7N-05
198508
P-47

NASA TN D-243

TECHNICAL NOTE
D-243

TABLES AND CHARTS FOR ESTIMATING STALL EFFECTS

ON LIFTING-ROTOR CHARACTERISTICS

By Alfred Gessow and Robert J. Tapscott

Langley Research Center
Langley Field, Va.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON May 1960

(NASA-TN-D-243) TABLES AND CHARTS FOR ESTIMATING STALL EFFECTS ON LIFTING-ROTOR CHARACTERISTICS (NASA. Langley Research Center) 47 p

N89-70811

Unclas
00/05 0198508

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TECHNICAL NOTE D-243

TABLES AND CHARTS FOR ESTIMATING STALL EFFECTS ON LIFTING-ROTOR CHARACTERISTICS

By Alfred Gessow and Robert J. Tapscott

SUMMARY

Tables and charts of lifting-rotor characteristics that include flight conditions well into the stall range are presented. The information was calculated by numerical methods for a rotor having rectangular blades with -8° of twist with the use of a representative set of airfoil section lift and drag characteristics covering a 180° angle-of-attack range. The application of the information to various types of rotor calculations for use in estimating blade motion, performance, stability derivatives, and load factors of lifting rotors is discussed.

INTRODUCTION

Although helicopters are designed to cruise under conditions that result in little or no rotor stall, severe stall is normally encountered in maneuvers and in flight at or near top speeds. Flight operation involving rotor stall is, therefore, an important design condition because of its influence on helicopter-blade and control-system stresses, vibrations, load factors, blade-fuselage clearance, performance, stability, and control. The effects of stall on many of these items have long been recognized, and analytical procedures for estimating some of these effects are available in the literature. In general, such procedures are based on two approaches: (1) the modification of unstalled-rotor theory (i.e., theory in which no account is taken of stall effects in the forward-velocity region of the rotor) by means of correction factors that are either empirically determined or obtained theoretically by numerical methods, or (2) the direct numerical calculation of rotor characteristics by means of equations that account for the effects of stall on the lift and drag curves of the rotor blade sections. Examples of the first approach to the problem can be found in references 1, 2, and 3, whereas procedures for carrying out the second approach are presented in references 4 and 5.

The use of theoretical correction factors in conjunction with unstalled-rotor theory possesses the advantages of simplicity and speed of calculation. These advantages are achieved, of course, with a reduction in accuracy inasmuch as the correction factors represent averages

representative of a range of conditions. The direct-numerical-calculation method yields answers that are as exact as the assumptions of the theory, but a practical approach requires the use of automatic computing machines. For situations in which an automatic computer is not available or when only a limited number of cases are to be investigated, it would be desirable to have numerically computed information available from which trends of rotor characteristics can be obtained over a wide range of stalled-flight conditions. The purpose of this paper is to present such information for a representative rotor in the form of tables and charts.

The variables covered in the calculations include combinations of tip-speed ratios (ranging from 0.1 to 0.5), inflow ratios, and pitch angles that represent flight conditions ranging from well below rotor stall to severe stall. Rotor blade flapping, rotor thrust, power, and profile-drag power, and orientation of the resultant rotor-force vector are determined for rectangular rotor blades with zero cutout and -8° of twist. L 6 9 7

SYMBOLS

a' projection of angle between rotor resultant-force vector and shaft axis in plane containing flight path and shaft axis, deg

a_0 constant term in Fourier series that expresses β; hence, rotor coning angle, deg

a_n coefficient of $\cos n\psi$ in expression for β; hence, longitudinal flapping coefficient, deg

b number of blades per rotor

b' projection of angle between rotor resultant-force vector and shaft axis in plane perpendicular to plane containing flight path and shaft axis, deg

b_n coefficient of $\sin n\psi$ in expression for β, therefore lateral flapping coefficient, deg

C_P rotor-shaft power coefficient, $\dfrac{P}{\pi R^2 \rho (\Omega R)^3}$

$C_{P,o}$ rotor-shaft profile power coefficient, $\dfrac{P_o}{\pi R^2 \rho (\Omega R)^3}$

C_T rotor-thrust coefficient, $\frac{T}{\pi R^2 \rho (\Omega R)^2}$

c blade-section chord, ft

$c_{d,o}$ section profile drag coefficient

c_e equivalent blade chord (weighted on thrust basis), $\frac{\int_0^R cr^2 dr}{\int_0^R r^2 dr}$

L
6
9
7

c_l section lift coefficient

I_1 mass moment of inertia of blade about flapping hinge, slug-ft^2

P rotor-shaft power

P_o rotor-shaft profile power

R blade radius measured from center of rotation, ft

r radial distance to blade element, ft

T rotor thrust, lb

V true airspeed of helicopter along flight path, fps

v induced velocity at rotor (always positive), fps

α rotor angle of attack; angle between axis of no feathering (that is, axis about which there is no cyclic pitch change) and plane perpendicular to flight path, positive when axis is inclined rearward, deg

α_r blade-element angle of attack, measured from line of zero lift, deg

$\alpha_{(u_T=0.4)(270^\circ)}$ blade-element angle of attack at radius at which tangential velocity equals 0.4 tip speed at 270° azimuth position, deg

$\alpha_{(1.0)(90^\circ)}$ blade-element angle of attack at tip of advancing blade at 90° azimuth position, deg

$\alpha_{(1.0)(270^\circ)}$ blade-element angle of attack at tip of retreating blade at 270° azimuth position, deg

β blade flapping angle with respect to shaft and particular azimuth position, $a_0 + a_n \cos \psi + b_n \sin \psi$ $(n = 1, 2, 3, \ldots)$, radians

γ' mass constant of rotor blade, $c_e \rho R^4 / I_1$

θ_0 collective pitch angle at blade root, average value of instantaneous blade-root pitch angle around azimuth, deg

$\theta_{.75}$ blade-section pitch angle at 0.75 radius; angle between line of zero lift of blade section and plane perpendicular to axis of no feathering, deg

λ inflow ratio, $\frac{V \sin \alpha - v}{\Omega R}$

μ tip-speed ratio, $\frac{V \cos \alpha}{\Omega R}$

ρ mass density of air, slugs/cu ft

σ rotor solidity, $\frac{bc_e}{\pi R}$

ψ blade azimuth angle measured from downwind position in direction of rotation, radians

Ω rotor angular velocity, radians/sec

L
6
9
7

ANALYSIS

Coefficients representing blade flapping motion, magnitude and direction of rotor force vector, rotor total power and profile power, and advancing- and retreating-blade-tip angles of attack were calculated for specific combinations of inflow ratio λ, blade pitch angle θ_0, and tip-speed ratio μ by means of an IBM 704 electronic data processing machine which was programmed according to the equations and procedures described in references 4 and 5. The calculations were carried out at azimuth intervals of 20° and with a total of nine radial stations.

Operating Variables

In the calculations, θ_0 was varied from 6° to 38°, μ from 0.1 to 0.5, and λ over a range to cover rotor angles of attack from large positive to large negative values and an extremely large range of rotor thrust coefficients. The operating variables thus cover regions of flight ranging from well below the stall to regions of extreme stall at flight conditions ranging from low-powered descents to high-powered climbs.

L
6
9
7

Blade Characteristics

All of the calculations were made for a rotor having untapered blades that incorporate -8° of twist, a mass factor γ' of 2.62, flapping hinges located on the rotor center line, zero cutout, and a tip-loss factor of 0.97. The blade-section lift and drag characteristics used are given in figure 1 as a function of section angle of attack. Below the stall (i.e., $\alpha_r = 12^\circ$), the section characteristics are representative of well-constructed production blades. The values of c_l and $c_{d,o}$ above the stall are based on data for the NACA 0015 airfoil given in reference 6. Inasmuch as differences in airfoil performance tend to be minimized above the stall, it is believed that rotor parameters computed with the data of figure 1 should be representative of rotors constructed with any of the commonly used airfoils. The effect of variation of airfoil characteristics above stall on rotor characteristics is discussed subsequently. No effects of Mach number are considered in the calculations.

RESULTS

Tables

The results of the calculations of rotor characteristics corresponding to tip-speed ratios of 0.10, 0.20, 0.30, 0.35, 0.40, 0.45, and 0.50 are presented in table 1. (The increment in μ is smaller at the higher values of μ because changes in power, flapping, and other quantities occur more rapidly at the high values of μ.) Within each part of table 1 the rotor quantities are given for values of θ_0 ranging from 6° to 38° (or $\theta_{.75}$ from 0° to 32°) in 4° increments, and for each value of θ_0, a range of C_T/σ values from 0 to 0.16 in increments of 0.01 are given. Flapping coefficients, inflow ratios, power coefficients, and other parameters associated with particular

values of μ, θ_0, and C_T/σ were determined and are presented in the table. The use of even increments of C_T/σ rather than those of λ for each value of θ_0 facilitates the use of the tables because C_T/σ is the usual known quantity. The even increments were obtained by interpolating from plots of C_T/σ against λ similar to those shown in figure 2.

There are two columns of values for a' in each part of the table. The values for a' listed in column 8 were computed from the following equation which is derived in reference 7:

L
6
9
7

$$\tan a' = \frac{1}{\mu}\left(\frac{C_{P,o}}{C_T} - \frac{C_P}{C_T} - \lambda\right)$$

whereas the values given in column 9 were computed from the differential equation given in reference 5. Differences between the two sets of values are generally negligible from a practical viewpoint, although the quantities given in column 9 should be considered as being more accurate. The less accurate values are presented because of possible value in obtaining compatible answers in problems where the power coefficients are used as starting points rather than the more basic conditions of λ, θ_0, and μ.

Charts

Rotor-thrust, profile-drag-power and total-power coefficients as functions of inflow ratio λ for constant values of the collective pitch angle θ_0, obtained from tables 1(a) to 1(g), are given in figures 2(a) to 2(g). Each figure corresponds to a constant tip-speed ratio μ, starting with $\mu = 0.1$ and ending with $\mu = 0.5$. Combinations of λ, θ_0, and μ which result in the onset of stall at the tip of the retreating blade $\left(\alpha_{(1.0)(270^\circ)} = 12^\circ\right)$ or inboard on the retreating blade $\left(\alpha_{(u_T = 0.4)(270^\circ)} = 12^\circ\right)$, whichever occurs first, are shown on the plots of C_T/σ against λ in the figure.

Values of $\frac{C_P - C_{P,o}}{\sigma}$ obtained from the tables are presented in figure 3 as a function of λ and μ for fixed values of C_T/σ ranging from 0.01 to 0.13 in increments of 0.02. These plots in conjunction with those of figure 2 can be used in carrying out the initial stages of performance, stability-derivative, and blade-motion calculations.

Use of Tables and Charts

As a first step in calculating such items as rotor blade motion, ranges for cyclic and collective pitch, helicopter performance, and rotor stability derivatives, it is necessary to convert the physical dimensions of the helicopter and the flight conditions of interest into the three basic variables, μ, θ_0, and λ. The procedure is outlined in a number of publications, reference 7 being a recent example. As described in that reference, the known data can be transformed into μ, C_T/σ, and $\frac{C_P - C_{P,o}}{\sigma}$ quantities from which λ, θ_0, and thence the desired information can be obtained from rotor analytical theory, tables, or charts.

Determination of λ and θ_0.- The inflow ratio λ can be read directly off the plots of figure 3 by noting, on the plot for the appropriate value of C_T/σ, the intersection of the input value of $\frac{C_P - C_{P,o}}{\sigma}$ with the particular μ line. The collective pitch angle θ_0 can then be obtained from the plots of C_T/σ against λ in figure 2.

Calculation of helicopter performance.- Rotor profile-drag power and total power can be determined from the plots of figure 2 when the values of λ and θ_0 are known. Any other performance problem, such as the determination of helicopter rate of climb at a given power condition and airspeed or the determination of the amount of parasite-drag area that could be handled at a given flight and power condition, can also be solved by the use of figures 2 and 3.

Calculation of rotor blade motion and tip angles of attack.- Once λ and θ_0 have been determined, the harmonics of rotor blade flapping motion and the angles of attack at the tip of the advancing and retreating blades can be read from table 1 by using the known values of μ, θ_0, and C_T/σ. Usually some interpolation between the values of θ_0 and C_T/σ will be necessary, and if a great deal of this type of computation is required, it may be more convenient to plot the tabulated data in order to avoid the numerical interpolation.

Calculation of rotor stability derivatives.- Methods and charts for calculating rotor stability derivatives in forward flight for non-stalled conditions are presented and discussed in references 8 and 9. In general, the derivatives depend on the variation of the magnitude and direction of rotor resultant force and variation of the magnitude of rotor power and blade flapping coefficients with rotor angle of attack α, tip speed ratio μ, collective pitch angle θ_0, and pitching

velocity. Many of these derivatives can be obtained for stalled conditions either directly from table 1 or by appropriate plots that can be constructed from the tabulated data.

The derivative $\Delta a'/\Delta\mu$ at constant values of C_T/σ and θ_0, for example, can be obtained by reading the a' values (corresponding to the appropriate C_T/σ and θ_0 values) from the table at two successive μ values. The various a' derivatives can be obtained by plotting the tabulated a' values in the same fashion as the a' charts of reference 8. Derivatives that depend on rotor angle of attack α are in turn a function of rotor solidity, as well as of μ, C_T/σ, and θ_0. Thus, for a particular value of solidity, α can be calculated for any μ, C_T/σ (or λ), and θ_0, combination given in the table, and the α derivatives can then be obtained from the tables in a manner similar to that discussed in reference 8.

L
6
9
7

Estimation of load factors.- It was previously noted that a very wide range of C_T/σ values was covered in the calculations. The prime reason for presenting information corresponding to C_T/σ values as high as 0.16 at the upper range of tip-speed ratios is to aid in the study of the maximum thrust capabilities of lifting rotors, particularly from the standpoint of load-factor estimation. Although the prediction of load factors reached during maneuvers involving cyclic-pitch manipulation is a dynamic problem involving the stability and mass characteristics of the helicopter, the material presented in this paper can provide the static derivatives required in the solution of the problem. The two pertinent derivatives $\frac{\partial C_T/\sigma}{\partial\theta}$ and $\frac{\partial C_T/\sigma}{\partial\alpha}$ can be obtained from the tables in the manner discussed in the previous section.

DISCUSSION

The interpretation and application of the tables and charts of rotor characteristics presented in this report are affected by the assumptions contained in the theory and by the use of a specific set of airfoil data and blade geometry. Some of the more important restrictions on the use of the tables and charts will be discussed.

Use of Two-Dimensional Data

A basic uncertainty of the theory on which the computations of this report are based is the use of strip analysis theory (i.e. - use

of two-dimensional airfoil data) to calculate rotor forces under the condition of severe rotor stall. Although the justification for the use of section data for calculating rotor characteristics in the unstalled condition has been well documented, very little data, particularly at full-scale, is available for checking its use in the stall condition. Aside from the paucity of experimental rotor data, a precise comparison between theory and experiment is difficult because of the lack of trustworthy section data in the ranges of Mach and Reynolds numbers encountered on the rotor, particularly in regard to the angle of attack for, and the value of, the maximum lift coefficient.

L
6
9
7

A preliminary study of the available data shows that although the onset of stall as indicated by the increase in profile power is well predicted, the effects of stall on the rotor thrust may be delayed somewhat beyond the point indicated by the theory. The trends of blade flapping, rotor thrust, and total power with increasing amounts of stall appear to be reasonably well predicted although the magnitude appears to be exaggerated by theory at a particular stall condition. The tables and charts of the report can therefore be expected to provide a basis for estimating the maximum effects of stall on various rotor characteristics and, in addition, can be conveniently used to compare theory with experiment when trustworthy, large-scale data on stall effects become available.

Effects of Specific Section Characteristics

In order to determine the extent to which the calculated rotor characteristics would be affected by variations from the section data shown in figure 1, a limited number of flight conditions were calculated with the airfoil lift characteristics that covered a range of variations in shape that may be encountered in practice. No significant differences in blade flapping or rotor thrust were obtained as a result of using the different lift-coefficient curves.

Although the curves of C_T/σ plotted against λ in figure 2 have a marked reduction in slope once stall occurs, the thrust continues to rise even for extremely positive increases in λ (or in rotor angle of attack) for all but the highest values of θ_0. The rise in thrust with positively increasing λ is greater than can be explained by the variation of c_l with α_r beyond the stall. By recomputing some of the C_T/σ curves with section drag data in which $c_{d,o}$ was limited to its value at $\alpha_r = 12^\circ$, it became apparent that the excess thrust capabilities of rotors operating at large positive rotor angles of attack are due in large measure to the contribution of the section drag forces.

Effect of Blade Geometry

A study of the curves of figure 3 shows that for a given value of C_T/σ, the values of $\frac{C_P - C_{P,o}}{\sigma}$ corresponding to a fixed value of λ decrease rapidly with increasing tip-speed ratio, and actually become negative at $\mu = 0.5$ for all but the lowest values of C_T/σ. Since $\frac{C_P - C_{P,o}}{\sigma}$ represents the power that the rotor expends in performing useful work (in overcoming parasite drag or causing a rate of climb), it would appear that pure helicopter operation might not be feasible at normal values of C_T/σ at a $\mu = 0.5$ without an increase in the section stall angles or a change in blade geometry from that used in the present set of calculations.

L
6
9
7

The items of blade geometry that can be expected to influence rotor characteristics in the stall regimes are blade cutout, twist, and plan-form taper. Unpublished results of calculations show that sizable reductions in profile-drag power as well as increases in "propulsive" power $\left(\text{i.e., increases in } \frac{C_P - C_{P,o}}{\sigma}\right)$ are achieved by a cutout of about 0.3 radius at tip-speed ratios above 0.3. Thus, in estimating the characteristics of rotors with greater than normal amounts of cutout at high tip-speed ratios, the information given in table 1 and figures 2 and 3, which are based on zero cutout, should be modified to include the beneficial effects of blade cutout. The amount of blade twist and plan-form taper can affect the amount of rotor stall and thus can influence rotor characteristics. The -8° of twist and rectangular plan form assumed in the calculations of this paper are representative of a wide range of present and projected designs. The primary influence of blade twist on rotor profile-drag power is brought about by its delay of rotor stall. In order to avoid large regions of negative thrust on the advancing side of the rotor at high tip-speed ratios and to minimize blade stresses, designers have generally avoided blade-twist values very much in excess of -8°.

CONCLUDING REMARKS

Lifting-rotor characteristics have been computed by numerical methods and presented in the form of tables and charts for ease of application. The calculations cover flight conditions that extend into the range of extreme stall and are based on a rotor with zero cutout and blades with rectangular plan form and -8° of twist. The two-dimensional airfoil data used in the calculations account for blade stall but not for variations in Mach number. The characteristics

presented include rotor blade motion, rotor thrust, total power, profile-drag power, and orientation of the rotor resultant force vector.

The charts and tables are expected to be useful in estimating the effects of stall on rotor blade motion, rotor performance, stability derivatives, and load factors.

Langley Research Center,
National Aeronautics and Space Administration,
Langley Field, Va., January 11, 1960.

L
6
9
7

REFERENCES

1. Gustafson, F. B., and Gessow, Alfred: Effect of Blade Stalling on the Efficiency of a Helicopter Rotor As Measured in Flight. NACA TN 1250, 1947.

2. Gessow, Alfred, and Myers, Garry C., Jr.: Aerodynamics of the Helicopter. The Macmillan Co., c.1952.

3. Amer, Kenneth B.: Effect of Blade Stalling and Drag Divergence on Power Required by a Helicopter Rotor at High Forward Speed. Proc. Eleventh Annual Forum, Am. Helicopter Soc., Inc., April 27-30, 1955, pp. 100-109.

4. Gessow, Alfred, and Crim, Almer D.: A Method for Studying the Transient Blade-Flapping Behavior of Lifting Rotors at Extreme Operating Conditions. NACA TN 3366, 1955.

5. Gessow, Alfred: Equations and Procedures for Numerically Calculating the Aerodynamic Characteristics of Lifting Rotors. NACA TN 3747, 1956.

6. Pope, Alan: Summary Report of the Forces and Moments Over an NACA 0015 Airfoil Through 180° Angle of Attack. Aero Digest, vol. 58, no. 4, Apr. 1949, pp. 76-78, 100.

7. Gessow, Alfred: A Note on the Calculation of Helicopter Performance at High Tip-Speed Ratios. NASA TN D-97, 1959.

8. Amer, Kenneth B., and Gustafson, F. B.: Charts for Estimation of Longitudinal-Stability Derivatives for a Helicopter Rotor in Forward Flight. NACA TN 2309, 1951.

9. Gustafson, F. B., and Tapscott, Robert J.: Methods for Obtaining Desired Helicopter Stability Characteristics and Procedures for Stability Predictions. NACA Rep. 1350, 1958. (Supersedes NACA TN 3945.)

L
6
9
7

L-697

TABLE 1

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(a) $\mu = 0.1$

$\frac{C_T}{\sigma}$	$\alpha(1.0)(90°)$, deg	$\alpha(1.0)(270°)$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 6°$																
0.0000	-2.14	-2.11	-0.63	0.02	0.00	0.00	2.70	2.70	0.09	-0.09	0.00	0.00	-0.002223	0.001089	0.001104	-0.000015
.0100	-1.84	-1.56	.32	.11	.00	.00	1.72	1.72	-.01	.04	.00	.00	.004965	.001019	.001093	-.000074
.0200	-1.53	-.99	1.29	.20	.01	.00	.99	1.00	-.07	.18	.00	.00	.012398	.000828	.001102	-.000275
.0300	-1.22	-.39	2.29	.30	.02	.00	.54	.55	-.10	.31	.00	.00	.020076	.000504	.001134	-.000630
.0400	-.89	.23	3.31	.40	.02	.00	.39	.40	-.10	.45	.00	.00	.027998	.000035	.001191	-.001156
.0500	-.56	.85	4.35	.50	.03	.00	.75	.77	-.03	.59	.00	.00	.036066	-.000618	.001257	-.001874
.0600	-.21	1.55	5.43	.62	.04	.00	.79	.81	.02	.72	-.01	.00	.044745	-.001344	.001418	-.002762
.0700	.14	2.28	6.53	.76	.05	.00	.72	.74	.11	.85	-.01	.00	.053756	-.002205	.001650	-.003855
.0800	.52	3.09	7.69	.91	.05	.00	.75	.76	.18	.99	-.02	.00	.063582	-.003185	.002004	-.005190
.0900	.91	3.91	8.87	1.05	.06	.00	.86	.85	.26	1.12	-.02	.00	.073853	-.004338	.002445	-.006783
.1000	1.35	4.94	10.14	1.26	.08	.00	1.00	.96	.32	1.26	-.03	-.01	.085748	-.005517	.003231	-.008749
.1100	1.82	6.15	11.44	1.53	.10	.00	1.22	1.11	.35	1.40	-.05	-.01	.099001	-.006707	.004417	-.011124
.1200	2.27	7.66	12.82	1.99	.15	.01	1.17	1.14	.39	1.57	-.06	.00	.115058	-.007714	.006330	-.014044
.1300	2.54	9.97	14.23	2.95	.29	.04	1.24	1.19	.41	1.85	-.04	.00	.136990	-.008115	.009965	-.018079
.1400	1.86	14.83	15.46	5.43	.55	.01	.80	.50	.14	2.73	.12	.07	.175398	-.003219	.021525	-.024744
.1500	2.05	18.57	16.78	6.97	.51	-.02	.71	.51	.30	2.83	.10	.10	.208638	-.000496	.030983	-.031479
.1600	2.67	21.55	18.14	8.00	.39	-.04	.82	.73	.43	2.98	.10	.10	.240849	.001664	.040434	-.038769
$\theta_0 = 10°$																
0.0000	-0.95	-0.39	0.09	0.52	-0.01	-0.01	5.43	5.47	0.13	-0.04	-0.04	-0.02	-0.048509	0.001107	0.001138	-0.000031
.0100	-.68	.16	1.06	.64	.01	.00	3.36	3.38	.12	.12	-.02	-.01	-.040925	.001483	.001115	.000368
.0200	-.39	.73	2.03	.74	.02	.00	1.91	1.92	.11	.27	-.01	.00	-.033342	.001713	.001102	.000612
.0300	-.09	1.30	3.00	.84	.03	.00	1.08	1.08	.10	.42	-.01	.00	-.025759	.001799	.001098	.000700
.0400	.22	1.88	3.98	.93	.04	.00	1.36	1.38	.07	.55	-.01	.00	-.018327	.001735	.001100	.000635
.0500	.54	2.48	4.98	1.03	.05	.00	1.33	1.36	.06	.68	-.01	.00	-.010615	.001535	.001121	.000414
.0600	.86	3.10	6.00	1.13	.05	.00	1.34	1.37	.07	.82	-.01	.00	-.002727	.001185	.001158	.000027
.0700	1.18	3.70	7.01	1.22	.06	.00	1.40	1.43	.10	.95	-.01	.00	.005035	.000653	.001186	-.000533
.0800	1.54	4.42	8.12	1.34	.06	.00	1.44	1.47	.15	1.09	-.02	.00	.013926	.000016	.001324	-.001308
.0900	1.91	5.18	9.25	1.47	.07	.00	1.47	1.49	.25	1.21	-.02	.00	.023126	-.000810	.001511	-.002321
.1000	2.32	6.17	10.51	1.68	.08	.00	1.54	1.51	.32	1.33	-.04	.00	.034311	-.001734	.001960	-.003694
.1100	2.75	7.32	11.80	1.93	.10	.00	1.65	1.53	.37	1.44	-.06	-.02	.046532	-.002790	.002644	-.005434
.1200	3.14	9.02	13.16	2.51	.19	.02	1.66	1.61	.42	1.61	-.08	-.01	.062944	-.003601	.004255	-.007856
.1300	2.03	15.81	14.70	6.11	.65	.02	1.10	.79	-.20	2.94	.15	.10	.114196	.002995	.018076	-.015080
.1400	2.08	20.71	16.08	8.17	.56	-.03	1.09	.87	-.02	2.99	.11	.13	.153875	.006790	.028595	-.021805
.1500	2.65	24.05	17.49	9.37	.39	-.05	1.21	1.12	.13	3.08	.12	.11	.188757	.009112	.037742	-.028630
.1600	3.75	26.71	18.91	10.04	.20	-.05	1.39	1.42	.21	3.33	.14	.07	.223447	.011301	.047441	-.036140
$\theta_0 = 14°$																
0.0000	0.10	1.21	0.74	1.10	0.02	0.00	1.94	1.92	0.47	0.10	-0.02	0.00	-0.095138	0.001285	0.001287	-0.000001
.0100	.41	1.80	1.72	1.20	.03	.00	1.84	1.83	.44	.24	-.02	.00	-.087504	.002071	.001227	.000843
.0200	.72	2.39	2.71	1.29	.04	.00	1.77	1.77	.41	.37	-.02	.00	-.079828	.002720	.001185	.001535
.0300	1.03	2.99	3.71	1.39	.04	.00	1.74	1.75	.40	.51	-.02	.00	-.072109	.003231	.001159	.002072
.0400	1.35	3.59	4.71	1.48	.05	.00	1.75	1.77	.38	.64	-.02	.00	-.064348	.003601	.001150	.002451
.0500	1.66	4.19	5.70	1.58	.06	.00	1.82	1.84	.39	.78	-.02	.00	-.056604	.003830	.001162	.002669
.0600	1.99	4.80	6.72	1.68	.06	.00	1.88	1.91	.38	.92	-.02	.00	-.048678	.003908	.001184	.002724
.0700	2.31	5.43	7.75	1.77	.07	.00	1.96	1.99	.36	1.06	-.02	.00	-.040627	.003828	.001219	.002608
.0800	2.64	6.06	8.79	1.87	.08	.01	2.05	2.09	.34	1.20	-.02	.00	-.032525	.003580	.001268	.002312
.0900	2.99	6.76	9.87	1.98	.09	.01	2.14	2.17	.31	1.34	-.02	.00	-.023882	.003165	.001344	.001821
.1000	3.34	7.37	10.90	2.04	.08	.00	2.25	2.25	.27	1.46	-.03	.00	-.016073	.002521	.001339	.001182
.1100	3.73	8.55	12.23	2.36	.12	.01	2.29	2.27	.30	1.61	-.05	-.01	-.003788	.001788	.001786	.000002
.1200	3.37	11.98	13.66	4.24	.51	.08	1.84	1.64	-.04	2.36	.09	.04	.023960	.003388	.006648	-.003260
.1300	2.08	21.99	15.24	9.02	.66	-.04	1.53	1.22	-.41	3.26	.14	.15	.092848	.012727	.025128	-.012401
.1400	2.57	26.25	16.75	10.64	.43	-.06	1.64	1.54	-.25	3.28	.14	.13	.133539	.015836	.034930	-.019094
.1500	3.67	29.31	18.24	11.49	.20	-.05	1.76	1.85	-.19	3.53	.16	.07	.171480	.018365	.044546	-.026181
.1600	5.60	31.64	19.68	11.65	.01	-.02	1.99	2.11	-.19	4.10	.12	.01	.208767	.020784	.054743	-.033960

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR BLADES WITH A LINEAR TWIST OF -8°

(a) μ = 0.1 - Continued

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90^\circ)}$, deg	$\alpha_{(1.0)(270^\circ)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 18^\circ$																
0.0000	1.17	2.79	1.39	1.67	0.05	0.01	6.56	6.94	2.55	0.18	-0.03	0.00	-0.143261	0.001725	0.001760	-0.000035
.0100	1.47	3.39	2.37	1.76	.05	.01	4.34	4.55	1.66	.32	-.03	.00	-.135500	.002932	.001627	.001305
.0200	1.78	3.99	3.36	1.85	.05	.00	2.73	2.81	1.00	.46	-.02	.00	-.127654	.004003	.001518	.002485
.0300	2.10	4.60	4.36	1.94	.06	.00	1.75	1.75	.58	.60	-.02	.00	-.119723	.004933	.001434	.003499
.0400	2.42	5.22	5.38	2.04	.06	.00	1.41	1.38	.41	.74	-.02	.00	-.111708	.005718	.001376	.004341
.0500	2.75	5.85	6.40	2.14	.07	.00	2.04	2.06	.60	.87	-.03	.00	-.103615	.006349	.001348	.005001
.0600	3.08	6.48	7.43	2.24	.08	.00	2.18	2.20	.60	1.01	-.03	.00	-.095412	.006837	.001339	.005498
.0700	3.41	7.13	8.47	2.34	.09	.01	2.34	2.36	.61	1.15	-.03	.00	-.087178	.007169	.001358	.005811
.0800	3.75	7.79	9.53	2.44	.09	.01	2.47	2.50	.61	1.30	-.03	.00	-.078690	.007342	.001391	.005951
.0900	4.07	8.42	10.53	2.54	.10	.01	2.59	2.62	.59	1.43	-.03	.00	-.070693	.007347	.001438	.005910
.1000	4.46	9.15	11.72	2.64	.10	.01	2.69	2.73	.56	1.59	-.03	.00	-.061250	.007154	.001505	.005649
.1100	4.78	10.18	12.87	2.94	.17	.02	2.93	2.94	.52	1.79	-.03	.00	-.050536	.006734	.001710	.005024
.1200	2.17	21.24	14.18	8.95	.83	-.05	2.01	1.50	-.97	3.93	.24	.17	.018889	.016851	.019539	-.002688
.1300	2.39	27.77	15.86	11.69	.56	-.07	2.12	1.96	-.77	3.67	.17	.17	.072052	.021516	.031357	-.009841
.1400	3.45	31.62	17.45	12.85	.24	-.08	2.28	2.27	-.72	4.06	.18	.09	.114642	.024601	.041209	-.016608
.1500	5.48	34.37	18.99	13.13	-.01	-.04	2.47	2.55	-.74	4.78	.12	.00	.155609	.027361	.051350	-.023989
.1600	8.74	36.00	20.24	12.38	-.14	.04	2.88	2.95	-.69	5.21	.01	-.03	.197205	.030663	.063021	-.032358
$\theta_0 = 22^\circ$																
0.0000	2.16	4.34	2.02	2.22	0.05	0.00	4.12	4.08	1.68	0.28	-0.03	0.00	-0.192856	0.002495	0.002498	-0.000003
.0100	2.47	4.94	3.00	2.32	.06	.00	3.63	3.60	1.40	.41	-.03	.00	-.184957	.004120	.002333	.001786
.0200	2.79	5.55	3.99	2.42	.06	.00	3.23	3.21	1.16	.55	-.03	.00	-.176942	.005611	.002184	.003427
.0300	3.11	6.18	5.00	2.52	.07	.00	2.91	2.91	.98	.68	-.03	.00	-.168810	.006963	.002050	.004913
.0400	3.44	6.81	6.02	2.62	.08	.00	2.69	2.69	.85	.82	-.03	.00	-.160561	.008167	.001933	.006235
.0500	3.77	7.45	7.06	2.72	.09	.00	2.56	2.57	.78	.96	-.03	.00	-.152196	.009218	.001833	.007385
.0600	4.11	8.10	8.10	2.82	.09	.00	2.55	2.56	.78	1.10	-.03	.00	-.143739	.010103	.001746	.008357
.0700	4.45	8.77	9.16	2.92	.10	.00	2.60	2.61	.76	1.25	-.03	.00	-.135070	.010836	.001697	.009138
.0800	4.81	9.41	10.24	3.01	.10	.00	2.75	2.78	.76	1.39	-.03	.00	-.126403	.011402	.001685	.009717
.0900	5.16	10.20	11.35	3.15	.12	.01	2.97	2.98	.76	1.54	-.04	.00	-.117083	.011773	.001697	.010076
.1000	5.16	10.21	11.36	3.16	.12	.01	2.97	2.98	.76	1.55	-.04	.00	-.116951	.011776	.001697	.010079
.1200	2.27	27.57	14.70	11.89	.76	-.12	2.93	2.34	-1.39	4.62	.25	.20	-.002146	.025803	.026160	-.000357
.1300	3.02	33.31	16.51	14.06	.38	-.11	2.87	2.73	-1.31	4.61	.22	.13	.051201	.029916	.037228	-.007311
.1400	5.04	36.81	18.22	14.67	.04	-.06	3.01	3.14	-1.40	5.50	.16	.01	.097739	.033296	.047719	-.014423
.1500	8.72	38.86	19.61	13.94	-.14	.05	3.43	3.54	-1.39	6.28	-.03	-.02	.143799	.036843	.059313	-.022470
.1600	13.57	38.31	19.88	11.10	-.07	.03	4.58	4.54	-.78	4.40	.05	-.01	.192995	.043603	.075764	-.032161
$\theta_0 = 26^\circ$																
0.0000	3.12	5.77	2.66	2.79	0.05	0.00	-2.13	-2.21	3.64	0.36	-0.03	0.00	-0.244678	0.004038	0.003986	0.000053
.0100	3.44	6.42	3.66	2.91	.07	.00	.34	.28	2.54	.50	-.03	.00	-.236276	.005919	.003584	.002335
.0200	3.76	7.07	4.67	3.02	.08	.00	2.14	2.11	1.71	.64	-.04	.00	-.227836	.007700	.003245	.004455
.0300	4.08	7.71	5.68	3.13	.09	.00	3.28	3.26	1.17	.77	-.04	.00	-.219359	.009379	.002968	.006412
.0400	4.41	8.36	6.70	3.24	.10	.00	3.73	3.73	.92	.91	-.04	.00	-.210845	.010956	.002754	.008202
.0500	4.74	9.01	7.73	3.34	.10	.00	3.31	3.31	1.04	1.05	-.04	.00	-.202325	.012441	.002615	.009825
.0600	5.08	9.68	8.78	3.45	.11	.01	3.35	3.34	.99	1.20	-.04	.00	-.193577	.013746	.002479	.011268
.0700	5.43	10.33	9.84	3.53	.11	.00	3.36	3.35	.96	1.33	-.04	.00	-.184904	.014881	.002364	.012517
.0800	5.76	11.13	10.93	3.70	.14	.01	3.41	3.40	.92	1.50	-.04	.00	-.175299	.015868	.002307	.013561
.0900	6.14	11.75	11.84	3.77	.16	.01	3.54	3.56	1.03	1.53	-.08	-.02	-.168079	.016013	.001784	.014229
.1000	6.21	12.41	12.44	4.04	.22	.02	3.55	3.52	.92	1.75	-.05	-.01	-.161148	.016754	.002216	.014538
.1100	2.80	24.43	13.68	10.56	.92	-.16	3.95	2.94	-1.71	5.79	.55	.16	-.084489	.028938	.020402	.008536
.1200	2.72	33.39	15.32	14.49	.59	-.17	3.88	3.36	-2.00	5.71	.32	.16	-.023308	.034164	.032177	.001987
.1300	4.40	38.48	17.25	15.91	.15	-.12	3.84	3.80	-2.22	6.68	.24	.02	.030967	.038267	.043165	-.004898
.1400	7.97	41.43	18.95	15.58	-.12	.02	4.13	4.26	-2.27	7.94	.03	-.05	.081977	.042105	.054590	-.012485
.1500	14.16	40.50	18.91	12.01	-.06	.01	5.56	5.49	-1.24	4.46	.05	-.02	.143223	.050951	.073871	-.022920
.1600	17.84	41.20	19.75	10.37	.00	.00	5.55	5.52	-.97	3.62	.10	.00	.188859	.054652	.086440	-.031788

L-697

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(a) $\mu = 0.1$ - Concluded

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90^\circ)}$, deg	$\alpha_{(1.0)(270^\circ)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 30^\circ$																
0.0000	4.04	7.24	3.36	3.43	0.07	0.00	-1.82	-1.90	3.54	0.46	-0.04	0.00	-0.298219	0.006108	0.006025	0.000083
.0100	4.35	7.86	4.35	3.54	.08	.00	.21	.15	2.67	.59	-.04	.00	-.289710	.008338	.005447	.002892
.0200	4.67	8.51	5.35	3.65	.09	.00	1.82	1.78	1.99	.73	-.04	.00	-.281082	.010465	.004929	.005536
.0300	4.99	9.17	6.37	3.76	.10	.00	3.01	2.98	1.50	.87	-.04	.00	-.272335	.012481	.004475	.008006
.0400	5.32	9.84	7.39	3.88	.11	.00	3.75	3.73	1.22	1.01	-.04	.00	-.263470	.014381	.004087	.010294
.0500	5.65	10.51	8.43	3.99	.12	.00	3.86	3.84	1.24	1.15	-.05	.00	-.254570	.016148	.003766	.012382
.0600	5.98	11.26	9.48	4.14	.14	.01	4.07	4.03	1.16	1.30	-.05	.00	-.245249	.017826	.003529	.014297
.0700	6.35	11.97	10.50	4.24	.15	.01	4.16	4.10	1.16	1.40	-.07	-.02	-.236594	.019112	.003179	.015933
.0800	6.52	13.09	11.59	4.69	.26	.03	4.04	3.92	.95	1.73	-.03	-.01	-.224425	.021157	.003688	.017469
.0900	6.31	14.68	12.51	5.64	.49	.07	3.53	3.28	.44	2.35	.11	.04	-.209226	.023884	.005577	.018308
.1000	3.72	22.60	13.04	9.96	.88	-.13	3.74	2.61	-1.70	5.62	.66	.14	-.157674	.032670	.017557	.015113
.1100	3.04	32.04	14.32	14.03	.80	-.24	5.06	4.09	-2.39	7.27	.55	.14	-.099131	.038159	.028230	.009929
.1200	3.74	38.78	16.03	16.59	.36	-.21	5.12	4.64	-2.91	7.84	.41	.05	-.045013	.042389	.038065	.004324
.1300	7.04	42.97	18.02	16.85	-.05	-.04	5.27	5.24	-3.21	9.86	.15	-.07	.010516	.046604	.049169	-.002565
.1400	13.50	43.56	18.28	14.02	-.11	.03	6.65	6.40	-2.03	6.21	.00	-.02	.084217	.056147	.069550	-.013403
.1500	18.51	43.55	18.81	11.36	.00	.00	6.45	6.45	-1.48	3.64	.08	-.02	.140879	.061735	.084578	-.022843
.1600	21.62	44.93	19.91	10.35	.02	.01	6.18	6.14	-1.39	3.65	.07	-.01	.182827	.064143	.095050	-.030907
$\theta_0 = 34^\circ$																
0.0000	4.87	8.75	4.11	4.19	0.12	0.01	0.13	0.02	3.42	0.59	-0.04	-0.01	-0.353905	0.008943	0.008744	0.000200
.0100	5.19	9.31	5.09	4.25	.11	.01	1.29	1.22	2.81	.71	-.05	.00	-.345590	.011440	.007957	.003483
.0200	5.51	9.92	6.08	4.34	.10	.00	2.31	2.26	2.28	.83	-.05	.00	-.336945	.013879	.007235	.006644
.0300	5.83	10.58	7.09	4.45	.11	.00	3.17	3.13	1.85	.97	-.05	.00	-.327971	.016242	.006589	.009654
.0400	6.14	11.29	8.11	4.60	.13	.00	3.84	3.79	1.53	1.12	-.05	.00	-.318667	.018511	.006029	.012482
.0500	6.49	11.98	9.12	4.71	.15	.01	4.30	4.25	1.47	1.23	-.07	-.01	-.309747	.020407	.005411	.014996
.0600	6.75	12.91	10.17	5.01	.21	.02	4.51	4.41	1.25	1.45	-.05	-.01	-.298933	.022736	.005260	.017476
.0700	6.89	13.84	11.04	5.43	.33	.05	4.24	4.07	.95	1.70	-.02	.00	-.288794	.024872	.005549	.019323
.0800	6.24	16.18	11.89	6.89	.61	.06	3.32	2.81	-.25	2.76	.23	.07	-.268424	.029649	.008764	.020886
.0900	4.27	22.83	12.50	10.46	.85	-.12	3.71	2.47	-2.23	5.63	.71	.14	-.223098	.037345	.017849	.019495
.1000	3.57	31.03	13.57	13.94	.81	-.25	5.14	3.89	-2.76	7.82	.73	.11	-.170486	.042516	.026365	.016151
.1100	3.86	38.48	15.10	16.75	.52	-.27	6.43	5.55	-3.40	9.33	.64	.04	-.116641	.046745	.035152	.011593
.1200	6.16	42.94	16.79	17.47	.10	-.14	6.89	6.51	-3.98	11.49	.42	-.10	-.068763	.050581	.043788	.006793
.1300	11.44	46.01	18.75	16.13	-.09	.09	7.32	7.37	-4.11	13.97	-.04	-.06	-.009382	.055286	.055727	-.000440
.1400	18.46	46.10	17.92	12.87	-.01	.01	7.63	7.61	-2.12	4.27	.06	-.02	.086871	.068026	.082055	-.014029
.1500	22.46	47.33	18.89	11.29	.04	.01	7.22	7.21	-1.88	3.53	.08	-.02	.138600	.071633	.094325	-.022693
.1600	25.29	49.05	20.06	10.57	.09	.01	6.93	6.93	-1.80	3.73	.09	-.01	.180669	.074102	.104713	-.030610
$\theta_0 = 38^\circ$																
0.0000	5.68	10.78	5.65	5.27	0.18	0.01	2.30	2.15	2.48	1.00	0.03	0.03	-0.404619	0.015557	0.011835	0.003722
.0100	5.92	11.03	6.18	5.23	.16	.01	2.70	2.58	2.44	.99	.00	.02	-.400681	.016727	.011143	.005584
.0200	6.23	11.42	6.92	5.20	.14	.01	3.22	3.13	2.36	1.01	-.03	.01	-.394817	.018435	.010255	.008180
.0300	6.58	11.98	7.83	5.25	.15	.01	3.76	3.69	2.18	1.07	-.06	.00	-.387026	.020642	.009337	.011305
.0400	6.88	12.74	8.83	5.43	.18	.01	4.18	4.10	1.87	1.22	-.07	-.01	-.377309	.023293	.008611	.014682
.0500	7.06	13.74	9.84	5.83	.26	.03	4.32	4.18	1.36	1.49	-.04	.00	-.365666	.026322	.008354	.017969
.0600	7.05	14.95	10.72	6.50	.43	.06	3.99	3.73	.65	1.90	.05	.03	-.352850	.029442	.008798	.020644
.0700	6.10	17.91	11.42	8.40	.72	.04	2.80	2.00	-1.42	3.29	.36	.10	-.328766	.035337	.012661	.022676
.0800	4.69	23.48	12.02	11.30	.84	-.12	3.38	1.99	-2.95	5.64	.73	.14	-.289912	.041839	.019119	.022720
.0900	4.04	30.68	12.93	14.37	.80	-.24	5.19	3.73	-3.73	8.12	.84	.09	-.241359	.047039	.026134	.020905
.1000	4.42	38.02	14.34	16.89	.50	-.30	7.25	5.90	-4.18	10.73	.84	-.02	-.186105	.051465	.034126	.017339
.1100	6.65	42.41	15.91	17.40	.12	-.17	8.70	7.93	-4.62	13.50	.66	-.16	-.138900	.055410	.041812	.013598
.1200	10.71	44.78	17.53	16.20	-.12	.04	9.52	9.21	-4.67	16.35	.28	-.16	-.094608	.059146	.049814	.009332
.1300	17.46	48.86	17.33	14.96	-.01	.04	9.36	9.33	-3.08	6.85	.02	-.02	.019636	.072721	.077387	-.004666
.1400	22.62	50.09	17.93	12.80	.07	.02	8.57	8.56	-2.57	3.89	.10	-.03	.090100	.078420	.093153	-.014733
.1500	25.88	52.33	19.09	12.10	.18	.03	8.10	8.12	-2.51	3.79	.13	-.03	.142307	.081627	.104993	-.023365
.1600	27.93	54.77	20.31	12.15	.29	.04	7.76	7.86	-2.59	4.44	.15	-.03	.182145	.083714	.114333	-.030619

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(b) $\mu = 0.2$

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 6°$																
0.0000	-2.18	-2.20	-0.72	0.02	-0.02	0.00	15.47	15.47	1.45	-0.20	0.00	0.00	-0.003231	0.001107	0.001195	-0.000088
.0100	-1.97	-1.48	.22	.19	.01	.00	9.46	9.47	.72	.06	.00	.00	.003833	.001041	.001179	-.000138
.0200	-1.77	-.73	1.18	.38	.03	.00	4.75	4.75	.18	.32	-.01	.00	.011157	.000858	.001189	-.000331
.0300	-1.55	.06	2.17	.57	.06	.00	1.50	1.50	-.16	.59	-.01	.00	.018740	.000544	.001227	-.000683
.0400	-1.33	.89	3.18	.77	.09	.01	-.13	-.13	-.27	.85	-.02	.00	.026583	.000087	.001295	-.001208
.0500	-1.11	1.74	4.19	.98	.11	.01	1.13	1.13	.02	1.12	-.02	.00	.034545	-.000553	.001374	-.001927
.0600	-.88	2.68	5.26	1.22	.14	.01	1.23	1.23	.13	1.39	-.03	.00	.043171	-.001291	.001557	-.002847
.0700	-.64	3.63	6.35	1.46	.17	.01	1.48	1.48	.23	1.66	-.04	.00	.052026	-.002223	.001790	-.004013
.0800	-.39	4.78	7.51	1.78	.21	.01	1.67	1.65	.34	1.94	-.06	.00	.062037	-.003193	.002235	-.005428
.0900	-.14	6.07	8.66	2.13	.25	.01	1.78	1.73	.46	2.19	-.09	-.01	.072474	-.004226	.002850	-.007076
.1000	.07	7.76	9.94	2.71	.35	.03	1.94	1.86	.57	2.53	-.11	-.01	.085771	-.005237	.004019	-.009256
.1100	.16	9.92	11.22	3.61	.53	.07	2.12	2.02	.64	2.98	-.10	.01	.102258	-.005930	.006141	-.012072
.1200	-.34	13.85	12.46	5.66	.95	.13	2.00	1.68	.27	3.93	.04	.08	.129476	-.003557	.012817	-.016374
.1300	-.77	18.06	13.76	7.43	1.07	.07	2.30	1.90	.15	4.67	.10	.16	.157746	-.001187	.020361	-.021549
.1400	-.87	21.66	15.10	8.87	1.08	.03	2.65	2.25	.28	5.12	.13	.20	.184728	.000322	.027481	-.027159
.1500	-.79	24.83	16.51	10.07	1.02	.00	2.91	2.57	.45	5.51	.18	.22	.211745	.001598	.034885	-.033287
.1600	-.53	27.56	17.98	11.02	.89	-.03	3.08	2.83	.64	5.87	.25	.22	.238849	.002663	.042602	-.039939
$\theta_0 = 10°$																
0.0000	-1.28	-0.19	0.00	1.10	0.03	0.00	8.50	8.47	0.11	0.01	-0.03	0.00	-0.050699	0.001111	0.001254	-0.000143
.0100	-1.07	.56	.96	1.28	.06	.00	5.89	5.87	.12	.27	-.03	.00	-.043380	.001480	.001231	.000249
.0200	-.86	1.32	1.92	1.46	.09	.01	3.96	3.94	.12	.53	-.04	.00	-.035999	.001702	.001217	.000485
.0300	-.65	2.09	2.89	1.65	.11	.01	2.71	2.70	.12	.79	-.04	.00	-.028555	.001774	.001214	.000560
.0400	-.44	2.86	3.87	1.83	.14	.01	2.17	2.16	.11	1.06	-.04	.00	-.021050	.001691	.001221	.000470
.0500	-.23	3.62	4.85	2.01	.17	.01	2.69	2.68	.07	1.33	-.04	.00	-.013607	.001438	.001228	.000210
.0600	-.01	4.48	5.87	2.22	.19	.01	2.68	2.66	.11	1.59	-.05	.00	-.005639	.001065	.001286	-.000221
.0700	.22	5.30	6.88	2.40	.21	.01	2.77	2.76	.22	1.84	-.06	.00	.002071	.000483	.001321	-.000838
.0800	.46	6.37	8.00	2.69	.24	.02	2.84	2.82	.33	2.12	-.08	.00	.011375	-.000165	.001536	-.001702
.0900	.63	7.34	8.89	2.97	.29	.02	2.90	2.87	.44	2.33	-.09	.00	.019229	-.000734	.001825	-.002559
.1000	.85	9.49	10.44	3.76	.44	.05	2.99	2.91	.61	2.77	-.12	.00	.035457	-.001580	.003014	-.004594
.1100	.11	13.87	11.70	6.14	.98	.13	2.75	2.38	-.01	3.93	.07	.10	.064156	.001195	.009304	-.008109
.1200	-.60	19.32	13.05	8.51	1.17	.06	3.05	2.52	-.22	4.83	.14	.19	.097486	.004463	.017434	-.012971
.1300	-.83	23.76	14.47	10.29	1.18	.01	3.43	2.90	-.13	5.38	.17	.24	.128569	.006676	.024956	-.018280
.1400	-.72	27.34	15.93	11.63	1.07	-.02	3.79	3.38	.08	5.71	.21	.25	.158333	.008323	.032347	-.024024
.1500	-.44	30.42	17.47	12.69	.92	-.04	4.02	3.72	.22	6.09	.28	.24	.188056	.009864	.040179	-.030316
.1600	.03	33.13	19.09	13.50	.75	-.06	4.09	3.89	.38	6.56	.38	.20	.217768	.010992	.048120	-.037127
$\theta_0 = 14°$																
0.0000	-0.40	1.78	0.69	2.18	0.09	0.01	7.03	6.94	0.82	0.20	-0.06	0.00	-0.098832	0.001273	0.001402	-0.000129
.0100	-.19	2.54	1.66	2.37	.11	.01	5.83	5.76	.74	.46	-.06	.00	-.091435	.002053	.001355	.000697
.0200	.02	3.30	2.63	2.55	.14	.01	4.88	4.83	.68	.73	-.06	.00	-.083957	.002689	.001322	.001367
.0300	.23	4.08	3.60	2.74	.17	.01	4.19	4.15	.64	.99	-.07	.00	-.076398	.003177	.001301	.001875
.0400	.44	4.88	4.59	2.93	.19	.01	3.78	3.75	.61	1.26	-.07	.00	-.068760	.003511	.001294	.002217
.0500	.66	5.68	5.59	3.12	.22	.02	3.65	3.62	.60	1.53	-.07	.00	-.061040	.003687	.001301	.002385
.0600	.88	6.48	6.59	3.30	.25	.02	3.92	3.89	.62	1.81	-.07	.00	-.053305	.003695	.001321	.002374
.0700	1.10	7.34	7.63	3.50	.27	.02	4.02	3.99	.60	2.08	-.08	.00	-.045227	.003546	.001361	.002185
.0800	1.34	7.91	8.51	3.54	.25	.01	4.20	4.19	.57	2.27	-.09	.00	-.039260	.003051	.001173	.001879
.0900	1.55	9.33	9.79	4.02	.36	.03	4.30	4.25	.50	2.67	-.09	.00	-.027526	.002779	.001637	.001142
.1000	1.57	11.19	10.77	4.96	.63	.11	4.21	4.04	.49	3.11	-.09	.01	-.014727	.002750	.002770	-.000020
.1100	-.22	19.33	12.23	9.03	1.26	.07	3.91	3.19	-.70	5.00	.19	.20	.031859	.009075	.014083	-.005008
.1200	-.68	25.08	13.71	11.39	1.27	.00	4.36	3.70	-.60	5.64	.21	.27	.068119	.011907	.021911	-.010005
.1300	-.70	29.45	15.24	13.06	1.15	-.04	4.65	4.14	-.42	6.04	.26	.28	.101585	.014240	.029562	-.015322
.1400	-.43	32.99	16.87	14.28	.98	-.06	4.94	4.58	-.31	6.44	.34	.26	.134390	.016246	.037481	-.021235
.1500	.15	36.02	18.55	15.13	.76	-.08	5.06	4.82	-.20	7.01	.43	.21	.166768	.017893	.045563	-.027670
.1600	1.02	38.60	20.28	15.63	.51	-.10	4.99	4.81	-.06	7.77	.52	.12	.198751	.019185	.053780	-.034595

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(b) $\mu = 0.2$ - Continued

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90^\circ)}$, deg	$\alpha_{(1.0)(270^\circ)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 18^\circ$																
0.0000	0.45	3.60	1.34	3.24	0.13	0.01	4.43	4.25	1.81	0.38	-0.08	0.01	-0.148607	0.001880	0.001877	0.000004
.0100	.66	4.40	2.32	3.44	.16	.01	4.48	4.34	1.51	.65	-.08	.01	-.140876	.003004	.001752	.001252
.0200	.87	5.22	3.31	3.64	.19	.01	4.54	4.43	1.28	.92	-.09	.00	-.133090	.003995	.001651	.002343
.0300	1.08	6.03	4.30	3.84	.22	.02	4.60	4.52	1.12	1.19	-.09	.00	-.125250	.004848	.001575	.003274
.0400	1.30	6.86	5.31	4.04	.25	.02	4.68	4.62	1.03	1.46	-.10	.00	-.117355	.005563	.001523	.004040
.0500	1.52	7.66	6.31	4.22	.27	.02	4.74	4.68	1.08	1.73	-.10	.01	-.109528	.006146	.001502	.004644
.0600	1.74	8.51	7.34	4.43	.30	.02	4.85	4.80	1.09	2.01	-.10	.01	-.101434	.006565	.001498	.005067
.0700	1.96	9.40	8.37	4.64	.34	.03	5.02	4.96	1.07	2.30	-.10	.00	-.093129	.006809	.001516	.005293
.0800	2.24	10.07	9.31	4.71	.33	.02	5.26	5.23	1.13	2.47	-.13	-.01	-.086665	.006551	.001219	.005332
.0900	2.23	11.67	10.54	5.45	.54	.07	5.40	5.24	.80	3.11	-.05	.02	-.073095	.007294	.002333	.004961
.1000	.86	16.43	11.39	8.20	1.19	.11	5.04	4.30	-.81	4.81	.28	.17	-.044837	.011630	.008908	.002722
.1100	-.38	25.11	12.82	11.95	1.38	-.01	5.39	4.55	-1.19	6.05	.30	.29	.001569	.016338	.018573	-.002234
.1200	-.63	30.88	14.43	14.18	1.23	-.07	5.79	5.06	-1.15	6.58	.32	.30	.040567	.019494	.026796	-.007302
.1300	-.43	35.19	16.12	15.68	1.02	-.11	6.03	5.45	-1.01	7.05	.39	.27	.076574	.021873	.034576	-.012703
.1400	.17	38.57	17.89	16.65	.78	-.12	6.09	5.73	-.85	7.63	.49	.20	.111773	.023874	.042512	-.018637
.1500	1.23	41.58	19.74	17.23	.52	-.11	6.06	5.87	-.84	8.51	.57	.10	.147811	.025919	.051273	-.025354
.1600	2.71	44.26	21.69	17.47	.27	-.07	5.91	5.80	-.91	9.64	.63	.01	.184463	.027626	.060456	-.032830
$\theta_0 = 22^\circ$																
0.0000	1.25	5.44	1.99	4.37	0.19	0.02	2.14	1.83	2.04	0.57	-0.11	0.01	-0.199742	0.002796	0.002715	0.000081
.0100	1.46	6.24	2.98	4.57	.22	.02	3.04	2.81	1.85	.84	-.11	.01	-.191826	.004326	.002505	.001821
.0200	1.68	7.07	3.97	4.77	.24	.02	3.83	3.65	1.69	1.11	-.11	.01	-.183817	.005715	.002322	.003393
.0300	1.89	7.90	4.98	4.97	.27	.02	4.49	4.36	1.57	1.38	-.12	.01	-.175717	.006956	.002168	.004789
.0400	2.11	8.76	6.00	5.18	.30	.02	5.03	4.93	1.49	1.66	-.12	.01	-.167524	.008045	.002043	.006002
.0500	2.34	9.57	7.02	5.34	.32	.02	5.37	5.29	1.50	1.91	-.13	.01	-.159588	.008894	.001888	.007006
.0600	2.55	10.50	8.06	5.59	.36	.03	5.70	5.61	1.46	2.22	-.13	.01	-.150920	.009729	.001875	.007854
.0700	2.73	11.53	9.11	5.92	.45	.05	5.96	5.85	1.39	2.56	-.11	.01	-.141674	.010489	.002007	.008482
.0800	2.94	12.49	10.07	6.24	.54	.07	6.15	6.01	1.38	2.86	-.12	.00	-.133198	.010863	.002032	.008831
.0900	1.98	15.15	10.97	7.98	1.02	.13	5.91	5.33	-.14	4.36	.27	.13	-.112508	.014680	.006430	.008250
.1000	.21	23.32	11.96	11.70	1.45	-.02	6.63	5.56	-1.57	6.48	.48	.27	-.070991	.019748	.014972	.004776
.1100	-.45	31.07	13.46	14.78	1.36	-.12	7.09	6.02	-1.91	7.28	.43	.32	-.027464	.023820	.023536	.000284
.1200	-.37	36.60	15.27	16.85	1.14	-.14	7.27	6.50	-1.74	7.73	.48	.30	.013944	.026617	.031354	-.004736
.1300	.22	40.72	17.13	18.05	.84	-.15	7.26	6.81	-1.71	8.49	.57	.21	.052968	.029252	.039449	-.010198
.1400	1.35	44.19	19.11	18.72	.53	-.14	7.30	7.05	-1.78	9.56	.65	.09	.092462	.031878	.048409	-.016530
.1500	3.02	47.20	21.15	18.96	.27	-.08	7.07	6.95	-1.84	10.82	.70	-.01	.132251	.033855	.057412	-.023558
.1600	5.80	49.78	23.15	18.50	.05	.04	7.05	6.94	-2.21	12.41	.61	-.09	.174484	.036591	.068466	-.031875
$\theta_0 = 26^\circ$																
0.0000	1.97	7.28	2.64	5.60	0.27	0.02	3.41	2.84	3.62	0.78	-0.13	0.00	-0.252655	0.004234	0.004168	0.000066
.0100	2.20	8.05	3.64	5.76	.28	.02	3.94	3.52	2.97	1.03	-.14	.01	-.244737	.006072	.003764	.002308
.0200	2.43	8.87	4.65	5.94	.30	.02	4.46	4.16	2.43	1.30	-.14	.01	-.236571	.007811	.003416	.004395
.0300	2.65	9.72	5.67	6.14	.33	.02	4.96	4.75	2.01	1.57	-.14	.01	-.228156	.009436	.003130	.006306
.0400	2.86	10.63	6.69	6.38	.37	.03	5.43	5.28	1.74	1.87	-.14	.01	-.219492	.010934	.002914	.008020
.0500	3.06	11.58	7.73	6.65	.42	.04	5.88	5.75	1.62	2.18	-.14	.01	-.210580	.012288	.002774	.009513
.0600	3.27	12.53	8.75	6.92	.48	.05	6.32	6.16	1.75	2.47	-.14	.01	-.201789	.013368	.002625	.010742
.0700	3.20	13.80	9.66	7.55	.66	.09	6.47	6.18	1.30	3.03	-.05	.03	-.190795	.015197	.003532	.011666
.0800	2.50	16.39	10.66	9.10	1.07	.13	6.43	5.73	-.07	4.35	.26	.13	-.170917	.018831	.006868	.011963
.0900	1.00	21.88	11.43	11.66	1.40	-.02	7.35	6.16	-1.46	6.43	.61	.23	-.140116	.023257	.012967	.010290
.1000	-.06	30.13	12.64	14.96	1.47	-.16	8.61	7.18	-2.41	7.95	.63	.31	-.098003	.027475	.020702	.006773
.1100	-.23	36.89	14.29	17.57	1.29	-.19	8.77	7.67	-2.50	8.62	.62	.32	-.055059	.030534	.027870	.002664
.1200	.32	42.08	16.19	19.17	.91	-.19	8.76	8.15	-2.69	9.53	.67	.21	-.011613	.034167	.036474	-.002306
.1300	1.35	46.14	18.27	19.97	.56	-.19	8.80	8.31	-2.86	10.90	.76	.07	.029715	.036791	.044679	-.007889
.1400	3.45	49.69	20.49	20.16	.27	-.08	8.66	8.44	-3.09	12.62	.77	-.05	.074995	.039658	.054426	-.014768
.1500	6.40	52.68	22.65	19.71	.06	.07	8.65	8.50	-3.49	14.40	.71	-.11	.122146	.042894	.065780	-.022886
.1600	9.98	55.03	24.55	18.67	.01	.19	8.58	8.43	-3.72	15.39	.60	-.04	.171819	.045975	.078309	-.032334

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(b) μ = 0.2 - Concluded

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 30°$																
0.0000	2.67	9.03	3.35	6.86	0.33	0.03	4.14	2.41	9.52	1.00	-0.15	0.01	-0.307969	0.006212	0.006136	0.000076
.0100	2.91	9.80	4.34	6.99	.33	.02	5.00	3.87	6.79	1.23	-.16	.01	-.300088	.008287	.005533	.002755
.0200	3.13	10.64	5.35	7.19	.36	.02	5.71	5.06	4.49	1.49	-.17	.01	-.291642	.010380	.005030	.005350
.0300	3.32	11.56	6.37	7.45	.41	.03	6.22	5.90	2.74	1.80	-.16	.01	-.282630	.012461	.004657	.007804
.0400	3.48	12.56	7.39	7.80	.49	.05	6.49	6.31	1.68	2.16	-.14	.02	-.273053	.014502	.004446	.010055
.0500	3.62	13.54	8.37	8.18	.60	.08	6.42	6.10	1.78	2.52	-.11	.03	-.263585	.016253	.004282	.011971
.0600	3.44	15.13	9.33	8.99	.81	.11	6.35	5.84	.86	3.24	.02	.07	-.250254	.019115	.005425	.013690
.0700	2.66	17.85	10.19	10.53	1.15	.11	6.46	5.54	-.71	4.57	.33	.16	-.230548	.023162	.008567	.014594
.0800	1.42	22.66	11.00	12.71	1.37	-.04	7.91	6.56	-1.99	6.61	.69	.24	-.201595	.027417	.013513	.013904
.0900	.46	29.24	12.05	15.28	1.47	-.19	9.58	7.87	-2.64	8.41	.84	.28	-.166534	.031085	.019147	.011938
.1000	.18	36.38	13.44	17.86	1.35	-.26	10.46	9.08	-3.25	9.85	.83	.28	-.125071	.034577	.025764	.008813
.1100	.56	42.21	15.12	19.69	.99	-.27	10.79	9.81	-3.86	11.03	.84	.18	-.082945	.038388	.033460	.004928
.1200	1.41	47.15	17.24	20.93	.62	-.25	10.66	9.91	-3.84	12.21	.91	.07	-.039181	.041136	.040953	.000183
.1300	3.71	51.29	19.59	21.12	.26	-.10	10.62	10.27	-4.32	14.49	.91	-.08	.010365	.044714	.050935	-.006222
.1400	7.11	54.70	22.04	20.37	-.01	.10	10.68	10.41	-4.89	17.12	.86	-.11	.062390	.048256	.062275	-.014019
.1500	11.23	57.30	23.95	19.01	-.07	.22	10.99	10.71	-5.17	18.23	.69	-.01	.117796	.052728	.076223	-.023495
.1600	13.88	59.52	24.68	18.94	.08	.20	11.11	10.64	-4.57	15.75	.70	.04	.177113	.057766	.092398	-.034631
$\theta_0 = 34°$																
0.0000	3.26	10.88	4.14	8.29	0.42	0.03	6.59	5.02	7.89	1.29	-0.16	0.02	-0.365317	0.009023	0.008698	0.000325
.0100	3.51	11.59	5.07	8.42	.43	.03	7.04	5.94	5.95	1.48	-.18	.01	-.357833	.011165	.007899	.003266
.0200	3.71	12.46	6.06	8.66	.48	.04	7.33	6.62	4.04	1.76	-.18	.01	-.349005	.013628	.007272	.006355
.0300	3.84	13.51	7.08	9.05	.57	.06	7.36	6.89	2.35	2.15	-.15	.02	-.338831	.016381	.006975	.009405
.0400	3.85	14.61	8.00	9.60	.73	.10	6.81	6.25	1.42	2.63	-.07	.04	-.328246	.019185	.007165	.012020
.0500	3.57	16.44	8.97	10.56	.95	.12	6.40	5.62	-.03	3.48	.10	.09	-.313163	.022846	.008216	.014630
.0600	2.79	19.27	9.77	12.06	1.22	.08	6.52	5.29	-1.77	4.83	.40	.19	-.293304	.026962	.010697	.016264
.0700	1.76	23.62	10.59	13.97	1.35	-.07	8.20	6.60	-3.04	6.84	.77	.24	-.265421	.031249	.014692	.016557
.0800	.83	29.74	11.58	16.40	1.45	-.21	10.37	8.38	-3.62	8.94	1.02	.28	-.230310	.035154	.019656	.015498
.0900	.63	35.89	12.81	18.41	1.33	-.30	11.80	10.03	-3.97	10.74	1.07	.23	-.193743	.038572	.024876	.013696
.1000	1.00	41.85	14.33	20.04	1.00	-.34	12.97	11.63	-4.80	12.67	1.10	.12	-.152688	.042495	.031826	.010669
.1100	1.75	47.03	16.18	21.34	.68	-.31	13.12	11.99	-4.95	14.03	1.12	.04	-.112497	.045105	.037848	.007257
.1200	3.99	51.38	18.41	21.54	.23	-.13	13.20	12.53	-5.49	16.48	1.09	-.12	-.064067	.049055	.046998	.002057
.1300	7.70	55.30	21.05	20.61	-.13	.10	13.37	12.94	-6.02	19.66	1.05	-.13	-.005970	.053060	.058463	-.005403
.1400	12.77	58.00	23.27	18.38	-.27	.24	13.85	13.47	-6.41	21.78	.78	.04	.053367	.058228	.072608	-.014381
.1500	15.37	62.19	24.07	19.43	.10	.23	13.19	13.25	-5.92	18.04	.80	.09	.130772	.064862	.091530	-.026668
.1600	10.44	68.67	20.95	29.44	1.58	.12	10.20	11.98	-3.59	.61	1.66	-.23	.232711	.074667	.118213	-.043546
$\theta_0 = 38°$																
0.0000	3.99	13.18	5.51	9.79	0.44	0.00	9.85	8.57	6.23	1.60	-0.24	0.00	-0.422765	0.013425	0.010935	0.002489
.0100	4.04	13.62	6.02	10.05	.53	.03	9.11	7.93	4.82	1.83	-.20	.01	-.417359	.015271	.010750	.004521
.0200	4.05	14.44	6.78	10.51	.68	.08	8.09	7.02	2.73	2.23	-.12	.03	-.408400	.018175	.010629	.007546
.0300	3.93	15.76	7.69	11.24	.87	.11	7.10	6.03	.33	2.88	.01	.07	-.395889	.021906	.010848	.011058
.0400	3.49	17.75	8.54	12.34	1.09	.10	6.60	5.25	-1.84	3.89	.23	.14	-.379883	.026172	.011936	.014235
.0500	2.90	20.45	9.34	13.66	1.28	.05	6.85	5.19	-3.27	5.11	.47	.20	-.360969	.030200	.013469	.016731
.0600	2.00	24.67	10.17	15.46	1.34	-.10	8.40	6.45	-4.82	7.18	.85	.25	-.332643	.034845	.016660	.018185
.0700	1.25	30.23	11.14	17.61	1.37	-.24	10.98	8.67	-5.20	9.43	1.14	.25	-.298205	.038646	.020489	.018157
.0800	1.20	35.79	12.26	19.29	1.21	-.32	13.08	11.20	-5.65	11.71	1.28	.16	-.261618	.042725	.025508	.017217
.0900	1.45	41.39	13.73	20.65	.91	-.40	14.86	12.97	-5.86	14.00	1.39	.05	-.223132	.046031	.030734	.015297
.1000	2.74	45.74	15.33	21.13	.57	-.33	15.67	14.42	-6.08	16.23	1.35	-.06	-.185121	.049607	.036717	.012890
.1100	4.50	49.89	17.25	21.34	.15	-.18	16.18	15.11	-6.39	18.58	1.33	-.18	-.143773	.052843	.043430	.009414
.1200	8.29	53.20	19.56	19.99	-.27	.07	16.64	15.98	-6.74	21.92	1.17	-.17	-.091179	.057111	.053344	.003767
.1300	14.06	55.59	22.09	16.96	-.55	.24	17.33	16.77	-7.01	25.08	.85	.05	-.029343	.062449	.066760	-.004311
.1400	17.64	62.61	23.33	18.00	-.17	.20	16.97	16.64	-6.80	22.08	.82	.16	.069192	.071145	.089377	-.018231
.1500	17.11	66.13	21.66	22.56	.37	.07	14.91	15.00	-4.57	9.61	.94	-.26	.153222	.081666	.112379	-.030712
.1600	16.77	65.99	20.69	24.06	.59	-.01	13.90	14.33	-3.32	3.73	.97	-.47	.180295	.085938	.120827	-.034889

L-697

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(c) $\mu = 0.3$

$\frac{C_T}{\sigma}$	$\alpha(1.0)(90°)$, deg	$\alpha(1.0)(270°)$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 6°$																
0.0000	-2.20	-2.35	-0.82	0.00	-0.04	0.00	12.42	12.42	1.08	-0.33	0.00	0.00	-0.004445	0.001164	0.001367	-0.000203
.0100	-2.08	-1.43	.10	.25	.01	.00	8.18	8.18	.52	.04	-.01	.00	.002390	.001106	.001344	-.000239
.0200	-1.95	-.47	1.03	.52	.07	.01	4.78	4.77	.09	.42	-.01	.00	.009488	.000927	.001351	-.000423
.0300	-1.82	.55	1.99	.81	.12	.01	2.33	2.32	-.17	.81	-.02	.00	.016849	.000616	.001389	-.000773
.0400	-1.69	1.62	2.97	1.11	.18	.02	.95	.93	-.26	1.19	-.03	.00	.024474	.000157	.001463	-.001306
.0500	-1.55	2.68	3.95	1.40	.23	.02	1.68	1.65	.00	1.57	-.05	.01	.032030	-.000524	.001522	-.002045
.0600	-1.41	3.94	5.00	1.77	.30	.03	1.78	1.74	.16	1.97	-.07	.01	.040549	-.001253	.001738	-.002992
.0700	-1.29	5.25	5.99	2.16	.38	.03	1.92	1.87	.32	2.35	-.09	.00	.049007	-.002015	.002069	-.004084
.0800	-1.14	6.97	7.18	2.70	.48	.05	2.17	2.09	.53	2.79	-.13	.00	.059680	-.003037	.002646	-.005684
.0900	-1.05	8.92	8.28	3.43	.66	.09	2.51	2.37	.64	3.26	-.17	-.01	.071241	-.003923	.003647	-.007570
.1000	-1.37	12.24	9.51	4.98	1.04	.16	2.66	2.32	.38	4.17	-.09	.06	.090409	-.003198	.007231	-.010430
.1100	-1.88	16.09	10.70	6.73	1.39	.19	2.86	2.33	.09	5.17	.03	.16	.112355	-.001691	.012324	-.014015
.1200	-2.31	20.07	11.93	8.24	1.52	.13	3.44	2.83	.11	6.00	.09	.24	.134540	-.000574	.017737	-.018311
.1300	-2.55	23.65	13.23	9.59	1.58	.09	3.92	3.28	.27	6.65	.14	.30	.156853	.000366	.023438	-.023073
.1400	-2.67	26.97	14.60	10.79	1.58	.06	4.37	3.75	.47	7.29	.21	.34	.179742	.001221	.029595	-.028374
.1500	-2.68	30.00	16.06	11.82	1.53	.03	4.78	4.20	.65	7.94	.31	.37	.203303	.002022	.036270	-.034248
.1600	-2.56	32.71	17.61	12.65	1.41	.00	5.14	4.65	.83	8.60	.43	.37	.227536	.002760	.043492	-.040732
$\theta_0 = 10°$																
0.0000	-1.50	-0.06	-0.11	1.59	0.07	0.01	15.77	15.68	-0.14	-0.02	-0.06	0.00	-0.054479	0.001113	0.001495	-0.000382
.0100	-1.38	.90	.83	1.86	.13	.01	11.08	11.01	-.06	.36	-.07	.01	-.047358	.001470	.001453	.000017
.0200	-1.25	1.89	1.78	2.13	.19	.02	7.42	7.35	.02	.75	-.07	.01	-.040129	.001676	.001427	.000249
.0300	-1.12	2.90	2.74	2.41	.24	.02	4.83	4.76	.08	1.13	-.08	.01	-.032793	.001723	.001417	.000306
.0400	-.98	3.93	3.71	2.69	.30	.03	3.36	3.29	.12	1.52	-.09	.01	-.025349	.001605	.001425	.000179
.0500	-.85	4.86	4.67	2.93	.34	.03	4.03	3.97	.10	1.90	-.09	.01	-.018291	.001248	.001400	-.000152
.0600	-.71	6.05	5.69	3.27	.41	.04	4.02	3.94	.16	2.31	-.11	.01	-.010151	.000841	.001496	-.000656
.0700	-.57	7.44	6.74	3.69	.50	.05	4.06	3.97	.29	2.72	-.14	.01	-.001305	.000310	.001703	-.001393
.0800	-.42	8.91	7.76	4.13	.59	.07	4.21	4.09	.54	3.07	-.19	-.01	.007402	-.000479	.001884	-.002362
.0900	-.73	11.84	8.89	5.63	1.03	.17	3.95	3.58	.22	3.99	-.09	.06	.024486	.000431	.004497	-.004067
.1000	-1.31	16.00	10.10	7.54	1.44	.21	4.01	3.38	-.16	5.08	.03	.16	.046967	.002134	.008939	-.006805
.1100	-2.10	21.34	11.34	9.62	1.64	.13	4.74	3.33	-.42	6.19	.13	.28	.074036	.004476	.015359	-.010882
.1200	-2.43	25.66	12.69	11.22	1.70	.08	5.32	4.50	-.24	6.95	.18	.34	.098927	.005809	.021038	-.015229
.1300	-2.62	29.42	14.11	12.56	1.67	.04	5.73	4.97	-.08	7.65	.27	.38	.123785	.007080	.027090	-.020010
.1400	-2.66	32.81	15.62	13.70	1.59	.00	6.08	5.40	.10	8.33	.38	.40	.149222	.008310	.033676	-.025366
.1500	-2.54	35.93	17.24	14.65	1.47	-.03	6.43	5.83	.29	9.01	.51	.40	.175595	.009534	.040940	-.031406
.1600	-2.26	38.72	19.00	15.41	1.31	-.05	6.78	6.25	.48	9.69	.66	.37	.202902	.010745	.048930	-.038184
$\theta_0 = 14°$																
0.0000	-0.82	2.15	0.57	3.17	0.18	0.02	16.99	16.66	0.50	0.28	-0.12	0.01	-0.105334	0.001336	0.001742	-0.000406
.0100	-.69	3.15	1.52	3.45	.24	.03	12.72	12.47	.56	.66	-.12	.01	-.098028	.002071	.001680	.000391
.0200	-.56	4.16	2.48	3.73	.30	.03	9.38	9.19	.61	1.05	-.13	.01	-.090651	.002650	.001632	.001018
.0300	-.43	5.18	3.45	4.01	.36	.04	7.01	6.86	.65	1.44	-.14	.01	-.083204	.003070	.001601	.001469
.0400	-.30	6.22	4.43	4.30	.42	.04	5.64	5.51	.68	1.84	-.15	.01	-.075687	.003324	.001585	.001739
.0500	-.15	7.15	5.39	4.50	.45	.04	6.11	5.99	.68	2.20	-.15	.01	-.068752	.003333	.001519	.001813
.0600	-.02	8.32	6.41	4.85	.53	.05	6.07	5.93	.68	2.64	-.16	.02	-.060498	.003312	.001597	.001715
.0700	.07	9.68	7.45	5.33	.66	.08	6.12	5.94	.67	3.12	-.15	.02	-.051389	.003172	.001812	.001360
.0800	.16	10.99	8.38	5.84	.82	.13	6.34	6.10	.70	3.57	-.15	.03	-.042790	.002675	.001946	.000729
.0900	-.84	15.86	9.46	8.32	1.46	.20	5.59	4.84	-.69	5.11	.08	.18	-.017811	.006234	.007275	-.001042
.1000	-1.74	21.72	10.69	10.64	1.72	.12	6.21	5.21	-.94	6.35	.19	.30	.010105	.008555	.012832	-.004277
.1100	-2.30	26.97	12.05	12.60	1.82	.06	6.75	5.69	-.97	7.35	.27	.38	.038274	.010706	.018818	-.008113
.1200	-2.53	31.61	13.54	14.21	1.75	.00	7.26	6.32	-.77	8.12	.34	.41	.066598	.012599	.025175	-.012577
.1300	-2.60	35.38	15.11	15.48	1.65	-.03	7.65	6.80	-.58	8.78	.46	.42	.093861	.014226	.031667	-.017440
.1400	-2.49	38.74	16.81	16.52	1.52	-.06	7.87	7.16	-.35	9.49	.61	.41	.121745	.015534	.038394	-.022860
.1500	-2.17	41.91	18.63	17.30	1.34	-.08	8.01	7.43	-.18	10.36	.77	.37	.150986	.016863	.045841	-.028978
.1600	-1.58	44.87	20.58	17.78	1.10	-.11	8.06	7.58	-.10	11.43	.95	.28	.181742	.018275	.054157	-.035881

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(c) $\mu = 0.3$ - Continued

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90^\circ)}$, deg	$\alpha_{(1.0)(270^\circ)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 18^\circ$																
0.0000	-0.16	4.33	1.26	4.80	0.31	0.04	13.83	13.18	1.03	0.59	-0.17	0.01	-0.157155	0.001928	0.002234	-0.000305
.0100	-.03	5.34	2.22	5.07	.36	.04	11.47	10.98	1.14	.97	-.18	.01	-.149743	.003012	.002117	.000895
.0200	.10	6.38	3.19	5.35	.42	.04	9.61	9.24	1.23	1.36	-.19	.02	-.142211	.003948	.002021	.001927
.0300	.23	7.44	4.17	5.64	.48	.05	8.28	8.00	1.29	1.76	-.19	.02	-.134561	.004729	.001947	.002782
.0400	.36	8.51	5.16	5.94	.54	.06	7.51	7.28	1.32	2.17	-.20	.02	-.126791	.005347	.001897	.003450
.0500	.47	9.42	6.00	6.20	.60	.06	7.30	7.10	1.32	2.52	-.20	.02	-.120180	.005734	.001874	.003860
.0600	.63	10.67	7.16	6.54	.68	.08	7.81	7.58	1.31	2.99	-.20	.02	-.111111	.006001	.001815	.004187
.0700	.60	11.62	7.83	6.96	.81	.11	7.81	7.51	1.08	3.42	-.15	.04	-.104301	.006524	.002281	.004243
.0800	.13	14.37	9.10	8.47	1.30	.21	7.77	7.08	-.09	4.74	.08	.15	-.085961	.008480	.004832	.003648
.0900	-1.19	20.78	10.05	11.18	1.76	.12	7.97	6.77	-1.35	6.42	.28	.31	-.057709	.011937	.010527	.001409
.1000	-2.00	27.38	11.35	13.61	1.87	.02	8.50	7.26	-1.67	7.72	.37	.39	-.025991	.014836	.016719	-.001882
.1100	-2.43	32.96	12.85	15.58	1.85	-.04	9.00	7.82	-1.69	8.71	.47	.44	.005379	.017317	.023138	-.005821
.1200	-2.51	37.49	14.53	17.10	1.73	-.07	9.40	8.33	-1.41	9.41	.57	.45	.035558	.019251	.029474	-.010223
.1300	-2.38	41.30	16.27	18.21	1.55	-.10	9.47	8.57	-1.12	10.16	.70	.42	.065156	.020865	.035840	-.014975
.1400	-2.00	44.73	18.15	18.97	1.32	-.13	9.54	8.85	-1.08	11.26	.88	.34	.096164	.022702	.043227	-.020525
.1500	-1.33	48.10	20.21	19.52	1.07	-.14	9.57	9.02	-1.09	12.49	1.09	.25	.129691	.024674	.051711	-.027037
.1600	-.32	51.35	22.48	19.82	.80	-.12	9.56	9.05	-1.12	13.84	1.30	.14	.165877	.026770	.061416	-.034646
$\theta_0 = 22^\circ$																
0.0000	0.41	6.62	1.97	6.61	0.49	0.07	10.94	9.99	1.82	1.00	-0.20	0.03	-0.209504	0.003326	0.003307	0.000019
.0100	.58	7.53	2.91	6.78	.50	.06	10.28	9.54	1.86	1.31	-.22	.02	-.202777	.004408	.002922	.001486
.0200	.73	8.53	3.88	7.01	.53	.05	9.71	9.13	1.87	1.66	-.24	.02	-.195494	.005515	.002633	.002882
.0300	.87	9.60	4.88	7.29	.59	.06	9.26	8.81	1.82	2.07	-.25	.02	-.187657	.006633	.002471	.004162
.0400	.97	10.75	5.88	7.66	.68	.08	8.97	8.59	1.72	2.52	-.24	.03	-.179264	.007745	.002468	.005277
.0500	1.03	11.70	6.67	8.00	.78	.10	8.87	8.50	1.59	2.91	-.22	.04	-.172355	.008595	.002599	.005996
.0600	1.09	13.24	7.86	8.62	.98	.15	9.02	8.58	1.32	3.57	-.17	.05	-.161115	.009810	.003020	.006789
.0700	.42	15.31	8.70	9.84	1.34	.18	9.10	8.27	-.09	4.83	.15	.19	-.146180	.012385	.005542	.006842
.0800	-.55	19.31	9.58	11.63	1.74	.13	9.80	8.44	-1.22	6.40	.44	.31	-.125713	.014803	.008912	.005891
.0900	-1.60	26.64	10.68	14.27	1.94	-.01	10.46	9.01	-2.34	8.12	.54	.39	-.093620	.018337	.014897	.003440
.1000	-2.19	33.27	12.08	16.60	1.93	-.09	11.02	9.50	-2.53	9.23	.60	.46	-.060935	.021220	.020970	.000250
.1100	-2.35	38.67	13.79	18.39	1.80	-.13	11.30	9.94	-2.29	10.08	.69	.47	-.028221	.023314	.026807	-.003493
.1200	-2.18	43.26	15.62	19.69	1.57	-.15	11.39	10.36	-2.16	11.09	.83	.41	.005415	.025756	.033662	-.007906
.1300	-1.75	47.31	17.60	20.58	1.31	-.17	11.44	10.63	-2.18	12.35	1.02	.32	.039537	.028209	.041237	-.013028
.1400	-1.10	51.01	19.77	21.16	1.05	-.18	11.38	10.67	-2.24	13.76	1.26	.21	.074693	.030383	.049298	-.018915
.1500	.10	54.62	22.17	21.35	.76	-.13	11.14	10.54	-2.37	15.43	1.49	.11	.112894	.032474	.058262	-.025788
.1600	2.24	57.92	24.74	20.77	.35	-.02	10.78	10.37	-2.81	17.65	1.65	.01	.153939	.034973	.068758	-.033785
$\theta_0 = 26^\circ$																
0.0000	0.99	8.69	2.66	8.30	0.59	0.07	12.62	10.41	3.06	1.30	-0.26	0.03	-0.265380	0.004691	0.004618	0.000073
.0100	1.16	9.60	3.60	8.50	.62	.07	11.71	10.08	2.89	1.62	-.28	.03	-.258464	.005999	.004047	.001953
.0200	1.30	10.63	4.58	8.78	.68	.08	10.89	9.76	2.62	2.01	-.28	.03	-.250613	.007492	.003657	.003835
.0300	1.38	11.80	5.59	9.17	.78	.10	10.23	9.47	2.20	2.49	-.26	.04	-.241828	.009173	.003547	.005626
.0400	1.39	13.10	6.59	9.69	.93	.13	9.83	9.23	1.60	3.07	-.20	.06	-.232109	.011045	.003827	.007218
.0500	1.32	14.50	7.54	10.35	1.15	.18	9.78	9.07	.78	3.74	-.11	.10	-.221774	.013067	.004589	.008478
.0600	.65	16.73	8.38	11.52	1.44	.17	10.22	9.08	-.54	5.00	.20	.22	-.206659	.015869	.006738	.009131
.0700	-.18	20.03	9.25	12.98	1.74	.11	11.12	9.58	-1.44	6.53	.52	.33	-.187753	.018375	.009387	.008987
.0800	-1.13	25.40	10.19	14.86	1.90	-.05	12.43	10.76	-2.83	8.46	.77	.38	-.161767	.021697	.014048	.007649
.0900	-1.85	32.55	11.43	17.26	1.97	-.16	13.31	11.43	-3.39	9.89	.82	.44	-.130185	.024543	.019210	.005333
.1000	-2.12	38.91	13.00	19.37	1.89	-.20	13.55	11.80	-3.17	10.98	.88	.47	-.096310	.026789	.024385	.002404
.1100	-1.89	44.18	14.78	20.77	1.59	-.22	13.60	12.40	-3.47	12.25	1.00	.39	-.060470	.030050	.031382	-.001333
.1200	-1.47	48.94	16.84	21.83	1.28	-.23	13.71	12.69	-3.49	13.63	1.19	.28	-.023711	.033063	.039000	-.005937
.1300	-.79	53.37	19.20	22.53	1.02	-.22	13.60	12.66	-3.57	15.37	1.47	.18	.014904	.035226	.046603	-.011376
.1400	.83	57.17	21.68	22.38	.64	-.13	13.33	12.64	-3.89	17.58	1.68	.07	.055609	.038056	.055791	-.017735
.1500	3.28	60.64	24.33	21.44	.17	-.01	13.17	12.56	-4.42	20.00	1.82	.00	.097689	.041264	.066446	-.025182
.1600	6.61	63.79	27.15	19.66	-.41	.14	13.16	12.40	-5.16	22.62	1.88	-.03	.141090	.044843	.078652	-.033808

L-697

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(c) $\mu = 0.3$ - Concluded

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 30°$																
0.0000	1.47	10.79	3.39	10.18	0.74	0.08	16.27	11.07	4.06	1.69	-0.29	0.04	-0.323247	0.006420	0.006333	0.000087
.0100	1.65	11.69	4.30	10.42	.81	.10	14.18	10.74	3.33	2.00	-.32	.03	-.316203	.008189	.005823	.002366
.0200	1.76	12.83	5.31	10.81	.91	.12	12.21	10.36	2.37	2.46	-.30	.04	-.307398	.010362	.005539	.004823
.0300	1.71	14.21	6.32	11.38	1.06	.15	10.80	9.97	1.17	3.12	-.21	.07	-.296831	.012913	.005718	.007195
.0400	1.41	15.77	7.19	12.21	1.30	.18	10.65	9.52	-.42	4.03	-.02	.15	-.284815	.015828	.006725	.009103
.0500	.79	18.08	8.05	13.35	1.57	.15	11.36	9.75	-1.58	5.28	.28	.26	-.269501	.018745	.008324	.010421
.0600	.01	21.34	8.92	14.70	1.77	.07	12.56	10.61	-2.61	6.87	.61	.35	-.250165	.021871	.010841	.011030
.0700	-.79	25.83	9.82	16.23	1.87	-.08	14.11	12.10	-3.72	8.78	.92	.38	-.226324	.025190	.014631	.010559
.0800	-1.49	31.70	10.95	18.13	1.97	-.21	15.55	13.26	-3.96	10.50	1.10	.43	-.198849	.027634	.018403	.009231
.0900	-1.70	38.37	12.31	20.09	1.87	-.27	16.00	14.10	-4.28	12.06	1.14	.43	-.165461	.030498	.023352	.007146
.1000	-1.47	44.03	13.93	21.47	1.56	-.30	16.34	14.88	-4.93	13.69	1.24	.33	-.130442	.034129	.029887	.004242
.1100	-1.20	49.40	15.94	22.75	1.27	-.31	16.30	14.93	-4.81	15.03	1.41	.25	-.094076	.036651	.035962	.000689
.1200	-.32	54.54	18.38	23.48	.94	-.26	16.19	15.06	-4.88	17.08	1.67	.14	-.051667	.039462	.043710	-.004249
.1300	1.69	58.53	20.83	22.99	.45	-.12	16.14	15.28	-5.40	19.76	1.84	.01	-.009212	.043497	.053590	-.010092
.1400	4.26	62.28	23.62	21.79	-.11	-.01	15.96	15.10	-5.79	22.38	1.99	-.05	.034212	.046624	.063429	-.016805
.1500	8.23	65.36	26.28	19.48	-.64	.14	15.87	15.12	-6.47	24.84	1.87	.01	.079175	.050339	.075006	-.024666
.1600	12.80	68.73	28.96	16.99	-.94	.22	15.96	15.40	-7.21	26.26	1.70	.19	.133394	.054454	.089528	-.035075
$\theta_0 = 34°$																
0.0000	1.94	12.93	4.15	12.22	0.92	0.09	18.36	12.24	0.96	2.07	-0.36	0.03	-0.384570	0.008786	0.008769	0.000017
.0100	1.93	13.91	5.03	12.70	1.07	.14	14.86	10.87	-.21	2.62	-.27	.07	-.375631	.011549	.008583	.002965
.0200	1.79	15.25	5.98	13.35	1.25	.17	12.14	9.86	-1.57	3.38	-.12	.13	-.364428	.014722	.008715	.006007
.0300	1.43	17.02	6.90	14.22	1.46	.17	11.34	9.67	-3.01	4.41	.11	.21	-.350962	.018113	.009412	.008701
.0400	.81	19.35	7.71	15.33	1.67	.12	12.97	10.60	-4.32	5.75	.43	.31	-.335054	.021502	.010840	.010662
.0500	.14	22.56	8.58	16.56	1.80	.02	14.33	11.88	-4.82	7.36	.75	.37	-.315697	.024755	.012783	.011971
.0600	-.57	26.80	9.47	17.94	1.83	-.14	16.08	13.62	-5.53	9.30	1.07	.39	-.292015	.028356	.016024	.012332
.0700	-1.12	31.70	10.57	19.47	1.91	-.25	17.57	14.87	-5.09	11.08	1.31	.42	-.266910	.030571	.018547	.012024
.0800	-1.14	37.33	11.75	20.78	1.72	-.34	18.73	16.69	-5.79	13.25	1.45	.33	-.235239	.034396	.023713	.010683
.0900	-.95	43.18	13.24	22.04	1.46	-.39	19.49	17.74	-6.34	15.22	1.55	.24	-.201631	.037855	.029256	.008599
.1000	-.68	48.72	15.09	23.22	1.19	-.40	19.51	17.75	-6.15	16.81	1.70	.19	-.167692	.040072	.033918	.006154
.1100	.34	53.80	17.28	23.75	.81	-.32	19.28	17.86	-6.24	18.90	1.87	.09	-.128038	.043049	.040500	.002549
.1200	2.57	58.17	19.70	23.14	.24	-.14	19.42	18.40	-6.84	21.81	1.98	-.06	-.082862	.047834	.050581	-.002747
.1300	5.46	62.10	22.48	21.63	-.39	.00	19.29	18.28	-7.08	24.67	2.05	-.09	-.037602	.051485	.060248	-.008763
.1400	9.80	65.10	25.22	18.95	-.94	.18	19.40	18.56	-7.53	27.21	1.87	.02	.009650	.056241	.072386	-.016146
.1500	14.70	68.42	27.81	15.98	-1.28	.21	19.41	18.70	-7.97	28.79	1.59	.20	.063855	.060573	.086007	-.025434
.1600	18.01	73.31	29.04	15.72	-.79	.07	19.84	19.55	-7.72	26.75	1.57	.34	.141071	.068013	.107891	-.039878
$\theta_0 = 38°$																
0.0000	2.11	14.98	4.84	14.71	1.22	0.15	17.10	9.05	-18.13	2.77	-0.27	0.08	-0.448548	0.012315	0.012302	0.000013
.0100	1.72	16.31	5.65	15.50	1.41	.15	15.25	9.47	-13.61	3.80	.01	.19	-.436188	.016110	.012565	.003544
.0200	1.28	18.11	6.50	16.41	1.59	.13	14.37	10.27	-10.13	4.98	.30	.28	-.421815	.019928	.013028	.006900
.0300	.81	20.50	7.35	17.43	1.76	.08	15.23	11.62	-8.65	6.26	.57	.34	-.405852	.023319	.013639	.009680
.0400	.19	23.81	8.19	18.59	1.79	-.06	16.83	13.67	-9.38	8.11	.92	.37	-.384702	.027559	.015801	.011758
.0500	-.40	27.69	9.13	19.85	1.81	-.20	18.73	15.47	-8.72	10.00	1.26	.39	-.361735	.030843	.017845	.012998
.0600	-.71	31.90	10.18	20.99	1.76	-.31	20.19	17.19	-7.75	11.96	1.52	.37	-.336710	.033789	.020198	.013591
.0700	-.53	36.79	11.31	21.84	1.49	-.39	21.84	19.58	-8.49	14.50	1.71	.22	-.305244	.038219	.025269	.012949
.0800	-.40	42.17	12.76	22.85	1.26	-.46	22.83	20.55	-7.93	16.65	1.89	.14	-.273842	.041029	.029223	.011806
.0900	-.06	47.20	14.44	23.61	1.00	-.48	22.98	20.72	-7.30	18.54	2.04	.09	-.243304	.043062	.032618	.010444
.1000	1.73	51.13	16.23	23.23	.52	-.31	23.19	21.81	-7.80	21.09	2.02	-.04	-.205795	.048011	.040287	.007724
.1100	3.54	55.48	18.45	22.69	-.03	-.19	23.33	21.92	-7.92	23.78	2.12	-.15	-.166029	.051530	.047488	.004042
.1200	6.42	59.32	21.06	21.11	-.64	-.03	23.15	21.83	-7.91	26.68	2.13	-.15	-.121457	.055277	.056093	-.000816
.1300	11.12	61.83	23.73	18.06	-1.26	.18	23.12	22.14	-8.15	29.32	1.79	-.04	-.074507	.060612	.067580	-.006968
.1400	16.73	64.45	26.27	14.29	-1.58	.19	23.48	22.61	-8.12	31.13	1.37	.21	-.017968	.066387	.082113	-.015726
.1500	20.55	71.95	28.29	13.79	-1.35	.10	23.23	22.83	-8.31	30.13	1.44	.38	.069109	.073295	.102975	-.029680
.1600	5.28	98.11	24.67	37.53	.60	.57	18.87	20.78	-8.14	18.00	5.38	-.17	.229545	.077402	.130318	-.052916

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR BLADES WITH A LINEAR TWIST OF -8°

(d) $\mu = 0.35$

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 6°$																
0.0000	-2.21	-2.45	-0.87	-0.02	-0.06	-0.00	11.59	11.59	0.98	-0.41	0.00	0.00	-0.005108	0.001209	0.001486	-0.000277
.0100	-2.12	-1.44	.03	.27	.01	.00	7.95	7.94	.47	.02	-.01	.00	.001540	.001140	.001451	-.000312
.0200	-2.02	-.36	.95	.58	.08	.01	4.97	4.96	.08	.45	-.02	.00	.008477	.000957	.001451	-.000494
.0300	-1.93	.79	1.89	.90	.16	.02	2.77	2.75	-.16	.89	-.03	.01	.015704	.000645	.001489	-.000844
.0400	-1.83	2.02	2.86	1.26	.24	.02	1.45	1.42	-.23	1.34	-.04	.01	.023220	.000190	.001571	-.001380
.0500	-1.73	3.22	3.81	1.59	.31	.03	1.95	1.91	.03	1.76	-.06	.01	.030581	-.000494	.001635	-.002129
.0600	-1.63	4.68	4.84	2.03	.40	.04	2.05	1.99	.22	2.23	-.09	.01	.039047	-.001223	.001871	-.003094
.0700	-1.54	6.36	5.90	2.56	.52	.06	2.21	2.12	.40	2.72	-.12	.01	.048366	-.002040	.002288	-.004328
.0800	-1.46	8.21	6.96	3.16	.66	.08	2.46	2.33	.60	3.19	-.16	.01	.058169	-.003006	.002845	-.005851
.0900	-1.63	11.05	8.08	4.44	1.03	.17	2.63	2.33	.53	4.00	-.13	.05	.073163	-.002958	.005074	-.008032
.1000	-2.08	14.76	9.23	6.03	1.38	.20	3.00	2.49	.17	5.00	-.04	.14	.091903	-.001947	.009076	-.011023
.1100	-2.55	18.65	10.40	7.57	1.63	.19	3.50	2.83	-.06	5.97	.05	.24	.111876	-.000847	.013814	-.014660
.1200	-2.93	22.53	11.63	8.97	1.75	.14	4.14	3.40	.03	6.83	.12	.31	.132271	-.000057	.018861	-.018918
.1300	-3.17	26.04	12.92	10.22	1.81	.11	4.69	3.94	.26	7.57	.18	.37	.152901	.000592	.024216	-.023623
.1400	-3.31	29.34	14.30	11.34	1.82	.08	5.18	4.45	.52	8.29	.27	.42	.174207	.001228	.030066	-.028838
.1500	-3.38	32.45	15.77	12.33	1.77	.05	5.60	4.91	.72	9.05	.39	.44	.196379	.001939	.036534	-.034595
.1600	-3.36	35.32	17.33	13.17	1.68	.01	5.94	5.31	.86	9.85	.53	.45	.219419	.002732	.043666	-.040933
$\theta_0 = 10°$																
0.0000	-1.81	-0.18	-0.36	1.84	0.08	-0.01	14.17	13.87	0.02	0.03	0.01	0.05	-0.057015	0.001124	0.001692	-0.000568
.0100	-1.50	1.05	.77	2.12	.17	.02	10.53	10.43	-.08	.39	-.09	.01	-.049737	.001477	.001618	-.000140
.0200	-1.25	2.27	1.85	2.43	.26	.05	7.67	7.71	-.13	.78	-.16	-.02	-.042407	.001667	.001570	.000096
.0300	-1.06	3.49	2.88	2.75	.34	.07	5.60	5.72	-.12	1.19	-.21	-.04	-.035025	.001688	.001551	.000137
.0400	-.95	4.69	3.85	3.09	.42	.08	4.36	4.48	-.07	1.64	-.23	-.04	-.027590	.001538	.001560	-.000022
.0500	-.91	5.89	4.78	3.44	.50	.08	3.94	4.00	.04	2.11	-.22	-.03	-.020104	.001213	.001598	-.000385
.0600	-.97	6.92	5.59	3.75	.54	.06	4.72	4.63	.22	2.60	-.16	.01	-.013193	.000628	.001581	-.000952
.0700	-.97	8.70	6.62	4.40	.71	.09	4.70	4.50	.33	3.19	-.15	.03	-.003224	.000279	.002053	-.001773
.0800	-.97	10.90	7.62	5.31	.99	.17	4.65	4.34	.41	3.77	-.18	.03	.007877	.000009	.002916	-.002907
.0900	-1.61	14.93	8.69	7.16	1.45	.22	4.48	3.85	-.23	4.96	-.04	.16	.027508	.001880	.006823	-.004943
.1000	-2.25	19.38	9.85	8.97	1.77	.21	4.81	3.93	-.58	6.09	.09	.27	.049038	.003597	.011461	-.007864
.1100	-2.77	24.12	11.12	10.62	1.89	.14	5.72	4.75	-.51	7.07	.16	.36	.072015	.004860	.016638	-.011779
.1200	-3.07	28.27	12.45	12.05	1.93	.09	6.31	5.37	-.28	7.92	.23	.42	.094874	.005991	.022026	-.016035
.1300	-3.28	32.01	13.87	13.29	1.91	.05	6.78	5.89	-.09	8.72	.33	.45	.117995	.007154	.027912	-.020759
.1400	-3.37	35.41	15.38	14.36	1.83	.01	7.17	6.34	.08	9.50	.47	.47	.141680	.008279	.034286	-.026007
.1500	-3.34	38.60	17.04	15.28	1.73	-.02	7.51	6.74	.28	10.33	.63	.48	.166426	.009264	.041136	-.031873
.1600	-3.17	41.54	18.84	16.01	1.60	-.04	7.77	7.08	.50	11.20	.82	.47	.192234	.010082	.048488	-.038406
$\theta_0 = 14°$																
0.0000	-1.00	2.25	0.50	3.63	0.25	0.04	-60.87	111.22	-167.26	0.31	-0.15	0.01	-0.109372	0.001345	0.001993	-0.000648
.0100	-.90	3.40	1.45	3.96	.32	.04	-26.76	60.68	-84.86	.75	-.16	.02	-.102092	.002054	.001917	.000136
.0200	-.80	4.56	2.40	4.29	.40	.05	-2.30	24.14	-25.46	1.20	-.17	.02	-.094766	.002599	.001860	.000739
.0300	-.71	5.73	3.36	4.62	.48	.06	12.33	1.87	10.51	1.65	-.18	.02	-.087396	.002978	.001821	.001156
.0400	-.62	6.80	4.24	4.92	.55	.06	16.94	-5.77	22.47	2.07	-.19	.02	-.080696	.003174	.001802	.001372
.0500	-.50	8.03	5.30	5.23	.62	.07	7.25	7.04	.68	2.55	-.20	.02	-.072833	.003173	.001754	.001419
.0600	-.43	9.49	6.32	5.73	.76	.10	7.03	6.78	.65	3.09	-.20	.03	-.064133	.003215	.001962	.001253
.0700	-.32	10.59	7.12	6.12	.91	.14	7.18	6.90	.63	3.48	-.22	.02	-.057586	.002811	.001940	.000871
.0800	-1.04	14.53	8.24	8.03	1.44	.21	6.80	6.08	-.41	4.89	-.01	.16	-.037727	.004919	.005234	-.000315
.0900	-1.96	19.55	9.29	10.20	1.89	.22	6.77	5.65	-1.27	6.32	.20	.32	-.014482	.007473	.009927	-.002454
.1000	-2.55	25.10	10.57	12.05	2.01	.12	7.55	6.34	-1.16	7.38	.23	.39	.009808	.008934	.014554	-.005620
.1100	-2.98	30.07	11.93	13.72	2.03	.06	8.15	7.00	-1.09	8.39	.32	.45	.035476	.010888	.020308	-.009420
.1200	-3.23	34.42	13.40	15.13	1.99	.01	8.63	7.54	-.92	9.28	.43	.49	.060889	.012544	.026222	-.013678
.1300	-3.31	38.12	14.98	16.29	1.90	-.02	8.98	7.95	-.63	10.02	.57	.51	.085895	.013895	.032256	-.018361
.1400	-3.27	41.53	16.70	17.25	1.79	-.05	9.22	8.31	-.36	10.89	.75	.50	.112018	.015012	.038654	-.023642
.1500	-3.04	44.84	18.57	17.98	1.62	-.07	9.37	8.59	-.19	11.94	.95	.47	.139772	.016261	.045883	-.029623
.1600	-2.59	48.03	20.59	18.43	1.38	-.11	9.43	8.77	-.16	13.21	1.20	.39	.169252	.017708	.054089	-.036381

L-697

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR BLADES WITH A LINEAR TWIST OF -8°

(d) $\mu = 0.35$ - Continued

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 18°$																
0.0000	-0.42	4.59	1.20	5.52	0.41	0.06	35.01	33.42	0.22	0.68	-0.22	0.02	-0.162669	0.001919	0.002548	-0.000629
.0100	-.32	5.74	2.15	5.84	.48	.06	24.14	23.06	.66	1.12	-.23	.02	-.155369	.002969	.002422	.000546
.0200	-.23	6.92	3.11	6.17	.56	.07	15.81	15.13	.99	1.58	-.24	.03	-.147929	.003866	.002322	.001544
.0300	-.13	8.12	4.09	6.51	.64	.08	10.19	9.78	1.22	2.04	-.25	.03	-.140351	.004600	.002248	.002352
.0400	-.03	9.34	5.07	6.87	.73	.09	7.43	7.16	1.33	2.52	-.26	.03	-.132634	.005161	.002202	.002960
.0500	.14	10.43	6.03	7.10	.79	.10	9.52	9.22	1.42	2.89	-.29	.01	-.125945	.005234	.001929	.003305
.0600	.07	12.04	7.08	7.77	1.00	.14	9.28	8.87	1.07	3.63	-.21	.06	-.115605	.006072	.002534	.003538
.0700	-.33	13.61	7.85	8.76	1.37	.23	9.11	8.35	.09	4.62	.01	.16	-.104255	.007451	.004119	.003332
.0800	-1.41	18.67	8.81	10.91	1.85	.18	9.34	8.04	-1.55	6.28	.27	.32	-.081841	.010421	.008478	.001943
.0900	-2.24	25.06	9.96	13.19	2.11	.11	9.79	8.30	-1.71	7.67	.35	.43	-.055447	.012427	.012872	-.000445
.1000	-2.82	30.97	11.28	15.09	2.11	.01	10.25	8.82	-2.02	8.88	.45	.48	-.027767	.015132	.018685	-.003553
.1100	-3.13	36.07	12.85	16.76	2.08	-.04	10.77	9.38	-1.82	9.84	.56	.52	.000174	.017007	.024360	-.007353
.1200	-3.23	40.51	14.53	18.10	1.98	-.07	11.11	9.83	-1.53	10.77	.71	.53	.028185	.018686	.030310	-.011624
.1300	-3.15	44.29	16.31	19.11	1.82	-.09	11.18	10.12	-1.21	11.72	.89	.52	.056083	.020261	.036550	-.016289
.1400	-2.82	47.85	18.20	19.76	1.59	-.12	11.22	10.35	-1.22	12.97	1.11	.43	.085263	.022224	.043883	-.021658
.1500	-2.29	51.41	20.32	20.21	1.32	-.15	11.20	10.45	-1.24	14.36	1.37	.34	.116890	.024155	.052079	-.027924
.1600	-1.51	54.93	22.70	20.43	1.04	-.14	11.14	10.40	-1.24	15.87	1.67	.26	.151090	.025959	.061169	-.035210
$\theta_0 = 22°$																
0.0000	0.06	7.07	1.95	7.59	0.62	0.09	19.66	17.99	0.53	1.18	-0.26	0.04	-0.216418	0.003394	0.003698	-0.000304
.0100	.21	8.04	2.85	7.79	.66	.09	17.02	15.71	1.12	1.52	-.30	.03	-.210191	.004257	.003232	.001025
.0200	.34	9.15	3.81	8.07	.72	.09	14.54	13.56	1.57	1.93	-.32	.03	-.203057	.005255	.002905	.002350
.0300	.41	10.38	4.80	8.45	.82	.11	12.48	11.72	1.77	2.44	-.31	.04	-.195014	.006393	.002803	.003591
.0400	.42	11.74	5.79	8.95	.97	.14	11.07	10.42	1.63	3.04	-.26	.07	-.186063	.007676	.003021	.004655
.0500	.38	12.98	6.68	9.54	1.18	.20	11.01	10.25	.94	3.67	-.18	.10	-.177279	.008942	.003553	.005389
.0600	.00	15.09	7.68	10.51	1.47	.22	10.92	9.93	-.07	4.74	.01	.19	-.164146	.010906	.005068	.005838
.0700	-.89	18.15	8.48	11.92	1.81	.18	11.44	10.01	-1.51	6.25	.36	.34	-.147364	.013407	.008038	.005369
.0800	-1.79	23.63	9.45	13.88	2.12	.08	12.19	10.46	-2.18	7.90	.55	.43	-.124269	.015439	.011529	.003910
.0900	-2.59	30.94	10.66	16.20	2.18	-.06	12.75	11.07	-3.17	9.47	.64	.49	-.093710	.018868	.017562	.001306
.1000	-2.96	36.80	12.14	18.07	2.16	-.10	13.09	11.35	-2.78	10.48	.71	.54	-.065501	.020799	.022384	-.001585
.1100	-3.08	41.89	13.88	19.60	2.04	-.12	13.32	11.81	-2.52	11.54	.87	.55	-.034991	.022696	.027964	-.005267
.1200	-2.89	46.36	15.72	20.64	1.80	-.15	13.38	12.19	-2.43	12.76	1.05	.48	-.004009	.025253	.034767	-.009514
.1300	-2.53	50.56	17.75	21.39	1.54	-.18	13.44	12.45	-2.45	14.20	1.28	.39	.028303	.027697	.042249	-.014552
.1400	-2.03	54.48	20.02	21.87	1.27	-.19	13.40	12.45	-2.48	15.81	1.61	.30	.061671	.029686	.049995	-.020309
.1500	-1.00	58.29	22.50	21.85	.92	-.17	13.12	12.25	-2.55	17.62	1.91	.22	.097092	.031622	.058417	-.026795
.1600	.98	62.07	25.21	21.02	.40	-.09	12.84	12.12	-3.00	19.88	2.14	.12	.135847	.034327	.068825	-.034497
$\theta_0 = 26°$																
0.0000	0.53	9.26	2.63	9.58	0.79	0.10	27.10	23.35	2.53	1.58	-0.33	0.05	-0.273937	0.004507	0.004880	-0.000373
.0100	.71	10.26	3.54	9.82	.85	.11	21.93	19.29	2.35	1.91	-.37	.04	-.267454	.005815	.004415	.001400
.0200	.83	11.46	4.53	10.18	.95	.13	17.03	15.39	2.01	2.38	-.37	.04	-.259518	.007411	.004147	.003263
.0300	.82	12.85	5.55	10.69	1.09	.16	13.26	12.31	1.43	3.02	-.32	.06	-.250131	.009290	.004258	.005032
.0400	.58	14.21	6.40	11.42	1.33	.21	12.72	11.58	.40	3.85	-.14	.15	-.239885	.011437	.005050	.006387
.0500	.13	16.25	7.33	12.39	1.60	.22	12.65	11.23	-.77	4.98	.10	.25	-.226633	.013871	.006453	.007418
.0600	-.64	19.18	8.18	13.64	1.87	.16	13.53	11.69	-1.98	6.44	.43	.37	-.210360	.016322	.008755	.007567
.0700	-1.36	23.26	9.08	15.00	2.05	.05	14.33	12.51	-2.80	8.08	.69	.42	-.190711	.018837	.011750	.007087
.0800	-2.25	29.63	10.12	17.00	2.18	-.11	15.50	13.44	-3.98	9.99	.91	.49	-.163468	.021925	.016611	.005315
.0900	-2.71	36.39	11.50	19.09	2.22	-.17	15.85	13.66	-3.63	11.18	.94	.56	-.134844	.023763	.020571	.003192
.1000	-2.79	42.22	13.15	20.64	2.06	-.21	15.95	14.20	-3.85	12.65	1.08	.53	-.102929	.026330	.026040	.000290
.1100	-2.56	47.33	14.94	21.79	1.76	-.23	15.99	14.64	-3.94	14.00	1.24	.43	-.070118	.029620	.032947	-.003327
.1200	-2.25	52.30	17.10	22.75	1.50	-.24	16.05	14.79	-3.85	15.58	1.51	.35	-.035031	.032223	.040107	-.007884
.1300	-1.61	56.75	19.50	23.16	1.18	-.23	15.87	14.71	-3.81	17.47	1.84	.26	.000647	.034407	.047431	-.013025
.1400	-.12	60.72	22.01	22.74	.71	-.16	15.66	14.71	-4.12	19.75	2.11	.16	.037956	.037494	.056547	-.019053
.1500	2.13	64.77	24.79	21.56	.11	-.08	15.44	14.59	-4.65	22.22	2.31	.07	.077407	.040609	.066722	-.026113
.1600	5.03	69.20	27.98	19.66	-.60	-.01	15.19	14.17	-5.29	24.70	2.46	.04	.118391	.042877	.077134	-.034256

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR BLADES WITH A LINEAR TWIST OF -8°

(d) $\mu = 0.35$ - Concluded

$\frac{C_T}{\sigma}$	$\alpha(1.0)(90^\circ)$, deg	$\alpha(1.0)(270^\circ)$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 30^\circ$																
0.0000	1.02	11.55	3.39	11.73	1.00	0.12	33.87	28.64	1.72	1.99	-0.42	0.04	-0.333840	0.006202	0.006707	-0.000505
.0100	1.07	12.55	4.27	12.14	1.13	.16	25.59	22.00	.81	2.48	-.38	.06	-.326136	.008309	.006485	.001824
.0200	1.00	13.86	5.24	12.69	1.29	.19	18.21	16.01	-.27	3.18	-.28	.11	-.316476	.010794	.006550	.004244
.0300	.73	15.49	6.18	13.44	1.49	.21	13.74	12.24	-1.51	4.12	-.09	.19	-.304859	.013548	.007134	.006414
.0400	.15	17.47	6.99	14.41	1.73	.19	14.99	12.88	-2.88	5.36	.23	.31	-.291331	.016451	.008551	.007899
.0500	-.51	20.25	7.84	15.53	1.94	.12	15.78	13.41	-3.33	6.83	.55	.40	-.275129	.018999	.010208	.008792
.0600	-1.24	24.16	8.71	16.78	2.03	-.02	16.99	14.69	-4.48	8.63	.88	.45	-.254710	.022295	.013435	.008860
.0700	-1.92	29.09	9.76	18.27	2.16	-.16	18.22	15.67	-4.77	10.45	1.14	.49	-.231840	.024679	.016515	.008163
.0800	-2.37	35.14	10.98	19.95	2.20	-.25	18.82	16.28	-4.57	12.07	1.27	.53	-.205611	.026689	.019773	.006916
.0900	-2.36	41.79	12.43	21.55	1.99	-.30	18.99	17.08	-5.19	13.79	1.34	.47	-.172643	.030155	.025454	.004700
.1000	-2.13	47.20	14.14	22.60	1.68	-.33	19.13	17.53	-5.58	15.47	1.50	.37	-.140489	.033491	.031586	.001905
.1100	-1.89	52.78	16.26	23.72	1.42	-.33	19.00	17.40	-5.24	17.01	1.75	.31	-.105461	.035759	.037416	-.001657
.1200	-1.01	57.93	18.75	24.07	1.03	-.28	18.86	17.50	-5.28	19.24	2.07	.21	-.066068	.038712	.045126	-.006414
.1300	.87	61.93	21.20	23.27	.47	-.16	18.73	17.68	-5.71	21.84	2.27	.09	-.028074	.042861	.054638	-.011777
.1400	3.05	66.25	23.98	21.89	-.24	-.10	18.68	17.33	-5.98	24.50	2.49	.01	.011103	.045791	.063919	-.018127
.1500	6.82	70.32	26.91	19.40	-.90	.04	18.35	17.38	-6.59	26.89	2.39	.05	.053558	.049662	.075115	-.025452
.1600	11.48	74.85	29.87	16.28	-1.50	.14	18.30	17.44	-7.45	28.76	2.11	.16	.099824	.053450	.087943	-.034493
$\theta_0 = 34^\circ$																
0.0000	1.26	13.76	4.10	14.29	1.33	0.19	36.78	29.22	-14.79	2.66	-0.39	0.09	-0.395972	0.008913	0.009534	-0.000621
.0100	.96	14.95	4.92	14.93	1.49	.19	27.43	22.05	-10.93	3.57	-.15	.18	-.385546	.012094	.009874	.002221
.0200	.58	16.56	5.79	15.70	1.67	.18	20.38	16.66	-7.87	4.64	.11	.28	-.373255	.015334	.010386	.004948
.0300	.10	18.67	6.65	16.63	1.87	.15	18.89	15.44	-6.69	5.86	.39	.37	-.359415	.018126	.010965	.007162
.0400	-.45	21.50	7.54	17.64	2.00	.06	18.94	15.79	-6.57	7.37	.69	.43	-.342599	.021405	.012489	.008916
.0500	-1.05	25.14	8.43	18.71	2.03	-.09	19.88	17.18	-7.23	9.18	1.02	.44	-.322518	.025011	.015211	.009800
.0600	-1.66	29.39	9.41	19.97	2.09	-.22	21.33	18.22	-6.68	11.09	1.36	.49	-.300290	.027436	.017610	.009826
.0700	-1.89	34.40	10.55	21.12	2.04	-.32	21.99	19.36	-6.40	13.03	1.55	.45	-.275078	.030138	.020780	.009358
.0800	-1.78	40.27	11.84	22.21	1.79	-.39	22.72	20.64	-7.12	15.27	1.70	.35	-.243867	.034117	.026329	.007788
.0900	-1.69	46.11	13.48	23.33	1.56	-.44	22.77	20.70	-6.94	16.94	1.84	.30	-.214260	.036542	.030495	.006047
.1000	-1.30	51.68	15.45	24.13	1.27	-.43	22.59	20.62	-6.71	18.81	2.05	.24	-.181188	.038933	.035355	.003578
.1100	-.15	56.87	17.68	24.26	.82	-.34	22.32	20.76	-6.86	21.11	2.25	.14	-.143073	.042451	.042514	-.000063
.1200	1.88	61.35	20.09	23.37	.18	-.19	22.29	21.07	-7.24	23.87	2.40	.00	-.102418	.047212	.052131	-.004919
.1300	4.32	65.94	22.96	21.84	-.52	-.09	22.00	20.72	-7.28	26.49	2.54	-.05	-.061537	.050645	.061023	-.010378
.1400	8.26	69.58	25.74	19.06	-1.21	.08	21.83	20.84	-7.68	28.92	2.36	.02	-.020530	.055244	.072004	-.016760
.1500	13.25	74.03	28.60	15.54	-1.81	.16	21.81	20.90	-8.13	30.80	1.97	.15	.026675	.059537	.084548	-.025012
.1600	18.14	78.96	30.49	12.67	-2.01	-.01	22.63	21.13	-8.37	30.78	1.36	.18	.082766	.065292	.101880	-.036588
$\theta_0 = 38^\circ$																
0.0000	0.78	16.14	4.65	17.38	1.66	0.15	42.49	31.27	-43.72	4.23	0.04	0.26	-0.457977	0.013625	0.014282	-0.000657
.0100	.44	17.57	5.43	18.10	1.83	.14	33.54	25.21	-28.38	5.23	.29	.34	-.446679	.016277	.014032	.002246
.0200	.03	19.63	6.31	18.94	1.97	.09	26.22	20.61	-16.16	6.54	.59	.41	-.432119	.019611	.014382	.005229
.0300	-.44	22.54	7.18	19.82	1.99	-.04	24.34	20.46	-14.18	8.20	.89	.41	-.414197	.023673	.015988	.007685
.0400	-.98	26.07	8.11	20.87	2.01	-.18	24.62	20.96	-12.27	10.04	1.24	.44	-.393855	.027073	.017735	.009338
.0500	-1.37	29.78	9.13	21.84	2.02	-.28	25.09	21.54	-10.07	11.84	1.54	.45	-.373009	.029580	.019133	.010447
.0600	-1.34	33.96	10.16	22.52	1.79	-.38	25.91	23.25	-9.85	14.15	1.79	.35	-.346662	.033628	.023026	.010602
.0700	-1.18	38.73	11.40	23.16	1.51	-.45	26.99	24.55	-9.74	16.65	2.04	.24	-.317124	.037348	.027613	.009735
.0800	-1.09	44.34	12.99	24.03	1.32	-.52	27.02	24.48	-8.60	18.58	2.22	.19	-.289267	.039525	.030664	.008861
.0900	-.46	49.29	14.71	24.39	1.00	-.49	26.72	24.40	-7.98	20.70	2.39	.14	-.258399	.042206	.034797	.007408
.1000	1.20	53.59	16.65	23.82	.48	-.35	26.42	25.00	-8.39	23.09	2.38	-.01	-.223445	.047059	.042102	.004957
.1100	2.98	58.12	18.91	22.95	-.15	-.23	26.51	24.93	-8.41	25.81	2.52	-.10	-.185538	.050883	.049674	.001209
.1200	5.50	62.36	21.50	21.21	-.86	-.13	26.29	24.52	-8.16	28.53	2.58	-.12	-.145804	.054480	.057729	-.003249
.1300	9.74	65.38	24.15	18.25	-1.47	.10	25.88	24.89	-8.37	30.81	2.23	-.02	-.104064	.060322	.068871	-.008549
.1400	14.88	69.12	26.93	14.50	-2.07	.15	25.85	24.79	-8.36	32.64	1.74	.12	-.057013	.065288	.081045	-.015757
.1500	20.39	74.48	29.08	10.93	-2.28	-.02	26.36	24.89	-8.47	32.78	1.01	.19	-.000954	.071376	.097285	-.025909
.1600	30.30	76.18	25.06	4.62	-3.74	-1.79	32.55	21.12	-7.18	22.51	-4.26	-2.75	.032836	.083352	.125565	-.042213

L-697

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(e) $\mu = 0.40$

$\frac{C_T}{\sigma}$	$\alpha(1.0)(90°)$, deg	$\alpha(1.0)(270°)$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 6°$																
0.0000	-2.22	-2.61	-0.93	-0.05	-0.08	-0.01	12.15	12.15	1.08	-0.50	0.00	0.00	-0.005936	0.001224	0.001604	-0.000380
.0100	-2.15	-1.44	-.04	.28	.01	.00	7.18	7.18	.32	-.02	-.01	.00	.000723	.001202	.001592	-.000390
.0200	-2.09	-.21	.87	.64	.10	.01	3.55	3.53	-.20	.47	-.02	.00	.007588	.001041	.001605	-.000564
.0300	-2.02	1.09	1.80	1.01	.20	.02	1.38	1.35	-.44	.96	-.04	.01	.014656	.000726	.001644	-.000917
.0400	-1.95	2.36	2.71	1.36	.29	.03	2.26	2.22	-.13	1.44	-.05	.01	.021563	.000173	.001652	-.001478
.0500	-1.88	3.86	3.69	1.81	.40	.05	2.17	2.11	.03	1.95	-.08	.01	.029364	-.000421	.001805	-.002226
.0600	-1.83	5.55	4.69	2.33	.53	.06	2.22	2.12	.22	2.48	-.11	.02	.037779	-.001125	.002087	-.003211
.0700	-1.76	7.32	5.68	2.86	.66	.08	2.49	2.36	.51	2.97	-.15	.02	.046205	-.002060	.002390	-.004450
.0800	-1.83	9.89	6.79	3.83	.92	.14	2.65	2.41	.58	3.70	-.16	.04	.058249	-.002488	.003653	-.006140
.0900	-2.09	13.10	7.81	5.19	1.32	.22	2.79	2.35	.38	4.59	-.12	.10	.072853	-.002209	.006107	-.008316
.1000	-2.60	17.02	8.92	6.73	1.64	.23	3.31	2.66	-.01	5.65	-.02	.21	.090658	-.001289	.010092	-.011381
.1100	-3.05	21.09	10.08	8.18	1.84	.20	4.10	3.32	.01	6.62	.06	.30	.109484	-.000435	.014771	-.015206
.1200	-3.38	24.88	11.30	9.49	1.97	.17	4.77	3.92	.16	7.50	.13	.38	.128310	.000174	.019591	-.019418
.1300	-3.62	28.45	12.60	10.68	2.04	.14	5.35	4.48	.38	8.33	.20	.44	.147499	.000673	.024731	-.024058
.1400	-3.81	31.81	13.97	11.74	-2.06	.11	5.86	5.00	.57	9.19	.31	.49	.167443	.001223	.030407	-.029184
.1500	-3.95	34.94	15.43	12.67	2.02	.07	6.30	5.48	.74	10.08	.46	.53	.188142	.001829	.036659	-.034830
.1600	-4.01	37.78	16.99	13.43	1.91	.02	6.65	5.90	.88	10.98	.65	.54	.209598	.002494	.043527	-.041033
$\theta_0 = 10°$																
0.0000	-1.69	0.12	-0.19	2.12	0.15	0.03	12.86	12.71	-0.02	-0.04	-0.10	0.01	-0.058574	0.001274	0.001943	-0.000669
.0100	-1.61	1.22	.70	2.40	.22	.04	10.39	10.26	-.07	.43	-.11	.01	-.052202	.001502	.001826	-.000324
.0200	-1.54	2.40	1.62	2.72	.31	.04	8.28	8.15	-.08	.92	-.12	.01	-.045487	.001621	.001744	-.000123
.0300	-1.47	3.68	2.56	3.08	.40	.05	6.60	6.46	-.07	1.42	-.13	.02	-.038428	.001611	.001703	-.000092
.0400	-1.41	5.06	3.51	3.48	.51	.06	5.42	5.27	-.01	1.93	-.15	.02	-.031026	.001453	.001710	-.000257
.0500	-1.34	6.55	4.49	3.93	.63	.08	4.84	4.66	.09	2.46	-.17	.03	-.023280	.001125	.001771	-.000646
.0600	-1.24	7.82	5.37	4.27	.72	.10	5.41	5.22	.34	2.88	-.20	.02	-.016716	.000321	.001611	-.001290
.0700	-1.30	10.19	6.50	5.15	.97	.15	5.32	5.01	.31	3.64	-.19	.05	-.005321	.000239	.002461	-.002222
.0800	-1.66	13.38	7.43	6.61	1.43	.24	4.94	4.33	-.20	4.61	-.12	.13	.009027	.001316	.004801	-.003485
.0900	-2.30	17.74	8.48	8.27	1.76	.23	5.26	4.41	-.52	5.76	.00	.25	.027389	.002623	.008402	-.005779
.1000	-2.85	22.21	9.62	9.87	2.00	.20	5.80	4.78	-.63	6.85	.10	.35	.047006	.003832	.012596	-.008764
.1100	-3.27	26.74	10.87	11.37	2.12	.16	6.59	5.50	-.46	7.83	.18	.43	.067853	.004874	.017425	-.012552
.1200	-3.60	30.83	12.19	12.69	2.18	.11	7.19	6.08	-.35	8.80	.28	.49	.088934	.005972	.022683	-.016711
.1300	-3.82	34.58	13.61	13.82	2.14	.07	7.71	6.69	-.17	9.72	.41	.53	.110537	.007055	.028467	-.021413
.1400	-3.94	37.96	15.12	14.82	2.08	.03	8.16	7.17	.08	10.57	.56	.56	.132533	.008032	.034633	-.026601
.1500	-3.97	41.26	16.79	15.68	1.99	.00	8.53	7.59	.32	11.52	.75	.58	.155778	.008899	.041256	-.032357
.1600	-3.87	44.41	18.62	16.35	1.85	-.03	8.79	7.93	.54	12.57	.98	.57	.180271	.009629	.048354	-.038725
$\theta_0 = 14°$																
0.0000	-1.15	2.33	0.44	4.09	0.32	0.06	33.86	33.09	-0.93	0.34	-0.19	0.02	-0.113659	0.001330	0.002303	-0.000973
.0100	-1.09	3.61	1.37	4.45	.41	.06	23.82	23.23	-.35	.83	-.20	.02	-.106607	.002012	.002220	-.000208
.0200	-1.02	4.92	2.31	4.82	.51	.07	15.95	15.50	.11	1.34	-.21	.03	-.099435	.002527	.002154	.000372
.0300	-.95	6.25	3.26	5.20	.61	.08	10.37	10.02	.45	1.85	-.23	.03	-.092143	.002863	.002106	.000757
.0400	-.88	7.61	4.23	5.59	.72	.10	7.20	6.91	.66	2.37	-.24	.03	-.084731	.003013	.002076	.000937
.0500	-.72	8.48	5.04	5.73	.75	.10	8.76	8.50	.78	2.70	-.28	.01	-.079818	.002558	.001714	.000844
.0600	-.75	10.48	6.21	6.43	.96	.14	8.35	8.02	.65	3.47	-.25	.04	-.069289	.002769	.002130	.000639
.0700	-1.20	13.19	7.06	7.84	1.45	.25	7.81	7.06	-.30	4.58	-.08	.16	-.055652	.004161	.004104	.000057
.0800	-2.00	17.78	8.04	9.67	1.88	.24	7.92	6.77	-1.14	5.95	.10	.30	-.036691	.006059	.007579	-.001519
.0900	-2.73	22.92	9.14	11.50	2.16	.19	8.31	6.93	-1.55	7.23	.23	.42	-.015593	.007810	.011663	-.003853
.1000	-3.20	28.22	10.40	13.17	2.26	.13	8.84	7.48	-1.30	8.32	.29	.49	.006956	.009104	.016023	-.006919
.1100	-3.58	32.91	11.76	14.61	2.29	.07	9.39	8.04	-1.24	9.38	.40	.54	.029720	.010700	.021240	-.010540
.1200	-3.81	37.14	13.24	15.82	2.23	.01	9.96	8.69	-1.12	10.36	.53	.57	.052996	.012358	.027142	-.014784
.1300	-3.90	40.85	14.82	16.90	2.15	-.01	10.28	9.08	-.69	11.20	.69	.60	.07[illegible]277	.013445	.032805	-.019360
.1400	-3.91	44.35	16.54	17.77	2.04	-.03	10.49	9.39	-.38	12.20	.89	.60	.100522	.014447	.038891	-.024444
.1500	-3.78	47.79	18.43	18.43	1.88	-.07	10.60	9.63	-.18	13.39	1.15	.57	.1[illegible]6488	.015574	.045783	-.030209
.1600	-3.43	51.31	20.52	18.84	1.64	-.10	10.68	9.85	-.17	14.82	1.44	.52	.15[illegible]	.017128	.053981	-.036853

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR BLADES WITH A LINEAR TWIST OF -8°

(e) μ = 0.40 - Continued

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90^\circ)}$, deg	$\alpha_{(1.0)(270^\circ)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 18^\circ$																
0.0000	-0.73	5.03	1.22	6.41	0.60	0.10	22.95	21.73	0.21	0.94	-0.24	0.05	-0.167172	0.002477	0.003274	-0.000797
.0100	-.60	6.13	2.09	6.62	.63	.10	19.54	18.55	.61	1.31	-.28	.04	-.161347	.002973	.002875	.000099
.0200	-.49	7.35	3.02	6.91	.70	.10	16.31	15.52	.92	1.74	-.32	.03	-.154739	.003544	.002588	.000956
.0300	-.42	8.68	3.98	7.28	.80	.11	13.51	12.87	1.09	2.26	-.32	.04	-.147350	.004191	.002475	.001716
.0400	-.41	10.12	4.96	7.76	.95	.14	11.43	10.85	1.06	2.87	-.30	.06	-.139178	.004918	.002608	.002310
.0500	-.45	11.26	5.68	8.21	1.10	.17	10.51	9.90	.88	3.40	-.25	.08	-.132527	.005519	.002915	.002604
.0600	-.62	13.19	6.81	9.11	1.43	.25	10.70	9.85	.16	4.39	-.12	.16	-.120689	.006595	.003892	.002703
.0700	-1.49	16.79	7.65	10.68	1.86	.23	10.75	9.45	-1.47	5.89	.18	.32	-.104055	.008856	.006895	.001960
.0800	-2.32	22.41	8.67	12.66	2.22	.18	11.13	9.47	-1.83	7.35	.32	.44	-.082624	.010498	.010188	.000309
.0900	-3.02	28.66	9.84	14.59	2.33	.08	11.56	9.93	-2.35	8.78	.44	.52	-.057563	.013007	.015189	-.002182
.1000	-3.49	34.17	11.21	16.24	2.36	.00	11.96	10.36	-2.42	10.00	.56	.57	-.032790	.015038	.020237	-.005199
.1100	-3.73	38.94	12.75	17.61	2.32	-.04	12.34	10.75	-2.03	11.01	.68	.60	-.008472	.016535	.025227	-.008691
.1200	-3.83	43.32	14.46	18.83	2.22	-.05	12.66	11.21	-1.63	11.99	.85	.62	.017730	.018030	.030952	-.012922
.1300	-3.76	47.30	16.26	19.71	2.06	-.08	12.80	11.56	-1.42	13.21	1.08	.60	.044532	.019774	.037385	-.017611
.1400	-3.53	51.11	18.21	20.31	1.84	-.11	12.84	11.80	-1.32	14.61	1.35	.54	.072495	.021637	.044552	-.022915
.1500	-3.12	54.86	20.37	20.63	1.56	-.15	12.84	11.88	-1.33	16.15	1.67	.47	.101915	.023544	.052503	-.028958
.1600	-2.50	58.51	22.75	20.62	1.19	-.18	12.79	11.78	-1.44	17.83	2.05	.37	.132793	.025487	.061299	-.035812
$\theta_0 = 22^\circ$																
0.0000	-0.28	7.36	1.89	8.55	0.79	0.12	33.35	30.66	-1.00	1.38	-0.32	0.07	-0.224379	0.003137	0.004089	-0.000952
.0100	-.11	8.47	2.77	8.78	.84	.13	27.05	25.05	.09	1.72	-.38	.04	-.218541	.003990	.003666	.000323
.0200	.01	9.76	3.75	9.11	.93	.14	20.88	19.51	.99	2.19	-.41	.03	-.211440	.005042	.003396	.001646
.0300	.04	11.23	4.75	9.58	1.07	.17	15.71	14.80	1.46	2.80	-.39	.05	-.203076	.006302	.003420	.002882
.0400	-.09	12.82	5.72	10.22	1.28	.20	12.58	11.80	1.22	3.59	-.29	.10	-.193448	.007780	.003908	.003872
.0500	-.45	14.39	6.53	11.08	1.58	.25	13.30	12.07	-.29	4.59	-.07	.22	-.182837	.009483	.005073	.004410
.0600	-1.09	16.84	7.36	12.16	1.89	.24	13.57	11.94	-1.37	5.87	.22	.35	-.169552	.011336	.007005	.004331
.0700	-1.94	21.25	8.32	13.74	2.20	.16	14.07	12.14	-2.45	7.54	.51	.47	-.150295	.013565	.010024	.003542
.0800	-2.74	27.60	9.33	15.66	2.39	.03	14.55	12.61	-3.21	9.21	.66	.54	-.126240	.015961	.014156	.001805
.0900	-3.32	34.27	10.62	17.57	2.42	-.07	15.00	13.02	-3.59	10.60	.76	.59	-.099623	.018537	.019211	-.000674
.1000	-3.59	39.79	12.18	19.12	2.40	-.10	15.15	13.19	-3.05	11.72	.86	.64	-.074153	.019943	.023362	-.003420
.1100	-3.66	44.86	13.89	20.43	2.25	-.12	15.26	13.60	-2.78	12.91	1.04	.62	-.045549	.022067	.029061	-.006994
.1200	-3.53	49.55	15.77	21.39	2.04	-.15	15.36	13.97	-2.67	14.33	1.28	.57	-.015823	.024553	.035836	-.011283
.1300	-3.24	53.85	17.83	21.98	1.77	-.17	15.45	14.22	-2.70	15.98	1.59	.49	.014633	.027204	.043486	-.016282
.1400	-2.81	58.03	20.16	22.26	1.46	-.20	15.37	14.16	-2.60	17.68	1.96	.43	.045583	.028977	.050754	-.021777
.1500	-1.88	62.31	22.74	22.01	1.03	-.20	15.11	14.01	-2.70	19.65	2.33	.35	.078941	.030915	.058951	-.028036
.1600	-.34	66.63	25.60	21.11	.44	-.17	14.64	13.78	-3.04	21.92	2.70	.27	.114708	.033026	.068160	-.035133
$\theta_0 = 26^\circ$																
0.0000	0.23	9.71	2.64	10.74	0.98	0.13	40.25	36.66	0.55	1.78	-0.45	0.05	-0.284140	0.004315	0.005383	-0.001067
.0100	.31	10.80	3.51	11.12	1.11	.18	31.29	28.61	.50	2.24	-.45	.06	-.277349	.005808	.005129	.000679
.0200	.30	12.16	4.46	11.62	1.28	.21	22.81	20.92	.23	2.87	-.40	.09	-.268892	.007609	.005120	.002489
.0300	.13	13.78	5.43	12.29	1.48	.24	16.56	15.13	-.36	3.72	-.27	.15	-.258769	.009682	.005559	.004123
.0400	-.39	15.53	6.23	13.16	1.73	.24	16.35	14.53	-1.73	4.89	.03	.28	-.247069	.012084	.006895	.005189
.0500	-.94	18.01	7.11	14.16	1.98	.21	16.20	14.14	-2.61	6.18	.31	.39	-.233379	.014249	.008391	.005857
.0600	-1.56	21.43	8.04	15.31	2.21	.13	16.76	14.60	-2.93	7.63	.56	.47	-.217383	.016086	.010259	.005828
.0700	-2.38	26.54	8.94	16.76	2.31	-.04	17.69	15.56	-4.36	9.57	.87	.51	-.195471	.019187	.014427	.004761
.0800	-3.07	33.17	10.10	18.69	2.46	-.14	18.32	15.84	-4.45	11.21	1.03	.61	-.170120	.021141	.018118	.003022
.0900	-3.35	39.81	11.59	20.42	2.42	-.19	18.31	16.01	-4.11	12.51	1.09	.64	-.142619	.023120	.022198	.000922
.1000	-3.34	45.32	13.23	21.61	2.22	-.22	18.32	16.53	-4.45	14.20	1.29	.59	-.112854	.026001	.027961	-.001960
.1100	-3.17	50.60	15.05	22.65	1.95	-.24	18.34	16.80	-4.37	15.67	1.51	.51	-.081862	.029113	.034695	-.005582
.1200	-2.94	55.64	17.27	23.37	1.69	-.25	18.37	16.86	-4.12	17.41	1.85	.45	-.049583	.031441	.041443	-.010002
.1300	-2.30	60.37	19.69	23.50	1.31	-.26	18.25	16.79	-4.02	19.39	2.22	.38	-.016471	.033736	.048739	-.015003
.1400	-1.04	64.71	22.21	22.88	.77	-.23	17.97	16.68	-4.22	21.65	2.55	.28	.017217	.036578	.057152	-.020574
.1500	1.12	69.39	24.98	21.42	.06	-.16	17.73	16.62	-4.72	24.11	2.74	.18	.052816	.040061	.067160	-.027099
.1600	3.92	75.35	28.32	19.26	-.79	-.11	17.30	16.21	-5.36	26.50	2.89	.12	.091751	.042414	.077032	-.034619

L-697

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(e) $\mu = 0.40$ - Concluded

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 30°$																
0.0000	0.64	11.94	3.37	13.18	1.27	0.19	43.93	38.97	-5.66	2.27	-0.54	0.05	-0.346466	0.006184	0.007432	-0.001249
.0100	.38	13.16	4.18	13.83	1.48	.22	33.16	29.19	-5.41	3.14	-.34	.15	-.336943	.008681	.007677	.001003
.0200	.05	14.71	5.04	14.57	1.68	.23	24.61	21.41	-5.14	4.14	-.11	.25	-.326124	.011255	.008143	.003112
.0300	-.36	16.64	5.94	15.38	1.89	.22	19.66	16.93	-4.86	5.27	.14	.35	-.314011	.013806	.008903	.004904
.0400	-.85	19.01	6.84	16.27	2.09	.17	20.07	17.31	-4.55	6.54	.41	.43	-.300659	.016202	.010021	.006181
.0500	-1.47	22.31	7.69	17.27	2.20	.05	20.27	17.82	-5.38	8.19	.72	.48	-.283718	.019235	.012436	.006798
.0600	-2.14	26.60	8.63	18.46	2.29	-.09	21.06	18.47	-5.82	10.01	1.04	.53	-.263859	.021924	.015337	.006587
.0700	-2.78	31.87	9.71	19.91	2.42	-.20	21.93	18.95	-5.40	11.86	1.33	.60	-.241467	.023605	.017983	.005622
.0800	-2.94	38.68	11.01	21.43	2.31	-.28	21.94	19.57	-5.82	13.68	1.42	.58	-.212732	.026693	.022565	.004127
.0900	-2.91	44.81	12.55	22.61	2.11	-.33	21.91	19.95	-6.08	15.43	1.57	.52	-.183592	.029758	.027709	.002049
.1000	-2.72	50.30	14.33	23.48	1.82	-.36	21.85	20.05	-6.11	17.13	1.78	.44	-.153839	.032671	.033321	-.000651
.1100	-2.50	56.14	16.52	24.38	1.55	-.35	21.66	19.82	-5.63	18.88	2.11	.39	-.120424	.034863	.039091	-.004228
.1200	-1.65	61.34	18.98	24.35	1.09	-.32	21.45	19.83	-5.54	21.19	2.48	.31	-.084651	.037929	.046633	-.008705
.1300	.09	65.75	21.42	23.36	.47	-.22	21.21	19.96	-5.89	23.61	2.68	.19	-.050327	.042247	.055889	-.013642
.1400	2.07	71.01	24.34	21.82	-.31	-.18	20.83	19.53	-6.10	26.12	2.92	.10	-.015006	.045076	.064277	-.019201
.1500	5.43	76.50	27.25	19.24	-1.12	-.08	20.62	19.44	-6.60	28.42	2.83	.08	.022602	.048927	.074898	-.025972
.1600	9.95	83.68	30.34	15.89	-1.91	.02	20.52	19.41	-7.46	30.32	2.48	.11	.064224	.052782	.087008	-.034226
$\theta_0 = 34°$																
0.0000	0.34	14.30	3.92	16.26	1.67	0.21	49.56	41.90	-31.37	3.60	-0.23	0.22	-0.407839	0.010109	0.011520	-0.001411
.0100	-.04	15.61	4.72	16.95	1.87	.21	39.07	32.69	-21.15	4.61	.04	.33	-.397536	.012285	.011390	.000895
.0200	-.47	17.47	5.60	17.74	2.05	.17	30.21	25.15	-12.84	5.83	.33	.43	-.384949	.014945	.011747	.003199
.0300	-.94	20.02	6.50	18.59	2.17	.10	25.35	21.53	-8.96	7.27	.62	.49	-.370087	.018087	.012896	.005192
.0400	-1.44	23.31	7.39	19.49	2.23	-.03	25.23	22.22	-9.70	8.91	.92	.49	-.352902	.021497	.014947	.006550
.0500	-2.00	27.11	8.32	20.49	2.27	-.17	25.58	22.38	-8.87	10.75	1.27	.53	-.333699	.024294	.017181	.007113
.0600	-2.39	31.40	9.41	21.49	2.30	-.27	25.77	22.59	-7.52	12.55	1.55	.55	-.313156	.026357	.019142	.007215
.0700	-2.44	36.68	10.52	22.36	2.11	-.37	26.26	23.74	-7.98	14.91	1.79	.47	-.285806	.030059	.023868	.006191
.0800	-2.36	42.99	11.97	23.37	1.88	-.44	26.37	24.14	-8.11	16.97	1.95	.40	-.256730	.033369	.028694	.004675
.0900	-2.26	49.01	13.72	24.29	1.65	-.47	25.98	23.72	-7.54	18.70	2.15	.37	-.228518	.035496	.032468	.003029
.1000	-1.87	54.68	15.76	24.82	1.33	-.47	25.51	23.32	-7.12	20.59	2.41	.32	-.198045	.037831	.037108	.000722
.1100	-.50	59.78	17.91	24.42	.80	-.35	25.31	23.71	-7.48	23.13	2.61	.20	-.161706	.042374	.045394	-.003019
.1200	1.05	64.97	20.41	23.52	.13	-.27	24.98	23.46	-7.42	25.57	2.83	.08	-.126322	.046267	.053479	-.007212
.1300	3.27	70.61	23.34	21.82	-.66	-.19	24.47	23.08	-7.39	28.06	3.00	.01	-.089252	.049717	.061774	-.012057
.1400	6.76	75.68	26.04	19.11	-1.43	-.05	24.28	23.04	-7.71	30.23	2.80	.03	-.053357	.054378	.072180	-.017802
.1500	11.45	82.66	28.95	15.58	-2.17	.06	24.18	23.04	-8.21	32.06	2.35	.09	-.011925	.059160	.084303	-.025143
.1600	17.19	94.28	32.38	11.39	-2.84	.04	23.83	22.74	-8.72	33.14	1.72	.19	.039174	.061895	.096465	-.034570
$\theta_0 = 38°$																
0.0000	-0.01	16.19	4.56	19.57	2.20	0.26	58.49	48.56	-43.15	4.76	0.10	0.45	-0.476810	0.011356	0.013831	-0.002476
.0100	-.50	18.30	5.32	20.21	2.18	.12	45.95	39.21	-31.89	6.43	.48	.46	-.461189	.015860	.015438	.000422
.0200	-.98	20.85	6.15	20.95	2.17	-.02	37.18	32.53	-23.18	8.17	.85	.48	-.444452	.019855	.016954	.002901
.0300	-1.47	23.90	7.06	21.79	2.21	-.14	33.75	29.65	-18.18	9.95	1.21	.50	-.426640	.023124	.018323	.004802
.0400	-1.92	27.35	8.01	22.69	2.24	-.26	32.29	28.08	-14.04	11.75	1.57	.54	-.407842	.025514	.019314	.006200
.0500	-2.01	31.13	8.99	23.27	2.07	-.36	31.61	28.28	-12.48	13.92	1.86	.47	-.384995	.029247	.022306	.006941
.0600	-1.83	35.53	10.18	23.71	1.81	-.44	31.33	28.83	-11.88	16.17	2.06	.33	-.359776	.033398	.026419	.006979
.0700	-1.79	40.40	11.57	24.28	1.60	-.52	31.23	28.59	-10.36	18.35	2.33	.28	-.334362	.035903	.029471	.006431
.0800	-1.67	46.12	13.18	24.93	1.37	-.57	30.84	28.03	-9.09	20.38	2.58	.26	-.307480	.037933	.032440	.005493
.0900	-.66	51.20	15.02	24.78	.95	-.50	30.08	28.10	-8.88	22.55	2.65	.16	-.276668	.041941	.037891	.004050
.1000	.96	55.98	17.04	24.04	.39	-.35	29.84	28.47	-9.22	25.04	2.71	.03	-.242110	.047152	.045886	.001266
.1100	2.25	61.12	19.28	23.15	-.26	-.32	29.46	27.60	-8.62	27.47	2.93	-.05	-.210045	.049889	.051637	-.001748
.1200	4.60	66.42	22.06	21.27	-1.01	-.21	28.78	27.21	-8.46	29.95	3.00	-.07	-.173815	.053698	.059205	-.005508
.1300	8.35	70.37	24.44	18.40	-1.71	-.03	28.63	27.32	-8.48	31.99	2.63	-.03	-.137947	.059729	.070189	-.010460
.1400	12.85	76.91	27.27	14.90	-2.49	.05	28.23	26.80	-8.52	33.63	2.09	-.02	-.099261	.063983	.080136	-.016153
.1500	17.76	91.67	31.90	11.56	-2.15	.52	26.75	29.05	-9.14	36.15	3.01	1.28	-.025217	.070413	.096821	-.026408
.1600	14.76	118.88	36.63	15.96	3.51	2.22	22.71	41.95	-11.61	38.62	9.93	6.92	.088242	.077132	.117300	-.040169

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(f) $\mu = 0.45$

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 6°$																
0.0000	-2.22	-2.88	-1.01	-0.11	-0.11	-0.01	-10.82	130.24	138.49	-0.60	0.00	0.00	-0.006955	0.001198	0.001730	-0.000533
.0100	-2.18	-1.53	-.13	.27	.00	.00	-3.98	66.85	69.36	-.07	-.01	.00	-.000363	.001216	.001725	-.000508
.0200	-2.14	-.11	.77	.67	.12	.02	1.02	20.02	18.38	.47	-.02	.01	.006418	.001085	.001745	-.000660
.0300	-2.10	1.37	1.68	1.09	.24	.03	4.02	-8.68	-12.73	1.01	-.04	.01	.013388	.000792	.001795	-.001003
.0400	-2.07	2.81	2.54	1.50	.35	.05	4.86	-17.71	-22.31	1.52	-.06	.02	.019996	.000365	.001868	-.001503
.0500	-2.02	4.51	3.53	1.98	.49	.06	2.42	2.33	.04	2.10	-.09	.02	.027691	-.000378	.001950	-.002328
.0600	-2.00	6.48	4.51	2.59	.66	.09	2.43	2.29	.22	2.70	-.12	.03	.036154	-.001040	.002291	-.003331
.0700	-1.97	8.56	5.45	3.25	.85	.13	2.69	2.49	.49	3.26	-.18	.03	.044592	-.001953	.002643	-.004597
.0800	-2.12	11.54	6.53	4.34	1.16	.19	2.85	2.50	.52	4.09	-.18	.07	.056794	-.002175	.004161	-.006335
.0900	-2.52	15.23	7.51	5.81	1.57	.25	2.97	2.38	.21	5.10	-.11	.17	.071628	-.001384	.007164	-.008548
.1000	-2.99	19.31	8.58	7.23	1.84	.24	3.69	2.93	.07	6.15	-.02	.28	.088096	-.000760	.010961	-.011721
.1100	-3.40	23.27	9.73	8.56	2.04	.22	4.40	3.51	.03	7.16	.06	.37	.105082	-.000211	.015149	-.015360
.1200	-3.72	27.16	10.94	9.81	2.17	.20	5.16	4.22	.18	8.08	.13	.45	.122702	.000180	.019810	-.019629
.1300	-4.00	30.80	12.23	10.94	2.24	.17	5.84	4.87	.33	9.04	.24	.52	.140843	.000663	.024963	-.024300
.1400	-4.23	34.11	13.58	11.89	2.25	.12	6.45	5.49	.52	10.01	.39	.56	.159360	.001248	.030704	-.029456
.1500	-4.40	37.36	15.04	12.77	2.23	.08	6.96	6.03	.72	11.00	.56	.61	.178819	.001784	.036854	-.035070
.1600	-4.49	40.54	16.63	13.55	2.16	.05	7.38	6.47	.94	12.00	.75	.64	.199220	.002260	.043431	-.041171
$\theta_0 = 10°$																
0.0000	-1.75	-0.18	-0.29	2.23	0.15	0.03	41.81	41.54	-1.25	-0.10	-0.12	0.01	-0.062073	0.001123	0.002137	-0.001014
.0100	-1.71	1.22	.62	2.62	.26	.05	27.02	26.79	-.76	.45	-.13	.02	-.055291	.001451	.002025	-.000573
.0200	-1.67	2.69	1.54	3.03	.38	.06	15.46	15.24	-.36	1.00	-.15	.02	-.048339	.001616	.001949	-.000333
.0300	-1.63	4.22	2.48	3.46	.51	.07	7.38	7.17	-.06	1.56	-.17	.03	-.041215	.001605	.001914	-.000309
.0400	-1.58	5.81	3.42	3.91	.64	.09	3.06	2.85	.15	2.12	-.19	.03	-.033921	.001405	.001921	-.000516
.0500	-1.47	7.12	4.30	4.20	.72	.10	6.12	5.91	.23	2.56	-.23	.01	-.028026	.000682	.001701	-.001019
.0600	-1.50	9.33	5.36	4.94	.95	.14	5.90	5.60	.20	3.30	-.24	.03	-.018384	.000494	.002177	-.001684
.0700	-1.74	12.09	6.26	6.14	1.36	.25	5.54	4.99	-.18	4.20	-.18	.10	-.006718	.001037	.003615	-.002578
.0800	-2.20	15.78	7.25	7.58	1.75	.29	5.58	4.74	-.50	5.29	-.08	.21	.008084	.001877	.006052	-.004175
.0900	-2.88	20.30	8.22	9.17	2.05	.26	6.13	5.03	-.72	6.49	.07	.36	.025454	.003055	.009693	-.006638
.1000	-3.36	24.89	9.36	10.63	2.24	.22	6.78	5.54	-.75	7.57	.15	.45	.043525	.004018	.013718	-.009700
.1100	-3.72	29.19	10.58	11.95	2.35	.19	7.39	6.14	-.48	8.56	.23	.53	.062067	.004786	.018034	-.013248
.1200	-4.02	33.28	11.90	13.11	2.37	.13	8.01	6.81	-.40	9.59	.34	.57	.081617	.005914	.023325	-.017411
.1300	-4.25	37.09	13.31	14.16	2.36	.09	8.54	7.39	-.22	10.58	.48	.61	.101571	.006886	.028884	-.021997
.1400	-4.40	40.50	14.81	15.07	2.31	.06	8.99	7.85	.10	11.50	.65	.65	.121728	.007705	.034730	-.027026
.1500	-4.47	43.96	16.47	15.87	2.23	.02	9.36	8.27	.38	12.56	.86	.68	.143401	.008465	.041098	-.032633
.1600	-4.46	47.39	18.31	16.52	2.10	-.02	9.64	8.61	.60	13.76	1.12	.69	.166590	.009142	.048003	-.038861
$\theta_0 = 14°$																
0.0000	-1.29	2.31	0.37	4.52	0.39	0.07	-46.43	113.98	-154.93	0.36	-0.23	0.03	-0.118464	0.001252	0.002689	-0.001437
.0100	-1.25	3.77	1.29	4.93	.51	.09	-17.61	63.82	-78.76	.91	-.24	.03	-.111484	.001931	.002592	-.000660
.0200	-1.21	5.27	2.22	5.35	.63	.10	3.20	27.01	-23.16	1.48	-.26	.04	-.104395	.002424	.002515	-.000090
.0300	-1.16	6.79	3.17	5.78	.76	.12	15.60	4.21	10.86	2.05	-.27	.04	-.097196	.002721	.002458	.000263
.0400	-1.13	7.80	3.80	6.06	.85	.13	18.98	-2.80	20.94	2.43	-.28	.04	-.092435	.002805	.002433	.000372
.0500	-1.01	9.69	5.06	6.53	1.00	.16	9.93	9.54	.69	3.12	-.32	.03	-.083560	.002461	.002212	.000249
.0600	-1.25	12.27	6.11	7.55	1.33	.21	9.16	8.55	.22	4.12	-.23	.11	-.071817	.003158	.003222	-.000064
.0700	-1.92	15.67	6.88	9.16	1.86	.30	8.85	7.71	-1.02	5.43	.00	.27	-.057116	.004823	.005734	-.000911
.0800	-2.69	20.75	7.86	10.88	2.20	.25	9.21	7.73	-1.62	6.78	.16	.42	-.038849	.006495	.009224	-.002729
.0900	-3.25	25.99	8.99	12.50	2.40	.20	9.67	8.12	-1.57	8.00	.26	.51	-.019204	.007573	.012750	-.005177
.1000	-3.70	30.96	10.23	13.95	2.51	.15	10.13	8.57	-1.52	9.17	.36	.58	.001034	.008933	.017069	-.008136
.1100	-4.04	35.65	11.56	15.20	2.49	.07	10.59	9.12	-1.48	10.26	.47	.62	.021929	.010739	.022414	-.011675
.1200	-4.27	39.92	13.03	16.34	2.46	.03	11.03	9.61	-1.22	11.31	.62	.66	.043298	.012019	.027736	-.015717
.1300	-4.38	43.69	14.64	17.32	2.39	.01	11.47	10.08	-.73	12.27	.80	.69	.065078	.012893	.033231	-.020338
.1400	-4.88	46.07	15.33	17.81	2.17	-.15	12.16	10.25	-.27	13.61	1.15	.74	.080492	.013950	.038481	-.024530
.1500	-4.06	51.42	18.72	18.77	2.21	.03	11.51	10.72	-.36	14.51	1.24	.67	.114277	.014892	.045807	-.030915
.1600	5.33	61.59	32.43	20.43	4.67	2.64	1.42	12.13	-5.06	6.93	-1.58	-.21	.170929	.010525	.039431	-.028906

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR BLADES WITH A LINEAR TWIST OF -8°

(f) $\mu = 0.45$ - Continued

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 18°$																
0.0000	-0.85	4.79	1.07	6.87	0.64	0.11	-13.40	114.86	-125.41	0.86	-0.34	0.05	-0.175819	0.001760	0.003475	-0.001715
.0100	-.81	6.30	2.00	7.28	.76	.13	4.04	60.18	-55.09	1.41	-.35	.05	-.168720	.002680	.003297	-.000617
.0200	-.78	7.83	2.94	7.73	.90	.15	15.74	21.38	-5.85	2.00	-.36	.06	-.161355	.003521	.003213	.000309
.0300	-.76	9.40	3.90	8.20	1.05	.17	20.99	.44	19.71	2.62	-.36	.07	-.153723	.004272	.003233	.001039
.0400	-.64	10.73	4.81	8.59	1.19	.21	13.93	13.23	.73	3.12	-.38	.06	-.147159	.004623	.003119	.001504
.0500	-.84	12.78	5.83	9.36	1.45	.25	12.52	11.74	.27	4.06	-.28	.13	-.136844	.005649	.003842	.001806
.0600	-1.52	14.93	6.55	10.48	1.83	.27	12.54	11.24	-1.24	5.38	.06	.30	-.124676	.007307	.005841	.001466
.0700	-2.30	19.81	7.48	12.20	2.24	.25	12.67	10.89	-1.86	6.83	.25	.45	-.107141	.008814	.008403	.000410
.0800	-3.04	25.69	8.53	14.01	2.52	.17	12.96	10.97	-2.38	8.34	.40	.55	-.086274	.010715	.012089	-.001374
.0900	-3.64	31.76	9.73	15.65	2.57	.07	13.32	11.49	-2.86	9.79	.54	.61	-.063206	.013008	.016905	-.003897
.1000	-4.01	37.03	11.11	17.09	2.61	.02	13.65	11.77	-2.51	10.94	.65	.67	-.041341	.014480	.021282	-.006803
.1100	-4.25	41.93	12.64	18.35	2.57	-.02	13.93	12.12	-2.18	12.08	.81	.71	-.018281	.015994	.026252	-.010258
.1200	-4.32	46.32	14.36	19.38	2.46	-.04	14.17	12.52	-1.75	13.14	.99	.72	.005677	.017400	.031715	-.014315
.1300	-4.28	50.47	16.16	20.14	2.29	-.07	14.30	12.90	-1.56	14.53	1.26	.69	.031128	.019263	.038229	-.018966
.1400	-4.10	54.58	18.15	20.61	2.05	-.11	14.41	13.17	-1.45	16.06	1.58	.65	.057667	.021201	.045456	-.024255
.1500	-3.76	58.66	20.35	20.78	1.73	-.16	14.49	13.33	-1.44	17.71	1.95	.59	.085255	.023169	.053403	-.030234
.1600	-3.24	62.71	22.77	20.59	1.32	-.22	14.56	13.34	-1.52	19.50	2.37	.51	.113893	.025163	.062120	-.036957
$\theta_0 = 22°$																
0.0000	-0.46	7.56	1.90	9.37	0.93	0.15	46.40	43.85	-0.47	1.48	-0.44	0.06	-0.233640	0.002992	0.004696	-0.001704
.0100	-.35	8.80	2.75	9.72	1.05	.18	36.34	34.35	.01	1.92	-.48	.05	-.227591	.003920	.004390	-.000470
.0200	-.32	10.28	3.69	10.19	1.21	.22	26.52	25.01	.30	2.52	-.48	.06	-.220116	.005079	.004286	.000793
.0300	-.42	11.97	4.66	10.80	1.41	.25	18.59	17.36	.20	3.31	-.40	.11	-.211215	.006476	.004556	.001920
.0400	-.74	13.83	5.56	11.57	1.66	.27	14.50	13.22	-.51	4.32	-.21	.20	-.200888	.008118	.005406	.002713
.0500	-1.34	15.86	6.32	12.54	1.95	.27	16.10	14.30	-2.03	5.58	.11	.36	-.189111	.009989	.007030	.002958
.0600	-1.86	18.75	7.19	13.55	2.24	.24	16.18	14.14	-2.15	6.81	.33	.46	-.176577	.011051	.008327	.002724
.0700	-2.73	24.73	8.14	15.25	2.47	.10	16.51	14.47	-3.56	8.66	.57	.54	-.155137	.013800	.012280	.001520
.0800	-3.47	31.22	9.23	17.05	2.62	-.01	16.96	14.72	-4.11	10.32	.76	.64	-.131825	.016118	.016551	-.000433
.0900	-3.89	37.33	10.62	18.68	2.67	-.06	17.09	14.78	-3.66	11.60	.87	.71	-.108527	.017585	.020286	-.002700
.1000	-4.13	42.98	12.16	20.05	2.63	-.09	17.15	14.96	-3.29	12.89	1.02	.74	-.084017	.019342	.024821	-.005479
.1100	-4.13	47.94	13.86	21.07	2.46	-.12	17.10	15.31	-3.10	14.17	1.21	.70	-.058297	.021497	.030316	-.008818
.1200	-4.03	52.77	15.73	21.84	2.24	-.15	17.16	15.64	-2.98	15.71	1.48	.65	-.030893	.024023	.036991	-.012968
.1300	-3.81	57.29	17.81	22.29	1.96	-.18	17.27	15.86	-2.89	17.45	1.84	.59	-.002440	.026559	.044437	-.017878
.1400	-3.43	61.89	20.18	22.37	1.61	-.23	17.19	15.78	-2.72	19.28	2.26	.55	.026298	.028283	.051461	-.023177
.1500	-2.61	66.80	22.79	21.90	1.10	-.26	16.99	15.66	-2.75	21.30	2.67	.48	.056951	.030196	.059350	-.029153
.1600	-1.26	72.01	25.68	20.77	.42	-.27	16.63	15.49	-3.03	23.55	3.08	.39	.089520	.032312	.068182	-.035870
$\theta_0 = 26°$																
0.0000	-0.07	9.56	2.49	11.84	1.23	0.22	-21.08	115.79	-129.87	1.94	-0.54	0.08	-0.296402	0.004101	0.006285	-0.002184
.0100	-.10	11.10	3.45	12.38	1.41	.25	7.92	59.14	-50.77	2.62	-.49	.11	-.288146	.005897	.006150	-.000253
.0200	-.28	12.80	4.39	13.03	1.61	.27	27.15	19.07	3.58	3.50	-.37	.17	-.278650	.007870	.006411	.001459
.0300	-.76	14.47	5.18	13.82	1.85	.27	22.24	19.85	-3.22	4.63	-.08	.31	-.267990	.010069	.007469	.002600
.0400	-1.25	16.75	6.05	14.70	2.09	.25	20.42	17.93	-3.92	5.87	.19	.42	-.255869	.012103	.008616	.003487
.0500	-1.74	19.68	6.96	15.68	2.33	.20	20.06	17.57	-3.58	7.18	.42	.50	-.242589	.013693	.009783	.003910
.0600	-2.46	23.85	7.83	16.76	2.44	.05	20.34	18.04	-4.93	8.99	.75	.55	-.224691	.016655	.013190	.003465
.0700	-3.24	29.76	8.82	18.36	2.61	-.08	21.00	18.27	-5.21	10.86	1.03	.65	-.202954	.018622	.016509	.002113
.0800	-3.71	36.53	10.10	20.07	2.71	-.14	20.98	18.16	-4.74	12.33	1.15	.73	-.179386	.020195	.019649	.000546
.0900	-3.86	42.90	11.64	21.39	2.59	-.20	20.85	18.53	-4.89	13.97	1.30	.72	-.152314	.022751	.024469	-.001718
.1000	-3.84	48.72	13.31	22.44	2.39	-.23	20.73	18.79	-4.92	15.58	1.51	.67	-.124762	.025581	.030134	-.004553
.1100	-3.67	53.98	15.13	23.19	2.11	-.25	20.62	18.93	-4.82	17.17	1.76	.59	-.096676	.028626	.036614	-.007988
.1200	-3.47	59.09	17.33	23.71	1.85	-.27	20.45	18.78	-4.33	18.88	2.13	.55	-.068062	.030683	.042650	-.011967
.1300	-2.96	64.22	19.81	23.63	1.42	-.30	20.23	18.64	-4.16	20.94	2.57	.50	-.037678	.032812	.049474	-.016662
.1400	-1.72	69.25	22.36	22.79	.82	-.27	19.96	18.65	-4.36	23.23	2.91	.41	-.006064	.036105	.058137	-.022032
.1500	.20	75.28	25.15	21.21	.03	-.24	19.67	18.52	-4.77	25.58	3.14	.30	.026517	.039434	.067536	-.028102
.1600	2.66	83.22	28.37	18.93	-.95	-.25	19.38	18.00	-5.28	27.88	3.27	.18	.059945	.041697	.076609	-.034912

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(f) μ = 0.45 - Concluded

$\frac{C_P}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 30°$																
0.0000	-0.06	11.89	3.16	14.77	1.63	0.26	-69.37	98.19	-116.02	2.89	-0.44	0.18	-0.358928	0.006484	0.009049	-0.002564
.0100	-.40	13.42	3.99	15.45	1.83	.26	-2.91	52.38	-46.60	3.92	-.21	.29	-.348845	.008998	.009371	-.000373
.0200	-.79	15.28	4.87	16.20	2.03	.24	36.48	23.18	-3.39	5.05	.04	.39	-.337751	.011403	.009872	.001530
.0300	-1.18	17.42	5.77	16.98	2.24	.22	27.15	23.64	-7.03	6.21	.28	.48	-.326155	.013352	.010418	.002934
.0400	-1.71	20.37	6.69	17.87	2.39	.13	25.03	22.02	-6.53	7.74	.59	.54	-.311331	.016064	.012101	.003963
.0500	-2.34	24.19	7.54	18.82	2.45	-.02	25.00	22.31	-7.53	9.54	.93	.57	-.293892	.019110	.014918	.004192
.0600	-2.93	28.78	8.55	19.94	2.55	-.15	25.18	22.13	-6.86	11.32	1.24	.63	-.275094	.021086	.017270	.003816
.0700	-3.37	34.17	9.71	21.13	2.63	-.24	25.20	22.07	-6.02	13.10	1.48	.69	-.254209	.022653	.019658	.002995
.0800	-3.44	41.72	11.06	22.51	2.43	-.31	25.16	22.78	-6.99	15.23	1.64	.64	-.223544	.026523	.025546	.000977
.0900	-3.40	47.55	12.63	23.39	2.22	-.36	24.85	22.70	-6.87	16.94	1.83	.58	-.197762	.029243	.030207	-.000963
.1000	-3.27	53.53	14.49	24.15	1.97	-.38	24.52	22.48	-6.53	18.69	2.09	.53	-.169791	.031754	.035295	-.003541
.1100	-3.02	59.65	16.71	24.75	1.66	-.38	24.21	22.15	-5.99	20.51	2.45	.49	-.139149	.033992	.040938	-.006947
.1200	-2.19	65.20	19.12	24.44	1.14	-.37	23.85	22.09	-5.82	22.77	2.82	.41	-.106886	.037190	.048239	-.011049
.1300	-.65	70.34	21.52	23.31	.46	-.31	23.65	22.12	-6.01	25.09	3.04	.29	-.075546	.041512	.057320	-.015809
.1400	1.32	77.06	24.35	21.58	-.36	-.27	23.28	21.83	-6.25	27.43	3.23	.18	-.043380	.044924	.065943	-.021019
.1500	4.01	84.76	27.37	19.14	-1.28	-.24	22.84	21.36	-6.58	29.58	3.23	.10	-.011132	.047866	.074611	-.026745
.1600	8.44	97.18	30.65	15.61	-2.20	-.10	22.56	21.40	-7.43	31.55	2.87	.12	.028216	.052386	.086821	-.034435
$\theta_0 = 34°$																
0.0000	-0.71	14.47	3.72	18.29	2.12	0.23	58.35	49.92	-34.53	4.67	0.05	0.45	-0.420985	0.009752	0.012943	-0.003191
.0100	-.95	15.99	4.53	18.78	2.22	.20	48.22	41.81	-25.92	5.65	.24	.49	-.411327	.012160	.013234	-.001074
.0200	-1.28	18.09	5.44	19.40	2.31	.13	38.73	34.18	-17.91	6.92	.49	.52	-.398900	.014994	.013951	.001043
.0300	-1.73	20.90	6.37	20.16	2.40	.03	32.54	29.14	-12.82	8.51	.81	.56	-.383703	.018056	.015351	.002705
.0400	-2.30	24.49	7.24	21.05	2.45	-.11	31.74	28.35	-12.20	10.36	1.18	.59	-.366092	.020992	.017496	.003495
.0500	-2.76	28.52	8.29	21.97	2.52	-.23	30.85	27.28	-9.74	12.11	1.50	.64	-.348148	.022980	.019013	.003967
.0600	-3.00	33.00	9.31	22.70	2.42	-.34	30.36	27.15	-8.92	14.24	1.82	.61	-.326149	.025658	.021905	.003753
.0700	-2.87	38.67	10.58	23.34	2.20	-.42	29.96	27.65	-9.36	16.35	1.97	.49	-.301024	.029693	.026778	.002914
.0800	-2.92	45.55	12.10	24.32	1.98	-.48	29.79	27.28	-8.81	18.51	2.23	.48	-.272525	.032282	.031092	.001190
.0900	-2.80	51.66	13.91	24.96	1.73	-.52	29.15	26.59	-8.01	20.29	2.49	.45	-.246676	.034331	.034718	-.000387
.1000	-2.26	58.11	16.08	25.17	1.34	-.50	28.59	26.27	-7.74	22.46	2.79	.39	-.215450	.037157	.040142	-.002985
.1100	-.95	63.42	18.30	24.62	.86	-.36	27.66	26.40	-7.95	24.55	2.94	.29	-.184835	.041888	.047491	-.005603
.1200	.55	69.49	20.72	23.50	.16	-.30	27.20	26.10	-7.84	26.85	3.14	.18	-.153008	.045910	.055311	-.009402
.1300	2.39	76.72	23.39	21.73	-.75	-.31	27.13	25.40	-7.46	29.27	3.34	.08	-.119831	.049174	.063563	-.014390
.1400	5.43	85.59	26.39	19.07	-1.64	-.22	26.60	25.14	-7.68	31.36	3.22	.04	-.085519	.053392	.072963	-.019571
.1500	9.74	96.73	29.19	15.63	-2.45	-.07	26.37	25.04	-8.19	33.01	2.71	.04	-.050865	.058593	.084420	-.025827
.1600	-285.62	1,741.07	99.19	241.51	79.91	46.26	-75.59	201.78	-22.54	175.13	197.96	103.25	.257887	-.143597	-.311829	.168232
$\theta_0 = 38°$																
0.0000	-0.49	17.41	4.67	21.11	2.16	0.14	56.33	55.22	-47.36	6.42	0.14	0.33	-0.486580	0.016430	0.019396	-0.002966
.0100	-1.20	19.08	5.26	21.87	2.28	.01	51.40	48.54	-37.53	7.94	.64	.46	-.474489	.017739	.019410	-.001672
.0200	-1.85	21.30	6.00	22.66	2.37	-.11	46.44	42.25	-28.11	9.65	1.13	.57	-.460016	.019500	.019763	-.000263
.0300	-2.34	24.21	6.88	23.41	2.41	-.23	41.95	37.28	-20.37	11.49	1.55	.62	-.443159	.021817	.020634	.001183
.0400	-2.51	27.99	7.95	24.05	2.38	-.32	38.52	34.86	-15.93	13.30	1.80	.58	-.424338	.024743	.022074	.002669
.0500	-2.47	31.99	8.87	24.33	2.04	-.45	37.69	34.58	-15.14	15.92	2.16	.45	-.398644	.029279	.026727	.002552
.0600	-2.34	36.60	10.29	24.74	1.90	-.50	36.02	33.53	-12.98	17.83	2.34	.37	-.377247	.032348	.029352	.002996
.0700	-2.32	41.69	11.70	25.17	1.68	-.58	35.29	32.46	-11.04	19.92	2.64	.34	-.354012	.034531	.032046	.002485
.0800	-2.11	47.68	13.28	25.47	1.34	-.64	34.70	31.43	-9.67	22.17	2.93	.32	-.326893	.036759	.035540	.001219
.0900	-1.15	53.79	15.74	25.52	1.15	-.48	32.22	31.19	-9.52	23.67	2.94	.26	-.301328	.040750	.039149	.001601
.1000	.55	58.15	16.98	23.98	.21	-.45	33.74	31.60	-9.81	26.84	3.08	.08	-.265023	.046716	.050206	-.003489
.1100	1.80	65.01	19.71	23.12	-.33	-.37	32.18	30.52	-9.06	28.89	3.28	.04	-.236072	.049648	.054836	-.005188
.1200	3.65	72.15	22.33	21.31	-1.15	-.35	31.56	29.63	-8.58	31.09	3.38	-.04	-.205868	.052896	.061359	-.008463
.1300	7.09	78.71	24.64	18.47	-1.88	-.18	31.16	29.74	-8.64	32.88	2.98	-.03	-.173036	.059245	.072127	-.012882
.1400	10.86	87.86	27.09	15.38	-2.73	-.13	30.77	28.91	-8.67	34.13	2.34	-.18	-.143798	.063224	.080536	-.017312
.1500	9.27	219.46	37.81	16.39	-.29	2.14	25.72	37.74	-10.69	43.13	9.74	4.85	-.045938	.061345	.085473	-.024129
.1600	-47.80	827.59	65.72	61.48	24.07	14.01	2.84	97.66	-21.42	77.22	58.88	34.68	.124236	.001747	.007054	-.005307

L-697

L-697

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR BLADES WITH A LINEAR TWIST OF -8°

(g) $\mu = 0.50$

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 6°$																
0.0000	-2.20	-3.06	-1.04	-0.15	-0.14	-0.01	-16.30	133.08	145.40	-0.70	-0.01	-0.02	-0.007628	0.001236	0.001899	-0.000663
.0100	-2.12	-1.50	-.11	.27	.01	.02	-6.98	70.92	75.46	-.13	-.05	-.02	-.001113	.001260	.001887	-.000627
.0200	-2.07	.12	.80	.71	.15	.04	-.07	24.53	23.39	.44	-.08	-.02	.005542	.001130	.001907	-.000777
.0300	-2.05	1.80	1.70	1.17	.30	.06	4.27	-5.01	-9.59	1.03	-.10	-.01	.012337	.000837	.001961	-.001124
.0400	-2.06	3.54	2.58	1.66	.44	.08	5.86	-16.56	-22.19	1.63	-.12	.00	.019272	.000369	.002052	-.001683
.0500	-2.11	5.16	3.38	2.11	.57	.08	2.73	2.63	.07	2.20	-.11	.03	.025796	-.000399	.002075	-.002474
.0600	-2.16	7.44	4.32	2.82	.78	.12	2.68	2.48	.27	2.90	-.13	.05	.034324	-.000954	.002520	-.003474
.0700	-2.19	10.07	5.24	3.71	1.08	.19	2.75	2.44	.36	3.59	-.18	.06	.043488	-.001507	.003209	-.004716
.0800	-2.39	13.32	6.24	4.82	1.41	.25	2.93	2.45	.35	4.47	-.17	.11	.055100	-.001644	.004816	-.006461
.0900	-2.82	17.13	7.20	6.16	1.75	.28	3.29	2.60	.09	5.50	-.09	.23	.068822	-.001088	.007695	-.008783
.1000	-3.23	21.12	8.26	7.47	2.02	.28	3.87	3.01	.00	6.53	-.01	.33	.083603	-.000628	.011122	-.011750
.1100	-3.66	25.36	9.36	8.76	2.21	.25	4.71	3.73	.01	7.59	.08	.43	.099642	-.000108	.015385	-.015493
.1200	-4.00	29.30	10.56	9.93	2.36	.22	5.43	4.38	.14	8.61	.18	.52	.115984	.000282	.019884	-.019602
.1300	-4.25	33.07	11.84	11.00	2.42	.20	6.16	5.12	.44	9.58	.28	.58	.132921	.000507	.024817	-.024310
.1400	-4.51	36.54	13.17	11.92	2.44	.16	6.81	5.77	.61	10.62	.43	.64	.150300	.001131	.030566	-.029435
.1500	-4.72	39.91	14.60	12.75	2.41	.11	7.40	6.36	.78	11.69	.62	.69	.168488	.001756	.036790	-.035033
.1600	-4.86	43.30	16.19	13.49	2.35	.07	7.89	6.86	1.00	12.81	.84	.74	.187700	.002201	.043299	-.041097
$\theta_0 = 10°$																
0.0000	-1.80	-0.40	-0.35	2.38	0.16	0.04	-10.41	113.09	-123.29	-0.15	-0.14	0.01	-0.065186	0.001045	0.002375	-0.001330
.0100	-1.78	1.27	.55	2.84	.31	.06	-.17	57.59	-57.82	.45	-.16	.02	-.058380	.001392	.002255	-.000862
.0200	-1.77	3.02	1.47	3.33	.47	.08	7.54	14.85	-7.58	1.07	-.18	.03	-.051338	.001600	.002199	-.000599
.0300	-1.76	4.85	2.39	3.86	.64	.11	12.43	-13.63	25.63	1.70	-.20	.03	-.044060	.001653	.002216	-.000563
.0400	-1.76	6.77	3.32	4.42	.83	.14	14.19	-26.28	39.95	2.35	-.22	.04	-.036545	.001534	.002312	-.000778
.0500	-1.64	8.01	4.07	4.77	.98	.19	6.91	6.56	.10	2.78	-.27	.02	-.031596	.000682	.002006	-.001324
.0600	-1.76	10.76	5.17	5.65	1.25	.23	6.35	5.87	.03	3.66	-.26	.06	-.021151	.000636	.002694	-.002058
.0700	-2.08	14.17	6.21	6.81	1.59	.27	6.10	5.40	-.21	4.71	-.19	.15	-.008659	.001046	.004275	-.003228
.0800	-2.78	18.39	6.97	8.42	2.01	.29	6.47	5.38	-.79	5.94	.00	.33	.006119	.002386	.007410	-.005024
.0900	-3.26	22.66	7.99	9.79	2.29	.29	6.87	5.57	-.93	7.06	.11	.44	.021436	.003171	.010533	-.007362
.1000	-3.69	27.27	9.10	11.10	2.46	.25	7.57	6.18	-.78	8.14	.19	.53	.037868	.003792	.014224	-.010433
.1100	-4.06	31.63	10.31	12.30	2.57	.21	8.14	6.73	-.66	9.22	.29	.60	.055011	.004651	.018548	-.013897
.1200	-4.34	35.85	11.60	13.36	2.58	.15	8.69	7.39	-.48	10.27	.39	.65	.073033	.005738	.023681	-.017943
.1300	-4.58	39.67	12.99	14.35	2.57	.12	9.27	7.98	-.19	11.29	.55	.70	.091421	.006586	.029106	-.022520
.1400	-4.76	43.36	14.50	15.23	2.53	.08	9.79	8.51	.12	12.36	.74	.75	.110684	.007356	.034946	-.027590
.1500	-4.87	47.04	16.17	15.97	2.45	.05	10.20	8.95	.41	13.53	.98	.79	.131015	.008050	.041173	-.033123
.1600	-4.90	50.65	17.99	16.54	2.33	.01	10.47	9.30	.67	14.79	1.26	.81	.152414	.008649	.047799	-.039150
$\theta_0 = 14°$																
0.0000	-1.41	2.13	0.31	4.92	0.47	0.10	-3.66	99.78	-102.70	0.39	-0.27	0.04	-0.123663	0.001229	0.003183	-0.001954
.0100	-1.39	3.85	1.22	5.39	.62	.12	8.82	48.82	-40.21	.99	-.29	.04	-.116726	.001848	.003057	-.001209
.0200	-1.37	5.59	2.14	5.86	.77	.14	16.46	14.43	1.27	1.61	-.31	.05	-.109698	.002285	.002964	-.000678
.0300	-1.35	7.34	3.08	6.34	.93	.16	19.08	-2.71	20.89	2.24	-.33	.06	-.102580	.002535	.002904	-.000370
.0400	-1.22	8.70	3.96	6.63	1.03	.18	12.45	11.93	.52	2.71	-.38	.03	-.097063	.002229	.002595	-.000365
.0500	-1.36	11.14	5.01	7.44	1.31	.23	10.72	10.11	.35	3.63	-.33	.08	-.087170	.002662	.003100	-.000438
.0600	-1.93	14.09	5.76	8.79	1.79	.30	10.30	9.18	-.87	4.87	-.10	.24	-.074926	.003935	.004876	-.000941
.0700	-2.50	17.99	6.70	10.22	2.20	.34	9.98	8.49	-1.66	6.16	.08	.39	-.060405	.005148	.007118	-.001971
.0800	-3.16	23.73	7.70	11.84	2.45	.27	10.57	8.90	-1.69	7.47	.18	.50	-.042782	.006204	.010256	-.004052
.0900	-3.70	28.77	8.81	13.27	2.65	.22	10.90	9.12	-1.83	8.73	.31	.60	-.025005	.007511	.013925	-.006414
.1000	-4.13	33.83	9.99	14.57	2.69	.15	11.32	9.60	-1.79	9.94	.43	.67	-.006030	.009215	.018630	-.009414
.1100	-4.45	38.45	11.33	15.73	2.72	.10	11.75	10.07	-1.58	11.07	.57	.72	.013068	.010461	.023346	-.012885
.1200	-4.65	42.66	12.83	16.74	2.70	.07	12.20	10.55	-1.17	12.11	.72	.76	.032389	.011318	.028201	-.016883
.1300	-4.78	46.78	14.45	17.61	2.64	.04	12.57	11.00	-.79	13.25	.93	.79	.052893	.012294	.033660	-.021366
.1400	-4.84	50.75	16.19	18.31	2.52	.00	12.84	11.39	-.47	14.51	1.19	.81	.074579	.013401	.039776	-.026375
.1500	-4.81	54.51	18.07	18.81	2.35	-.03	13.00	11.73	-.21	15.89	1.52	.82	.097447	.014652	.046609	-.031957
.1600	-4.67	58.00	20.10	19.06	2.10	-.06	13.01	11.98	-.01	17.39	1.92	.80	.121498	.016060	.054218	-.038158

TABLE 1.- Continued

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

(g) μ = 0.50 - Continued

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
θ_0 = 18°																
0.0000	-0.94	4.79	1.06	7.44	0.75	0.15	-0.82	100.09	-99.50	0.89	-0.45	0.03	-0.183415	0.001642	0.004111	-0.002469
.0100	-.93	6.52	1.99	7.92	.90	.17	14.10	50.99	-36.90	1.51	-.46	.04	-.176334	.002524	.003922	-.001399
.0200	-.95	8.26	2.91	8.44	1.08	.20	23.10	17.28	4.77	2.18	-.45	.06	-.168896	.003373	.003888	-.000515
.0300	-1.02	9.99	3.82	9.03	1.29	.24	25.19	1.59	21.98	2.92	-.41	.10	-.161101	.004180	.004034	.000146
.0400	-1.10	11.49	4.68	9.61	1.52	.30	15.99	14.82	-.07	3.66	-.34	.15	-.153625	.004792	.004261	.000531
.0500	-1.49	13.96	5.61	10.54	1.84	.32	14.22	12.81	-.85	4.80	-.15	.26	-.142614	.006027	.005418	.000610
.0600	-2.26	17.06	6.36	11.76	2.20	.29	14.55	12.70	-2.40	6.25	.18	.44	-.129407	.007707	.007731	-.000025
.0700	-2.98	21.96	7.36	13.27	2.53	.25	14.44	12.34	-3.31	7.81	.42	.57	-.112130	.009446	.010616	-.001170
.0800	-3.66	29.09	8.38	15.06	2.72	.14	14.86	12.78	-3.29	9.33	.50	.64	-.091060	.011081	.014409	-.003328
.0900	-4.13	34.69	9.60	16.49	2.83	.08	15.03	12.90	-3.21	10.65	.64	.72	-.071361	.012630	.018282	-.005652
.1000	-4.44	40.02	10.97	17.77	2.84	.03	15.21	13.10	-2.70	11.81	.76	.78	-.051305	.014077	.022538	-.008461
.1100	-4.67	44.95	12.49	18.88	2.81	-.00	15.43	13.40	-2.31	13.04	.94	.82	-.030031	.015445	.027309	-.011864
.1200	-4.77	49.47	14.20	19.79	2.71	-.02	15.66	13.81	-1.88	14.27	1.17	.83	-.007590	.016768	.032678	-.015910
.1300	-4.71	53.88	16.03	20.42	2.52	-.05	15.70	14.16	-1.66	15.68	1.44	.80	.016026	.018651	.038999	-.020348
.1400	-4.55	58.34	18.03	20.73	2.25	-.10	15.82	14.48	-1.59	17.33	1.79	.77	.040842	.020779	.046327	-.025548
.1500	-4.26	62.81	20.23	20.68	1.89	-.17	16.04	14.77	-1.71	19.25	2.23	.72	.066857	.023175	.054763	-.031588
.1600	-3.84	67.28	22.64	20.21	1.43	-.26	16.37	15.00	-2.04	21.45	2.77	.66	.094073	.025862	.064415	-.038552
θ_0 = 22°																
0.0000	-0.64	7.57	1.88	10.19	1.10	0.20	57.73	55.33	-2.28	1.61	-0.55	0.05	-0.243563	0.002751	0.005544	-.002793
.0100	-.65	8.88	2.68	10.66	1.29	.25	44.41	42.24	-1.77	2.20	-.53	.09	-.237177	.003815	.005381	-.001566
.0200	-.74	10.50	3.56	11.26	1.50	.29	31.68	29.67	-1.46	2.95	-.45	.15	-.229330	.005100	.005465	-.000365
.0300	-.98	12.42	4.47	11.98	1.75	.32	21.75	19.80	-1.52	3.91	-.31	.23	-.220022	.006590	.005970	.000619
.0400	-1.51	14.43	5.26	12.82	2.02	.31	20.29	18.06	-2.60	5.11	-.03	.37	-.209482	.008367	.007339	.001028
.0500	-2.08	17.31	6.13	13.82	2.30	.28	19.26	16.85	-3.39	6.47	.25	.50	-.196887	.010040	.008947	.001094
.0600	-2.67	21.22	7.01	14.91	2.55	.21	19.06	16.68	-3.48	7.94	.49	.57	-.182588	.011225	.010637	.000588
.0700	-3.44	28.05	7.99	16.56	2.72	.06	19.14	16.79	-4.75	9.73	.68	.65	-.161481	.014070	.014913	-.000843
.0800	-4.01	34.57	9.16	18.13	2.84	-.03	19.22	16.80	-4.91	11.27	.84	.73	-.140204	.016043	.018761	-.002717
.0900	-4.38	40.76	10.58	19.63	2.91	-.05	19.25	16.66	-3.85	12.62	.99	.82	-.118285	.017088	.022152	-.005064
.1000	-4.56	46.09	12.13	20.70	2.84	-.09	19.16	16.84	-3.60	14.01	1.19	.84	-.095897	.018690	.026480	-.007789
.1100	-4.57	51.23	13.80	21.56	2.69	-.11	19.01	17.06	-3.42	15.43	1.41	.80	-.072137	.021054	.032072	-.011018
.1200	-4.43	56.22	15.64	22.16	2.44	-.14	18.86	17.28	-3.27	16.94	1.68	.75	-.047153	.023779	.038622	-.014843
.1300	-4.23	61.30	17.76	22.43	2.13	-.18	18.81	17.40	-3.08	18.68	2.05	.71	-.021143	.026022	.045413	-.019391
.1400	-3.93	66.48	20.19	22.34	1.75	-.23	18.86	17.39	-2.84	20.66	2.55	.70	.005895	.027710	.052442	-.024732
.1500	-3.55	71.73	22.94	21.85	1.30	-.30	19.02	17.26	-2.54	22.92	3.18	.71	.033960	.028768	.059706	-.030937
.1600	-3.07	77.05	26.06	20.91	.76	-.38	19.32	16.97	-2.19	25.46	3.96	.76	.063051	.029119	.067199	-.038080
θ_0 = 26°																
0.0000	-0.46	9.51	2.42	13.02	1.50	0.28	-51.42	102.59	-136.48	2.30	-0.57	0.13	-0.307867	0.004042	0.007490	-0.003448
.0100	-.69	11.09	3.27	13.67	1.73	.31	-.73	58.27	-57.44	3.20	-.41	.22	-.299183	.005967	.007685	-.001718
.0200	-.99	12.96	4.16	14.38	1.96	.32	32.59	26.96	-3.58	4.22	-.22	.32	-.289478	.007940	.008173	-.000233
.0300	-1.38	15.01	5.03	15.13	2.19	.30	27.44	24.37	-5.28	5.32	-.00	.43	-.279403	.009767	.009000	.000767
.0400	-1.91	17.78	5.93	16.02	2.41	.25	24.62	21.72	-5.29	6.72	.29	.53	-.266587	.011869	.010440	.001430
.0500	-2.61	21.36	6.72	17.00	2.57	.13	24.26	21.46	-5.83	8.46	.66	.61	-.251070	.014079	.012792	.001287
.0600	-3.23	26.35	7.65	18.15	2.73	.00	24.03	21.13	-5.94	10.08	.90	.68	-.234525	.015971	.015296	.000675
.0700	-3.80	32.44	8.79	19.51	2.86	-.11	23.83	20.87	-5.89	11.84	1.13	.75	-.214215	.017964	.018414	-.000450
.0800	-4.21	39.98	10.18	21.16	2.90	-.16	23.71	20.79	-5.45	13.55	1.31	.83	-.189105	.019680	.022123	-.002443
.0900	-4.35	46.32	11.66	22.25	2.79	-.21	23.44	20.83	-5.40	15.26	1.51	.82	-.164711	.022167	.026841	-.004674
.1000	-4.24	51.79	13.26	22.88	2.54	-.25	23.04	20.99	-5.64	16.95	1.74	.74	-.140333	.025291	.032521	-.007230
.1100	-4.13	57.52	15.22	23.62	2.32	-.25	22.62	20.87	-5.08	18.39	2.00	.69	-.114732	.027746	.038037	-.010292
.1200	-3.98	63.15	17.39	23.89	1.98	-.30	22.57	20.70	-4.57	20.26	2.43	.67	-.087944	.029817	.044225	-.014409
.1300	-3.51	68.99	19.77	23.58	1.50	-.36	22.53	20.55	-4.27	22.37	2.89	.63	-.060143	.032087	.051229	-.019142
.1400	-2.40	75.34	22.34	22.59	.85	-.36	22.14	20.46	-4.38	24.57	3.24	.55	-.031476	.035119	.059178	-.024058
.1500	-.60	82.25	25.11	20.88	.02	-.31	21.39	20.45	-4.92	26.85	3.48	.41	-.001943	.038977	.068140	-.029163
.1600	1.94	89.73	28.09	18.36	-.99	-.21	20.23	20.53	-5.93	29.22	3.60	.22	.028455	.043726	.078184	-.034458

L-697

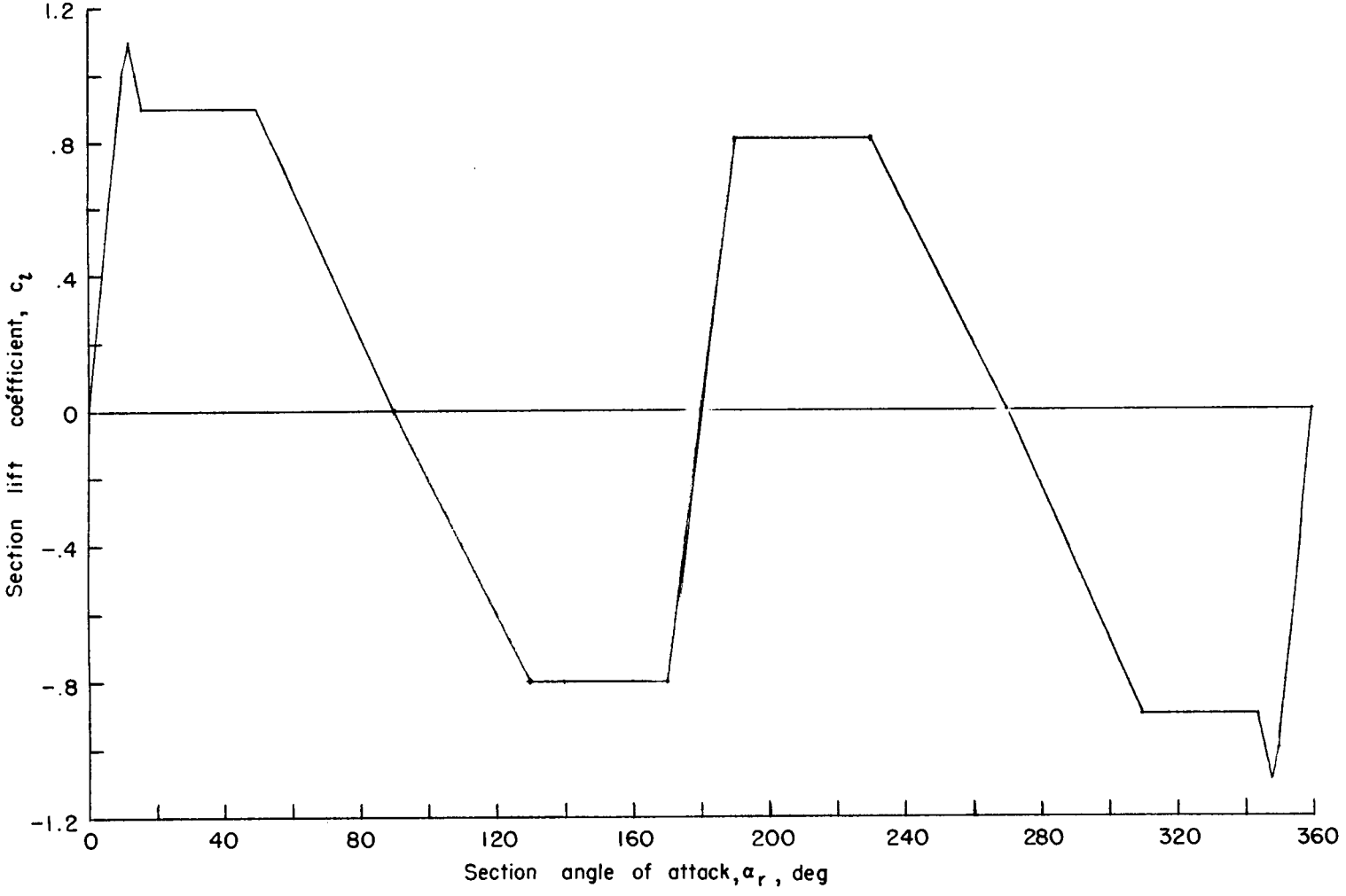
TABLE 1.- Concluded

CALCULATED CHARACTERISTICS OF A ROTOR HAVING RECTANGULAR

BLADES WITH A LINEAR TWIST OF -8°

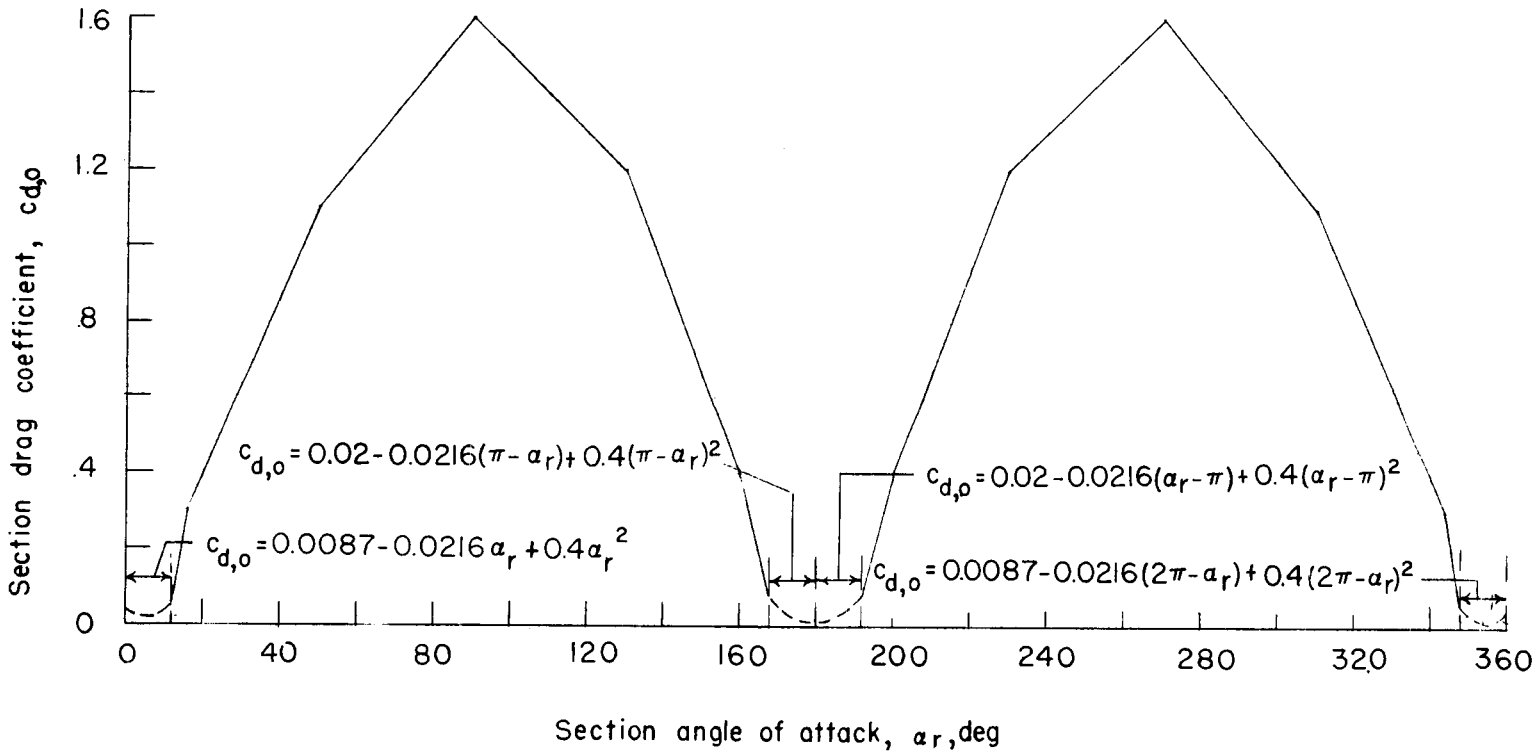
(g) $\mu = 0.50$ - Concluded

$\frac{C_T}{\sigma}$	$\alpha_{(1.0)(90°)}$, deg	$\alpha_{(1.0)(270°)}$, deg	a_0, deg	a_1, deg	a_2, deg	a_3, deg	a', deg (ref. 7)	a', deg (ref. 5)	b', deg	b_1, deg	b_2, deg	b_3, deg	λ, deg	$\frac{C_P}{\sigma}$	$\frac{C_{P,o}}{\sigma}$	$\frac{C_P - C_{P,o}}{\sigma}$
$\theta_0 = 30°$																
0.0000	-0.72	11.73	2.97	16.27	1.97	0.31	82.34	80.18	-62.99	3.56	-0.34	0.31	-0.372091	0.006555	0.010824	-0.004269
.0100	-1.13	13.40	3.79	16.96	2.18	.29	57.62	53.80	-34.18	4.67	-.07	.44	-.362268	.008667	.011149	-.002482
.0200	-1.58	15.49	4.66	17.69	2.36	.24	38.78	34.07	-13.29	5.95	.22	.55	-.350866	.011003	.011883	-.000880
.0300	-2.05	17.99	5.50	18.39	2.47	.16	33.70	29.78	-10.79	7.41	.54	.61	-.337919	.013562	.013296	.000266
.0400	-2.55	21.27	6.42	19.20	2.59	.05	30.51	27.18	-9.43	9.00	.85	.66	-.323266	.016037	.015035	.001002
.0500	-3.09	25.49	7.41	20.12	2.71	-.07	29.86	26.46	-8.56	10.69	1.14	.70	-.307312	.018109	.017072	.001037
.0600	-3.54	30.80	8.54	21.17	2.78	-.19	28.84	25.65	-7.81	12.56	1.42	.73	-.287740	.020435	.019730	.000705
.0700	-3.81	37.51	9.72	22.32	2.76	-.28	28.44	25.61	-7.57	14.46	1.61	.74	-.264935	.022548	.022961	-.000413
.0800	-3.87	44.36	11.08	23.30	2.56	-.34	28.18	25.70	-7.85	16.51	1.84	.70	-.238432	.026090	.028455	-.002366
.0900	-3.84	50.98	12.72	24.06	2.33	-.39	27.79	25.48	-7.71	18.42	2.10	.66	-.212375	.028945	.033545	-.004600
.1000	-3.79	57.15	14.62	24.68	2.11	-.41	27.17	24.82	-6.93	20.09	2.40	.64	-.188186	.030638	.037481	-.006842
.1100	-3.52	63.64	16.83	24.90	1.72	-.45	26.75	24.40	-6.26	22.02	2.80	.60	-.159969	.033096	.043230	-.010135
.1200	-2.65	69.80	19.13	24.38	1.18	-.42	26.32	24.33	-6.07	24.14	3.13	.52	-.130968	.036807	.050767	-.013960
.1300	-1.24	76.63	21.60	23.15	.47	-.38	25.86	24.30	-6.21	26.35	3.37	.41	-.101947	.040975	.059223	-.018248
.1400	.48	85.74	24.41	21.37	-.40	-.39	25.44	23.86	-6.30	28.54	3.56	.28	-.073045	.044195	.067269	-.023075
.1500	2.50	97.12	27.57	19.05	-1.46	-.45	25.07	23.01	-6.33	30.70	3.72	.13	-.044261	.046478	.074911	-.028433
.1600	4.81	110.72	31.07	16.20	-2.68	-.56	24.74	21.77	-6.31	32.84	3.83	-.03	-.015595	.047836	.082154	-.034318
$\theta_0 = 34°$																
0.0000	-1.34	14.96	3.58	19.85	2.35	0.20	57.39	52.91	-35.64	5.57	0.11	0.53	-0.435299	0.010453	0.015355	-0.004902
.0100	-1.75	16.47	4.31	20.35	2.43	.12	51.69	47.30	-29.36	6.84	.43	.58	-.424831	.012742	.016297	-.003555
.0200	-2.19	18.53	5.15	20.94	2.51	.02	46.07	41.78	-23.06	8.31	.79	.64	-.412370	.015161	.017392	-.002230
.0300	-2.65	21.29	6.08	21.62	2.59	-.08	41.15	36.94	-17.37	9.95	1.15	.69	-.397915	.017551	.018624	-.001073
.0400	-3.09	24.91	7.08	22.39	2.66	-.19	37.63	33.46	-13.02	11.73	1.50	.73	-.381466	.019727	.019978	-.000251
.0500	-3.40	29.38	8.15	23.15	2.68	-.30	35.75	31.89	-10.75	13.62	1.79	.73	-.362996	.021960	.021829	.000131
.0600	-3.35	34.33	9.33	23.60	2.51	-.38	34.40	31.70	-10.75	15.69	2.00	.63	-.341441	.025730	.025808	-.000079
.0700	-3.35	40.98	10.64	24.29	2.30	-.47	33.79	31.28	-10.57	17.86	2.23	.56	-.316419	.029066	.030331	-.001265
.0800	-3.42	47.82	12.21	25.03	2.09	-.54	33.02	30.25	-9.39	19.81	2.52	.56	-.292026	.031081	.033721	-.002641
.0900	-3.22	54.79	14.05	25.40	1.77	-.58	32.35	29.44	-8.54	21.86	2.83	.54	-.265629	.033478	.038073	-.004595
.1000	-2.62	61.85	16.21	25.25	1.31	-.58	31.67	29.01	-8.22	24.02	3.12	.47	-.237128	.036612	.043743	-.007131
.1100	-1.38	67.86	18.33	24.49	.79	-.45	30.69	28.99	-8.32	26.08	3.28	.38	-.209262	.041495	.051109	-.009614
.1200	-.18	75.47	20.74	23.35	.05	-.44	30.11	28.35	-7.92	28.21	3.52	.26	-.181049	.045078	.058154	-.013076
.1300	1.60	86.15	23.49	21.57	-.82	-.43	29.56	27.70	-7.64	30.31	3.65	.15	-.151319	.048649	.065839	-.017191
.1400	4.25	100.87	26.64	18.97	-1.80	-.38	28.93	27.24	-7.75	32.32	3.60	.07	-.119718	.052571	.074493	-.021922
.1500	7.90	120.24	30.23	15.42	-2.89	-.27	28.20	27.02	-8.29	34.19	3.32	.02	-.086248	.056870	.084203	-.027334
.1600	12.69	144.90	34.29	10.77	-4.10	-.11	27.36	27.07	-9.36	35.88	2.78	.00	-.050907	.061569	.095065	-.033496
$\theta_0 = 38°$																
0.0000	-4.21	9.66	3.38	22.91	2.56	-0.31	70.95	53.39	-29.68	7.82	2.32	1.61	-0.522176	-0.002789	0.010175	-0.012964
.0100	-3.76	14.32	4.39	23.57	2.58	-.31	62.14	49.87	-26.87	9.48	2.09	1.26	-.501982	.005972	.015001	-.009029
.0200	-3.39	18.92	5.47	24.14	2.56	-.32	54.76	46.70	-24.12	11.24	1.97	.97	-.481557	.013541	.019417	-.005876
.0300	-3.11	23.45	6.61	24.63	2.49	-.35	48.87	43.91	-21.43	13.11	1.97	.74	-.460901	.019876	.023408	-.003532
.0400	-2.92	27.91	7.83	25.03	2.38	-.40	44.51	41.50	-18.81	15.08	2.09	.58	-.440013	.024930	.026957	-.002027
.0500	-2.80	32.21	9.15	25.34	2.24	-.45	41.71	39.54	-16.27	17.12	2.31	.49	-.419380	.028625	.029899	-.001273
.0600	-2.97	36.85	10.11	25.49	1.85	-.64	41.29	37.69	-13.68	19.72	2.80	.44	-.395030	.030809	.033469	-.002659
.0700	-2.90	42.71	11.64	25.79	1.63	-.71	39.86	36.07	-11.58	21.73	3.07	.42	-.373148	.032946	.036048	-.003102
.0800	-2.33	49.41	13.60	25.82	1.33	-.68	37.97	35.03	-10.59	23.66	3.21	.37	-.348208	.036304	.039646	-.003343
.0900	-1.08	55.40	15.44	25.14	.81	-.56	37.05	34.95	-10.65	25.90	3.26	.25	-.318617	.041948	.047249	-.005301
.1000	.17	62.58	17.56	24.13	.19	-.49	36.16	34.39	-10.32	28.09	3.39	.15	-.290382	.046424	.053930	-.007506
.1100	1.14	70.55	19.92	23.09	-.45	-.49	35.05	33.08	-9.30	30.10	3.65	.09	-.265824	.048872	.058215	-.009343
.1200	3.00	81.87	22.66	21.12	-1.29	-.46	34.19	32.32	-8.94	32.17	3.71	.03	-.237073	.052637	.064938	-.012301
.1300	5.79	99.36	25.33	18.55	-2.09	-.34	33.52	31.93	-8.83	34.01	3.51	.01	-.206693	.057684	.073871	-.016187
.1400	9.64	124.25	27.82	15.34	-2.81	-.11	33.07	31.93	-8.97	35.51	3.00	.06	-.174897	.064226	.085312	-.021086
.1500	14.67	157.44	30.07	11.44	-3.44	.24	32.87	32.38	-9.38	36.64	2.14	.19	-.141687	.072435	.099546	-.027111
.1600	21.03	199.87	32.04	6.76	-3.96	.72	32.97	33.34	-10.09	37.32	.88	.41	-.107063	.082490	.116873	-.034383



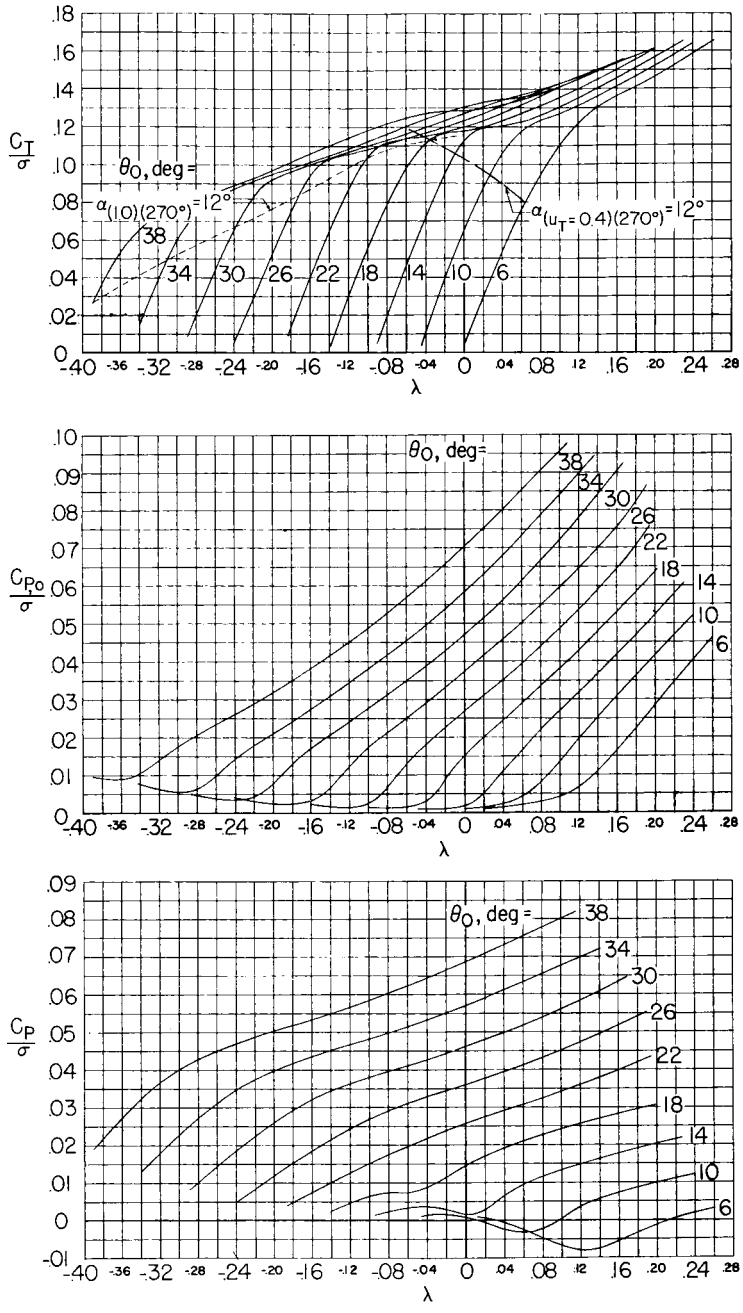
(a) C_l plotted against α_r.

Figure 1.- Section lift and drag coefficient used in calculations.



(b) $c_{d,o}$ plotted against α_r.

Figure 1.- Concluded.

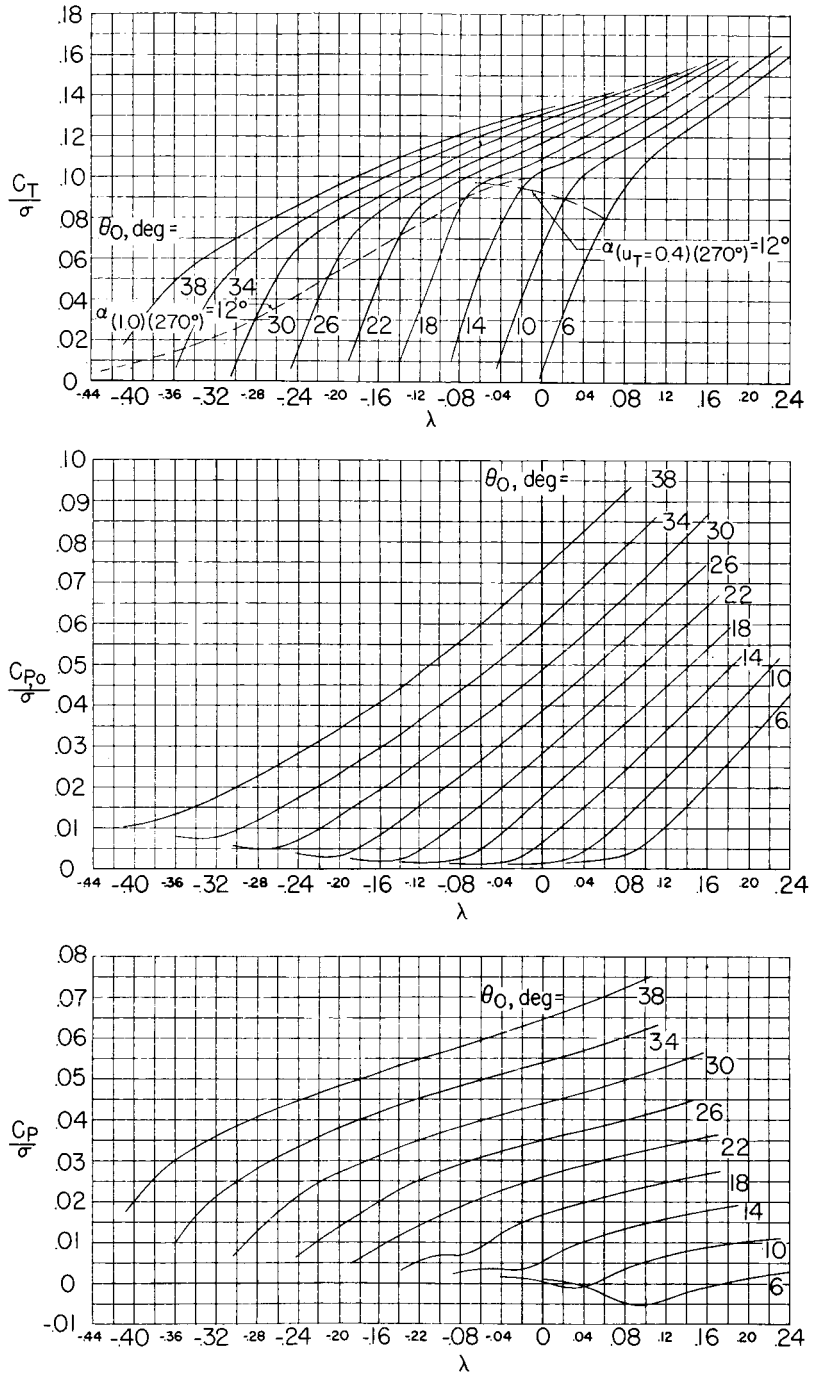


(a) $\mu = 0.1$.

Figure 2.- Charts of thrust coefficient, profile power coefficient, and total power coefficient as a function of inflow ratio and pitch angle for blades with -8° of twist.

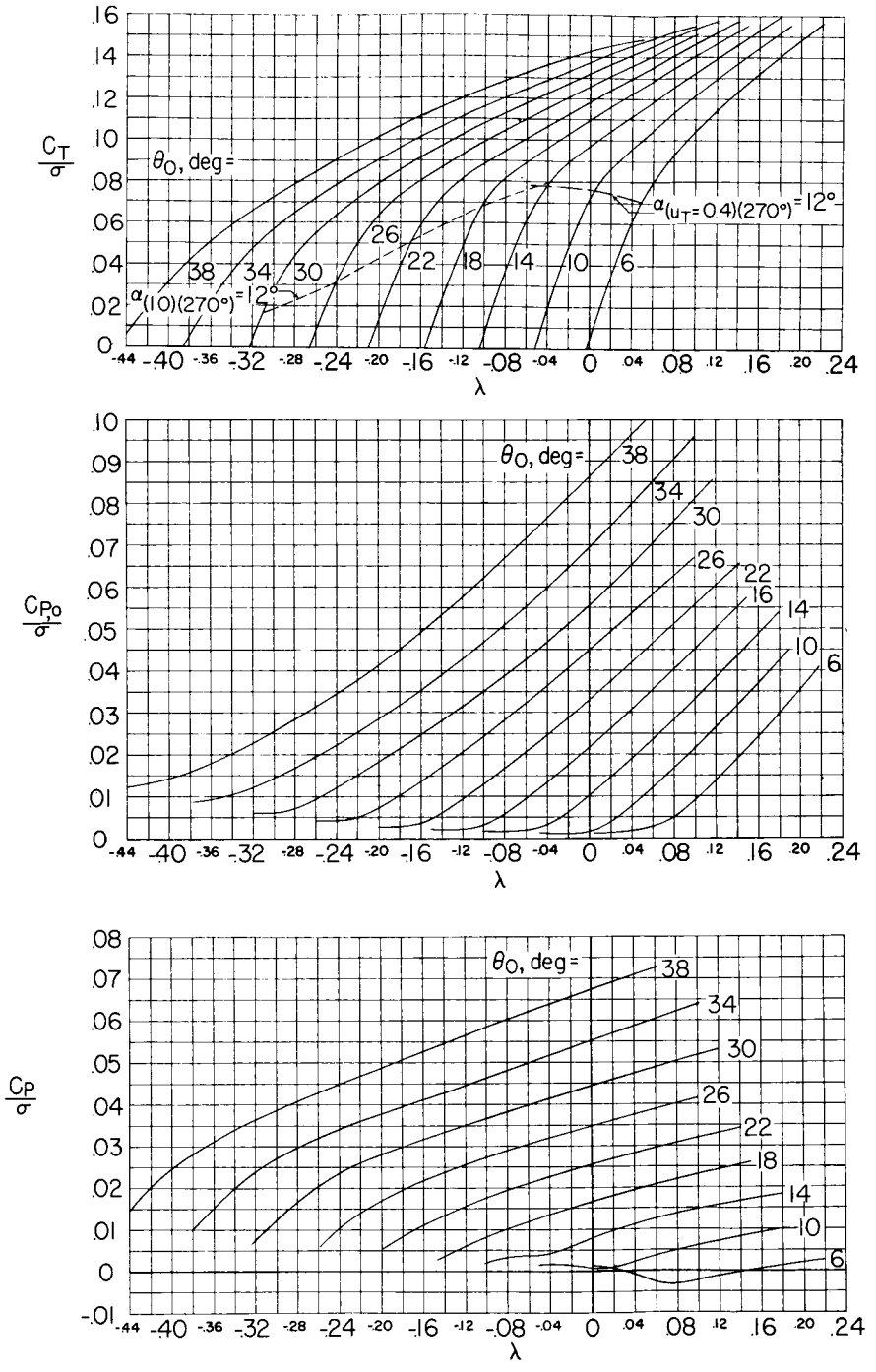
L-697

L-697



(b) $\mu = 0.2$.

Figure 2.- Continued.

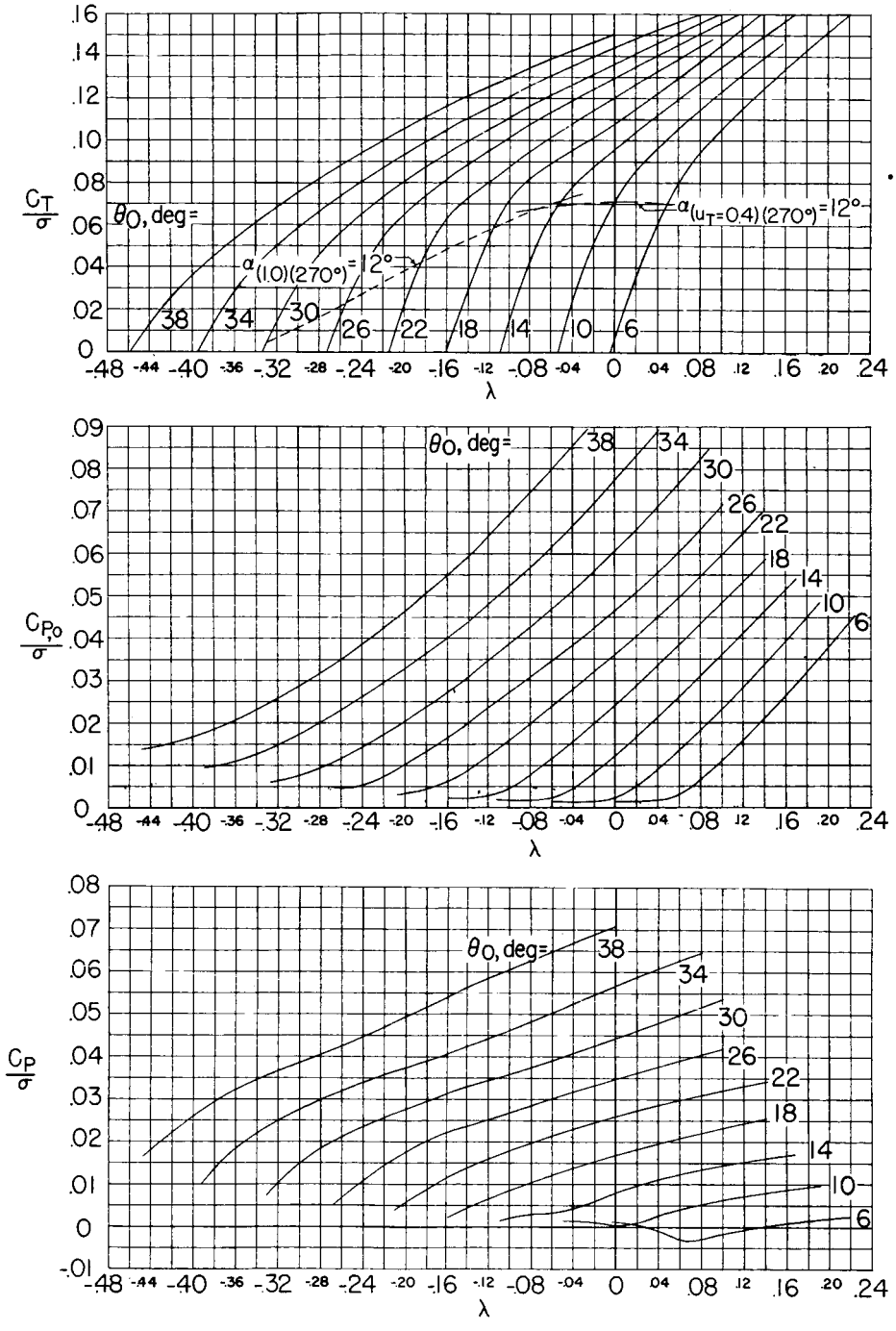


(c) $\mu = 0.3$.

Figure 2.- Continued.

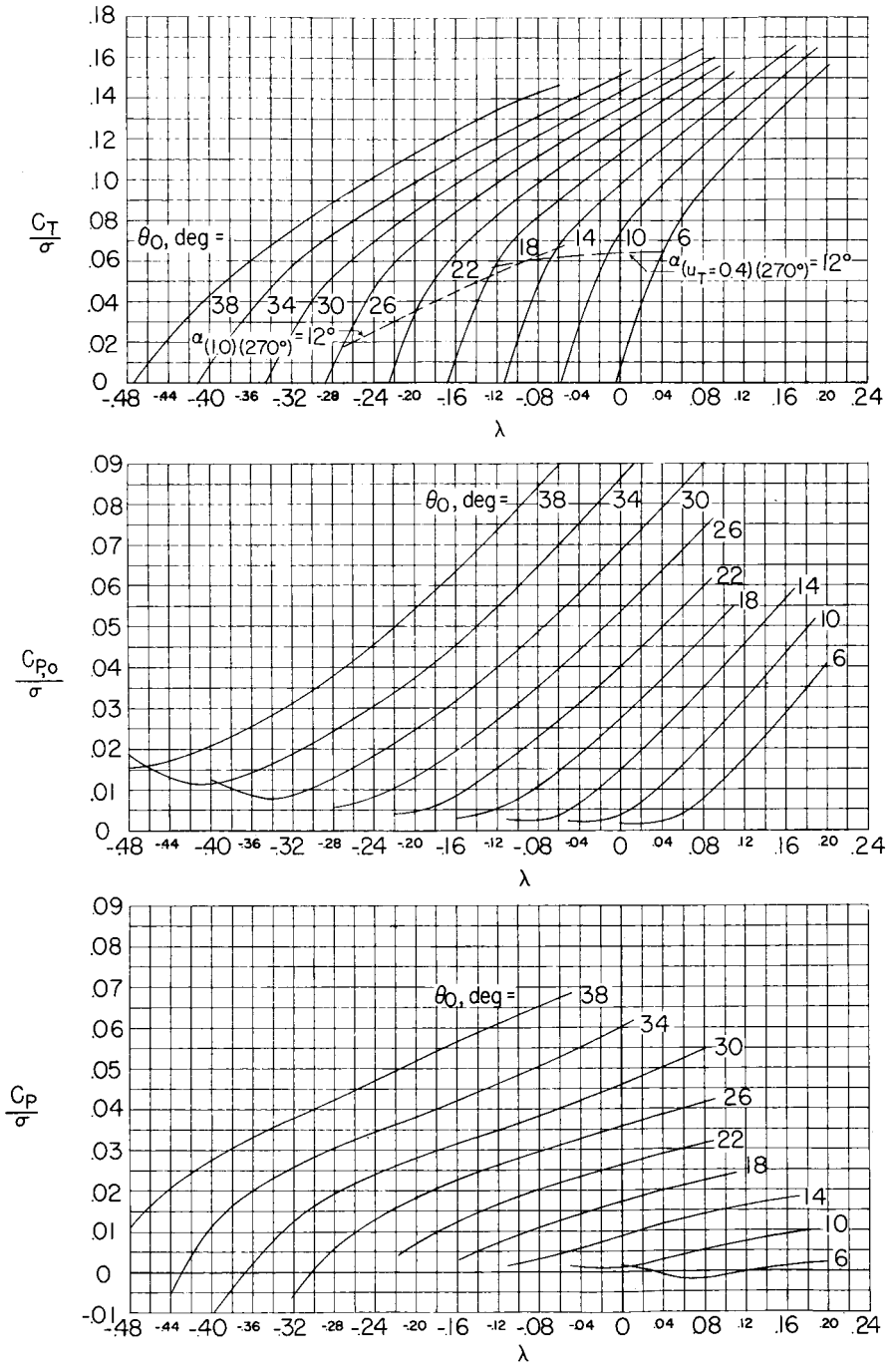
L-697

L-697



(d) $\mu = 0.35$.

Figure 2.- Continued.

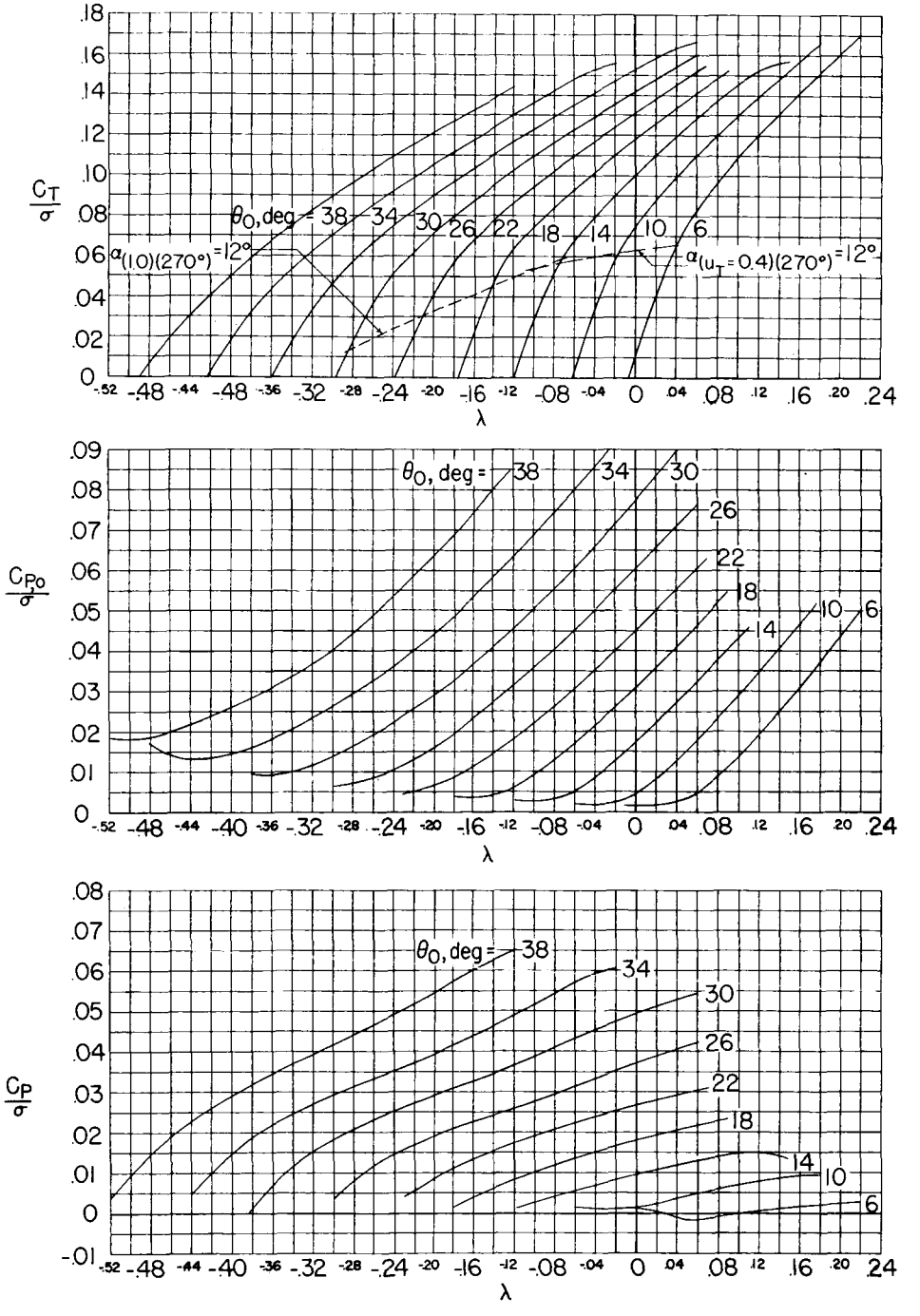


(e) $\mu = 0.4$.

Figure 2.- Continued.

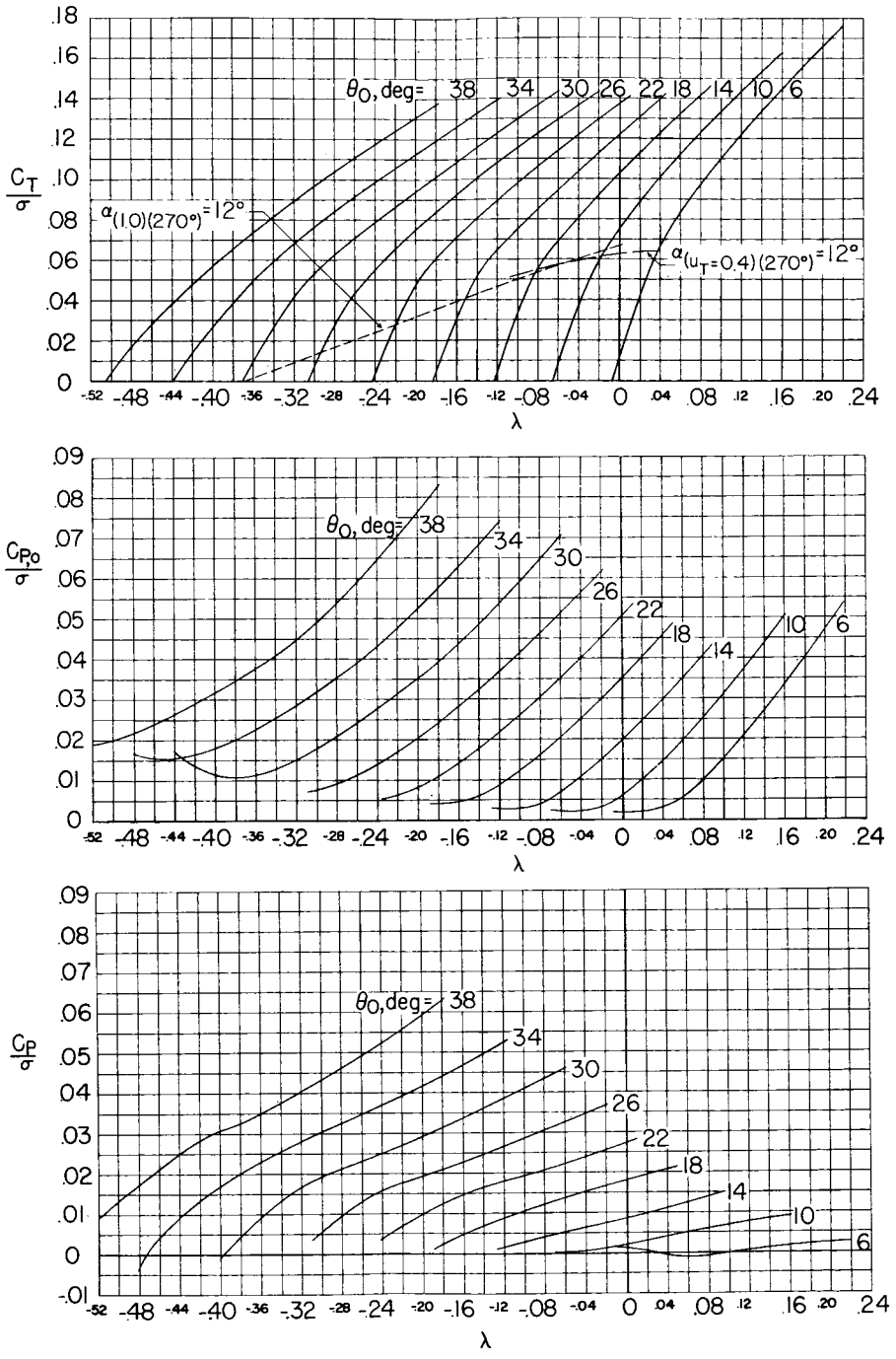
L-697

L-697



(f) $\mu = 0.45$.

Figure 2.- Continued.

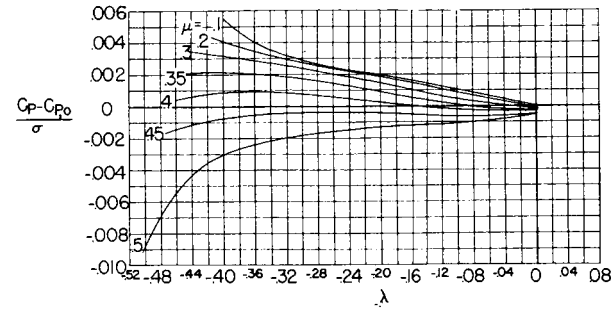


(g) $\mu = 0.5$.

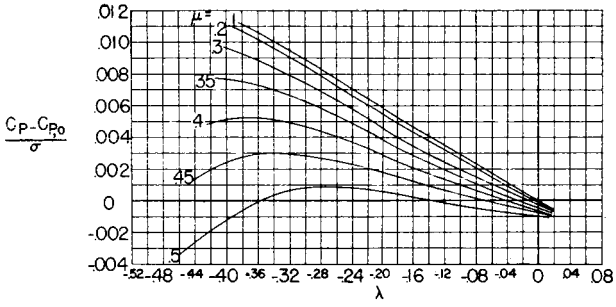
Figure 2.- Concluded.

L-697

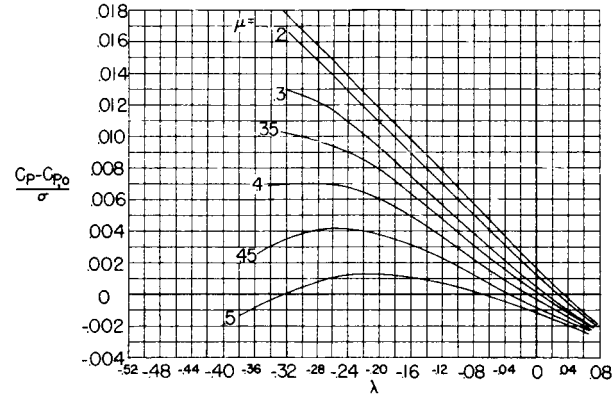
L-697



(a) $\frac{C_T}{\sigma} = 0.01.$

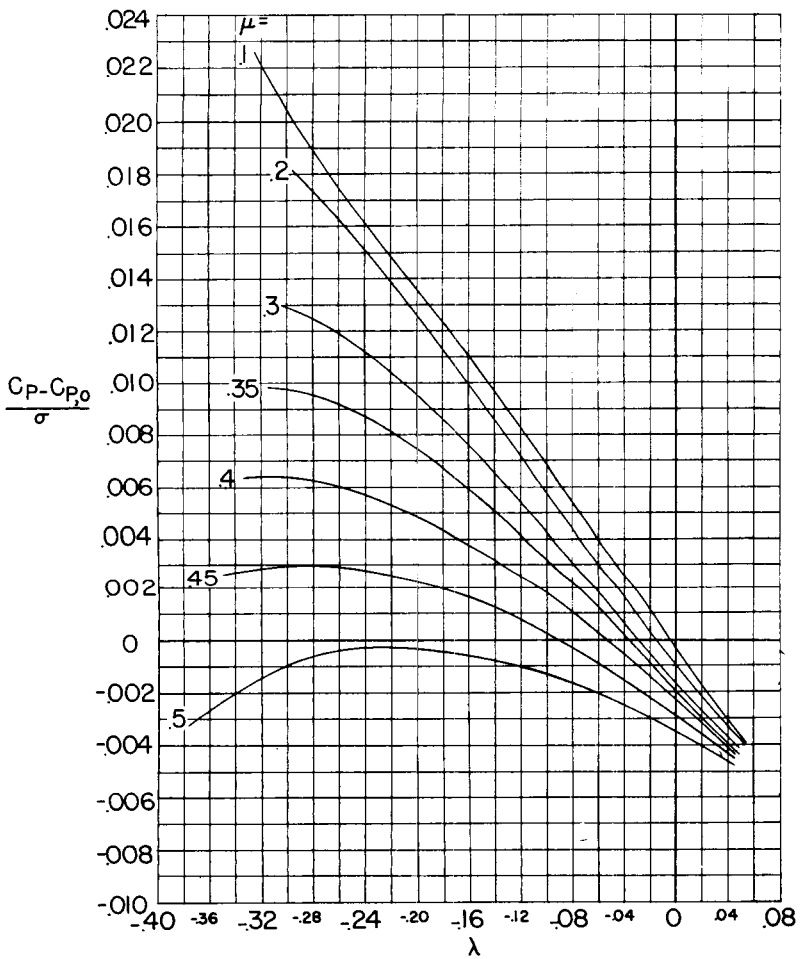


(b) $\frac{C_T}{\sigma} = 0.03.$

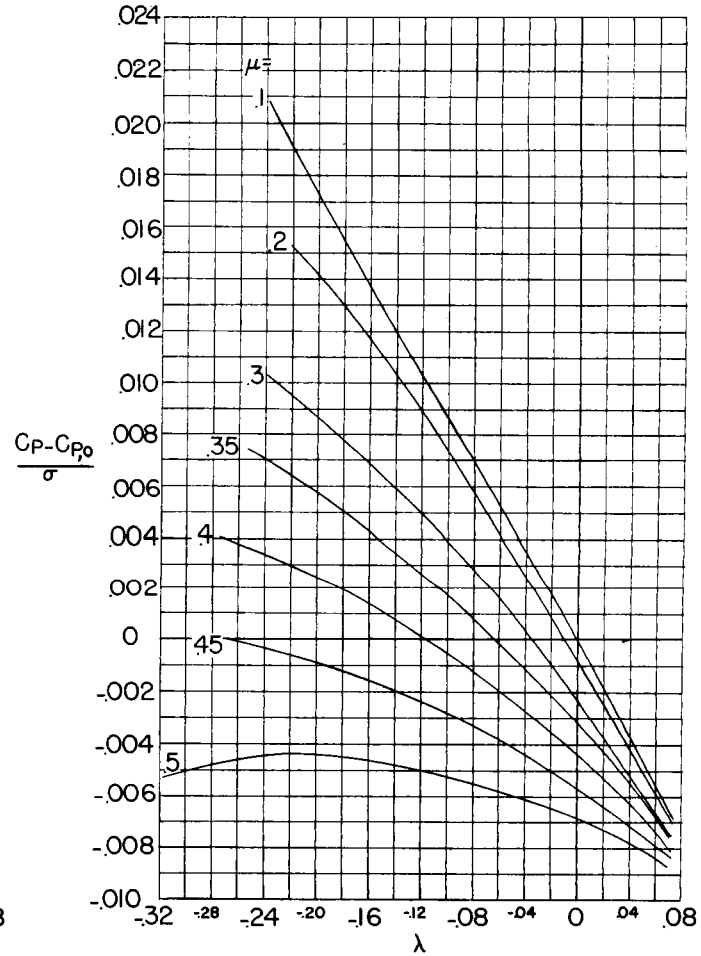


(c) $\frac{C_T}{\sigma} = 0.05.$

Figure 3.- Charts of useful power $\left(C_P - C_{P,o}/\sigma\right)$ as a function of inflow ratio and tip speed for blades with -8° of twist.

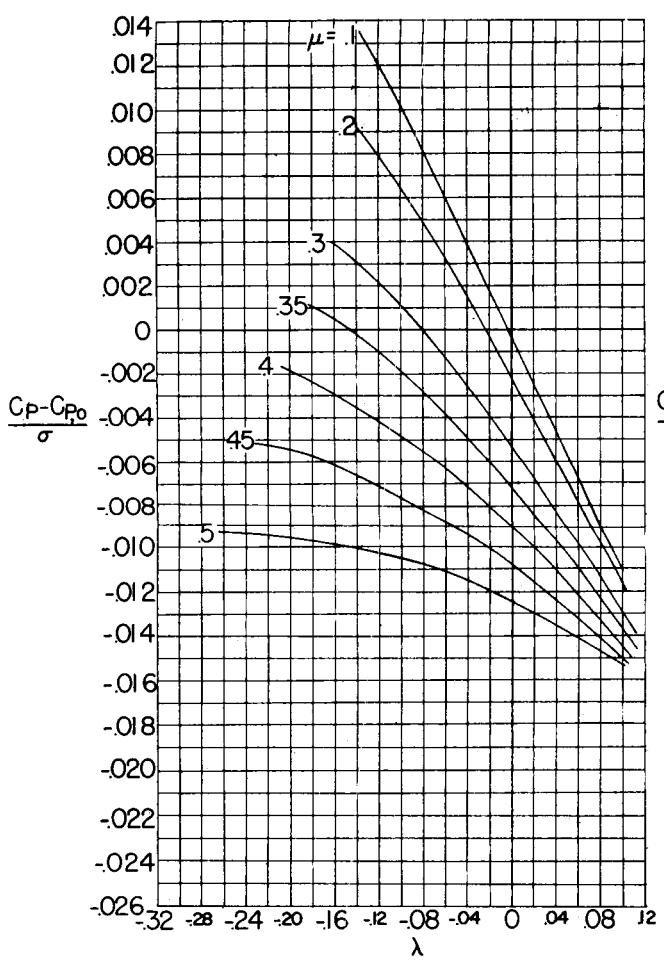


(d) $\frac{C_T}{\sigma} = 0.07.$

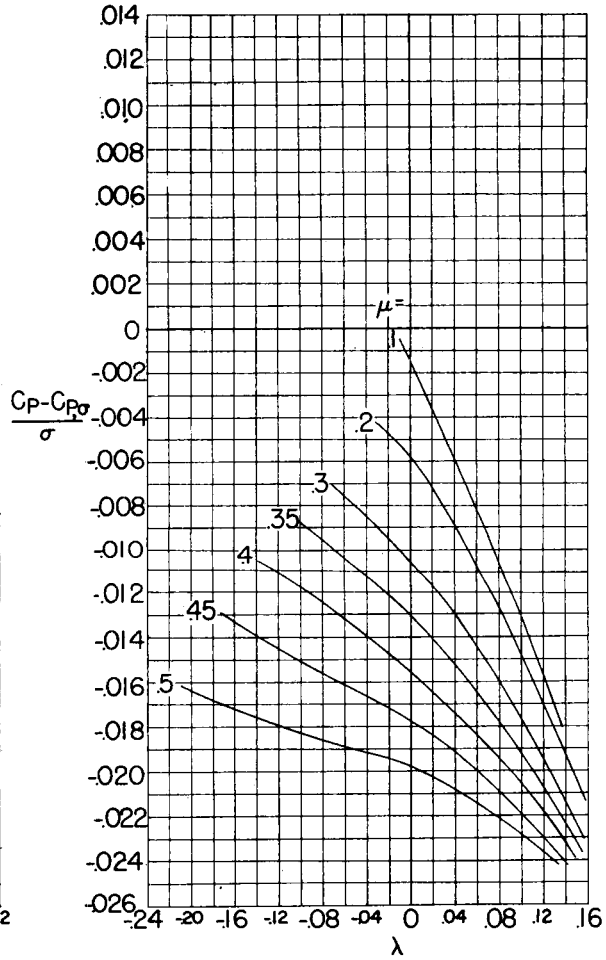


(e) $\frac{C_T}{\sigma} = 0.09.$

Figure 3.- Continued.



(f) $\frac{C_T}{\sigma} = 0.11.$



(g) $\frac{C_T}{\sigma} = 0.13.$

Figure 3.- Concluded.

NASA - Langley Field, Va. L-697