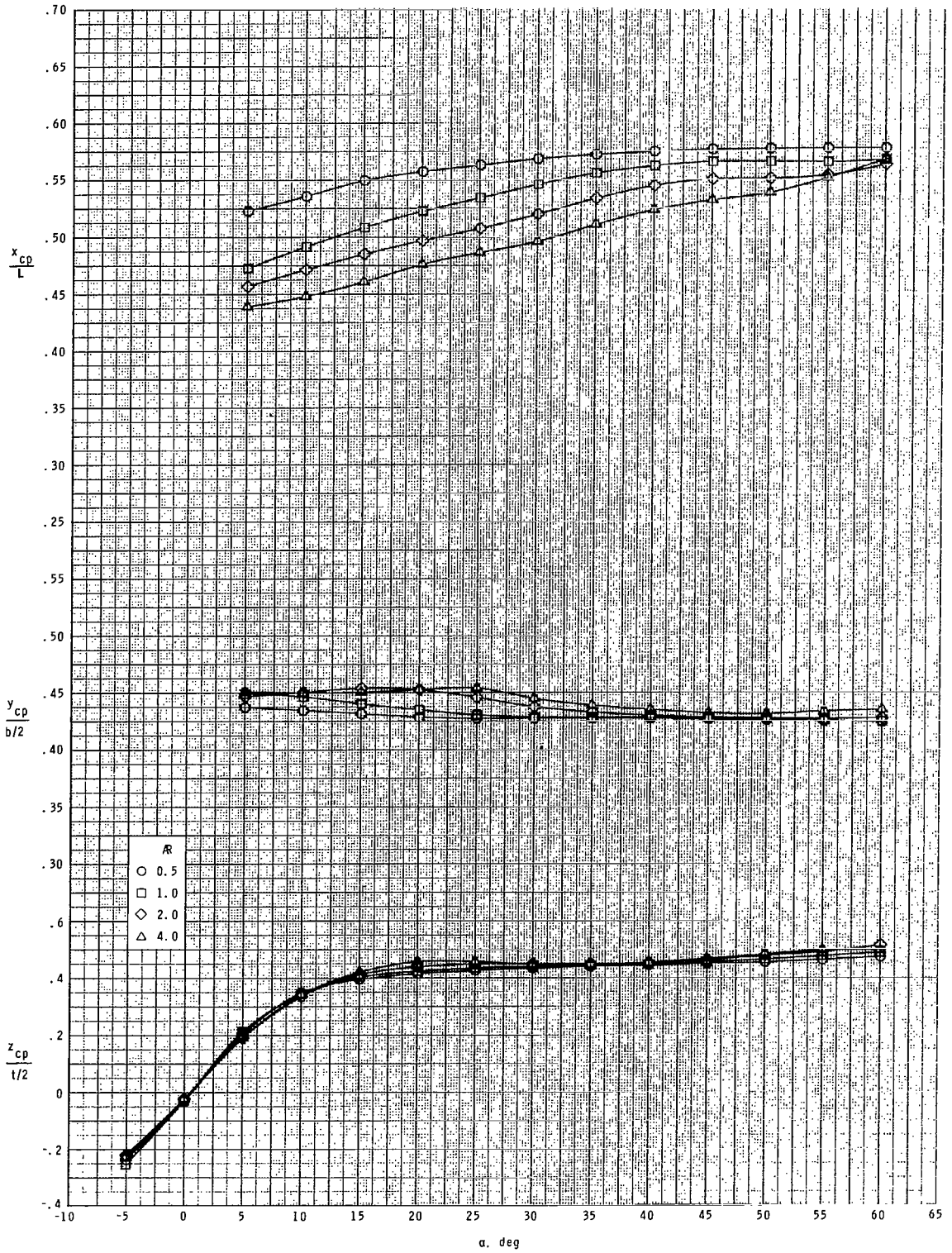
(e) M = 4.60.

Figure 13.- Continued.



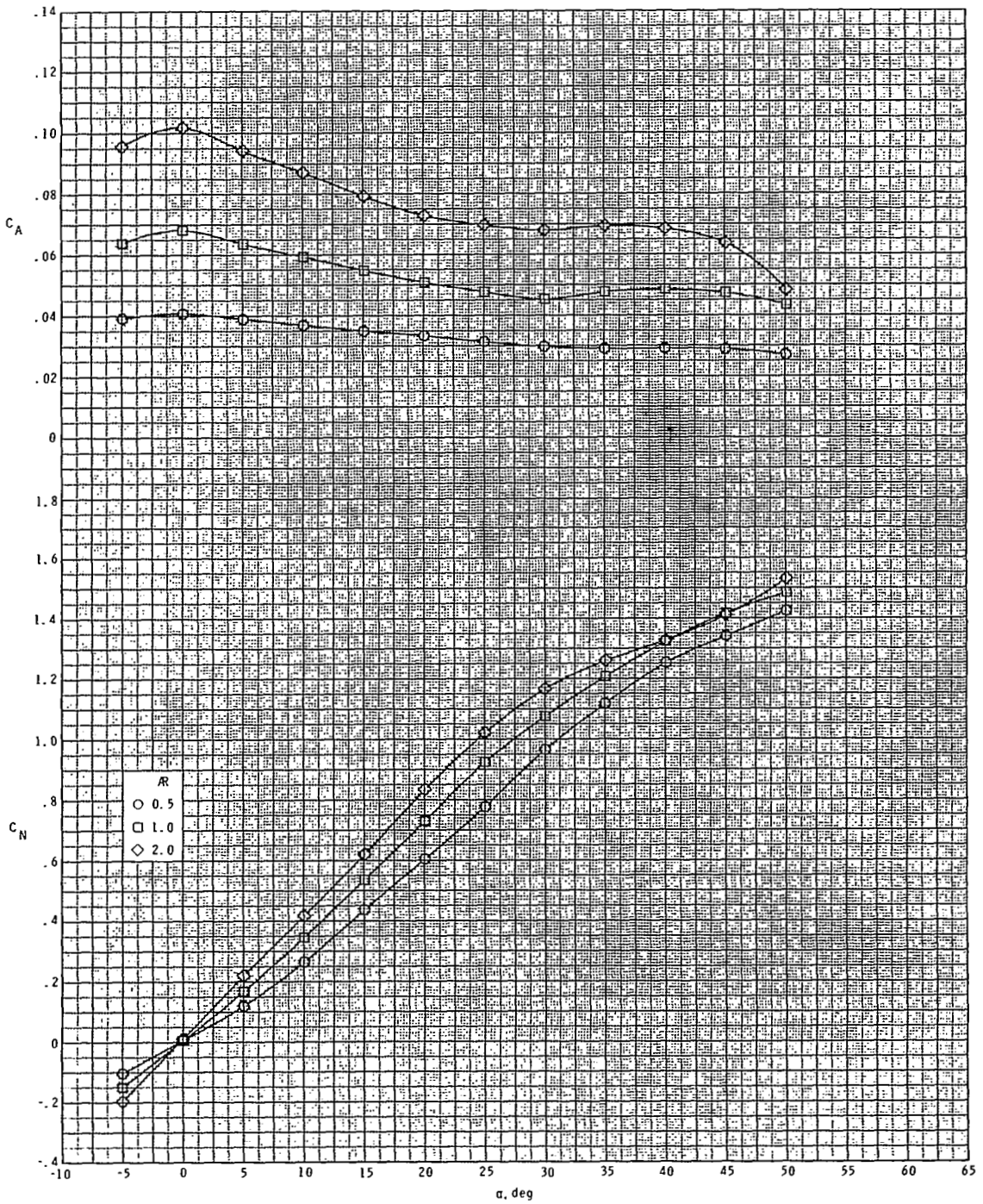
(e) Continued.

Figure 13.- Continued.



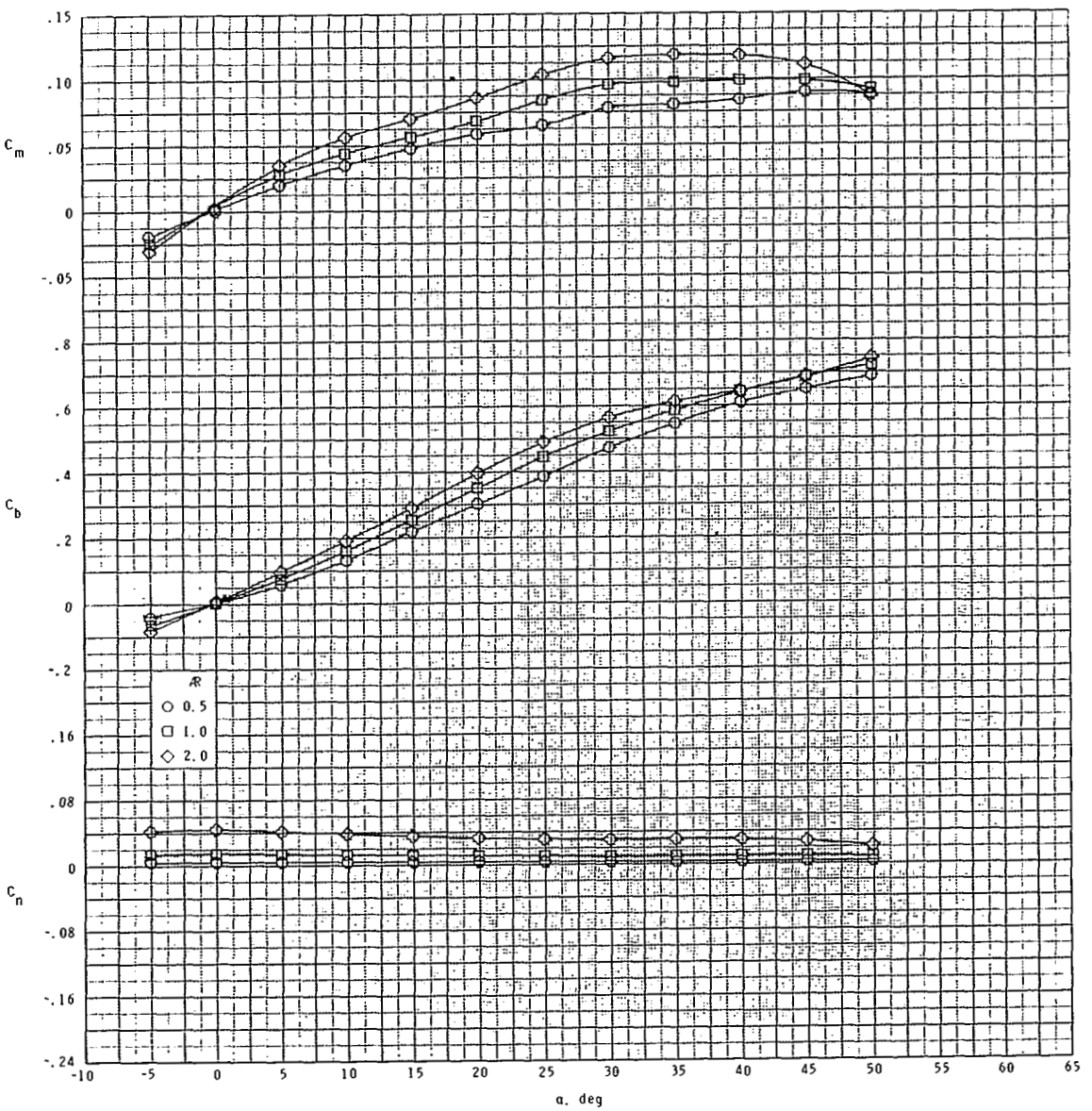
(e) Concluded.

Figure 13.- Concluded.



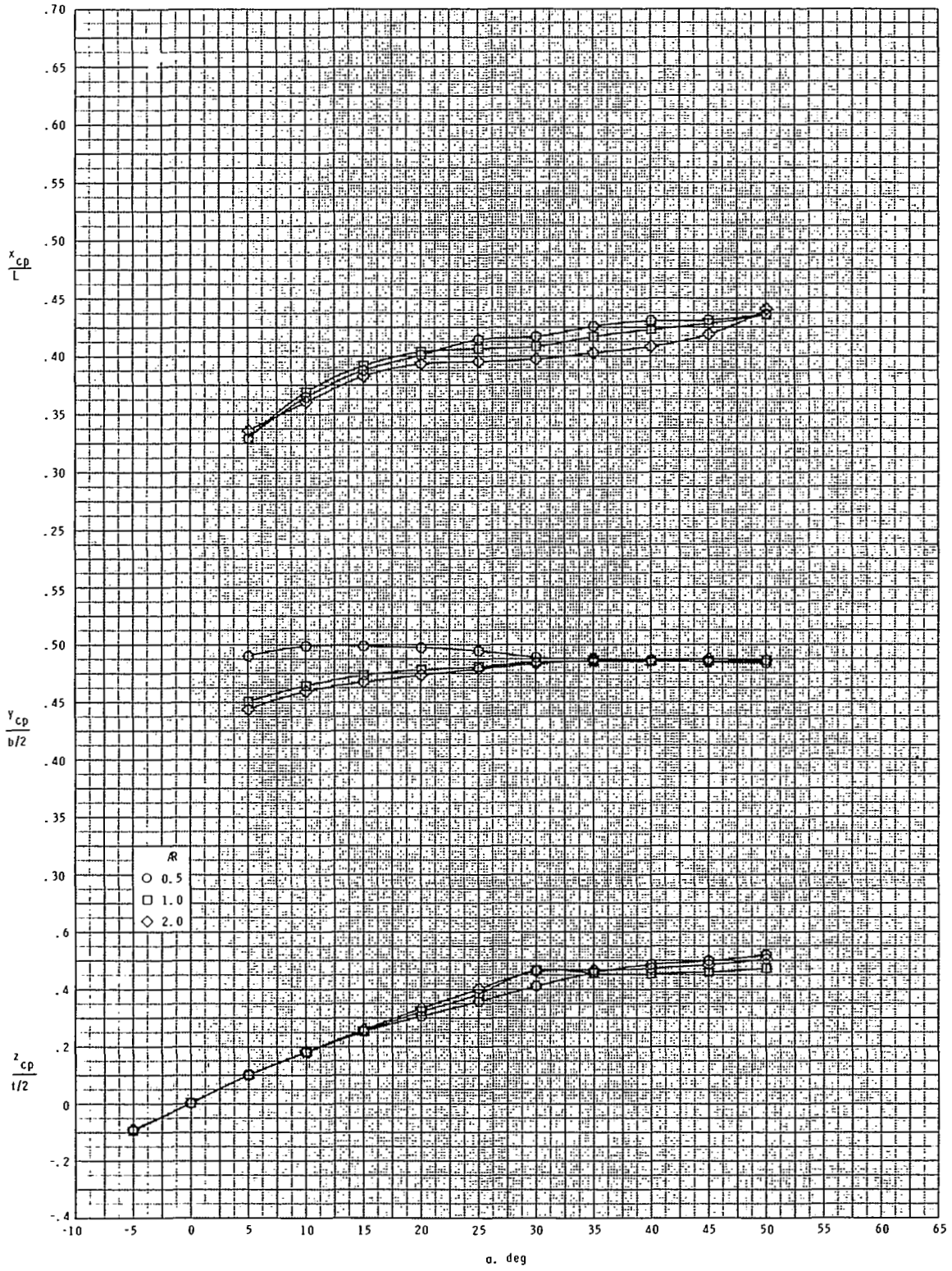
(a) M = 1.60.

Figure 14.- Effects of aspect ratio on wing aerodynamic characteristics. λ = 1.0.



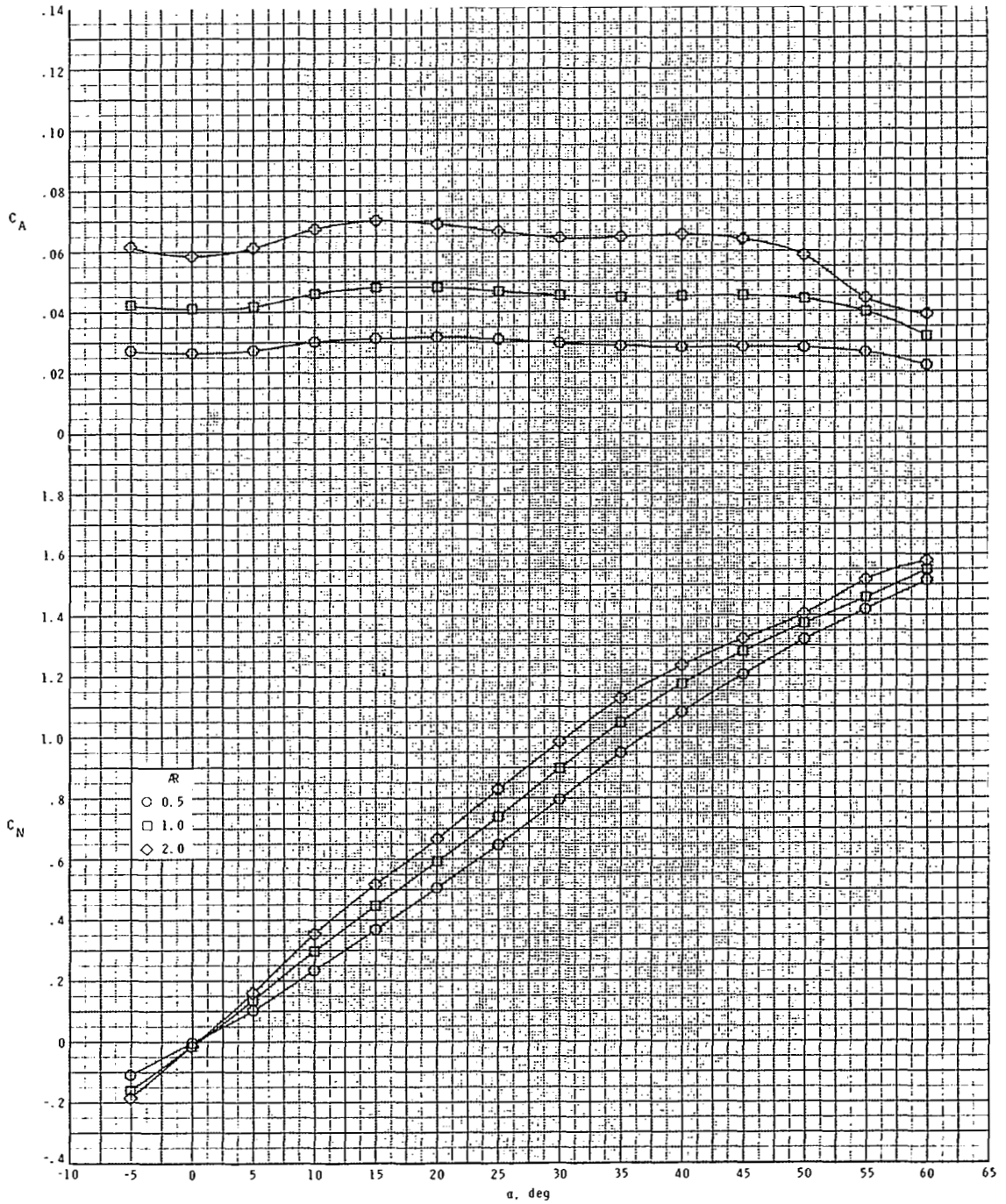
(a) Continued.

Figure 14.- Continued.



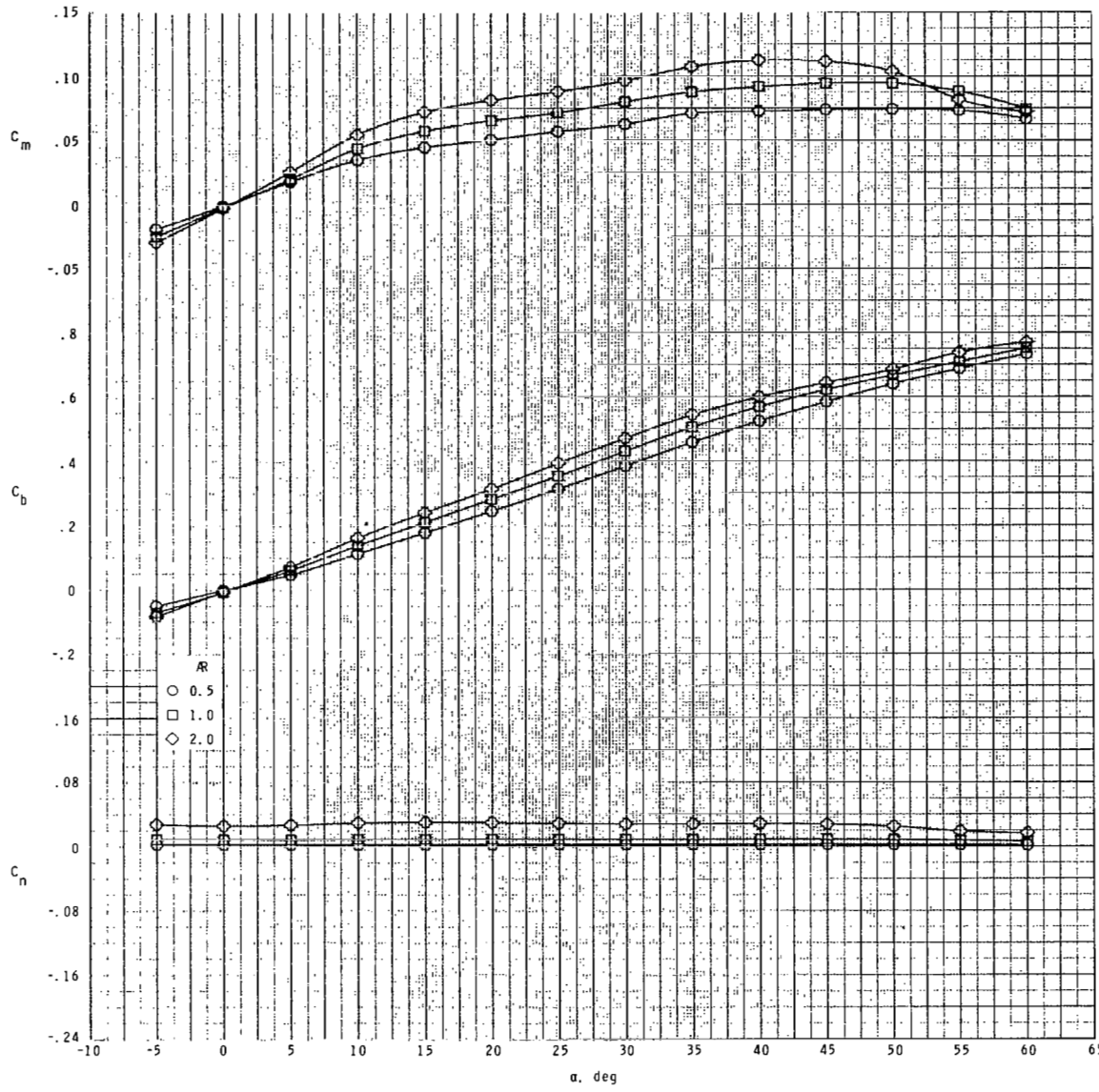
(a) Concluded.

Figure 14.- Continued.



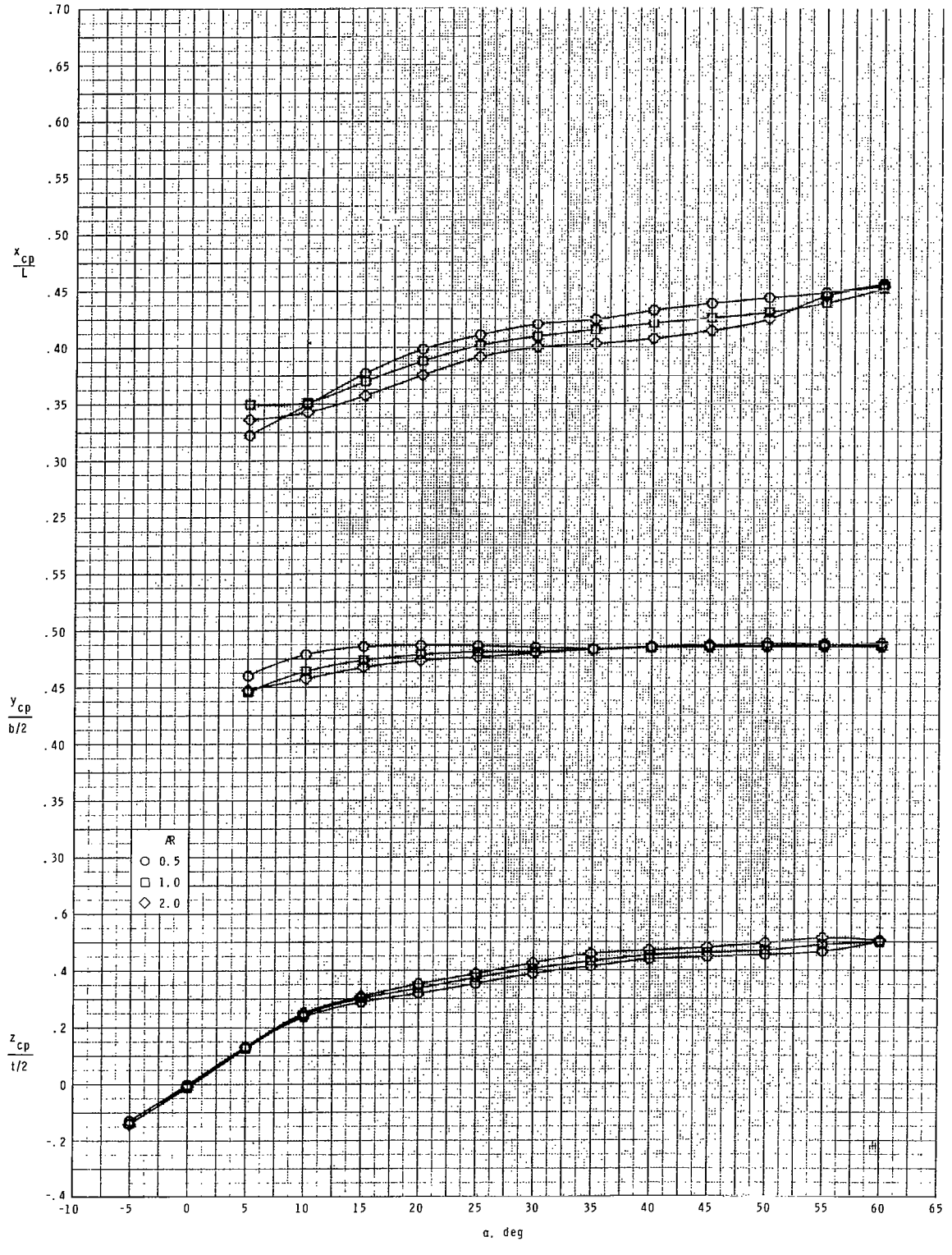
(b) M = 2.16.

Figure 14.- Continued.



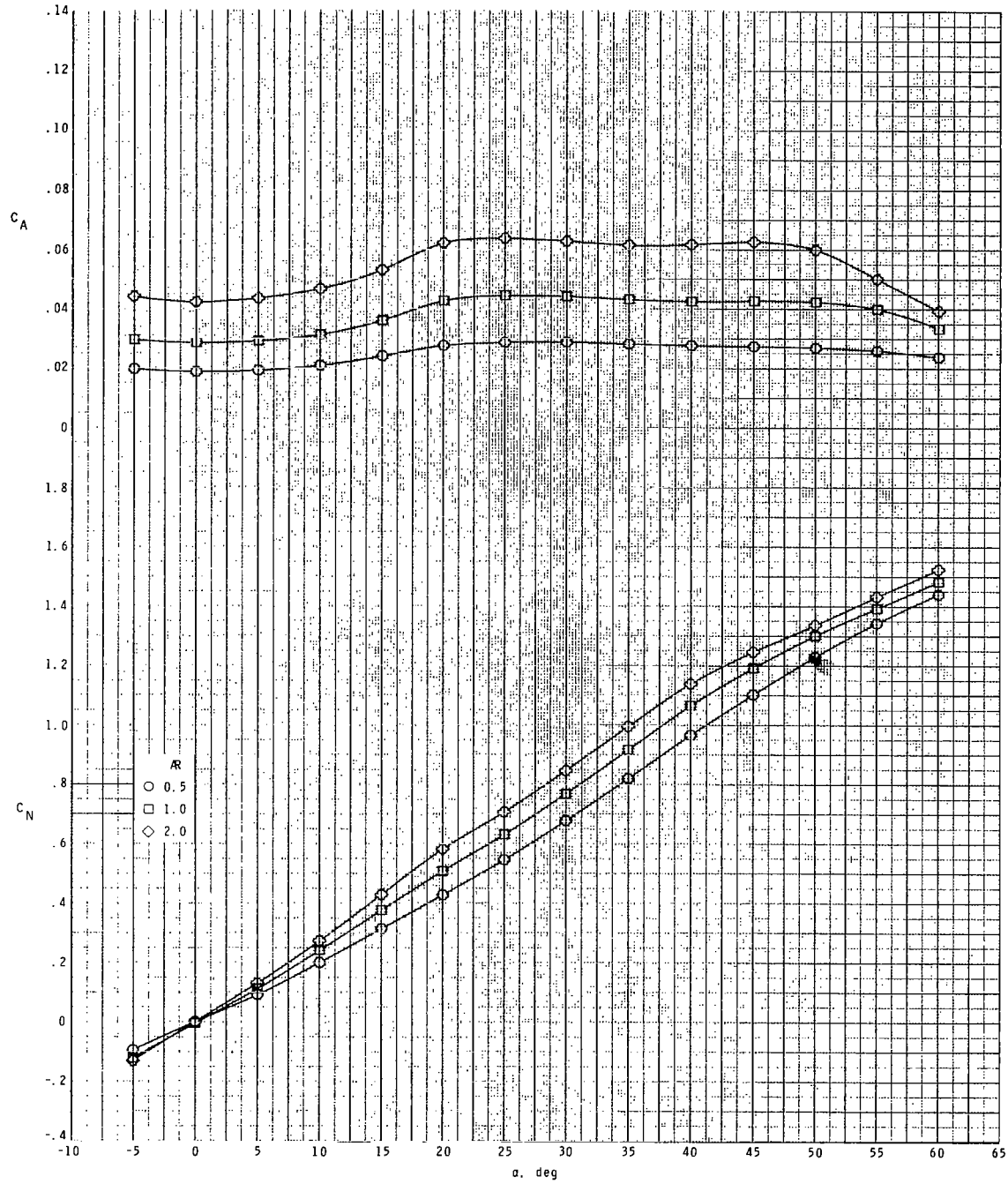
(b) Continued.

Figure 14.- Continued.



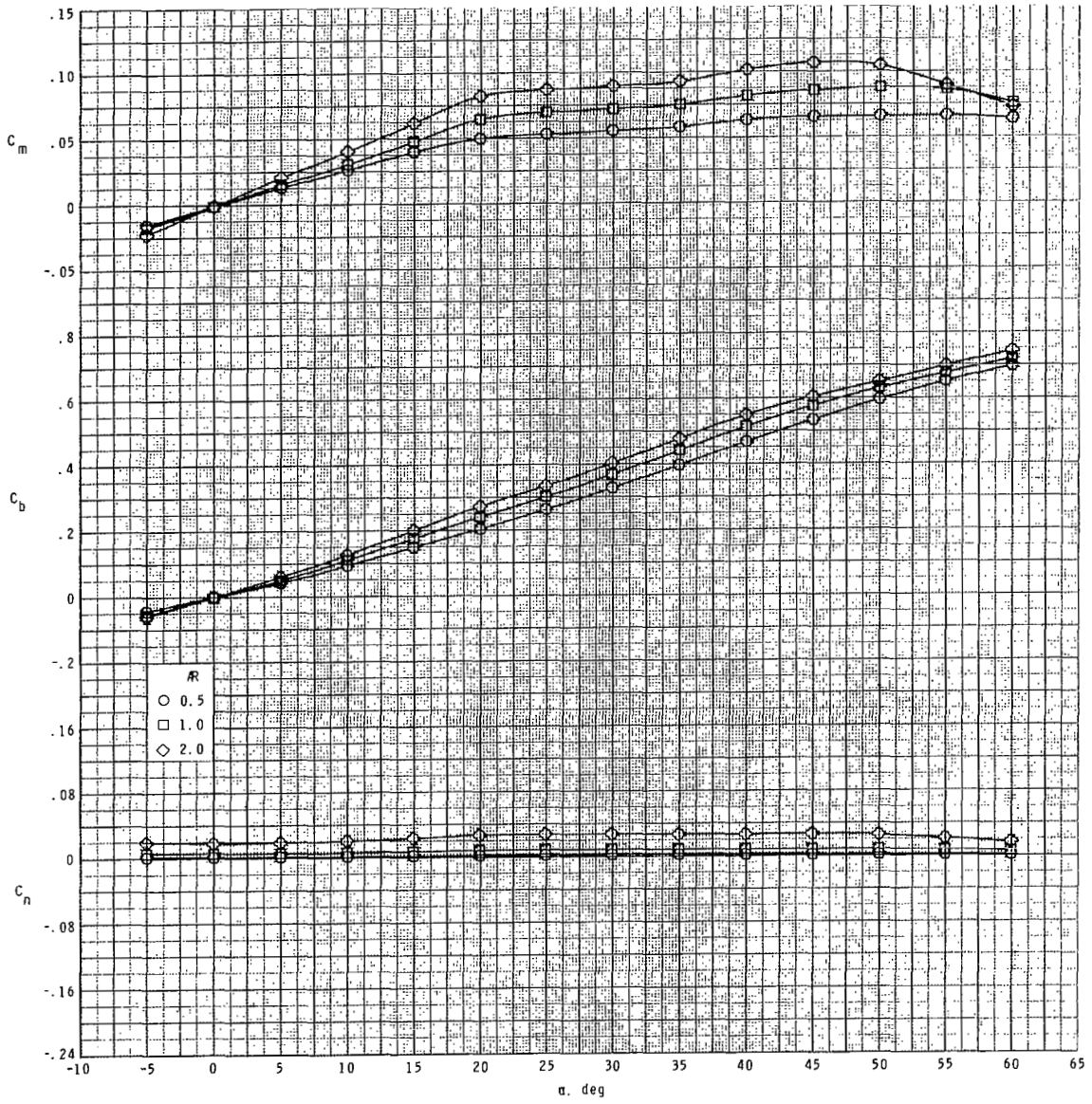
(b) Concluded.

Figure 14.- Continued.



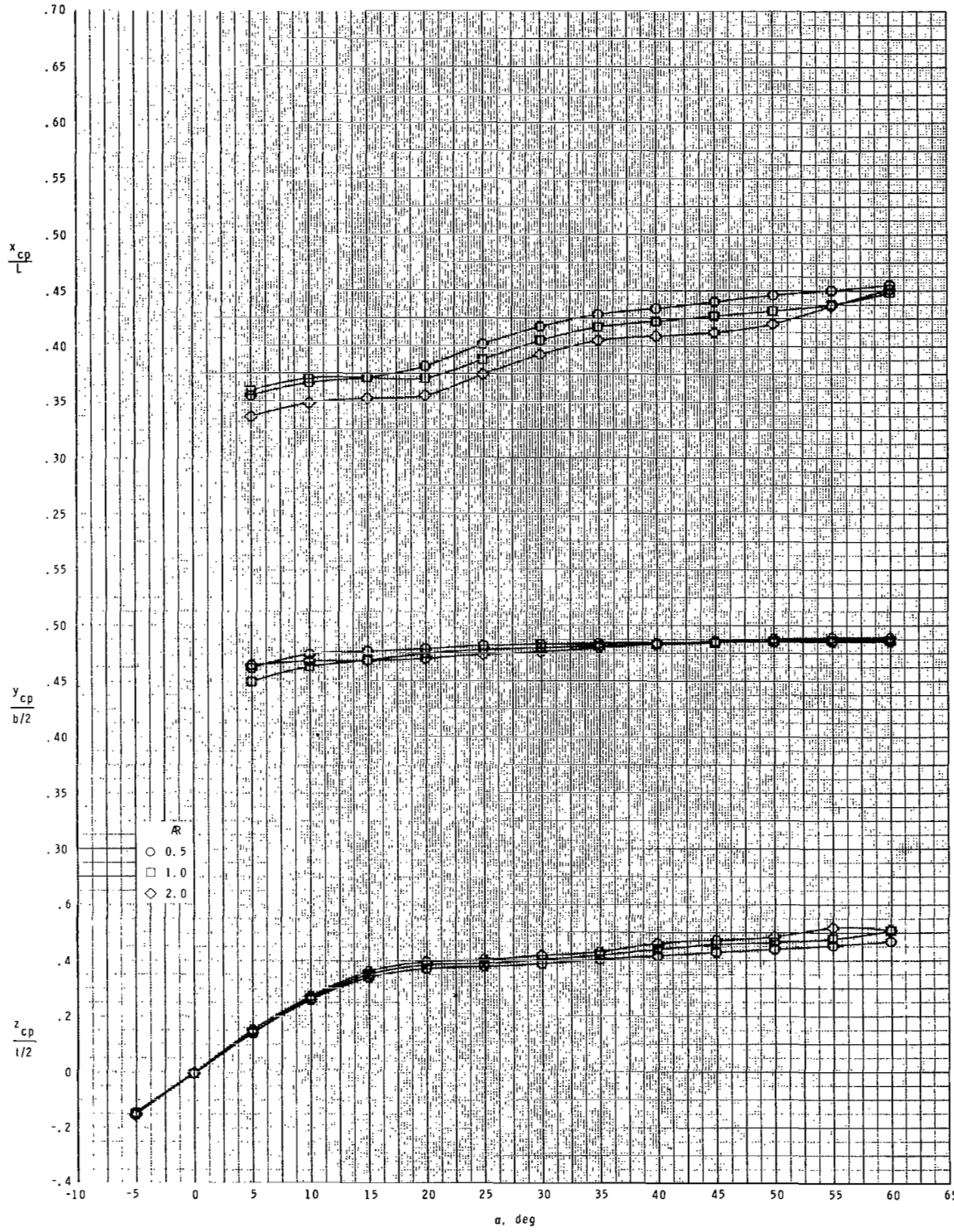
(c) M = 2.86.

Figure 14.- Continued.



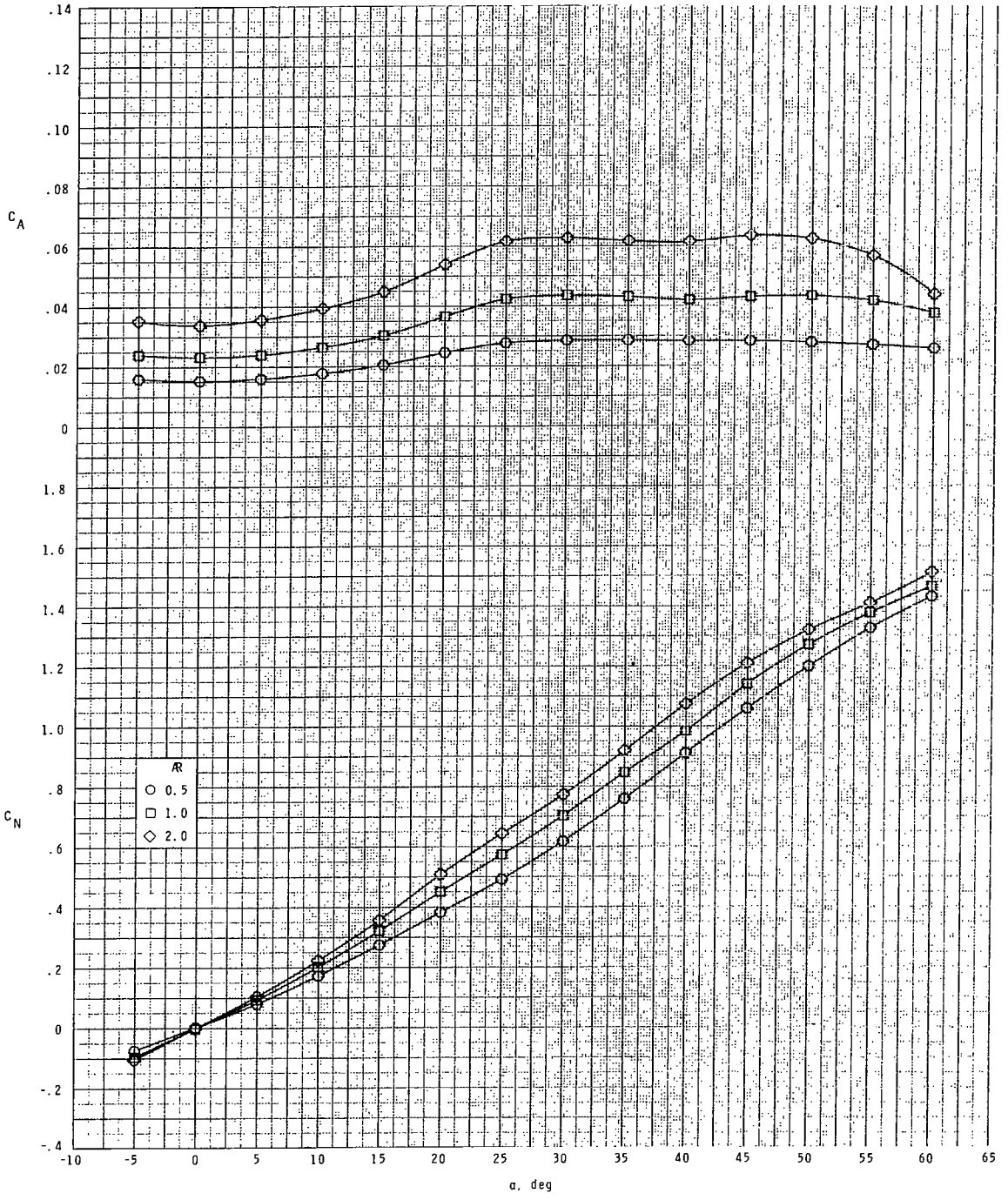
(c) Continued.

Figure 14.- Continued.



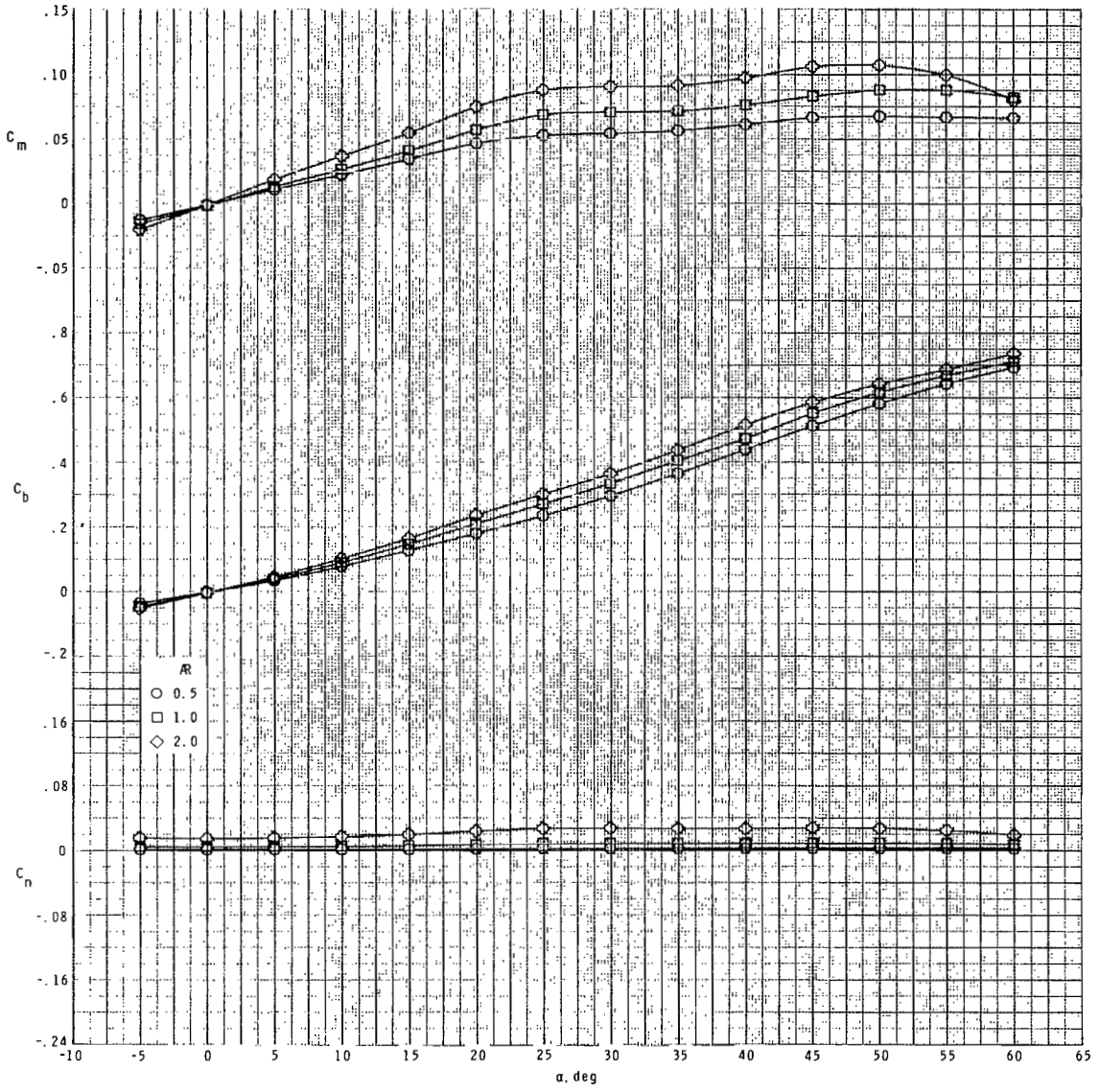
(c) Concluded.

Figure 14.- Continued.



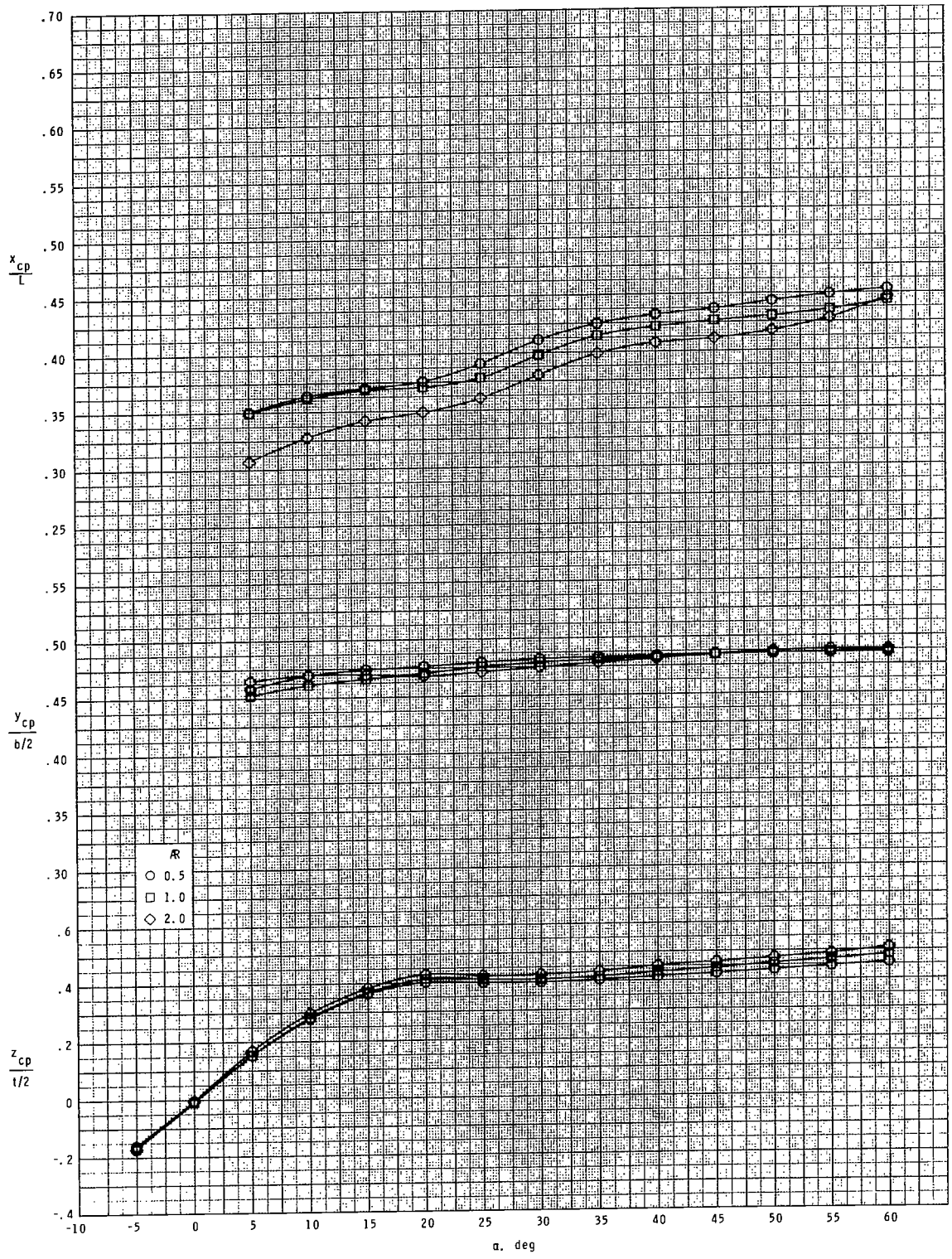
(d) M = 3.50.

Figure 14.- Continued.



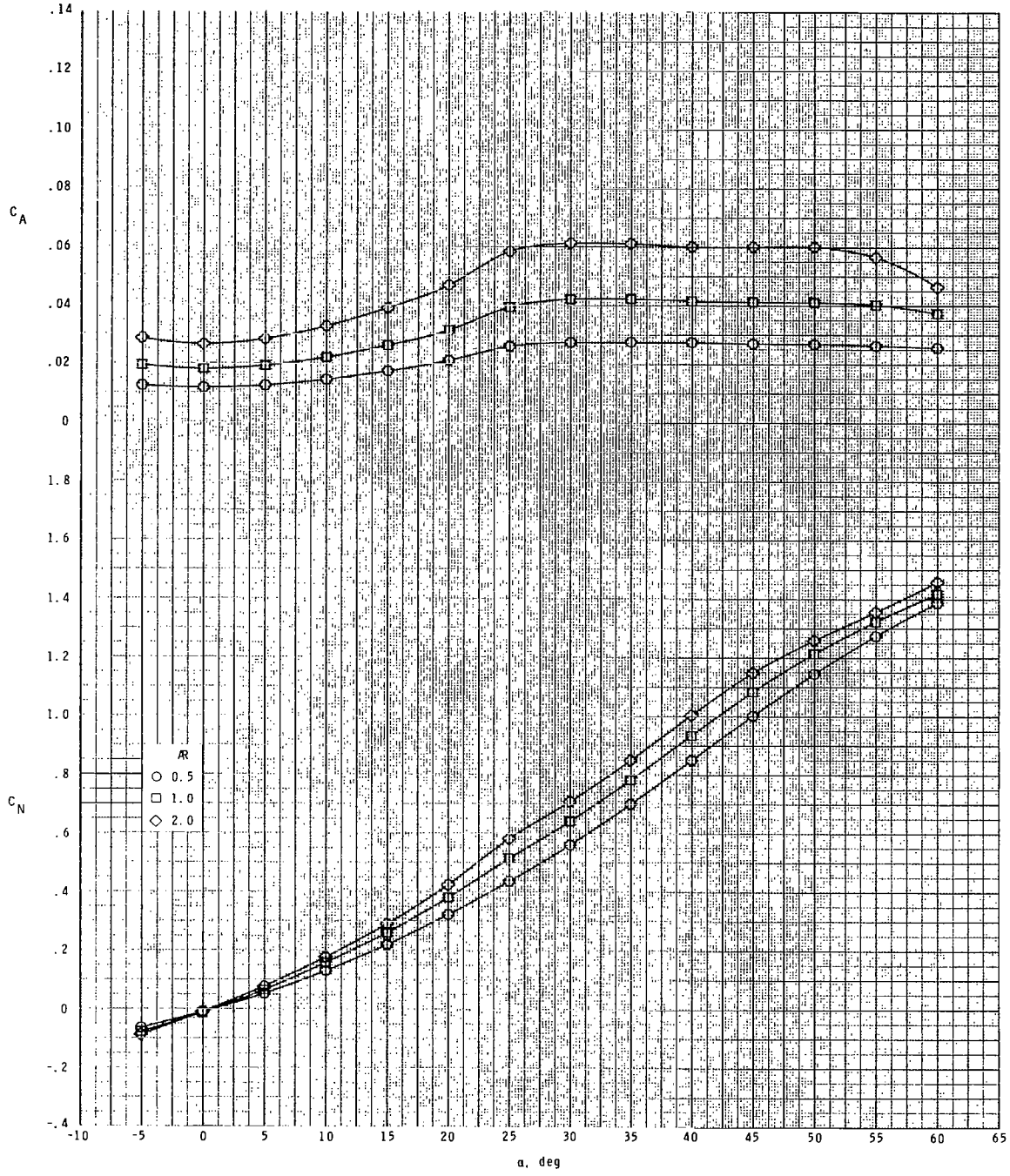
(d) Continued.

Figure 14.- Continued.



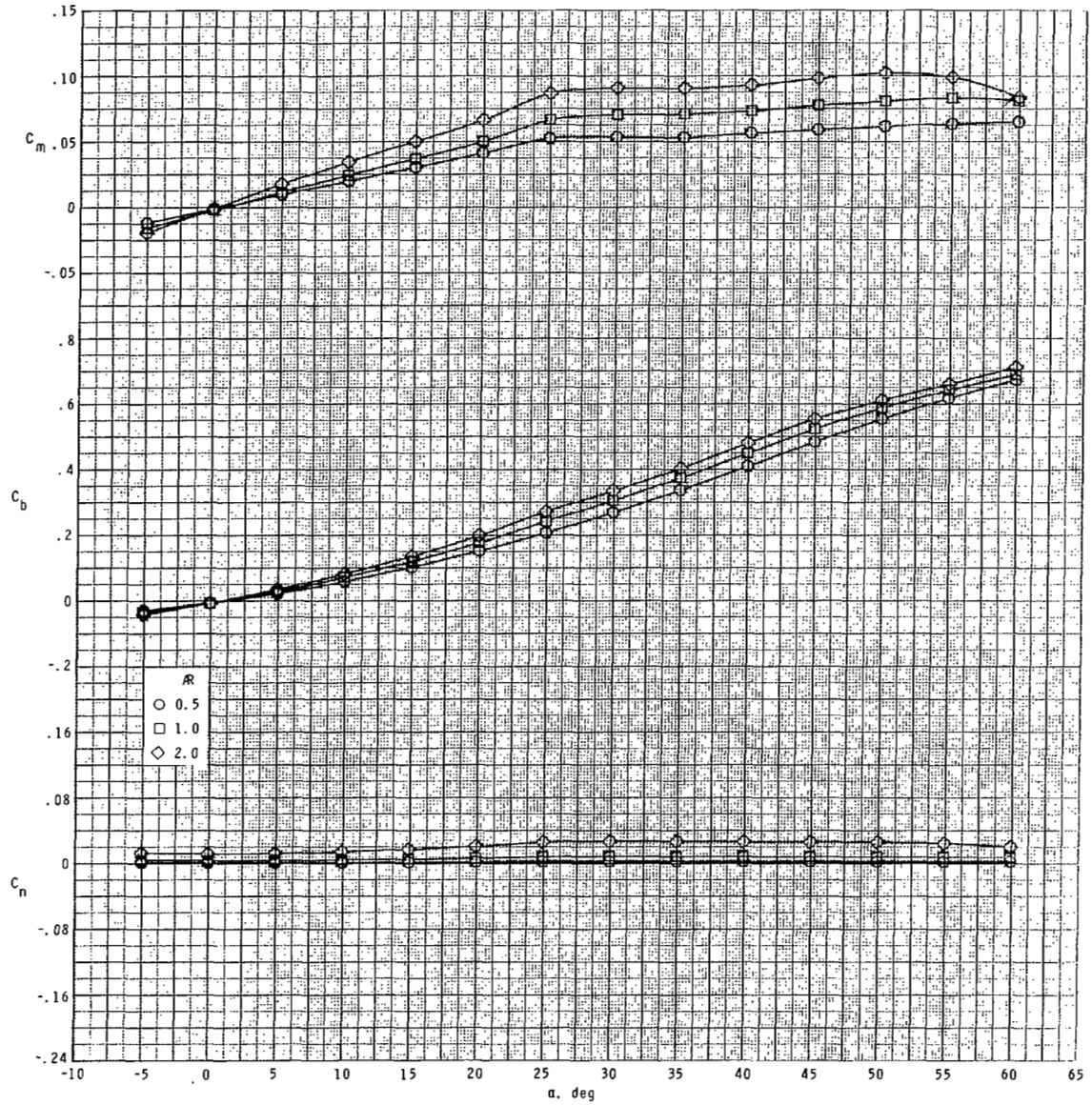
(d) Concluded.

Figure 14.- Continued.



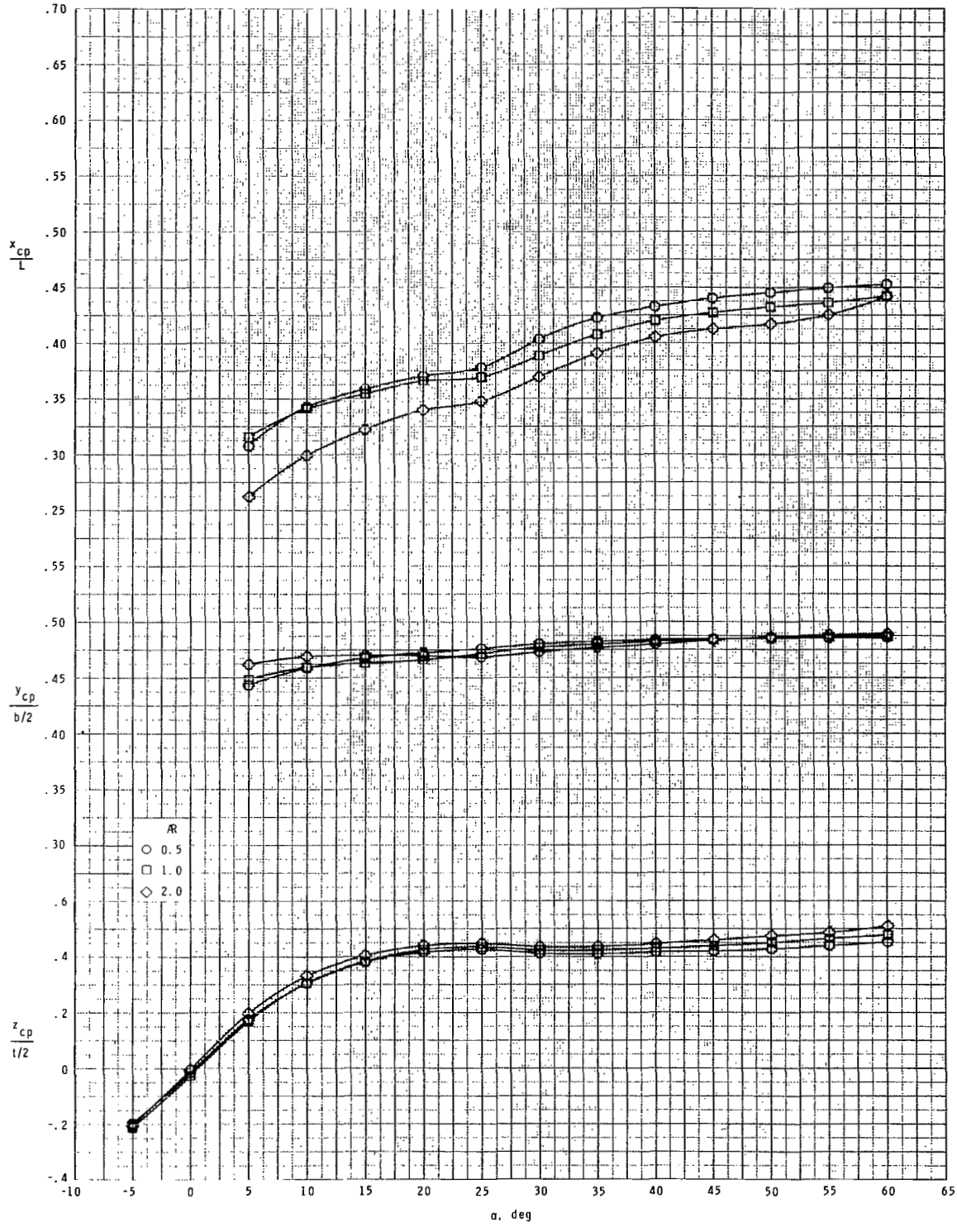
(e) M = 4.60.

Figure 14.- Continued.



(e) Continued.

Figure 14.- Continued.



(e) Concluded.

Figure 14.- Concluded.

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15. Supplementary Notes

16. Abstract

An experiment has been conducted to determine wing-alone supersonic aerodynamic characteristics at high angles of attack. The wings tested varied in aspect ratio from 0.5 to 4.0 and in taper ratio from 0 to 1.0. The wings were tested at angles of attack ranging from -5° to 60° and at Mach number from 1.60 to 4.60. The aerodynamic characteristics were obtained by integrating local pressures measured over the wing surfaces. Presented and discussed are results showing the effects of aspect ratio, taper ratio, Mach number, and angle of attack on force and moment coefficients and center-of-pressure locations. Also included are tabulations of the pressure measurements.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
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