NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

REPORT No. 421

MEASUREMENT OF THE DIFFERENTIAL AND TOTAL THRUST AND TORQUE OF SIX FULL-SCALE ADJUSTABLE-PITCH PROPELLERS

By GEORGE W. STICKLE

1932

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AERONAUTICAL SYMBOLS

1. FUNDAMENTAL AND DERIVED UNITS

	Symbol	Metric		English	
		Unit	Symbol	Unit	Symbol
Length	l	meter	m	foot (or mile)	ft. (or mi.)
Time	t	second	s	second (or hour)	sec. (or hr.)
Force	F	weight of one kilogram	kg	weight of one pound	lb.
Power	P	kg/m/s		horsepower	hp
Speed		km/h	k. p. h.	mi./hr.	m. p. h.
		m/s	m. p. s.	ft./sec.	f. p. s.

2. GENERAL SYMBOLS, ETC.

W, Weight $=mg$

g, Standard acceleration of gravity $=9.80665$ m/s^2 $=32.1740$ ft./sec.^{2}

m, Mass $=\frac{W}{g}$

ρ, Density (mass per unit volume).

Standard density of dry air, 0.12497 (kg-m^{-4} s^2) at 15° C. and 760 mm $=0.002378$ (lb.-ft.$^{-4}$ sec.^{2}).

Specific weight of "standard" air, 1.2255 kg/m^3 $=0.07651$ lb./ft.^{3}.

mk^2, Moment of inertia (indicate axis of the radius of gyration k, by proper subscript).

S, Area.

S_w, Wing area, etc.

G, Gap.

b, Span.

c, Chord.

$\frac{b^2}{S}$, Aspect ratio.

μ, Coefficient of viscosity.

3. AERODYNAMICAL SYMBOLS

V, True air speed.

q, Dynamic (or impact) pressure $=\frac{1}{2}\rho V^2$.

L, Lift, absolute coefficient $C_L=\frac{L}{qS}$

D Drag, absolute coefficient $C_D=\frac{D}{qS}$

D_o, Profile drag, absolute coefficient $C_{D_o}=\frac{D_o}{qS}$

D_i, Induced drag, absolute coefficient $C_{D_i}=\frac{D_i}{qS}$

D_p, Parasite drag, absolute coefficient $C_{D_p}=\frac{D_p}{qS}$

C, Cross-wind force, absolute coefficient $C_C=\frac{C}{qS}$

R, Resultant force.

i_w, Angle of setting of wings (relative to thrust line).

i_t, Angle of stabilizer setting (relative to thrust line).

Q, Resultant moment.

Ω, Resultant angular velocity.

$\rho\frac{Vl}{\mu}$, Reynolds Number, where l is a linear dimension.

e. g., for a model airfoil 3 in. chord, 100 mi./hr. normal pressure, at 15° C., the corresponding number is 234,000;

or for a model of 10 cm chord 40 m/s, the corresponding number is 274,000.

C_p, Center of pressure coefficient (ratio of distance of c. p. from leading edge to chord length).

α, Angle of attack.

ϵ, Angle of downwash.

α_o, Angle of attack, infinite aspect ratio.

α_i, Angle of attack, induced.

α_a, Angle of attack, absolute.

(Measured from zero lift position.)

γ Flight path angle.

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By GEORGE W. STICKLE
Langley Memorial Aeronautical Laboratory

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

NAVY BUILDING, WASHINGTON, D. C.

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By George W. Stickle

SUMMARY

Force measurements giving total thrust and torque, and propeller slip stream surveys giving differential thrust and torque were simultaneously made on each of six full-scale propellers in the 20-foot propeller-research tunnel of the National Advisory Committee for Aeronautics. They were adjustable-pitch metal propellers 9.5 feet in diameter; three had modified Clark Y blade sections and three had modified R.A.F. 6 blade sections. This report gives the differential thrust and torque and the variation caused by changing the propeller tip speed, $\frac{V}{nD}$, *and the pitch setting. The total thrust and torque obtained from integration of the thrust and torque distribution curves are compared with those obtained by direct force measurements.*

In the above comparison the torques measured by the two methods were directly comparable but the thrusts derived from the slip-stream survey differed from those obtained from the force measurements by two factors, the drag of the hub and the increase of body drag due to the slip stream. Since single values of two coefficients used to obtain the factors brought all the thrust curves measured by the two methods into very good agreement, it is believed that the factors represent accurately the drag of the hub and the increase of body drag due to the slip stream.

INTRODUCTION

An investigation of propeller characteristics, conducted in the 20-foot propeller-research tunnel of the National Advisory Committee for Aeronautics, included tests on six full-scale propellers, three having modified Clark Y blade sections and three modified R.A.F. 6 blade sections. Simultaneous readings were taken of the total thrust and torque and of the differential thrust and torque at six stations along the blade. The results of the total force measurements are given in references 1 and 2. The present report gives the results of measuring the differential thrust and torque at six stations along the blade and derives factors for hub drag and increase of body drag due to the propeller slip stream. A later report will give the airfoil characteristics of the propeller sections deduced from the measurements given in this report.

The differential thrust and torque for each station along the blade was determined by measurements of the total head and the twist of the propeller slip stream. The thrust and torque distribution along the blade for any operating condition was obtained by plotting the elementary thrust and torque for each section against the radius of the propeller. Since it was impossible to survey the air stream behind the hub portion of the propeller, that part of the distribution curves was undetermined. This made it necessary to find a hub-drag coefficient that could be used to account for the negative thrust of the hub.

The total thrust (integrated thrust corrected for hub drag) obtained in the above manner differs from that obtained in the force tests of references 1 and 2 by an amount equal to the effect of the propeller slip stream on the drag of the body, since only the net force was measured on the thrust balance in the force tests. From a comparison of the thrust curves obtained by the two methods the value of the increase of body drag due to the slipstream was obtained.

APPARATUS AND METHODS

The measurement of total head and angular twist at a series of points in the slip stream, which are the essential quantities required in computing the propeller thrust and torque, was accomplished by the use of yawmeters of the type used by G. P. Douglas, of the British Aeronautical Research Committee. (References 3 and 4.) The term "yawmeter" is used to designate the combination of a yaw head and a recording manometer. A suitable yawmeter for the purpose is one that gives a differential pressure, proportional to the resultant dynamic pressure multiplied by the sine of twice the angle of twist of the slip stream, or $H_yK=\rho W^2 \sin 2\psi$. (See list of symbols.) A yaw head constructed of three small tubes (fig. 1) with the forward ends of the two outside tubes turned 45° to the central tube, was found to have a calibration that conformed to the above standard up to approximately 40° of yaw. This angle is much greater than the angle

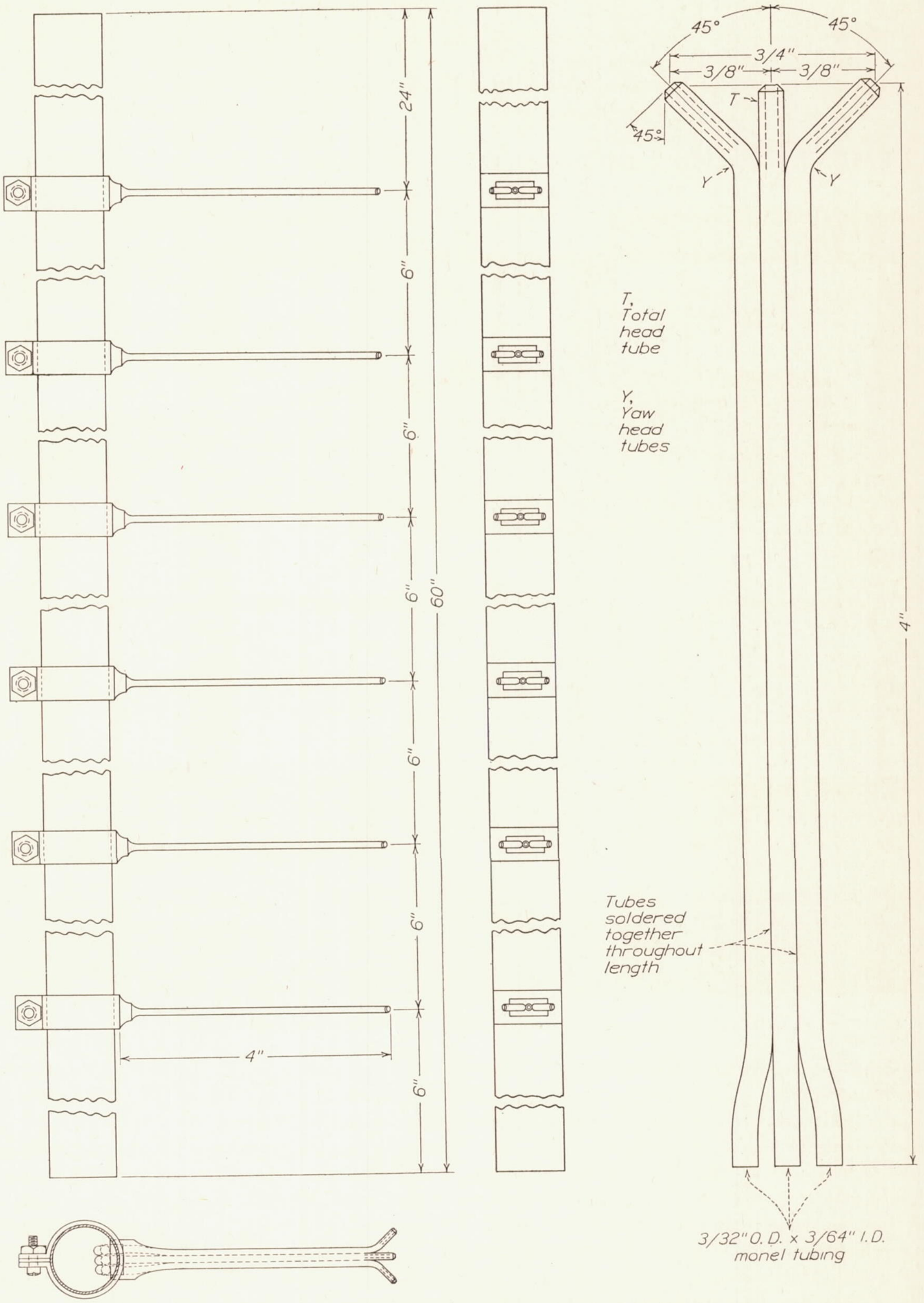

FIGURE 1.—Yaw-head bank assembly and detail

of yaw (twist) encountered in the slip stream of ordinary propellers. The central tube was used to measure the total head.

Six of these yaw heads were clamped at intervals of 6 inches on a tube (fig. 1) which was mounted vertically below the crankshaft central in the rear of the propeller as shown in Figure 2. The vertical position of the tube was such that the yaw heads were 24, 30, 36, 42, 48, and 54 inches from the center of the crankshaft. The yaw head at the 54-inch station was thus 3 inches above the propeller tip.

The tube supports were arranged to allow a fore-and-aft adjustment of the tube position. The model experiments of reference 3 indicated that the readings might be seriously affected by the distance between the tip of the yaw head and the trailing edge of the propeller. A few position trials showed no appreciable effect up to 3 inches between the trailing edge and the yaw heads. Therefore the tube was fixed with a maximum distance from the trailing edge of the propeller to the tip of the yaw heads equal to 2.5 inches. This distance was chosen to allow a sufficient clearance (0.3 inch) for the 24-inch station yaw head with the propeller set 27° at the 42-inch radius. The yaw heads were connected by small copper tubes to a photographically-recording multiple-tube manometer, located in a dark room under the entrance cone of the tunnel. Pressures were recorded simultaneously with the readings for the force tests reported in references 1 and 2. The yawmeters were calibrated with the yaw heads in front of the body for angles of yaw from 5° to the left to 15° to the right for use with right-hand propellers.

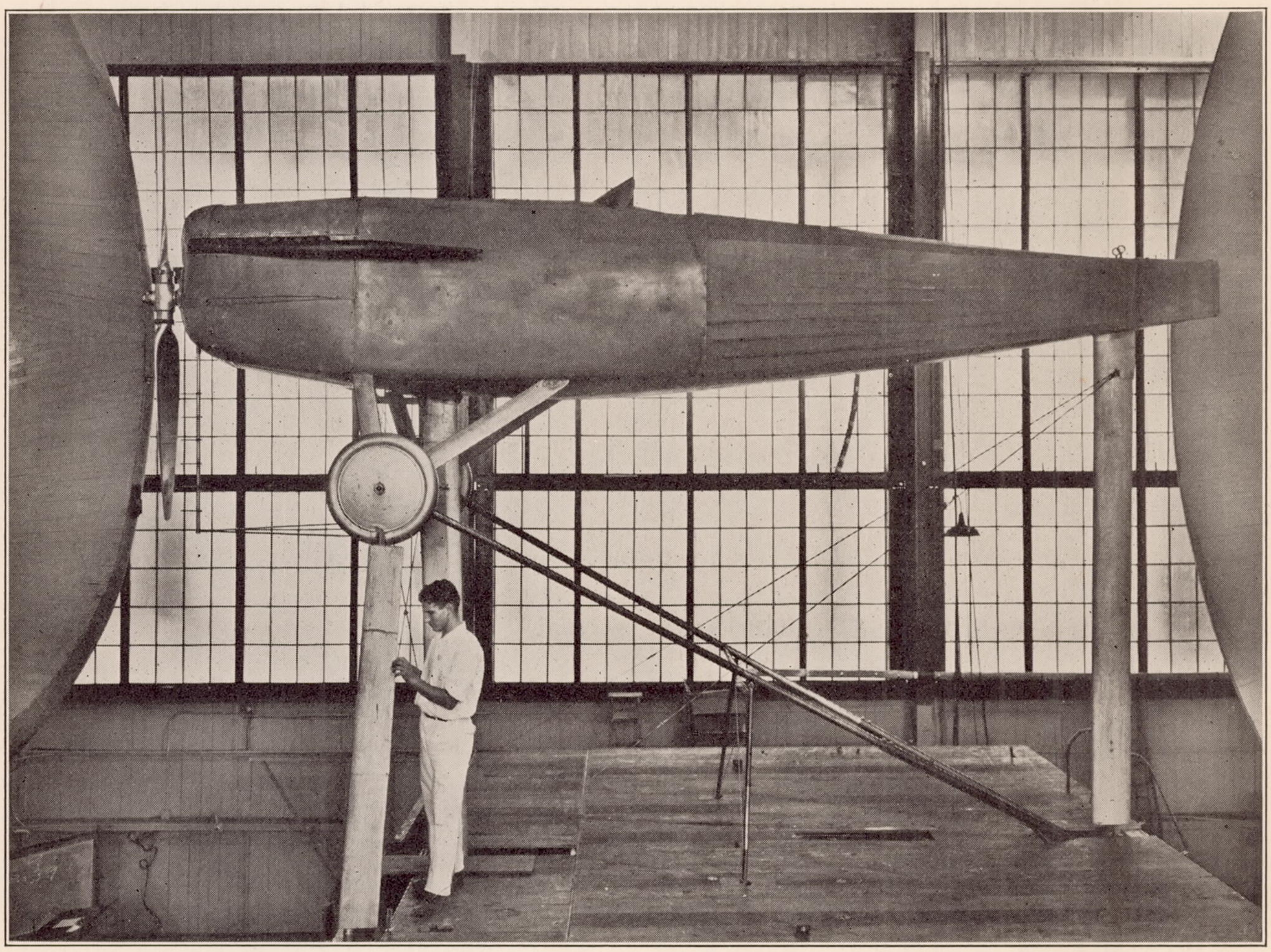

FIGURE 2.—Set-up in propeller-research tunnel with yaw-head bank in place

The propeller-research tunnel and its equipment are described in reference 5. A Curtiss D-12 engine rated at 435 hp. at 2,300 r. p. m. was mounted in a tractor fuselage (fig. 2) to drive the propellers.

Results from tests on six 9.5-foot adjustable-pitch metal propellers, three having modified Clark Y blade sections, and three having modified R.A.F. 6 blade sections, are presented in this report. The outer third of all six propeller blades have sections of constant thickness/chord ratio. This ratio is used to designate the propellers, as shown in the following table:

PROPELLER DESIGNATION

R.A.F. 6	Clark Y	Thickness/ chord ratio
R-6	C-6	0.06
R-8	C-8	.08
R-10	C-10	.10

The blade-form curves for these propellers are given in Figure 3. Section characteristics may be obtained from reference 1. Each propeller was tested at five pitch settings (11°, 15°, 19°, 23°, and 27° at 42-inch radius) to cover the range ordinarily used. The propeller tip speed for these tests was kept below 900 feet per second in order to minimize the compressibility effects of high tip speeds. In addition, an investigation of the effect of high tip speed was made in which the pitch was set to 9.8° at 42-inch radius on all propellers and also to 7° at 42-inch radius on C-6 and R-6.

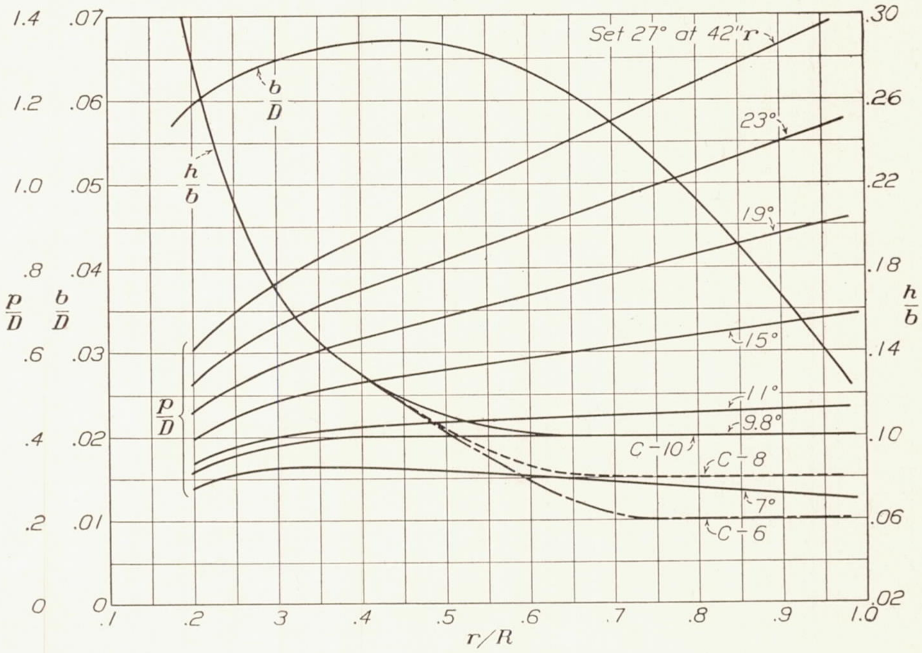

FIGURE 3.—Pitch distribution and blade form curves

RESULTS

Thrust distribution.—The thrust of a differential element of a propeller is equal to the increase in total head due to the thrust, multiplied by the differential annular area described by the element.

$$\mathrm{d}T = H\mathrm{d}A$$

Substituting,
$$\mathrm{d}T = H(2\pi r\mathrm{d}r)$$

Therefore
$$\frac{\mathrm{d}T}{\mathrm{d}r} = 2\pi rH$$

Let
$$x = \frac{r}{R} = \frac{2r}{D}$$

Then
$$\frac{\mathrm{d}T}{\mathrm{d}x} = \frac{\pi}{2}D^2Hx$$

Now
$$\mathrm{d}T = \mathrm{d}C_T\rho n^2D^4$$

Therefore
$$\frac{\mathrm{d}C_T}{\mathrm{d}x} = \frac{\pi Hx}{2\rho n^2D^2}$$

The values of $\frac{\mathrm{d}C_T}{\mathrm{d}x}$ for each propeller section behind which a yaw head is located are plotted against $\frac{V}{nD}$ and faired curves are drawn through the points. An example of these curves is given for the C-10 propeller at $x = 0.526$ (30-inch radius) in Figure 4. Values of $\frac{\mathrm{d}C_T}{\mathrm{d}x}$ at even values of $\frac{V}{nD}$ are given in Tables I to to XIV. The thrust-gradient curves for even values of $\frac{V}{nD}$ are plotted from these tables, as in Figures 5 to 7. The curves are drawn through 0 at 0.2 of the radius because that is approximately where the propeller changes to a circular section. It is impossible to determine exactly where this point of zero thrust along the blade occurs, but for convenience 0.2 of the radius was adopted as a standard. The total thrust is not very sensitive to a small shift of this point one way or the other, but whatever change does occur is taken care of in the correction for the increased drag of the body due to the slip stream. Graphical integration of these curves gives the total thrust coefficient C_T uncorrected for hub drag, as shown in Figure 8.

Inasmuch as the same hub was used for all the propellers, it seems reasonable to suppose that a constant hub-drag coefficient could be applied to all propellers and all pitch settings. At zero thrust the C_T curves from force measurements and total-head measurements should coincide since at this point the increase of body drag due to the slip stream should be zero. Therefore it is permissible to assume that the separation of the curves for force measurements and total-head measurements as shown in Figure 8 at the $\frac{V}{nD}$ for zero measured thrust is due to the negative area that should be added to the distribution curves between $x=0$ and $x=0.2$. If the thrust coefficient, $C_T=\frac{T}{\rho n^2D^4}$, is divided by $\left(\frac{V}{nD}\right)^2$ it becomes $\frac{T}{\rho V^2D^2}$ which is in the form of a drag coefficient. When the values of C_T from the total-head measurements, at values of $\frac{V}{nD}$ corresponding to zero thrust from the force measurements, were converted into this form they were found to be nearly constant; therefore an arithmetical mean was taken of them which gave:

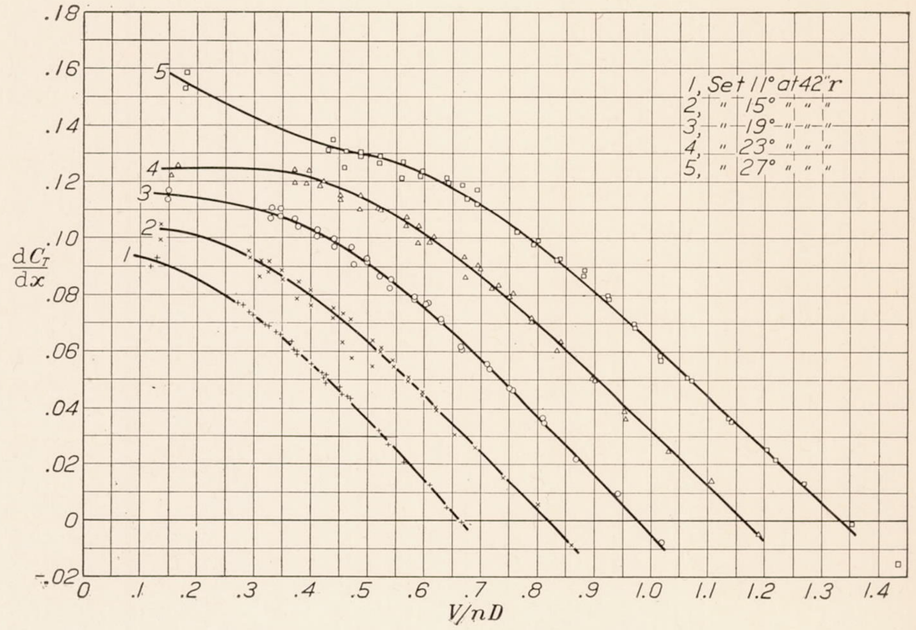

FIGURE 4.—Differential-thrust coefficient. Propeller C-10. $x=0.526$

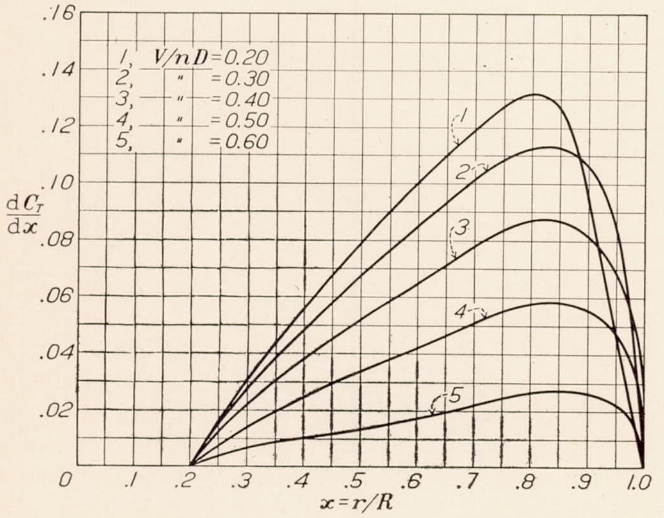

FIGURE 5.—Thrust-gradient curves. Propeller C-10. Set 11° at 42-inch radius

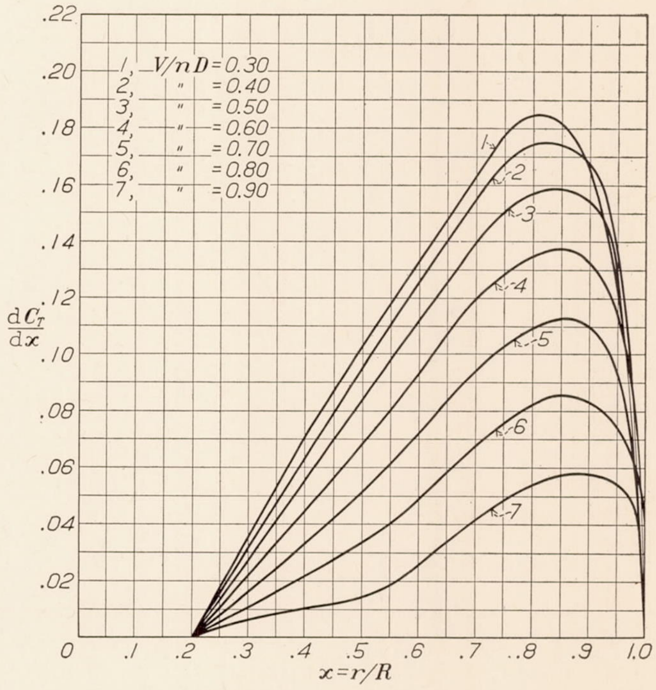

FIGURE 6.—Thrust-gradient curves. Propeller C-10. Set 19° at 42-inch radius

$$\text{Drag coefficient}=0.005=\frac{\text{Drag}}{\rho V^2D^2}$$

$$C_T\ \text{correction}=0.005\left(\frac{V}{nD}\right)^2$$

This hub-drag coefficient is approximately equal to 25 per cent of that of a circular flat plate of a diameter equal to that of the hub.

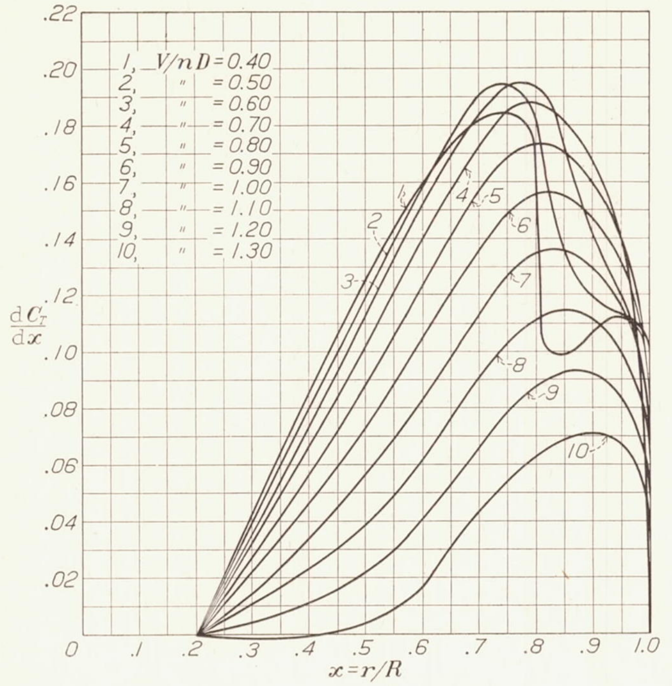

FIGURE 7.—Thrust-gradient curves. Propeller C–10. Set 27° at 42-inch radius

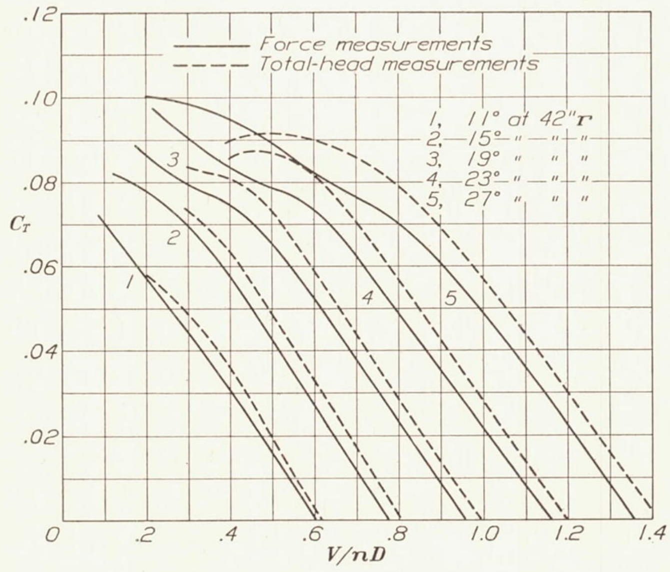

FIGURE 8.—Comparison of effective thrust coefficient from force measurements and integrated thrust coefficient from total-head measurements. Propeller C-6

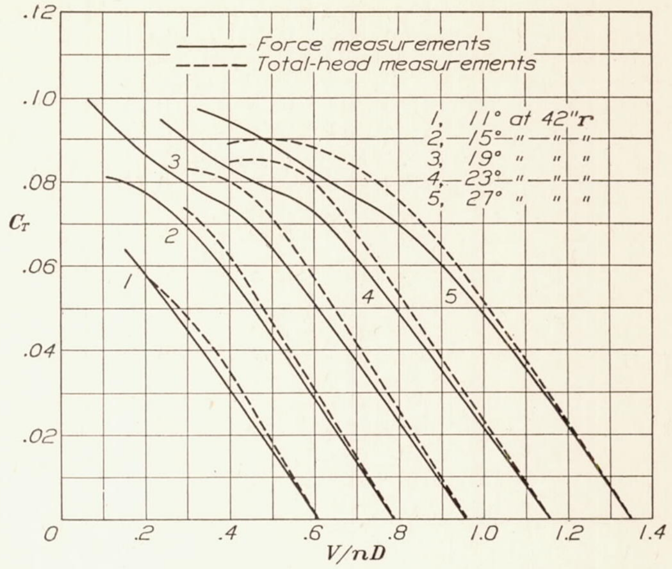

FIGURE 9.—Comparison of effective thrust coefficient from force measurements and total thrust coefficient (integrated thrust coefficient corrected for hub drag) from total-head measurements. Propeller C-6

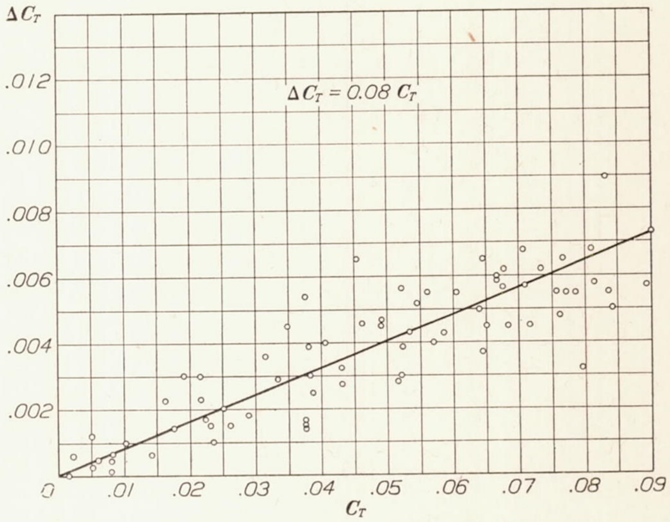

FIGURE 10.—Increase of body drag due to the propeller slip stream

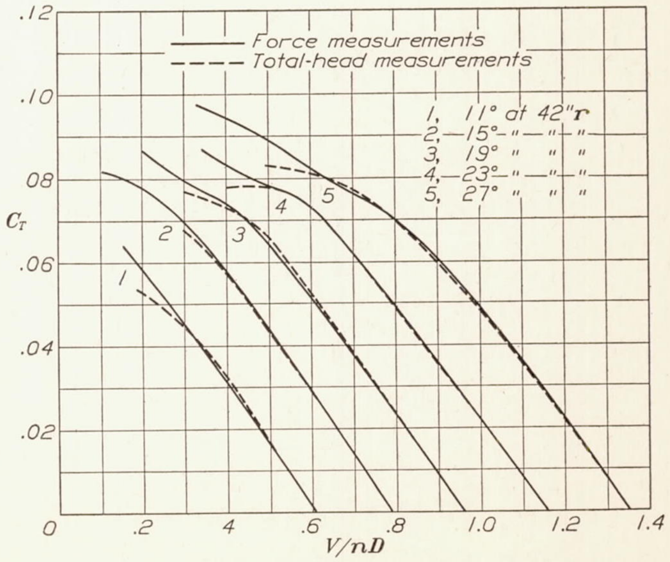

FIGURE 11.—Comparison of effective thrust coefficient from force measurements and corrected total head-measurements. Propeller C–6

Figure 9 gives a comparison of the total thrust computed from total-head measurements and the measured effective thrust from the force measurements. The difference in the two values (ΔC_T) at any $\frac{V}{nD}$ may be accounted for by the increase in body drag due to the slip stream. In Figure 10, ΔC_T is plotted against the total C_T and a straight line determined by the theory of least squares is drawn through these points. Figures 11 to 16 give a comparison of effective thrust coefficients obtained by the two methods.

Torque distribution.—From a consideration of the angular momentum in the wake of a propeller, the differential torque of a propeller element can be expressed as:

$$dQ = rV_1 dM$$

Substituting $dM = \rho U dA = \rho U 2\pi r dr$

$$\frac{dQ}{dr} = 2\pi r^2 V_1 U \rho$$

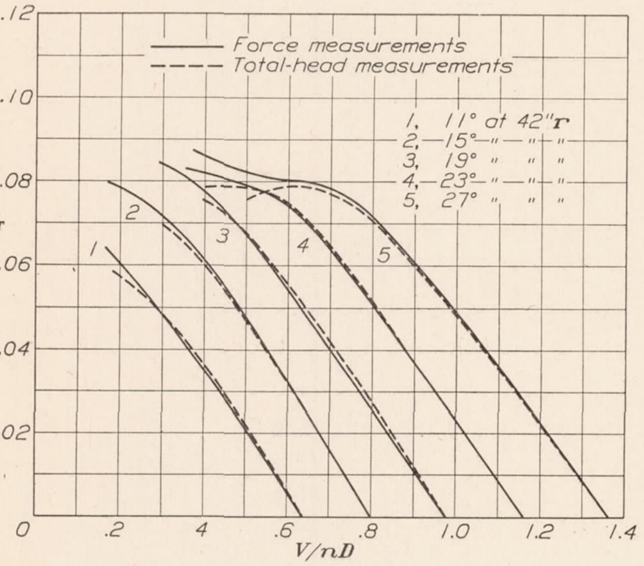

FIGURE 12.—Comparison of effective thrust coefficient from force measurements and corrected total-head measurements. Propeller C–8

But $V_1 = W \sin\psi U = W \cos\psi$

Therefore $\frac{dQ}{dr} = 2\ \pi\rho r^2 W^2 \sin\psi \cos\psi$

or $= \pi\rho r^2 W^2 \sin 2\psi$

From the calibration of the yawmeter,

$$\rho W^2 \sin 2\psi = KH_y$$

Therefore $\frac{dQ}{dr} = \pi r^2 KH_y$

Substituting $\frac{dQ}{dx} = \frac{\pi x^2 D^3 KH_y}{8}$

Now $dQ = dC_Q \rho n^2 D^5$

Hence $\frac{dC_Q}{dx} = \frac{\pi x^2 KH_y}{8\rho n^2 D^2}$

Owing to the type of mounting and the sensitivity of the yawmeters, it was impossible to get them all to record zero differential pressure in the undisturbed air stream. This initial deflection for zero twist must be subtracted before the H_y can be used in the above formula. The amount to be subtracted is determined by plotting the yawmeter reading for each radius against total head from the 0° calibration run. This plot gives the yawmeter correction as a straight-line function of the total head. With the propeller running, this function is theoretically in error by the change in static pressure, but this error is much smaller than the experimental error, and consequently the method may be used with confidence. The only place the error could become appreciable is at low values of $\frac{V}{nD}$, and in this range the yawmeter method of measuring torque is admittedly not very accurate.

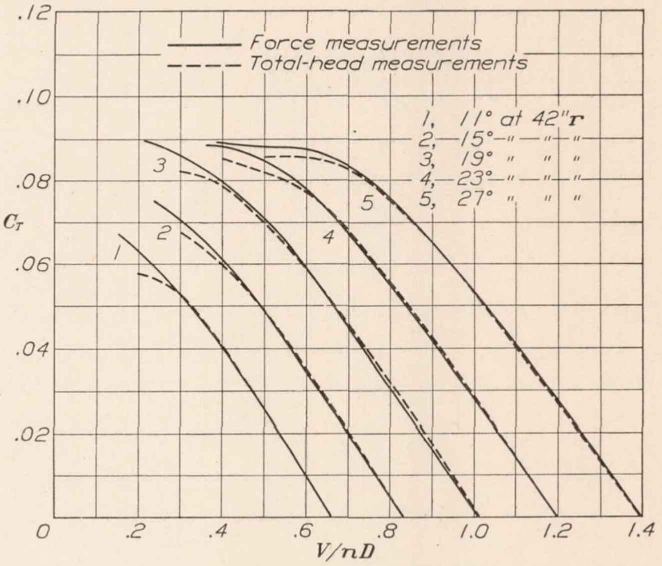

FIGURE 13.—Comparison of effective thrust coefficient from force measurements and corrected total-head measurements. Propeller C–10

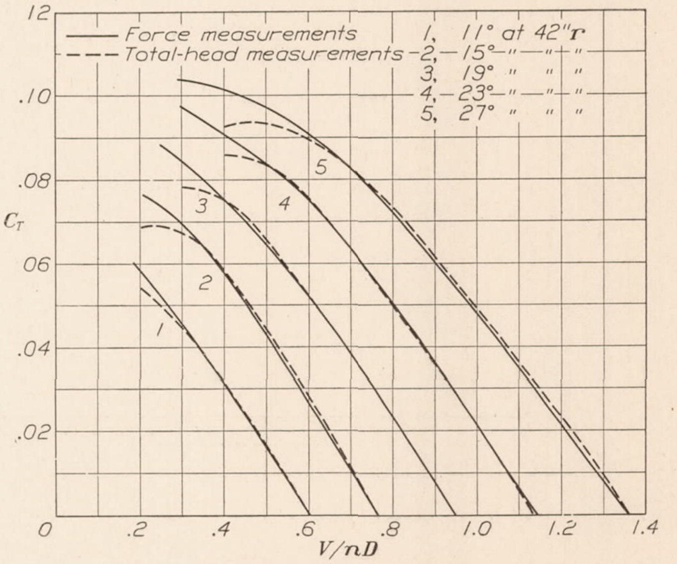

FIGURE 14.—Comparison of effective thrust coefficient from force measurements and corrected total-head measurements. Propeller R–6

The values of $\frac{dC_Q}{dx}$ are plotted against $\frac{V}{nD}$ and faired curves drawn through them, as in Figure 17. Values are read from these curves at even values of $\frac{V}{nD}$ and are given in Tables I to XIV.

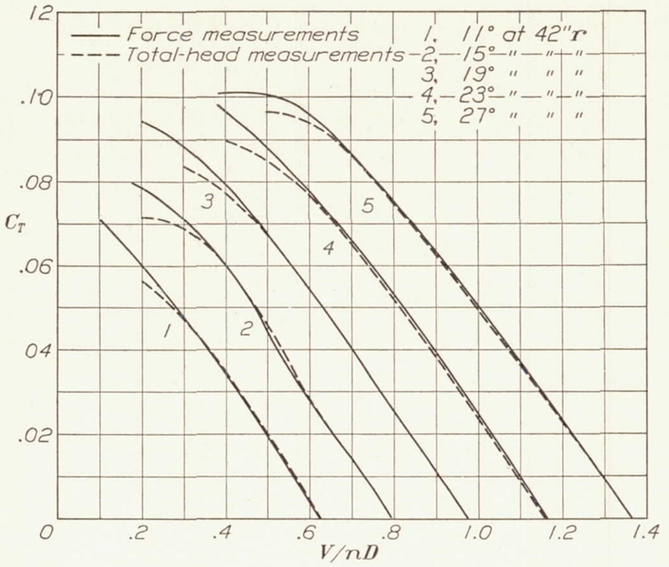

FIGURE 15.—Comparison of effective thrust coefficient from force measurements and corrected total-head measurements. Propeller R-8

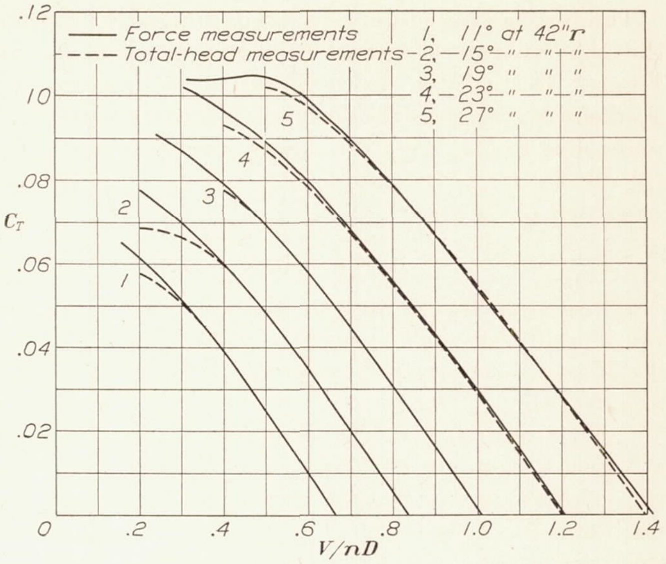

FIGURE 16.—Comparison of effective thrust coefficient from force measurements and corrected total-head measurements. Propeller R-10

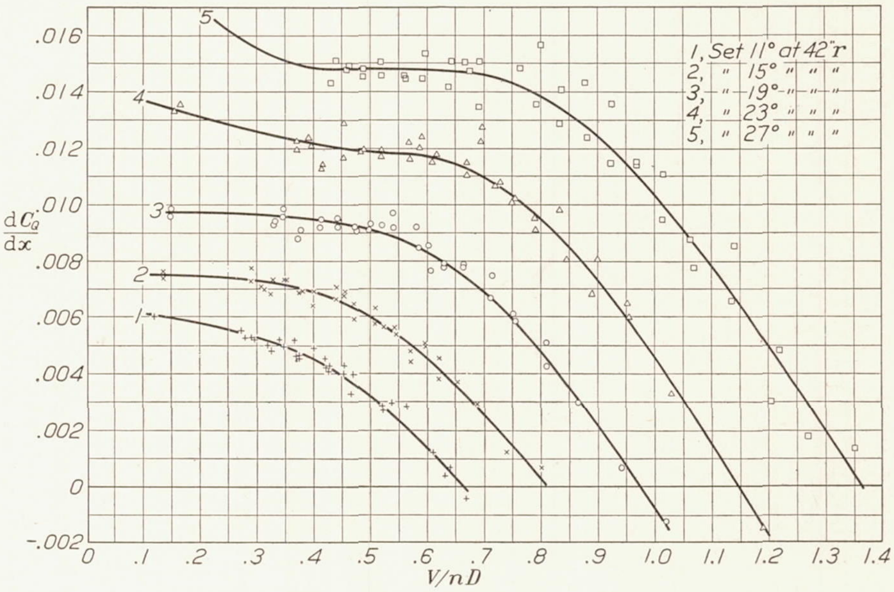

FIGURE 17.—Differential torque coefficient. Propeller C-10. $x = 0.526$

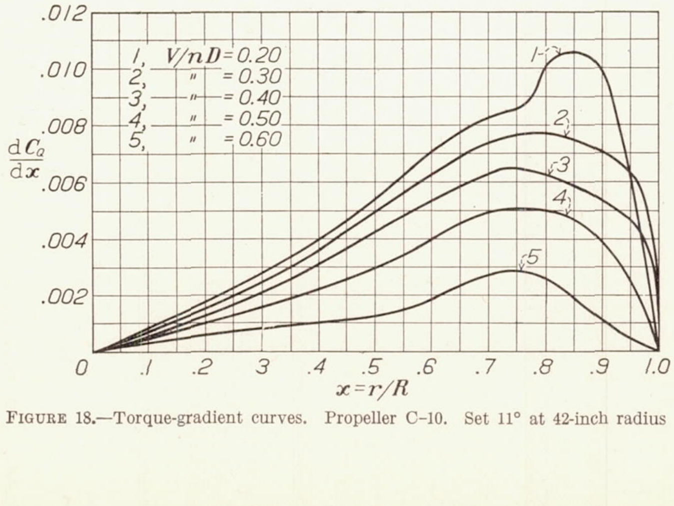

FIGURE 18.—Torque-gradient curves. Propeller C-10. Set 11° at 42-inch radius

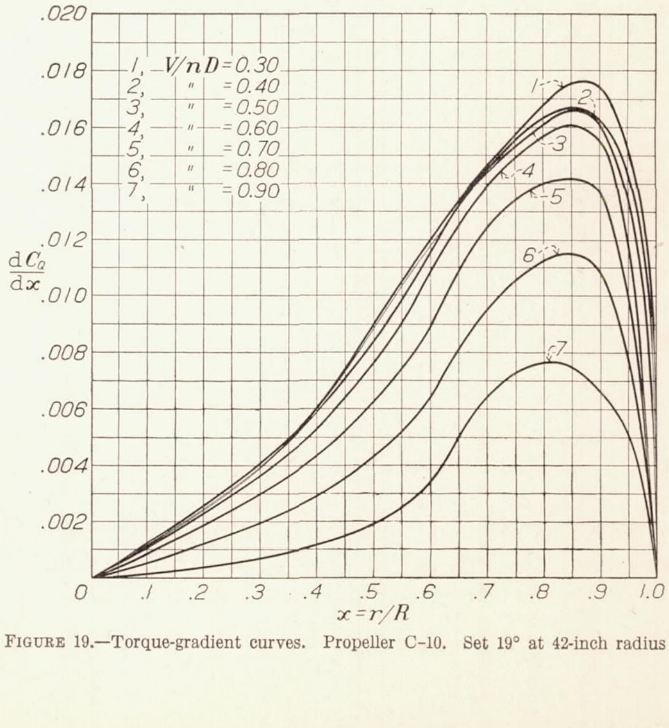

FIGURE 19.—Torque-gradient curves. Propeller C-10. Set 19° at 42-inch radius

The torque-gradient curves are obtained by plotting the tabular values against percentage radius, as in Figures 18 to 20. The integration of the torque-gradient curves gives the torque coefficient C_Q which if multiplied by 2π, gives the power coefficient C_P. The C_P obtained in this manner is compared with the measured C_P in Figures 21 to 26.

DISCUSSION

Differential thrust and torque.—A brief study of the thrust and torque gradient curves for different blade settings, Figures 5 to 7, and 18 to 20, shows the following:

(1) As the blade setting is increased, the thrust of the outer sections increases more rapidly than the thrust of the inner sections, which causes the point of maximum unit thrust to shift toward the tip. This shift results from the fact that the pitch increases more rapidly toward the tip of the blade than near the hub.

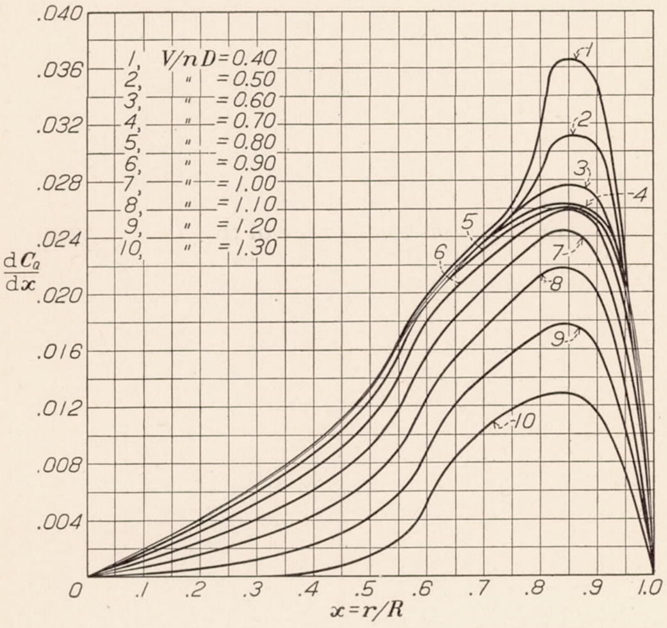

FIGURE 20.—Torque-gradient curves. Propeller C–10. Set 27° at 42-inch radius

(2) As the $\frac{V}{nD}$ is lowered from the point of zero thrust, the increments of thrust are large and nearly uniform, because the propeller sections are working on the straight-line portion of their lift curves.

(3) As the propeller approaches maximum thrust for the high pitch settings, the tip sections begin to fall off in thrust, owing to the blade sections operating near their stalling angles.

(4) At the lowest $\frac{V}{nD}$ given for the 27° pitch setting (figs. 7 and 20), the blade is stalled from the 75 per cent radius to the tip, showing a pronounced decrease of thrust and an increase of torque.

Effect of propeller speed on differential thrust and torque.—The change in the thrust and torque distribution resulting from the variation of the rotational velocity of the propeller is given in Figures 27 to 30. These curves are taken for the $\frac{V}{nD}$ of maximum efficiency in order to show the results of most interest to the designer. For tip speeds up to 1,050 feet per second (2,100 r. p. m.), the ordinates of the thrust and torque gradient curves are continually increasing. Above this speed, the outer sections begin to fall off in thrust and increase in torque, whereas the inner sections increase in thrust as before. At 1,250 feet per second (2,500 r. p. m.) and above, the outer 10 per cent of the blade for propeller C–6 is producing negative thrust and positive torque. At 1,350 feet per second (2,700 r. p. m.), the whole outer 25 per cent of the blade is traveling above 1,050 feet per second, and showing a corresponding decrease in thrust along the blade. The R.A.F. 6 propeller does not drop off as much in thrust toward the tip above 2,500 r. p. m. as the Clark Y

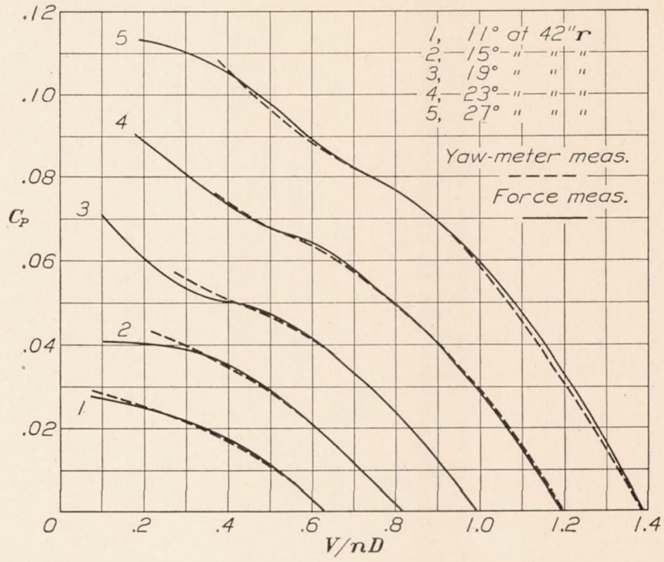

FIGURE 21.—Comparison of power coefficient from force measurements and yaw-meter measurements. Propeller C–6

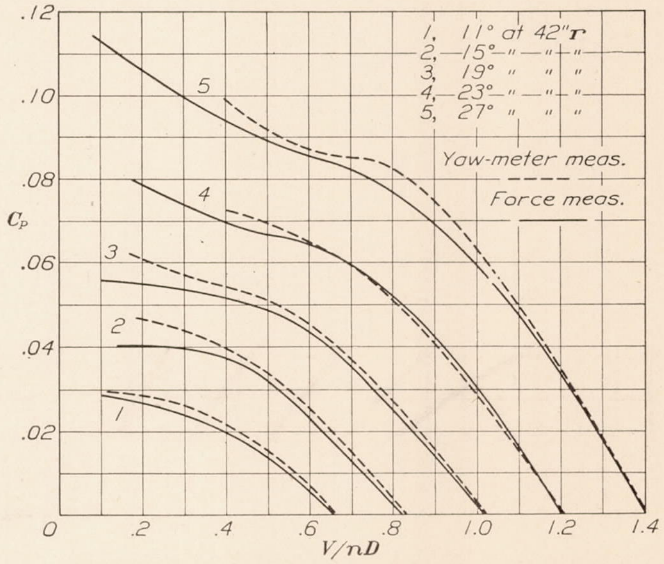

FIGURE 22.—Comparison of power coefficient from force measurements and yaw-meter measurements. Propeller C–8

propeller but otherwise shows very nearly the same characteristics.

Total thrust and torque.—From a comparison of the total propeller thrust and torque from the force tests and yawmeter tests, Figures 11 to 16, and 21 to 26, respectively, the following may be noted:

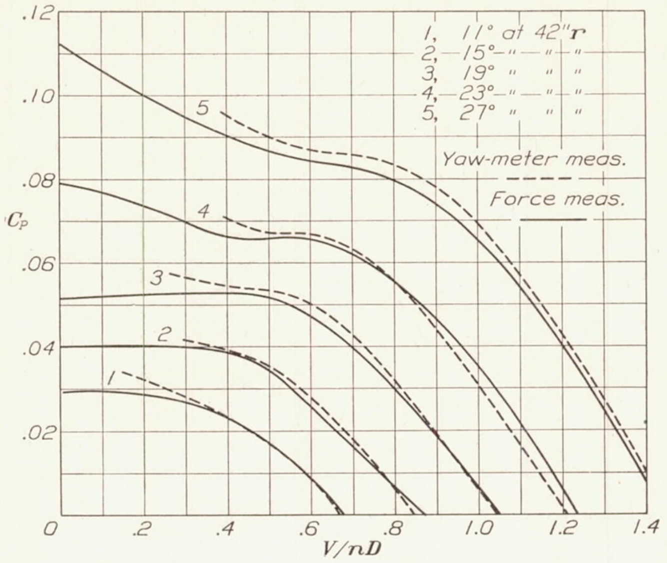

FIGURE 23.—Comparison of power coefficient from force measurements and yawmeter measurements. Propeller C–10

(1) The constant hub-drag coefficient brings all of the thrust curves like those shown in Figure 9 into very good agreement at the point of zero thrust. It should do this for ordinary propellers that have a washout of pitch toward the hub, since where there is zero thrust the slip stream should be negligible and consequently the drag due to the slip stream should be zero.

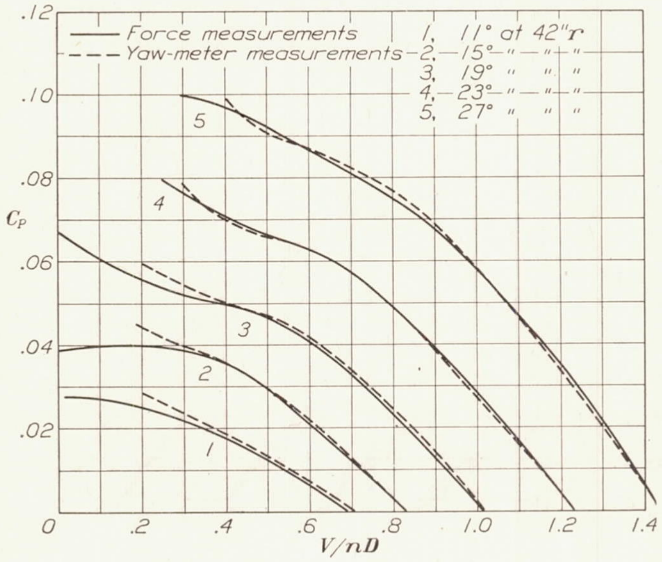

FIGURE 24.—Comparison of power coefficient from force measurements and yawmeter measurements. Propeller R–6

(2) The thrust curves of Figure 9 have a very uniform separation which is due to the increase in body drag caused by the slip stream. This difference in the ordinates of the two thrust curves at any $\frac{V}{n\,D}$ is called $\triangle C_T$ and is plotted against the total C_T in Figure 10. The increase in body drag due to the slip stream is approximately equal to 8 per cent of the total thrust of the propeller for this particular type of body. This relationship is independent of pitch setting, provided that the propeller is set to have a washout of pitch toward the hub. If, as with the 9.8° and 7° settings (fig. 3), the geometric pitch is constant along the blade, or increases toward the hub, the curves of integrated and measured thrust do not go through zero at the same $\frac{V}{n\,D}$, consequently this relationship does not hold. In such propellers, when

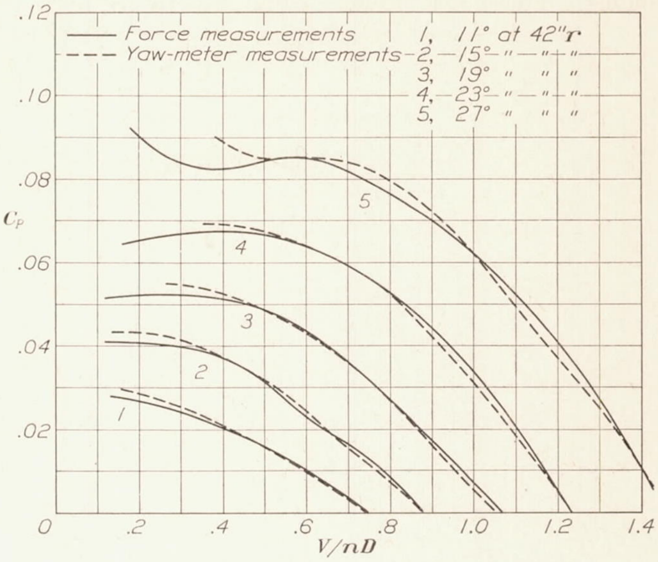

FIGURE 25.—Comparison of power coefficient from force measurements and yawmeter measurements. Propeller R–8

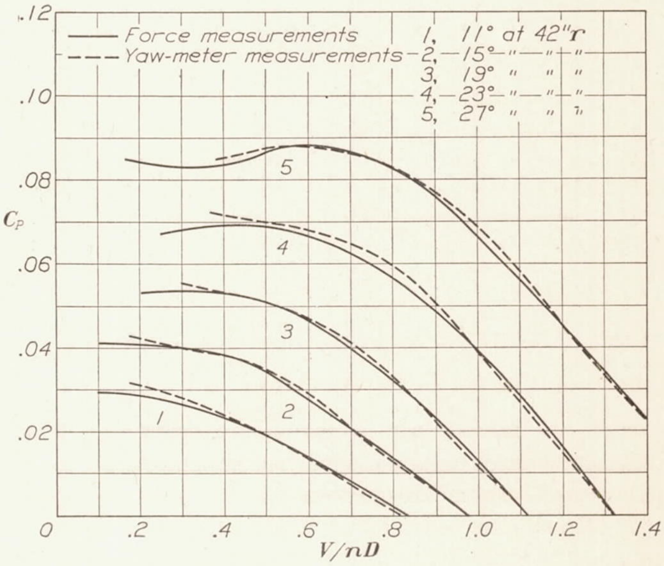

FIGURE 26.—Comparison of power coefficient from force measurements and yawmeter measurements. Propeller R–10

the total thrust is zero, the velocity of the slip stream over the body is greater than the free-air velocity, because of the positive thrust on the inner sections and negative thrust on the outer sections of the blades. These low pitch settings are rarely used in practice, consequently the above relationship is sufficiently accurate for practical purposes.

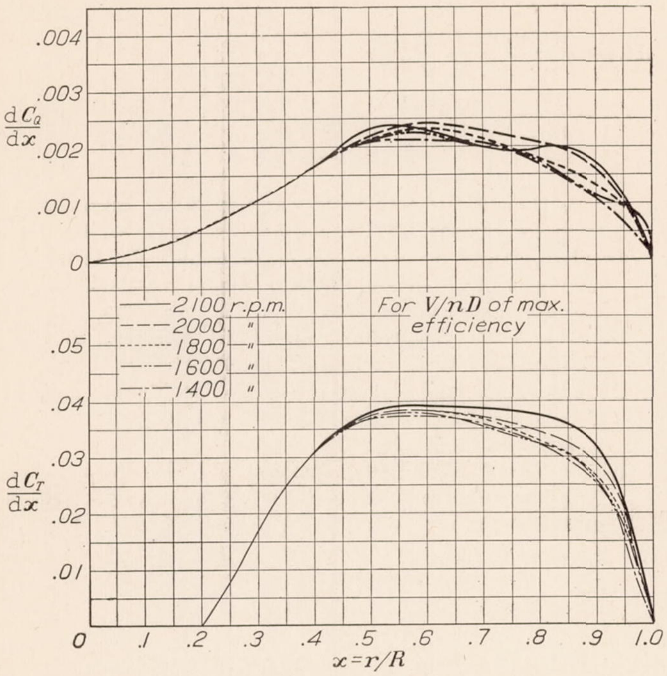

FIGURE 27.—Variation of thrust and torque distribution due to change in r. p. m. Propeller C-6. Set 7° at 42-inch radius. Low r. p. m.

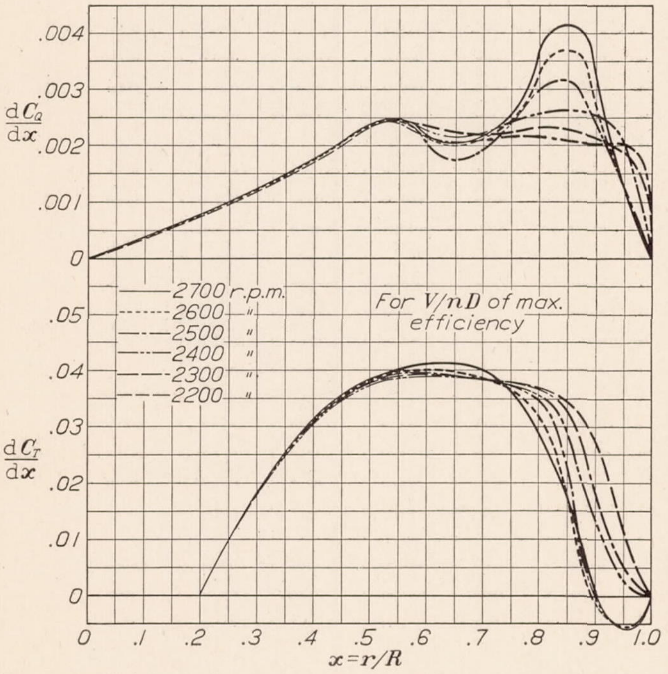

FIGURE 28.—Variation of thrust and torque distribution due to change in r. p. m. Propeller C-6. Set 7° at 42-inch radius. High r. p. m.

(3) The agreement of the effective thrust coefficients obtained by the two methods indicates that the above factors are very satisfactory in predicting total thrust from total head measurements.

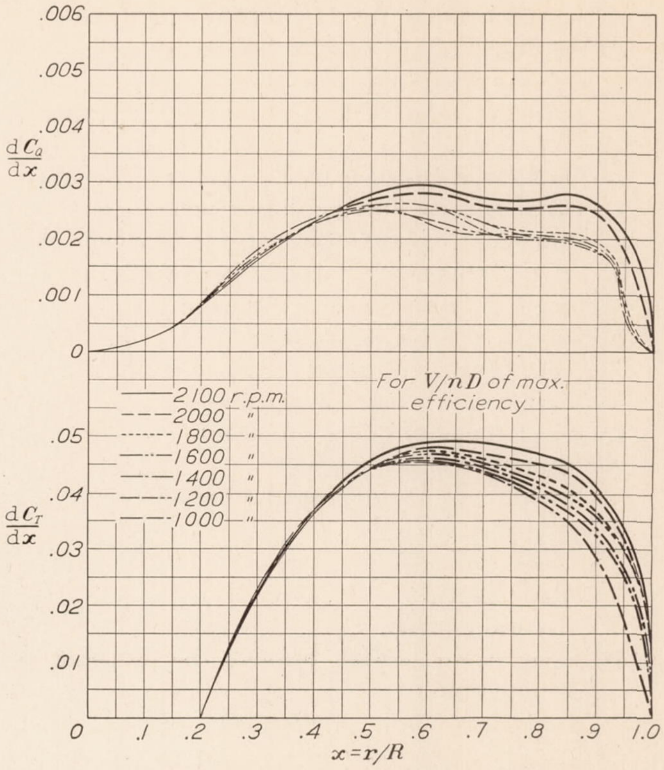

FIGURE 29.—Variation of thrust and torque distribution due to change in r. p. m. Propeller R-6. Set 7° at 42-inch radius. Low r. p. m.

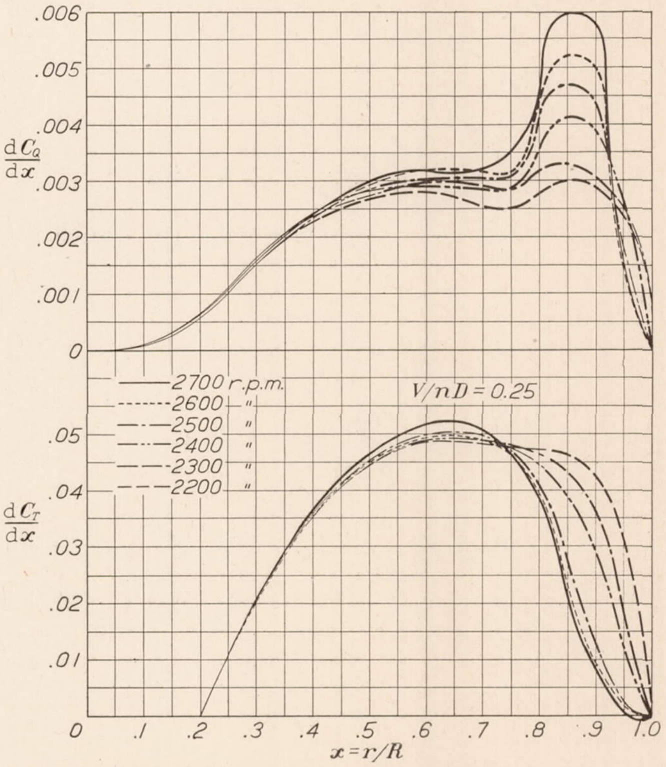

FIGURE 30.—Variation of thrust and torque distribution due to change in r. p. m. Propeller R-6. Set 7° at 42-inch radius. High r. p. m.

(4) The power curves are in good agreement.

LANGLEY MEMORIAL AERONAUTICAL LABORATORY,
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS,
LANGLEY FIELD, VA., *April 15, 1932.*

LIST OF SYMBOLS

H_y—recorded differential pressure in yaw head tubes due to the twist of the slip stream
H_T—recorded total head behind the propeller with propeller running
H_{T_0}—recorded total head at the same point with the propeller off
H—total head added by the propeller $= H_T - H_{T_0}$
U—axial velocity through the propeller plane
V_1—tangential velocity through the propeller plane
W—resultant velocity through the propeller plane
ψ—angle of twist of the slip stream
K—constant for each yawmeter
ρ—mass density of the air
r—radius of any blade element
D—total diameter of the propeller
R—tip radius of the propeller
n—revolutions of the propeller per unit time
P—propeller pitch
h—blade thickness
b—blade width
V—free-air velocity
M—mass of air passing through the propeller per unit time
Q—torque of the propeller

$$C_P = \frac{\text{Power}}{\rho n^3 D^5}$$

T—thrust

$$C_T = \frac{T}{\rho n^2 D^4}$$

$$\Delta C_T = \frac{\text{propeller thrust–effective thrust}}{\rho n^2 D^4}$$

$$C_Q = \frac{Q}{\rho n^2 D^5}$$

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TABLE I

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller C–6. (From faired curves)

Setting	$\frac{V}{nD}$	$x=0.421$		$x=0.526$		$x=0.631$		$x=0.737$		$x=0.842$		$x=0.947$	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
11°	0.20	0.0568	0.00354	0.0795	0.00570	0.0961	0.00550	0.1086	0.00700	0.1112	0.00800	0.0660	0.00506
11°	.30	.0480	.00313	.0652	.00435	.0777	.00455	.0870	.00570	.0905	.00580	.0675	.00500
11°	.40	.0362	.00260	.0475	.00348	.0554	.00335	.0605	.00420	.0630	.00430	.0460	.00390
11°	.50	.0220	.00196	.0275	.00240	.0300	.00300	.0315	.00240	.0315	.00250	.0230	.00210
11°	.60	.0072	.00105	.0061	.00072	.0040	.00010	.0010	.00020	−.0020	.00025	−.0005	.00000
15°	.20	.0708	.00470	.1001	.00708	.1249	.00795	.1427	.01250	.1478	.01565	----------	----------
15°	.30	.0648	.00460	.0920	.00680	.1147	.00730	.1352	.01075	.1465	.01225	.1128	.01250
15°	.40	.0548	.00432	.0780	.00621	.0980	.00650	.1142	.00900	.1254	.01025	.1057	.01050
15°	.50	.0421	.00374	.0588	.00510	.0738	.00560	.0862	.00720	.0954	.00835	.0811	.00811
15°	.60	.0288	.00287	.0390	.00355	.0485	.00430	.0580	.00510	.0653	.00625	.0553	.00550
15°	.70	.0152	.00172	.0193	.00168	.0231	.00235	.0298	.00280	.0350	.00380	.0295	.00265
19°	.20	.0802	.00600	.1150	.00900	.1428	.01125	.1482	.01705	.1320	.02520	----------	----------
19°	.30	.0758	.00595	.1092	.00897	.1375	.01090	.1560	.01450	.1500	.01800	.1240	.01800
19°	.40	.0705	.00585	.1012	.00873	.1290	.01040	.1530	.01310	.1550	.01550	.1265	.01540
19°	.50	.0600	.00550	.0881	.00814	.1130	.00970	.1350	.01190	.1460	.01430	.1220	.01400
19°	.60	.0478	.00500	.0690	.00700	.0908	.00870	.1090	.01030	.1200	.01250	.1015	.01200
19°	.70	.0345	.00418	.0500	.00546	.0665	.00700	.0815	.00820	.0920	.01050	.0783	.00970
19°	.80	.0213	.00295	.0305	.00345	.0425	.00430	.0540	.00590	.0640	.00830	.0550	.00710
19°	.90	.0075	.00132	.0113	.00102	.0180	.00080	.0263	.00310	.0363	.00570	.0315	.00410
23°	.20	.0963	.00780	.1370	.01215	.1484	.01880	.1323	.03105	.1325	.03570	----------	----------
23°	.30	.0900	.00782	.1295	.01185	.1520	.01635	.1522	.02500	.1432	.02930	----------	----------
23°	.40	.0830	.00775	.1208	.01145	.1515	.01460	.1620	.02040	.1485	.02420	.1050	.02210
23°	.50	.0755	.00760	.1111	.01098	.1440	.01380	.1612	.01790	.1575	.02130	.1260	.02010
23°	.60	.0670	.00730	.0983	.01028	.1290	.01290	.1526	.01660	.1595	.01940	.1345	.01880
23°	.70	.0550	.00668	.0822	.00920	.1090	.01160	.1340	.01520	.1425	.01750	.1195	.01690
23°	.80	.0422	.00563	.0640	.00750	.0860	.01000	.1063	.01370	.1175	.01550	.1000	.01440
23°	.90	.0293	.00422	.0448	.00550	.0625	.00820	.0810	.01180	.0925	.01340	.0810	.01160
23°	1.00	.0163	.00255	.0253	.00330	.0388	.00590	.0540	.00910	.0675	.01080	.0612	.00850
23°	1.10	.0035	.00070	.0055	.00100	.0150	.00310	.0280	.00500	.0425	.00750	.0415	.00540
27°	.30	.1049	.01038	.1495	.01648	.1745	.02600	.1100	.03700	----------	----------	----------	----------
27°	.40	.0970	.01000	.1428	.01583	.1840	.02270	.1360	.03450	.1400	.03520	.1035	.02990
27°	.50	.0895	.00980	.1333	.01497	.1735	.01980	.1580	.03030	.1490	.03140	.1195	.02760
27°	.60	.0814	.00960	.1220	.01410	.1590	.01750	.1660	.02560	.1550	.02810	.1275	.02570
27°	.70	.0724	.00930	.1095	.01314	.1430	.01630	.1625	.02210	.1600	.02560	.1315	.02390
27°	.80	.0620	.00880	.0960	.01210	.1260	.01590	.1520	.02030	.1600	.02380	.1295	.02210
27°	.90	.0500	.00795	.0798	.01075	.1080	.01440	.1340	.01840	.1460	.02160	.1210	.02040
27°	1.00	.0380	.00660	.0617	.00888	.0870	.01170	.1115	.01590	.1258	.01850	.1075	.01780
27°	1.10	.0260	.00485	.0423	.00650	.0635	.00890	.0865	.01250	.1025	.01480	.0910	.01460
27°	1.20	.0140	.00285	.0225	.00385	.0394	.00570	.0600	.00860	.0770	.01070	.0720	.01050

TABLE II

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller C-8. (From faired curves)

Setting	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
11°	0.20	0.0593	0.00420	0.0815	0.00550	0.0995	0.00672	0.1170	0.00773	0.1145	0.00848	0.0820	0.00590
11°	.30	.0508	.00380	.0683	.00500	.0828	.00596	.0968	.00670	.0980	.00752	.0730	.00585
11°	.40	.0390	.00328	.0510	.00414	.0615	.00505	.0720	.00555	.0750	.00610	.0580	.00441
11°	.50	.0250	.00242	.0317	.00285	.0375	.00378	.0442	.00410	.0460	.00408	.0345	.00275
11°	.60	.0095	.00130	.0102	.00125	.0119	.00165	.0155	.00200	.0150	.00165	.0100	.00101
15°	.20	.0709	.00550	.1019	.00755	.1284	.01014	.1538	.01179	.1510	.01595	.0790	.01225
15°	.30	.0655	.00539	.0935	.00730	.1184	.00975	.1420	.01110	.1500	.01352	.1080	.01215
15°	.40	.0558	.00505	.0790	.00680	.1010	.00915	.1232	.01025	.1340	.01234	.1040	.01045
15°	.50	.0435	.00432	.0610	.00588	.0790	.00800	.0975	.00900	.1055	.01065	.0840	.00830
15°	.60	.0300	.00322	.0412	.00435	.0545	.00612	.0685	.00700	.0740	.00805	.0580	.00585
15°	.70	.0150	.00180	.0200	.00225	.0282	.00360	.0390	.00442	.0410	.00470	.0310	.00325
19°	.20	.0792	.00695	.1121	.00940	.1410	.01375	.1545	.01620	.1280	.02190	--------	.01750
19°	.30	.0755	.00690	.1085	.00940	.1378	.01285	.1620	.01468	.1630	.01800	.0920	.01690
19°	.40	.0697	.00670	.1014	.00930	1292	01232	.1555	.01410	.1670	.01690	.1290	.01565
19°	.50	.0605	.00632	.0885	.00882	.1150	.01195	.1400	.01362	.1510	.01660	.1280	.01380
19°	.60	.0485	.00560	.0710	.00775	.0940	.01092	.1185	.01272	.1280	.01540	.1080	.01150
19°	.70	.0350	.00442	.0520	.00614	.0705	.00922	.0935	.01100	.1010	.01300	.0860	.00885
19°	.80	.0215	.00300	.0320	.00412	.0465	.00690	.0654	.00838	.0730	.00980	.0620	.00610
19°	.90	.0076	.00140	.0120	.00185	.0222	.00420	.0370	.00500	.0420	.00580	.0370	.00330
23°	.20	.0900	.00840	.1211	.01272	.1532	.01990	.1090	.02540	.1020	.03110	--------	--------
23°	.30	.0865	.00840	.1210	.01260	.1528	.01680	.1470	.02160	.1330	.02820	--------	--------
23°	.40	.0821	.00835	.1190	.01237	.1496	.01505	.1705	.01940	.1550	.02555	.1040	.02040
23°	.50	.0755	.00827	.1120	.01200	.1425	.01450	.1705	.01850	.1660	.02315	.1220	.01960
23°	.60	.0660	.00795	.0990	.01140	.1300	.01380	.1588	.01765	.1640	.02120	.1340	.01780
23°	.70	.0548	.00725	.0830	.01035	.1120	.01250	.1395	.01650	.1490	.01990	.1250	.01550
23°	.80	.0422	.00595	.0650	.00865	.0905	.01030	.1145	.01489	.1250	.01855	.1050	.01290
23°	.90	.0290	.00435	.0460	.00645	.0670	.00780	.0890	.01215	.0990	.01620	.0840	.01015
23°	1.00	.0152	.00252	.0268	.00400	.0422	.00490	.0632	.00920	.0720	.01290	.0630	.00725
23°	1.10	.0016	.00058	.0075	.00130	.0172	.00190	.0375	.00575	.0450	.00900	.0420	.00435
27°	.30	.1029	.01062	.1395	.01560	.1660	.02590	--------	.03170	--------	--------	--------	--------
27°	.40	.0954	.01003	.1365	.01463	.1733	.02300	.1225	.02840	.0720	.03310	.0640	.02790
27°	.50	.0878	.00990	.1282	.01452	.1645	.02095	.1535	.02590	.1240	.03050	.0835	.02480
27°	.60	.0800	.00986	.1190	.01435	.1552	.01990	.1762	.02430	.1570	.02890	.1020	.02280
27°	.70	.0713	.00970	.1085	.01397	.1440	.01970	.1738	.02370	.1720	.02820	.1180	.02200
27°	.80	.0612	.00915	.0950	.01315	.1281	.01915	.1575	.02290	.1640	.02720	.1300	.02130
27°	.90	.0492	.00795	.0770	.01165	.1080	.01765	.1370	.02100	.1450	.02560	.1225	.01950
27°	1.00	.0368	.00635	.0580	.00955	.0860	.01520	.1140	.01820	.1235	.02290	.1062	.01690
27°	1.10	.0242	.00442	.0390	.00695	.0635	.01200	.0900	.01470	.1010	.01930	.0890	.01370
27°	1.20	.0115	.00230	.0205	.00410	.0410	.00830	.0652	.01090	.0790	.01505	.0720	.01010

TABLE III

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller C-10. (From faired curves)

Setting	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
11°	0.20	0.0610	0.00425	0.0855	0.00579	0.1060	0.00750	0.1256	0.00850	0.1260	0.01055	--------	--------
11°	.30	.0530	.00385	.0725	.00530	.0901	.00670	.1067	.00760	.1128	.00750	0.0860	0.00645
11°	.40	.0411	.00332	.0553	.00452	.0693	.00570	.0823	.00650	.0872	.00600	.0695	.00475
11°	.50	.0268	.00237	.0357	.00320	.0452	.00435	.0541	.00509	.0580	.00480	.0480	.00270
11°	.60	.0112	.00103	.0140	.00135	.0190	.00215	.0238	.00290	.0271	.00207	.0225	.00050
15°	.20	.0703	.00536	.1005	.00745	.1288	.01010	.1548	.01160	.1412	.01715	--------	--------
15°	.30	.0647	.00505	.0923	.00728	.1195	.00980	.1435	.01130	.1449	.01410	.1013	.01090
15°	.40	.0556	.00482	.0795	.00690	.1038	.00920	.1255	.01084	.1330	.01212	.1020	.01020
15°	.50	.0440	.00430	.0630	.00600	.0824	.00825	.1023	.00992	.1095	.01090	.0875	.00868
15°	.60	.0308	.00320	.0442	.00451	.0586	.00645	.0752	.00830	.0823	.00860	.0683	.00670
15°	.70	.0170	.00168	.0238	.00258	.0345	.00395	.0462	.00590	.0544	.00570	.0475	.00425
19°	.20	.0815	.00675	.1140	.00972	.1478	.01340	.1773	.01535	.1738	.02180	--------	--------
19°	.30	.0782	.00658	.1102	.00968	.1430	.01290	.1749	.01535	.1830	.01750	.1250	.01555
19°	.40	.0710	.00648	.1030	.00950	.1349	.01262	.1650	.01525	.1747	.01670	.1400	.01470
19°	.50	.0612	.00635	.0910	.00910	.1207	.01260	.1485	.01504	.1586	.01660	.1325	.01370
19°	.60	.0500	.00572	.0750	.00832	.1020	.01190	.1266	.01467	.1375	.01610	.1155	.01240
19°	.70	.0375	.00466	.0569	.00685	.0800	.01010	.1010	.01315	.1123	.01420	.0955	.01050
19°	.80	.0245	.00315	.0368	.00475	.0560	.00750	.0740	.01025	.0852	.01150	.0750	.00818
19°	.90	.0112	.00128	.0160	.00215	.0310	.00430	.0468	.00705	.0567	.00765	.0544	.00530
23°	.20	.0916	.00879	.1247	.01312	.1595	.01970	.1453	.02360	.1124	.03290	--------	--------
23°	.30	.0890	.00855	.1241	.01261	.1632	.01800	.1800	.01975	.1565	.02690	--------	--------
23°	.40	.0832	.00840	.1212	.01218	.1590	.01680	.1860	.01870	.1822	.02310	.1275	.01860
23°	.50	.0755	.00833	.1130	.01189	.1496	.01630	.1802	.01840	.1842	.02125	.1500	.01790
23°	.60	.0665	.00821	.1015	.01172	.1360	.01640	.1670	.01800	.1753	.02100	.1462	.01700
23°	.70	.0560	.00751	.0865	.01094	.1182	.01550	.1480	.01720	.1585	.02058	.1305	.01535
23°	.80	.0442	.00625	.0695	.00945	.0973	.01365	.1252	.01580	.1360	.01870	.1135	.01320
23°	.90	.0315	.00452	.0508	.00730	.0745	.01095	.1000	.01320	.1120	.01555	.0957	.01072
23°	1.00	.0183	.00270	.0315	.00455	.0512	.00765	.0736	.00975	.0870	.01120	.0778	.00800
23°	1.10	.0057	.00085	.0121	.00145	.0277	.00400	.0468	.00590	.0618	.00620	.0598	.00520
27°	.30	.0990	.01047	.1428	.01560	.1517	.02245	.1630	.02800	--------	--------	--------	--------
27°	.40	.0940	.01002	.1347	.01485	.1685	.02126	.1842	.02550	.0987	.03650	.1120	.02425
27°	.50	.0882	.00998	.1292	.01480	.1693	.02070	.1945	.02500	.1420	.03105	.1135	.02245
27°	.60	.0815	.01011	.1226	.01479	.1630	.02090	.1920	.02490	.1782	.02765	.1213	.02190
27°	.70	.0732	.00994	.1118	.01460	.1510	.02100	.1820	.02470	.1830	.02630	.1420	.02195
27°	.80	.0630	.00934	.0975	.01384	.1344	.02070	.1660	.02420	.1718	.02605	.1417	.02135
27°	.90	.0514	.00820	.0810	.01240	.1145	.01950	.1460	.02330	.1553	.02590	.1324	.01975
27°	1.00	.0388	.00660	.0630	.01035	.0925	.01730	.1240	.02165	.1360	.02450	.1173	.01735
27°	1.10	.0260	.00470	.0441	.00780	.0704	.01440	.1000	.01880	.1144	.02180	.1010	.01440
27°	1.20	.0129	.00260	.0254	.00495	.0482	.01105	.0760	.01525	.0915	.01780	.0843	.01120

TABLE IV

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller C–6. Set 9.8° at 42-inch radius. (From faired curves)

R. p. m.	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
1,200	0.10	0.0600	0.00300	0.0787	0.00430	0.0903	0.00482	0.0950	0.00570	0.0885	0.00605	---	0.00043
1,200	.20	.0546	.00276	.0693	.00375	.0797	.00442	.0844	.00485	.0816	.00522	0.0551	.00114
1,200	.30	.0450	.00243	.0556	.00321	.0630	.00390	.0659	.00387	.0648	.00414	.0448	.00155
1,200	.40	.0323	.00203	.0385	.00264	.0410	.00322	.0410	.00273	.0400	.00290	.0270	.00150
1,200	.50	.0178	.00150	.0200	.00202	.0180	.00215	.0104	.00143	.0153	.00145	.0064	.00120
1,200	.60	.0017	.00067	.0000	.00131	–.0052	.00044	–.0085	.00000	–.0095	–.00017	–.0154	.00060
1,400	.10	.0618	.00310	.0802	.00450	.0920	.00502	.0980	.00639	.0920	.00773	---	–.00135
1,400	.20	.0550	.00287	.0705	.00400	.0805	.00443	.0855	.00532	.0854	.00550	.0570	.00227
1,400	.30	.0444	.00240	.0563	.00340	.0628	.00377	.0660	.00422	.0656	.00416	.0465	.00285
1,400	.40	.0310	.00215	.0384	.00267	.0412	.00293	.0423	.00300	.0403	.00270	.0284	.00220
1,400	.50	.0163	.00160	.0183	.00165	.0180	.00173	.0145	.00165	.0127	.00097	.0058	.00070
1,400	.60	.0000	.00025	–.0030	.00000	–.0105	–.00033	–.0146	–.00010	–.0150	–.00133	–.0195	–.00140
1,600	.10	.0618	.00310	.0814	.00457	.0940	.00543	.1033	.00638	.0990	.00772	---	–.00135
1,600	.20	.0546	.00290	.0715	.00410	.0815	.00467	.0875	.00530	.0886	.00565	.0350	.00227
1,600	.30	.0440	.00260	.0567	.00353	.0634	.00390	.0664	.00420	.0674	.00436	.0481	.00285
1,600	.40	.0309	.00211	.0387	.00275	.0413	.00298	.0420	.00300	.0413	.00295	.0282	.00220
1,600	.50	.0163	.00135	.0184	.00166	.0166	.00172	.0152	.00163	.0132	.00140	.0052	.00070
1,600	.60	.0005	–.00006	–.0033	–.00005	–.0094	–.00044	–.0122	–.00008	–.0154	–.00013	–.0193	–.00140
1,800	.10	.0617	.00332	.0823	.00490	.0957	.00566	.1060	.00675	.1065	.00875	---	---
1,800	.20	.0546	.00300	.0718	.00434	.0834	.00490	.0917	.00563	.0932	.00585	.0365	.00465
1,800	.30	.0440	.00255	.0565	.00370	.0637	.00406	.0687	.00445	.0697	.00422	.0506	.00297
1,800	.40	.0308	.00202	.0383	.00283	.0414	.00310	.0430	.00315	.0425	.00308	.0302	.00205
1,800	.50	.0162	.00140	.0182	.00162	.0172	.00180	.0152	.00158	.0133	.00176	.0065	.00072
1,800	.60	.0003	.00050	–.0030	–.00070	–.0125	–.00030	–.0195	–.00054	–.0160	.00030	–.0187	–.00084
2,000	.10	.0600	.00340	.0803	.00500	.0960	.00603	.1096	.00737	.1115	---	---	---
2,000	.20	.0545	.00305	.0727	.00442	.0865	.00507	.0977	.00597	.1023	.00693	.0390	.00587
2,000	.30	.0445	.00263	.0575	.00378	.0665	.00400	.0735	.00460	.0757	.00494	.0563	.00410
2,000	.40	.0312	.00211	.0390	.00297	.0427	.00290	.0453	.00312	.0455	.00318	.0333	.00226
2,000	.50	.0156	.00136	.0180	.00183	.0170	.00177	.0170	.00150	.0140	.00120	.0040	.00026
2,100	.10	.0618	.00358	.0858	.00520	.1067	.00590	.1182	.00765	---	---	---	.00115
2,100	.20	.0549	.00313	.0748	.00457	.0893	.00500	.1020	.00625	.1107	.00804	.0400	.00703
2,100	.30	.0447	.00262	.0591	.00382	.0684	.00407	.0757	.00482	.0812	.00561	.0640	.00497
2,100	.40	.0320	.00203	.0402	.00298	.0455	.00316	.0482	.00340	.0500	.00347	.0385	.00288
2,100	.50	.0180	.00143	.0195	.00210	.0205	.00270	.0198	.00196	.0156	.00140	.0063	.00217
2,200	.10	.0592	.00340	.0803	.00490	.1035	.00522	.1145	.00757	---	.01540	---	.00673
2,200	.20	.0552	.00306	.0747	.00447	.0895	.00464	.1035	.00628	.1107	.00870	.0365	.00612
2,200	.30	.0444	.00255	.0583	.00380	.0680	.00388	.0770	.00477	.0830	.00565	.0595	.00483
2,200	.40	.0313	.00202	.0395	.00297	.0443	.00305	.0475	.00313	.0500	.00346	.0361	.00303
2,200	.50	.0172	.00148	.0195	.00206	.0201	.00215	.0160	.00138	.0140	.00146	.0040	.00093
2,300	.20	---	.00312	---	.00482	---	.00483	---	.00612	---	.00916	---	.00675
2,300	.25	.0502	.00288	.0673	.00440	.0795	.00441	.0915	.00548	.0960	.00806	.0642	.00592
2,300	.30	.0450	.00264	.0590	.00396	.0696	.00397	.0797	.00482	.0826	.00680	.0548	.00505
2,300	.35	.0390	.00236	.0498	.00348	.0580	.00352	.0652	.00410	.0662	.00535	.0424	.00416
2,300	.40	.0322	.00207	.0400	.00300	.0451	.00303	.0488	.00337	.0490	.00387	.0269	.00326
2,300	.45	.0246	.00176	.0296	.00250	.0318	.00255	.0310	.00264	.0300	.00236	.0080	.00236

TABLE V

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller C–8. Set 9.8° at 42-inch radius. (From faired curves)

R. p. m.	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
1,200	0.10	0.0612	0.00385	0.0815	0.00430	0.0950	0.00525	0.1053	0.00540	0.0950	0.00600	–0.0600	0.00026
1,200	.20	.0550	.00345	.0720	.00380	.0842	.00463	.0932	.00483	.0883	.00507	.0394	.00175
1,200	.30	.0460	.00300	.0578	.00330	.0678	.00393	.0748	.00420	.0726	.00408	.0543	.00222
1,200	.40	.0335	.00240	.0403	.00265	.0466	.00310	.0516	.00336	.0491	.00301	.0347	.00200
1,200	.50	.0192	.00160	.0205	.00176	.0225	.00200	.0213	.00227	.0227	.00182	.0142	.00118
1,400	.10	.0610	.00390	.0810	.00452	.0955	.00544	.1068	.00575	.0990	.00646	–.0140	.00536
1,400	.20	.0553	.00350	.0717	.00400	.0844	.00481	.0943	.00515	.0922	.00537	.0395	.00436
1,400	.30	.0452	.00300	.0561	.00344	.0665	.00410	.0740	.00445	.0723	.00426	.0514	.00340
1,400	.40	.0324	.00240	.0382	.00274	.0446	.00325	.0497	.00360	.0482	.00315	.0338	.00235
1,400	.50	.0183	.00155	.0190	.00175	.0206	.00203	.0236	.00243	.0217	.00197	.0137	.00121
1,600	.10	.0624	.00390	.0840	.00467	.0996	.00542	.1102	.00595	.1040	.00700	–.0290	---
1,600	.20	.0556	.00350	.0727	.00412	.0860	.00478	.0962	.00530	.0957	.00576	.0340	.00490
1,600	.30	.0447	.00300	.0572	.00345	.0671	.00407	.0747	.00458	.0738	.00455	.0523	.00382
1,600	.40	.0322	.00240	.0391	.00270	.0447	.00320	.0500	.00375	.0488	.00333	.0343	.00270
1,600	.50	.0180	.00155	.0192	.00170	.0207	.00197	.0232	.00260	.0215	.00210	.0145	.00150
1,800	.10	.0602	.00390	.0817	.00484	.0984	.00576	.1115	.00650	.1100	.00890	---	---
1,800	.20	.0542	.00348	.0724	.00420	.0865	.00510	.0985	.00573	.0988	.00625	.0385	.00575
1,800	.30	.0444	.00300	.0563	.00350	.0673	.00410	.0763	.00488	.0775	.00475	.0545	.00432
1,800	.40	.0316	.00240	.0383	.00275	.0458	.00327	.0517	.00395	.0514	.00356	.0367	.00300
1,800	.50	.0173	.00154	.0194	.00180	.0223	.00167	.0256	.00273	.0238	.00253	.0160	.00176
2,000	.10	.0590	.00407	.0805	.00494	.1000	.00610	.1152	.00711	.1040	---	---	---
2,000	.20	.0555	.00360	.0741	.00430	.0890	.00527	.1030	.00623	.1071	.00750	.0415	.00665
2,000	.30	.0452	.00310	.0580	.00358	.0696	.00435	.0813	.00523	.0845	.00556	.0617	.00500
2,000	.40	.0321	.00245	.0398	.00278	.0467	.00325	.0543	.00413	.0558	.00403	.0410	.00362
2,000	.50	.0170	.00160	.0196	.00180	.0211	.00185	.0236	.00285	.0235	.00267	.0150	.00240
2,100	.10	.0600	.00400	.0830	.00506	.1026	.00640	.1190	.00745	.0920	---	---	---
2,100	.20	.0560	.00355	.0747	.00440	.0905	.00550	.1065	.00652	.1056	.00855	.0390	.00700
2,100	.30	.0450	.00303	.0590	.00366	.0707	.00450	.0833	.00550	.0874	.00623	.0596	.00570
2,100	.40	.0323	.00240	.0407	.00285	.0486	.00335	.0565	.00440	.0597	.00440	.0446	.00435
2,100	.50	.0182	.00154	.0211	.00180	.0244	.00185	.0264	.00300	.0247	.00270	.0196	.00286
2,200	.15	.0587	.00470	.0811	.00550	.0982	.00665	.1175	.00775	.1000	.01230	–.0400	.00646
2,200	.25	.0516	.00330	.0681	.00400	.0830	.00492	.0975	.00597	.0962	.00844	.0522	.00567
2,200	.35	.0400	.00297	.0507	.00361	.0610	.00425	.0715	.00527	.0747	.00604	.0425	.00487
2,200	.45	.0250	.00190	.0305	.00240	.0373	.00282	.0432	.00366	.0425	.00393	.0205	.00405
2,300	.15	---	---	---	---	---	---	---	---	---	---	---	---
2,300	.25	.0508	.00340	.0663	.00435	.0803	.00522	.0960	.00607	.0850	.00946	.0580	.00595
2,300	.35	.0397	.00298	.0514	.00350	.0622	.00417	.0725	.00505	.0715	.00748	.0445	.00560
2,300	.45	.0225	.00210	.0273	.00225	.0330	.00250	.0365	.00327	.0330	.00150	.0075	.00320

TABLE VI

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller C-10. Set 9.8° at 42-inch radius. (From faired curves)

R. p. m.	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
1200	0.10	0.0610	0.00377	0.0842	0.00456	0.1007	0.00588	0.1130	0.00640	0.1040	----------	----------	0.00070
1200	.20	.0555	.00340	.0743	.00420	.0895	.00519	.0997	.00567	.0946	0.00480	0.0630	.00168
1200	.30	.0460	.00297	.0603	.00377	.0732	.00442	.0811	.00486	.0795	.00387	.0575	.00213
1200	.40	.0340	.00240	.0434	.00318	.0527	.00354	.0585	.00395	.0590	.00290	.0442	.00184
1200	.50	.0202	.00166	.0245	.00229	.0300	.00245	.0335	.00286	.0347	.00173	.0267	.00080
1200	.60	.0054	.00047	.0045	.00082	.0055	.00090	.0070	.00137	.0083	.00003	.0066	−.00100
1400	.10	.0610	.00380	.0830	.00450	.1001	.00614	.1140	.00668	.1068	.00817	−.0200	----------
1400	.20	.0552	.00353	.0738	.00413	.0892	.00545	.0995	.00587	.0982	.00558	.0440	.00420
1400	.30	.0456	.00320	.0593	.00370	.0717	.00470	.0800	.00500	.0794	.00424	.0585	.00331
1400	.40	.0330	.00247	.0421	.00323	.0506	.00380	.0570	.00405	.0565	.00322	.0440	.00235
1400	.50	.0192	.00180	.0237	.00220	.0275	.00260	.0320	.00293	.0320	.00198	.0260	.00118
1400	.60	.0040	.00051	.0031	.00112	.0045	.00070	.0060	.00148	.0075	.00030	----------	----------
1600	.10	.0610	.00380	.0842	.00468	.1019	.00625	.1175	.00685	.1135	----------	−.0245	----------
1600	.20	.0554	.00353	.0741	.00433	.0899	.00555	.1012	.00610	.1005	.00530	.0425	.00465
1600	.30	.0458	.00320	.0598	.00390	.0730	.00480	.0810	.00528	.0820	.00446	.0603	.00370
1600	.40	.0332	.00247	.0433	.00330	.0522	.00394	.0588	.00435	.0592	.00348	.0462	.00265
1600	.50	.0193	.00180	.0245	.00242	.0295	.00278	.0345	.00322	.0340	.00228	.0278	.00145
1600	.60	.0042	.00051	.0040	.00135	.0055	.00098	.0060	.00166	.0075	.00050	----------	.00018
1800	.10	.0620	.00380	.0860	.00474	.1040	.00643	.1222	.00732	.1180	----------	−.0245	----------
1800	.20	.0560	.00353	.0762	.00440	.0923	.00571	.1055	.00645	.1075	.00590	.0435	.00535
1800	.30	.0460	.00320	.0617	.00400	.0743	.00493	.0845	.00554	.0874	.00495	.0658	.00420
1800	.40	.0333	.00247	.0437	.00340	.0535	.00402	.0605	.00450	.0625	.00382	.0490	.00300
1800	.50	.0191	.00180	.0242	.00252	.0293	.00285	.0340	.00330	.0355	.00250	.0273	.00162
1800	.60	.0037	.00051	.0029	.00148	.0050	.00104	.0050	.00169	.0050	.00062	.0030	----------
2000	.10	.0612	.00380	.0850	.00484	.1050	.00657	.1208	.00776	.0880	----------	−.0185	----------
2000	.20	.0558	.00353	.0765	.00450	.0930	.00585	.1080	.00683	.1050	.00808	.0435	.00645
2000	.30	.0463	.00320	.0625	.00410	.0770	.00505	.0892	.00583	.0924	.00590	.0618	.00502
2000	.40	.0336	.00247	.0437	.00352	.0548	.00415	.0638	.00475	.0700	.00423	.0545	.00350
2000	.50	.0195	.00180	.0226	.00262	.0280	.00298	.0335	.00345	.0395	.00275	.0272	.00186
2100	.10	.0600	.00380	.0845	.00505	.1037	.00680	.1222	.00806	.0773	----------	−.0127	----------
2100	.20	.0556	.00353	.0773	.00463	.0940	.00608	.1093	.00710	.0925	.01040	.0315	.00685
2100	.30	.0465	.00320	.0636	.00416	.0775	.00530	.0905	.00608	.0885	.00760	.0540	.00555
2100	.40	.0337	.00247	.0450	.00354	.0557	.00438	.0652	.00495	.0683	.00502	.0455	.00415
2100	.50	.0187	.00180	.0245	.00263	.0307	.00317	.0367	.00351	.0338	.00295	.0102	----------
2200	.20	.0555	.00342	.0760	.00453	.0936	.00581	.1097	.00676	.0720	.01064	.0320	.00420
2200	.25	.0517	.00350	.0706	.00460	.0865	.00576	.1015	.00664	.0830	.00980	.0490	.00506
2200	.30	.0467	.00338	.0634	.00440	.0775	.00547	.0913	.00629	.0820	.00874	.0465	.00537
2200	.35	.0403	.00310	.0545	.00404	.0666	.00500	.0785	.00572	.0757	.00745	.0403	.00520
2200	.40	.0334	.00266	.0445	.00353	.0547	.00434	.0633	.00496	.0634	.00596	.0300	.00486
2200	.45	.0250	.00210	.0330	.00285	.0413	.00350	.0480	.00400	.0466	.00433	.0150	.00412
2300	.30	.0460	.00320	.0620	.00433	.0765	.00570	.0890	.00662	.0734	.00807	.0473	.00577
2300	.35	.0404	.00303	.0544	.00396	.0673	.00522	.0788	.00607	.0646	.00728	.0365	.00574
2300	.40	.0334	.00260	.0445	.00343	.0546	.00457	.0643	.00534	.0534	.00605	.0223	.00493
2300	.45	.0248	.00196	.0325	.00276	.0390	.00372	.0450	.00440	.0404	.00516	.0055	.00400

TABLE VII

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller C-6. Set 7° at 42-inch radius. (From faired curves)

R. p. m.	$\frac{V}{nD}$	$x=0.421$		$x=0.526$		$x=0.631$		$x=0.737$		$x=0.842$		$x=0.947$	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{cx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
1200	0.10	0.0511	0.00226	0.0638	0.00290	0.0681	0.00315	0.0662	0.00320	0.0584	0.00328	−0.0215	−0.00048
1200	.20	.0441	.00199	.0528	.00260	.0545	.00299	.0533	.00292	.0478	.00240	.0240	.00121
1200	.30	.0334	.00161	.0375	.00215	.0365	.00240	.0337	.00201	.0303	.00130	.0162	.00050
1200	.40	.0201	.00107	.0193	.00141	.0154	.00130	.0096	.00070	.0060	−.00025	.0048	−.00105
1200	.45	.0128	.00070	.0093	.00086	.0040	.00057	−.0038	−.00022	−.0080	−.00140	−.0160	−.00190
1400	.10	.0515	.00240	.0645	.00300	.0685	.00335	.0688	.00331	.0630	.00380	−.0190	−.00016
1400	.20	.0440	.00196	.0529	.00275	.0560	.00283	.0562	.00269	.0496	.00237	.0323	.00116
1400	.30	.0339	.00180	.0370	.00213	.0370	.00212	.0345	.00197	.0300	.00159	.0164	.00071
1400	.40	.0197	.00130	.0190	.00132	.0147	.00106	.0090	.00103	.0053	.00052	−.0045	−.00024
1400	.45	.0122	.00090	.0085	.00085	.0020	.00026	−.0040	.00042	−.0084	−.00023	−.0155	−.00090
1600	.10	.0515	.00240	.0644	.00310	.0705	.00312	.0720	.00346	.0660	.00405	−.0210	−.00016
1600	.20	.0436	.00196	.0533	.00284	.0563	.00274	.0560	.00278	.0518	.00226	.0335	.00150
1600	.30	.0325	.00180	.0375	.00223	.0370	.00213	.0340	.00200	.0310	.00147	.0180	.00100
1600	.40	.0190	.00130	.0185	.00140	.0140	.00110	.0083	.00096	.0048	.00062	−.0050	.00021
1600	.45	.0118	.00090	.0085	.00094	.0016	.00030	−.0060	.00028	−.0100	.00012	−.0178	−.00032
1800	.10	.0505	.00240	.0640	.00327	.0710	.00374	.0740	.00363	.0690	.00416	−.0200	.00020
1800	.20	.0432	.00196	.0530	.00288	.0573	.00312	.0580	.00292	.0548	.00253	.0333	.00155
1800	.30	.0322	.00180	.0375	00222	.0380	.00232	.0355	.00207	.0310	.00161	.0190	.00116
1800	.40	.0185	.00130	.0175	.00135	.0138	.00110	.0080	.00090	.0025	.00060	−.0058	.00044
1800	.45	.0112	.00090	.0078	.00087	.0005	.00017	−.0070	.00010	−.0125	.00002	−.0183	−.00010
2000	.10	.0510	.00240	.0647	.00325	.0730	.00374	.0780	.00384	.0770	.00515	−.0125	.00025
2000	.20	.0435	.00196	.0538	.00295	.0582	.00305	.0610	.00308	.0598	.00313	.0360	.00250
2000	.30	.0325	.00180	.0380	.00228	.0380	.00235	.0360	.00215	.0330	.00194	.0205	.00110
2000	.40	.0185	.00130	.0180	.00144	.0145	.00120	.0075	.00083	.0025	.00065	−.0065	.00060
2000	.45	.0110	.00090	.0075	.00095	.0012	.00028	−.0072	−.00010	−.0140	−.00014	−.0210	.00012
2100	.10	.0518	.00261	.0662	.00338	.0755	.00378	.0825	.00406	.0823	.00578	−.0400	.00050
2100	.20	.0440	.00201	.0550	.00295	.0600	.00283	.0642	.00311	.0640	.00362	.0380	.00273
2100	.30	.0328	.00182	.0387	.00237	.0390	.00221	.0385	.00195	.0363	.00201	.0223	.00122
2100	.40	.0190	.00132	.0188	.00145	.0150	.00120	.0075	.00095	.0010	.00088	−.0090	.00055
2100	.45	.0116	.00087	.0075	.00040	.0020	.00000	−.0090	−.00032	−.0185	−.00040	−.0250	.00015
2200	.10	.0508	.00252	.0663	.00335	.0755	.00400	.0822	.00425	.0815	.00700	−.1000	.00025
2200	.20	.0440	.00211	.0550	.00301	.0600	.00277	.0640	.00330	.0665	.00378	.0410	.00327
2200	.30	.0328	.00183	.0385	.00241	.0388	.00225	.0383	.00223	.0351	.00230	.0228	.00193
2200	.40	.0183	.00128	.0180	.00137	.0140	.00103	.0080	.00073	−.0010	.00066	−.0100	.00120
2200	.45	.0100	.00079	.0066	.00047	.0002	−.00020	−.0085	−.00028	−.0210	−.00039	−.0288	.00108
2300	.10	.0518	.00266	.0677	.00356	.0777	.00371	.0860	.00430	.0800	.00961	----------	.00071
2300	.20	.0445	.00216	.0556	.00310	.0613	.00300	.0656	.00328	.0660	.00443	.0318	.00311
2300	.30	.0328	.00186	.0384	.00238	.0392	.00208	.0380	.00215	.0340	.00210	.0125	.00205
2300	.40	.0183	.00128	.0177	.00115	.0131	.00068	.0046	.00067	−.0052	.00075	−.0205	.00135
2300	.45	.0103	.00068	.0065	.00017	−.0010	−.00026	−.0133	−.00100	−.0260	.00010	−.0386	.00110
2400	.10	.0520	.00275	.0683	.00375	.0795	.00416	.0880	.00485	.0640	.00950	−.0385	.00113
2400	.20	.0448	.00211	.0560	.00306	.0625	.00315	.0670	.00340	.0604	.00578	+.0200	.00260
2400	.30	.0324	.00190	.0382	.00245	.0390	.00215	.0375	.00238	.0310	.00263	+.0033	.00218
2400	.40	.0172	.00116	.0170	.00096	.0110	.00035	.0018	.00015	−.0098	.00015	−.0285	.00040
2500	.15	.0492	.00264	.0634	.00366	.0723	.00373	.0804	.00447	.0640	.00865	−.0136	.00103
2500	.20	.0448	.00220	.0566	.00323	.0628	.00300	.0683	.00356	.0540	.00622	.0025	.00207
2500	.30	.0328	.00185	.0390	.00245	.0393	.00188	.0377	.00225	.0263	.00316	−.0050	.00128
2500	.35	.0252	.00160	.0273	.00205	.0260	.00141	.0200	.00182	.0087	.00202	−.0173	.00073
2600	.20	.0450	.00220	.0571	.00310	.0645	.00278	.0688	.00343	.0512	.00625	.0075	.00104
2600	.25	.0398	.00207	.0488	.00280	.0525	.00243	.0537	.00298	.0365	.00492	.0022	.00125
2600	.30	.0333	.00188	.0392	.00242	.0400	.00202	.0374	.00235	.0204	.00368	−.0052	.00135
2600	.35	.0255	.00163	.0285	.00195	.0263	.00158	.0203	.00155	.0030	.00255	−.0147	.00137
2700	.20	.0438	----------	.0565	----------	.0635	----------	.0654	----------	.0465	----------	.0090	----------
2700	.25	.0392	.00211	.0486	.00290	.0532	.00278	.0530	.00306	.0340	.00518	.0022	.00132
2700	.30	.0332	.00189	.0394	.00247	.0412	.00204	.0378	.00245	.0192	.00414	−.0055	.00135
2700	.35	.0261	.00158	.0290	.00194	.0277	.00122	.0202	.00182	.0025	.00310	−.0138	.00132

TABLE VIII

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller R-6. (From faired curves)

Setting	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
11°	0.20	0.0581	0.00403	0.0813	0.00541	0.0974	0.00640	0.1096	0.00702	0.1098	0.00855	0.0785	0.00780
11°	.30	.0496	.00372	.0658	.00501	.0780	.00560	.0869	.00590	.0892	.00590	.0725	.00535
11°	.40	.0379	.00310	.0475	.00426	.0555	.00465	.0605	.00470	.0633	.00425	.0511	.00400
11°	.50	.0231	.00222	.0273	.00324	.0307	.00350	.0320	.00335	.0338	.00315	.0272	.00302
11°	.60	.0063	.00119	.0063	.00205	.0054	.00235	.0033	.00180	.0032	.00165	.0030	.00150
15°	.20	.0715	.00533	.1020	.00768	.1276	.00960	.1490	.01125	.1489	.01530	.0700	.01400
15°	*.30*	*.0661*	*.00510*	*.0925*	*.00743*	*.1149*	*.00915*	*.1377*	*.01045*	*.1440*	*.01250*	*.1130*	*.01205*
15°	.40	.0565	.00475	.0780	.00700	.0967	.00845	.1171	.00945	.1253	.01060	.1118	.01020
15°	.50	.0438	.00401	.0600	.00617	.0742	.00730	.0880	.00790	.0945	.00845	.0865	.00810
15°	.60	.0290	.00298	.0402	.00490	.0490	.00570	.0570	.00590	.0624	.00603	.0578	.00580
15°	.70	.0130	.00175	.0180	.00337	.0229	.00385	.0261	.00360	.0303	.00340	.0291	.00325
19°	.20	.0800	.00660	.1190	.00973	.1525	.01260	.1725	.01680	.1735	.02370	.0800	.02040
19°	.30	.0762	.00652	.1128	.00969	.1438	.01230	.1668	.01510	.1705	.01725	.1180	.01720
19°	.40	.0695	.00630	.1020	.00949	.1296	.01195	.1540	.01375	.1622	.01460	.1304	.01510
19°	.50	.0602	.00582	.0870	.00898	.1111	.01120	.1339	.01290	.1454	.01365	.1230	.01390
19°	.60	.0488	.00502	.0695	.00812	.0898	.01020	.1075	.01180	.1185	.01210	.1030	.01190
19°	.70	.0359	.00411	.0504	.00700	.0661	.00860	.0790	.00985	.0885	.01000	.0768	.00940
19°	.80	.0211	.00280	.0302	.00542	.0422	.00650	.0505	.00720	.0589	.00740	.0541	.00660
19°	.90	.0042	.00082	.0100	.00352	.0180	.00400	.0240	.00430	.0305	.00435	.0340	.00360
23°	.20	.0910	.00812	.1309	.01130	.1720	.01645	.1760	.02440	.1470	----------	.0130	----------
23°	.30	.0876	.00811	.1295	.01180	.1670	.01600	.1895	.02065	.1570	.03240	.0780	.02460
23°	.40	.0832	.00805	.1245	.01205	.1595	.01560	.1885	.01870	.1720	.02470	.1185	.02250
23°	.50	.0768	.00787	.1140	.01215	.1477	.01540	.1770	.01850	.1850	.02060	.1415	.02060
23°	.60	.0675	.00753	.0996	.01198	.1310	.01480	.1575	.01820	.1730	.01920	.1404	.01910
23°	.70	.0570	.00687	.0828	.01135	.1111	.01340	.1335	.01690	.1460	.01750	.1240	.01705
23°	.80	.0449	.00570	.0643	.00990	.0889	.01130	.1075	.01465	.1190	.01500	.1030	.01460
23°	.90	.0309	.00410	.0452	.00795	.0650	.00890	.0815	.01170	.0915	.01200	.0831	.01200
23°	1.00	.0148	.00218	.0258	.00565	.0410	.00625	.0550	.00820	.0650	.00880	.0650	.00910
23°	1.10	−.0028	.00005	.0062	.00310	.0170	.00340	.0295	.00450	.0405	.00530	.0490	.00620
27°	.30	.1001	.01040	.1470	.01536	.1850	.02250	.1950	.03130	.1430	----------	.0695	----------
27°	.40	.0956	.01028	.1430	.01548	.1841	.02030	.2105	.02790	.1665	.03630	.1070	.03130
27°	.50	.0891	.01010	.1346	.01552	.1750	.01948	.2055	.02540	.1840	.03050	.1315	.02850
27°	.60	.0820	.00983	.1230	.01545	.1609	.01920	.1920	.02870	.1920	.02650	.1425	.02630
27°	.70	.0740	.00933	.1102	.01513	.1448	.01860	.1750	.02290	.1850	.02420	.1460	.02490
27°	.80	.0647	.00847	.0960	.01440	.1277	.01750	.1550	.02190	.1680	.02250	.1427	.02310
27°	.90	.0538	.00727	.0797	.01305	.1084	.01560	.1340	.02040	.1455	.02090	.1275	.02070
27°	*1.00*	*.0414*	*.00565*	*.0615*	*.01115*	*.0872*	.01320	*.1115*	.01770	*.1230*	.01840	.1097	.01800
27°	1.10	.0276	.00391	.0424	.00885	.0662	.01050	.0890	.01400	.1010	.01500	.0945	.01500
27°	1.20	.0118	.00205	.0233	.00625	.0455	.00760	.0670	.00980	.0795	.01100	.0815	.01200
27°	1.30	−.0055	.00015	.0040	.00350	.0255	.00450	.0443	.00530	.0600	.00650	.0695	.00890

TABLE IX

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller R-8. (From faired curves)

Setting	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
11°	0.20	0.0582	0.00417	0.0808	0.00553	0.0998	0.00662	0.1160	0.00800	0.1190	0.00845	0.0825	0.00645
11°	.30	.0495	.00377	.0664	.00512	.0810	.00573	.0942	.00682	.0990	.00670	.0755	.00645
11°	.40	.0370	.00315	.0485	.00443	.0590	.00470	.0690	.00550	.0710	.00565	.0561	.00535
11°	.50	.0218	.00232	.0285	.00332	.0345	.00345	.0410	.00410	.0430	.00426	.0342	.00400
11°	.60	.0046	.00134	.0071	.00187	.0098	.00211	.0120	.00250	.0141	.00260	.0118	.00225
15°	.20	.0720	.00538	.1047	.00740	.1310	.00970	.1550	.01153	.1525	.01530	.0800	.00980
15°	.30	.0645	.00522	.0935	.00712	.1185	.00927	.1420	.01051	.1510	.01265	.1095	.01120
15°	.40	.0543	.00485	.0777	.00657	.1005	.00846	.1220	.00921	.1330	.01055	.1075	.01070
15°	.50	.0411	.00411	.0588	.00562	.0770	.00710	.0930	.00773	.1040	.00846	.0870	.00900
15°	.60	.0259	.00305	.0381	.00427	.0495	.00535	.0610	.00615	.0665	.00630	.0555	.00664
15°	.70	.0091	.00181	.0162	.00266	.0260	.00341	.0335	.00440	.0405	.00420	.0357	.00395
19°	.30	.0775	.00670	.1133	.00936	.1490	.01220	.1770	.01483	.1795	.01750	.1270	.01610
19°	.40	.0695	.00640	.1025	.00904	.1335	.01170	.1610	.01410	.1695	.01630	.1338	.01575
19°	.50	.0591	.00600	.0875	.00855	.1140	.01100	.1390	.01223	.1500	.01475	.1245	.01410
19°	.60	.0472	.00541	.0696	.00774	.0920	.00984	.1140	.01192	.1255	.01265	.1062	.01180
19°	.70	.0328	.00450	.0497	.00645	.0685	.00820	.0867	.00995	.0980	.01027	.0820	.00930
19°	.80	.0167	.00320	.0288	.00470	.0445	.00620	.0600	.00747	.0700	.00768	.0605	.00678
19°	.90	−.0010	.00165	.0075	.00270	.0195	.00395	.0322	.00465	.0425	.00500	.0405	.00405
23°	.40	.0821	.00809	.1225	.01135	.1640	.01506	.1955	.01835	.2020	.02075	.1474	.01986
23°	.50	.0731	.00802	.1108	.01117	.1490	.01492	.1805	.01792	.1900	.02015	.1538	.01895
23°	.60	.0638	.00780	.0962	.01077	.1305	.01441	.1610	.01726	.1725	.01920	.1453	.01760
23°	.70	.0537	.00729	.0811	.00990	.1102	.01333	.1390	.01615	.1510	.01750	.1275	.01575
23°	.80	.0425	.00650	.0648	.00853	.0890	.01167	.1140	.01430	.1280	.01500	.1061	.01364
23°	.90	.0277	.00517	.0460	.00683	.0666	.00945	.0890	.01184	.1025	.01218	.0851	.01130
23°	1.00	.0100	.00333	.0250	.00490	.0445	.00712	.0635	.00900	.0765	.00910	.0670	.00880
23°	1.10	−.0106	.00119	.0020	.00280	.0220	.00462	.0375	.00590	.0504	.00600	.0501	.00625
27°	.40	.0958	.01027	.1410	.01449	.1845	.01950	.2145	.02370	.1705	.03350	.1275	.01910
27°	.50	.0908	.01017	.1372	.01443	.1803	.01947	.2145	.02345	.2003	.02826	.1460	.02030
27°	.60	.0828	.01000	.1267	.01422	.1690	.01940	.2045	.02318	.2125	.02600	.1580	.02315
27°	.70	.0727	.00967	.1128	.01379	.1530	.01900	.1867	.02260	.1980	.02570	.1642	.02366
27°	.80	.0613	.00908	.0967	.01294	.1335	.01782	.1650	.02170	.1780	.02458	.1520	.02295
27°	.90	.0488	.00798	.0790	.01144	.1122	.01610	.1415	.02020	.1555	.02240	.1300	.02145
27°	1.00	.0360	.00635	.0608	.00958	.0890	.01400	.1170	.01760	.1320	.01962	.1115	.01920
27°	1.10	.0230	.00437	.0422	.00750	.0665	.01166	.0925	.01440	.1032	.01645	.0945	.01655
27°	1.20	.0100	.00216	.0235	.00526	.0430	.00920	.0680	.01075	.0850	.01290	.0775	.01362
27°	1.30	−.0033	−.00073	.0048	.00301	.0200	.00670	.0430	.00685	.0610	.00925	.0605	.01050

TABLE X

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller R-10. (From faired curves)

Setting	$\frac{V}{nD}$	$x=0.421$		$x=0.526$		$x=0.631$		$x=0.737$		$x=0.842$		$x=0.947$	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
11°	0.20	0.0585	0.00402	0.0813	0.00530	0.1023	0.00663	0.1200	0.00810	0.1170	0.00970	0.0860	0.00860
11°	.30	.0492	.00371	.0681	.00490	.0860	.00610	.1020	.00726	.1085	.00779	.0830	.00790
11°	.40	.0373	.00326	.0510	.00430	.0652	.00540	.0785	.00625	.0840	.00650	.0695	.00670
11°	.50	.0235	.00257	.0313	.00343	.0415	.00456	.0520	.00530	.0550	.00590	.0470	.00520
11°	.60	.0083	.00149	.0095	.00224	.0155	.00320	.0225	.00390	.0230	.00490	.0190	.00360
15°	.20	.0696	.00532	.1038	.00742	.1333	.00960	.1570	.01130	.1323	.01620	.0750	.01000
15°	.30	.0626	.00505	.0934	.00710	.1200	.00933	.1440	.01070	.1440	.01310	.0960	.01100
15°	.40	.0540	.00470	.0791	.00664	.1022	.00900	.1250	.00992	.1345	.01210	.1030	.01080
15°	.50	.0427	.00416	.0616	.00596	.0822	.00830	.1020	.00900	.1125	.01110	.0920	.00980
15°	.60	.0295	.00340	.0426	.00493	.0596	.00690	.0765	.00790	.0830	.00960	.0692	.00820
15°	.70	.0144	.00266	.0223	.00354	.0362	.00500	.0493	.00626	.0556	.00720	.0482	.00613
19°	.20	.0812	.00672	.1186	.00962	.1590	.01260	.1875	.01565	----------	.02170	----------	----------
19°	.30	.0767	.00663	.1143	.00945	.1515	.01250	.1800	.01535	.1750	.01820	----------	.01600
19°	.40	.0690	.00647	.1045	.00915	.1375	.01230	.1655	.01482	.1705	.01620	.1270	.01590
19°	.50	.0590	.00620	.0904	.00864	.1195	.01200	.1465	.01420	.1560	.01530	.1265	.01510
19°	.60	.0476	.00570	.0730	.00782	.0990	.01120	.1240	.01326	.1360	.01460	.1120	.01355
19°	.70	.0350	.00485	.0535	.00662	.0765	.00990	.0995	.01183	.1125	.01350	.0950	.01150
19°	.80	.0208	.00350	.0330	.00495	.0530	.00785	.0742	.00980	.0865	.01180	.0760	.00900
19°	.90	.0023	.00160	.0118	.00295	.0300	.00536	.0485	.00710	.0600	.00905	.0555	.00630
23°	.20	.0943	.00844	.1390	.01193	.1800	.01622	.2100	.02080	----------	.02520	----------	----------
23°	.30	.0905	.00833	.1371	.01200	.1790	.01622	.2110	.02060	.2000	.02280	----------	----------
23°	.40	.0845	.00823	.1298	.01200	.1700	.01620	.2036	.02037	.2060	.02110	.1410	.01900
23°	.50	.0757	.00810	.1177	.01180	.1550	.01590	.1885	.02000	.1962	.02015	.1470	.01900
23°	.60	.0653	.00780	.1022	.01136	.1370	.01558	.1695	.01950	.1802	.01967	.1450	.01885
23°	70	.0540	.00736	.0845	.01060	.1185	.01490	.1475	.01880	.1602	.01920	.1320	.01830
23°	.80	.0423	.00660	.0654	.00940	.0950	.01375	.1235	.01770	.1380	.01830	.1140	.01683
23°	.90	.0287	.00540	.0457	.00782	.0722	.01202	.0985	.01592	.1130	.01670	.0960	.01490
23°	1.00	.0108	.00355	.0259	.00600	.0495	.00960	.0730	.01312	.0875	.01390	.0775	.01230
27°	.40	.0986	.01040	.1461	.01558	.1890	.02020	.2225	.02490	.1610	.02820	.1570	.02280
27°	.50	.0905	.01030	.1363	.01551	.1815	.02020	.2200	.02540	.2180	.02740	.1710	.02460
27°	.60	.0811	.01007	.1247	.01538	.1700	.02010	.2090	.02550	.2155	.02720	.1750	.02570
27°	.70	.0712	.00975	.1117	.01512	.1535	.01985	.1930	.02530	.2015	.02670	.1665	.02590
27°	.80	.0610	.00922	.0980	.01465	.1355	.01930	.1730	.02470	.1855	.02540	.1550	.02490
27°	.90	.0496	.00832	.0823	.01380	.1156	.01840	.1515	.02350	.1655	.02370	.1405	.02310
27°	1.00	.0368	.00682	.0637	.01225	.0952	.01670	.1280	.02170	.1435	.02170	.1242	.02050
27°	1.10	.0227	.00467	.0430	.01005	.0740	.01440	.1040	.01910	.1195	.01930	.1070	.01760
27°	1.20	.0057	.00180	.0211	.00753	.0522	.01170	.0800	.01590	.0962	.01690	.0900	.01440

TABLE XI

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller R-6. Set 9.8° at 42-inch radius. (From faired curves)

R. p. m.	$\frac{V}{nD}$	$x=0.421$		$x=0.526$		$x=0.631$		$x=0.737$		$x=0.842$		$x=0.947$	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
1,200	0.15	0.0572	0.00330	0.0742	0.00399	0.0845	0.00442	0.0870	0.00482	0.0828	0.00495	----------	----------
1,200	.25	.0486	.00296	.0612	.00368	.0689	.00380	.0700	.00400	.0673	.00327	0.0505	0.00265
1,200	.35	.0387	.00280	.0465	.00345	.0515	.00346	.0510	.00338	.0493	.00224	.0370	.00204
1,200	.45	.0256	.00242	.0290	.00308	.0300	.00278	.0271	.00265	.0254	.00150	.0181	.00138
1,200	.55	.0094	.00158	.0085	.00235	.0054	.00167	.0000	.00165	−.0017	.00090	−.0040	.00035
1,400	.15	.0575	.00350	.0753	.00430	.0863	.00502	.0903	.00485	.0878	.00510	----------	----------
1,400	.25	.0485	.00294	.0613	.00368	.0690	.00402	.0721	.00393	.0710	.00338	.0522	.00288
1,400	.35	.0375	.00263	.0457	.00339	.0493	.00343	.0500	.00350	.0485	.00257	.0384	.00213
1,400	.45	.0251	.00222	.0285	.00298	.0279	.00281	.0251	.00292	.0241	.00181	.0193	.00128
1,400	.55	.0100	.00130	.0086	.00215	.0060	.00180	.0000	.00195	−.0008	.00085	−.0030	.00040
1,600	.15	.0571	.00360	.0753	.00434	.0800	.00523	.0917	.00510	.0912	.00485	----------	----------
1,600	.25	.0487	.00308	.0630	.00381	.0714	.00409	.0743	.00392	.0747	.00345	.0547	.00327
1,600	.35	.0382	.00283	.0467	.00361	.0518	.00348	.0523	.00350	.0510	.00270	.0402	.00230
1,600	.45	.0248	.00235	.0281	.00320	.0293	.00303	.0275	.00305	.0248	.00224	.0200	.00167
1,600	.55	.0078	00145	.0066	.00235	.0048	.00208	.0000	.00228	−.0028	.00164	−.0043	.00118
1,800	.15	.0564	.00359	.0757	.00435	.0878	.00528	.0955	.00535	.0955	.00590	----------	----------
1,800	.25	.0488	.00325	.0630	.00404	.0726	.00443	.0770	.00445	.0781	.00400	.0574	.00408
1,800	.35	.0382	.00282	.0468	.00363	.0525	.00368	.0532	.00390	.0535	.00285	.0425	.00295
1,800	.45	.0248	.00221	.0280	.00295	.0297	.00271	.0265	.00295	.0248	.00202	.0202	.00209
1,800	.55	.0065	.00130	.0075	.00178	.0050	.00145	.0015	.00118	−.0060	.00116	−.0048	.00115
2,000	.15	.0575	.00373	.0773	.00468	.0908	.00560	.1023	.00581	.1060	.00710	----------	----------
2,000	.25	.0491	.00330	.0643	.00427	.0741	.00484	.0830	.00470	.0842	.00465	.0632	.00500
2,000	.35	.0384	.00280	.0482	.00375	.0542	.00391	.0570	.00409	.0580	.00392	.0455	.00360
2,000	.45	.0245	.00225	.0282	.00300	.0300	.00282	.0270	.00325	.0272	.00300	.0203	.00261
2,100	.15	.0580	.00374	.0780	.00471	.0932	.00566	.1053	.00612	.1094	.00815	----------	----------
2,100	.25	.0501	.00333	.0660	.00421	.0773	.00482	.0864	.00498	.0913	.00540	.0683	.00620
2,100	.35	.0387	.00284	.0487	.00363	.0554	.00392	.0596	.00406	.0618	.00428	.0525	.00450
2,100	.45	.0249	.00230	.0285	.00300	.0302	.00300	.0270	.00313	.0265	.00293	.0205	.00275
2,200	.15	.0585	.00380	.0795	.00485	.0950	.00585	.1096	.00650	.1113	.01040	----------	----------
2,200	.25	.0496	.00333	.0657	.00434	.0771	.00485	.0874	.00510	.0927	.00590	.0590	.00590
2,200	.35	.0392	.00281	.0492	.00381	.0568	.00393	.0604	.00411	.0634	.00410	.0478	.00450
2,200	.45	.0250	.00230	.0298	.00328	.0302	.00305	.0303	.00338	.0280	.00310	.0200	.00310
2,300	.20	.0532	.00347	.0712	.00451	.0846	.00510	.0973	.00548	.1012	.00790	.0400	.00680
2,300	.25	.0497	.00335	.0658	.00437	.0773	.00490	.0880	.00530	.0922	.00690	.0567	.00611
2,300	.30	.0450	.00318	.0587	.00416	.0680	.00455	.0760	.00490	.0798	.00585	.0522	.00535
2,300	.35	.0389	.00293	.0497	.00387	.0565	.00410	.0610	.00435	.0636	.00475	.0385	.00451
2,300	.40	.0316	.00268	.0390	.00348	.0435	00353	.0441	.00363	.0430	.00360	.0220	.00360
2,400	.30	.0449	.00325	.0584	.00472	.0690	.00502	.0767	.00545	.0759	.00680	.0480	.00500
2,400	.35	.0387	.00290	.0495	.00403	.0568	.00424	.0610	.00450	.0590	.00530	.0330	.00430
2,400	.40	.0315	.00252	.0390	.00330	.0428	.00338	.0420	.00340	.0400	.00360	.0170	.00350

TABLE XII

Values of $\frac{\mathrm{d}C_T}{\mathrm{d}x}$ and $\frac{\mathrm{d}C_Q}{\mathrm{d}x}$ for propeller R-8 set 9.8° at 42-inch radius. (From faired curves)

R. p. m.	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$
1200	0.15	0.0585	0.00360	0.0766	0.00408	0.0900	0.00507	0.0985	0.00562	0.0940	0.00605	----------	----------
1200	.25	.0508	.00350	.0652	.00387	.0762	.00450	.0837	.00495	.0824	.00468	0.0570	0.00330
1200	.35	.0394	.00305	.0498	.00338	.0569	.00385	.0626	.00420	.0618	.00371	.0462	.00285
1200	.45	.0250	.00247	.0315	.00264	.0335	.00308	.0370	.00330	.0370	.00293	.0270	.00233
1200	.55	.0083	.00165	.0082	.00185	.0075	.00203	.0081	.00211	.0088	.00225	.0060	.00177
1400	.15	.0585	.00360	.0766	.00430	.0898	.00539	.0994	.00585	.0964	.00652	----------	----------
1400	.25	.0497	.00340	.0640	.00395	.0750	.00478	.0827	.00521	.0824	.00510	.0572	.00405
1400	.35	.0376	.00308	.0474	.00352	.0551	.00405	.0605	.00449	.0600	.00397	.0445	.00318
1400	.45	.0234	.00258	.0283	.00294	.0320	.00322	.0350	.00368	.0341	.00327	.0253	.00280
1400	.55	.0079	.00174	.0075	.00205	.0070	.00235	.0070	.00267	.0070	.00275	.0048	.00243
1600	.15	.0582	.00369	.0775	.00446	.0911	.00543	.1022	.00577	.0998	.00653	----------	----------
1600	.25	.0493	.00330	.0645	.00401	.0748	.00460	.0833	.00500	.0835	.00490	.0585	.00443
1600	.35	.0370	.00303	.0475	.00365	.0539	.00405	.0600	.00443	.0600	.00418	.0450	.00356
1600	.45	.0233	.00255	.0282	.00291	.0318	.00323	.0338	.00364	.0350	.00338	.0260	.00300
1600	.55	.0070	.00159	.0075	.00181	.0065	.00220	.0060	.00235	.0075	.00248	.0050	.00263
1800	.15	.0583	.00358	.0780	.00435	.0930	.00560	.1057	.00592	.1058	.00720	----------	----------
1800	.25	.0485	.00341	.0645	.00408	.0765	.00500	.0862	.00532	.0874	.00523	.0611	.00505
1800	.35	.0378	.00308	.0475	.00363	.0555	.00423	.0620	.00460	.0627	.00461	.0480	.00400
1800	.45	.0238	.00243	.0283	.00290	.0318	.00333	.0350	.00369	.0348	.00400	.0270	.00352
1800	.55	.0063	.00140	.0058	.00165	.0055	.00235	.0055	.00240	.0055	.00315	.0035	.00332
2000	.15	.0580	.00383	.0787	.00470	.0950	.00583	.1100	.00633	.1121	.00881	----------	----------
2000	.25	.0495	.00343	.0660	.00417	.0787	.00505	.0905	.00545	.0967	.00610	.0690	.00630
2000	.35	.0377	.00304	.0488	.00369	.0579	.00443	.0655	.00490	.0705	.00512	.0560	.00515
2000	.45	.0232	.00242	.0290	.00298	.0338	.00352	.0364	.00375	.0382	.00447	.0305	.00438
2100	.15	.0578	.00386	.0787	.00480	.0955	.00604	.1114	.00658	.1073	.00995	----------	----------
2100	.25	.0500	.00350	.0667	.00428	.0803	.00522	.0940	.00558	.0987	.00708	.0598	.00675
2100	.35	.0383	.00307	.0500	.00371	.0595	.00438	.0684	.00480	.0752	.00554	.0543	.00586
2100	.45	.0243	.00253	.0300	.00307	.0345	.00351	.0375	.00368	.0411	.00439	.0325	.00494
2200	.15	.0570	.00404	.0790	.00504	.0960	.00602	.1138	.00693	.0955	.01270	----------	----------
2200	.25	.0498	.00340	.0670	.00436	.0804	.00513	.0945	.00558	.0965	.00845	.0529	.00614
2200	.35	.0382	.00314	.0500	.00387	.0594	.00446	.0683	.00472	.0730	.00623	.0408	.00520
2200	.45	.0235	.00226	.0297	.00293	.0350	.00350	.0373	.00408	.0380	.00440	.0169	.00470
2300	.25	.0483	.00340	.0650	.00432	.0791	.00510	.0908	.00565	.0858	.00920	.0520	.00505
2300	.35	.0383	.00300	.0505	.00373	.0603	.00451	.0691	.00498	.0670	.00665	.0365	.00605
2300	.45	.0223	.00208	.0273	.00240	.0320	.00262	.0320	.00300	.0285	.00370	.0000	.00395

TABLE XIII

Values of $\frac{\mathrm{d}C_T}{\mathrm{d}x}$ and $\frac{\mathrm{d}C_Q}{\mathrm{d}x}$ for propeller R-10 set 9.8° at 42-inch radius. (From faired curves)

R. p. m.	$\frac{V}{nD}$	x=0.421		x=0.526		x=0.631		x=0.737		x=0.842		x=0.947	
		$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$	$\frac{\mathrm{d}C_T}{\mathrm{d}x}$	$\frac{\mathrm{d}C_Q}{\mathrm{d}x}$
1000	0.15	0.0588	0.00335	0.0795	0.00318	0.0954	0.00482	0.1058	0.00564	0.0991	0.00620	0.0380	----------
1000	.25	.0495	.00318	.0665	.00385	.0802	.00460	.0895	.00521	.0873	.00555	.0600	0.00365
1000	.35	.0393	.00285	.0510	.00355	.0610	.00418	.0683	.00475	.0685	.00495	.0510	.00320
1000	.45	.0269	.00218	.0322	.00295	.0390	.00360	.0445	.00422	.0464	.00428	.0360	.00266
1000	.55	.0092	.00122	.0054	.00198	.0151	.00278	.0195	.00360	.0223	.00345	.0200	.00195
1200	.15	.0585	.00342	.0792	.00430	.0954	.00568	.1069	.00608	.1024	.00675	.0215	----------
1200	.25	.0496	.00319	.0668	.00385	.0800	.00480	.0911	.00527	.0905	.00560	.0610	.00440
1200	.35	.0394	.00288	.0522	.00361	.0622	.00436	.0723	.00489	.0728	.00495	.0553	.00380
1200	.45	.0253	.00242	.0335	.00329	.0406	.00400	.0485	.00445	.0502	.00427	.0336	.00315
1200	.55	.0084	.00165	.0118	.00231	.0168	.00272	.0216	.00368	.0248	.00355	.0226	.00248
1400	.15	.0577	.00339	.0780	.00431	.0942	.00557	.1059	.00615	.1040	.00690	----------	----------
1400	.25	.0498	.00316	.0665	.00408	.0809	.00504	.0914	.00556	.0925	.00570	.0633	.00506
1400	.35	.0388	.00281	.0505	.00375	.0623	.00444	.0710	.00522	.0727	.00526	.0562	.00440
1400	.45	.0245	.00227	.0313	.00322	.0401	.00372	.0470	.00473	.0490	.00477	.0395	.00370
1400	.55	.0082	.00135	.0100	.00233	.0153	.00272	.0202	.00395	.0229	.00425	.0210	.00298
1600	.15	.0572	.00355	.0790	.00438	.0952	.00578	.1095	.00640	.1060	.00725	.0050	.00650
1600	.25	.0490	.00320	.0670	.00405	.0811	.00518	.0938	.00558	.0942	.00594	.0618	.00595
1600	.35	.0380	.00273	.0508	.00382	.0620	.00460	.0720	.00526	.0737	.00550	.0590	.00510
1600	.45	.0242	.00213	.0318	.00306	.0402	.00368	.0472	.00452	.0493	.00493	.0400	.00410
1600	.55	.0085	.00120	.0109	.00175	.0163	.00252	.0205	.00326	.0225	.00395	.0192	.00295
1800	.15	.0580	.00366	.0812	.00468	.0980	.00595	.1130	.00678	.1133	.00830	----------	----------
1800	.25	.0500	.00328	.0680	.00420	.0830	.00532	.0966	.00582	.0990	.00643	.0654	.00692
1800	.35	.0385	.00282	.0508	.00392	.0635	.00494	.0748	.00556	.0708	.00578	.0600	.00570
1800	.45	.0244	.00223	.0320	.00310	.0415	.00400	.0494	.00461	.0515	.00480	.0410	.00450
1800	.55	.0088	.00138	.0130	.00162	.0175	.00256	.0218	.00282	.0240	.00350	.0185	.00328
2000	.15	.0580	.00374	.0820	.00478	.0992	.00643	.1162	.00728	.1037	.01165	----------	----------
2000	.25	.0498	.00338	.0688	.00448	.0845	.00570	.1000	.00625	.1045	.00738	.0650	.00721
2000	.35	.0380	.00294	.0520	.00388	.0648	.00484	.0773	.00548	.0823	.00604	.0630	.00618
2000	.45	.0243	.00233	.0332	.00308	.0420	.00395	.0505	.00480	.0550	.00530	.0456	00530
2100	.15	.0583	.00385	.0816	.00511	.1006	.00660	.1185	.00767	.0884	.01350	----------	----------
2100	.25	.0503	.00343	.0694	.00460	.0860	.00576	.1020	.00662	.0963	.00962	.0527	.00730
2100	.35	.0387	.00295	.0527	.00400	.0660	.00483	.0792	.00553	.0809	.00670	.0452	.00575
2100	.45	.0246	.00235	.0333	.00335	.0428	.00385	.0513	.00443	.0548	.00544	.0263	.00512
2200	.25	.0488	.00342	.0677	.00463	.0860	.00590	.0998	.00695	.0836	.01040	.0480	.00690
2200	.35	.0383	.00297	.0523	.00388	.0650	.00483	.0774	.00560	.0690	.00780	.0327	.00600
2200	.45	.0234	.00235	.0311	.00307	.0400	.00350	.0475	.00404	.0470	.00550	.0110	.00520

TABLE XIV

Values of $\frac{dC_T}{dx}$ and $\frac{dC_Q}{dx}$ for propeller R–6 set 7° at 42-inch radius. (From faired curves)

R. p. m.	$\frac{V}{nD}$	$x=0.421$		$x=0.526$		$x=0.631$		$x=0.737$		$x=0.842$		$x=0.947$	
		$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$	$\frac{dC_T}{dx}$	$\frac{dC_Q}{dx}$
1000	0.15	0.0480	0.00255	0.0579	0.00283	0.0605	0.00290	0.0582	0.00292	0.0510	0.00311	0.0130	0.00077
1000	.25	.0385	.00235	.0450	.00250	.0450	.00215	.0420	.00208	.0355	.00203	.0180	.00092
1000	.35	.0255	.00192	.0275	.00193	.0242	.00135	.0191	.00116	.0135	.00082	.0070	.00040
1000	.45	.0104	.00113	.0075	.00095	.0000	.00050	−.0082	.00015	−.0135	−.00040	−.0125	−.00135
1200	.15	.0479	.00260	.0585	.00284	.0608	.00280	.0598	.00215	.0542	.00302	.0250	.00110
1200	.25	.0385	.00233	.0450	.00248	.0454	.00225	.0425	.00205	.0373	.00205	.0260	.00090
1200	.35	.0261	.00191	.0280	.00201	.0260	.00168	.0208	.00141	.0155	.00130	.0093	.00000
1200	.45	.0115	.00118	.0088	.00137	.0040	.00080	−.0040	.00062	−.0095	.00040	−.0115	−.00140
1400	.15	.0485	.00285	.0595	.00300	.0610	.00330	.0610	.00305	.0560	.00295	.0205	.00078
1400	.25	.0388	.00245	.0452	.00256	.0458	.00252	.0435	.00215	.0385	.00200	.0275	.00073
1400	.35	.0260	.00196	.0279	.00204	.0254	.00177	.0195	.00161	.0145	.00133	.0090	.00040
1400	.45	.0110	.00135	.0082	.00140	.0020	.00102	−.0078	.00098	−.0140	.00090	−.0142	−.00012
1600	.15	.0472	.00258	.0590	.00292	.0615	.00305	.0612	.00283	.0582	.00260	.0320	.00080
1600	.25	.0382	.00235	.0452	.00260	.0466	.00250	.0440	.00202	.0400	.00193	.0302	.00081
1600	.35	.0270	.00195	.0287	.00218	.0270	.00205	.0205	.00183	.0152	.00172	.0096	.00075
1600	.45	.0122	.00128	.0090	.00148	.0015	.00131	−.0082	.00127	−.0146	.00131	−.0150	.00055
1800	.15	.0468	.00264	.0590	.00300	.0630	.00331	.0645	.00310	.0620	.00313	.0320	.00120
1800	.25	.0380	.00235	.0455	.00260	.0470	.00250	.0450	.00220	.0415	.00214	.0308	.00100
1800	.35	.0260	.00200	.0280	.00212	.0260	.00197	.0200	.00181	.0150	.00169	.0082	.00093
1800	.45	.0103	.00132	.0075	.00146	.0005	.00125	−.0088	.00118	−.0152	.00125	−.0155	.00079
2000	.15	.0470	.00275	.0595	.00318	.0648	.00340	.0677	.00345	.0665	.00402	.0215	.00210
2000	.25	.0381	.00240	.0455	.00273	.0480	.00275	.0461	.00255	.0440	.00260	.0325	.00179
2000	.35	.0255	.00196	.0275	.00218	.0260	.00221	.0195	.00215	.0152	.00190	.0078	.00145
2000	.45	.0095	.00100	.0070	.00150	.0005	.00145	−.0105	.00132	−.0168	.00115	−.0165	.00089
2100	.15	.0483	.00280	.0612	.00328	.0668	.00345	.0720	.00345	.0740	.00418	.0250	.00318
2100	.25	.0387	.00242	.0470	.00287	.0490	.00290	.0482	.00270	.0455	.00282	.0345	.00214
2100	.35	.0258	.00200	.0282	.00230	.0260	.00231	.0190	.00228	.0140	.00202	.0070	.00164
2100	.45	.0103	.00125	.0065	.00143	.0000	.00132	−.0112	.00148	−.0182	.00122	−.0218	.00093
2200	.15	.0478	.00277	.0602	.00318	.0675	.00345	.0730	.00352	.0747	.00490		
2200	.25	.0375	.00240	.0460	.00275	.0480	.00277	.0475	.00250	.0470	.00300	.0325	.00243
2200	.35	.0245	.00198	.0274	.00222	.0250	.00222	.0178	.00210	.0120	.00210	.0042	.00190
2200	.45	.0093	.00128	.0053	.00138	−.0018	.00145	−.0148	.00150	−.0230	.00111	−.0252	.00100
2300	.15	.0479	.00283	.0615	.00331	.0682	.00358	.0742	.00362	.0733	.00670		
2300	.25	.0380	.00245	.0463	.00282	.0490	.00296	.0485	.00285	.0443	.00330	.0197	.00260
2300	.35	.0249	.00195	.0269	.00231	.0242	.00229	.0175	.00228	.0090	.00244	−.0070	.00215
2300	.45	.0098	.00124	.0050	.00130	−.0042	.00130	−.0170	.00148	−.0280	.00138	−.0340	.00130
2400	.15	.0478	.00286	.0613	.00338	.0682	.00360	.0750	.00385	.0642	.00752		
2400	.25	.0380	.00253	.0462	.00288	.0492	.00290	.0482	.00282	.0400	.00410	.0132	.00278
2400	.35	.0246	.00200	.0268	.00238	.0242	.00222	.0155	.00212	.0058	.00250	−.0150	.00141
2400	.45	.0088	.00111	.0042	.00142	−.0048	.00127	−.0210	.00133	−.0310	.00128		
2500	.15	.0481	.00296	.0628	.00338	.0702	.00371	.0765	.00388	.0565	.00792	−.0130	.00165
2500	.25	.0383	.00247	.0470	.00292	.0500	.00305	.0483	.00304	.0310	.00470	.0028	.00195
2500	.35	.0245	.00195	.0275	.00220	.0240	.00228	.0155	.00227	.0015	.00313	−.0166	.00125
2600	.20	.0434	.00271	.0548	.00335	.0600	.00358	.0612	.00357	.0410	.00665	.0098	.00125
2600	.30	.0320	.00226	.0375	.00262	.0375	.00272	.0325	.00267	.0120	.00395	−.0058	.00170
2600	.40	.0178	.00150	.0165	.00167	.0097	.00150	−.0018	.00167	−.0180	.00224	−.0225	.00125
2700	.25	.0390	.00253	.0483	.00310	.0521	.00316	.0480	.00341	.0245	.00595	.0010	.00181
2700	.30	.0323	.00233	.0385	.00275	.0383	.00285	.0325	.00309	.0110	.00448	−.0060	.00165
2700	.35	.0178	.00209	.0278	.00238	.0241	.00248	.0160	.00265	−.0035	.00333	−.0138	.00145

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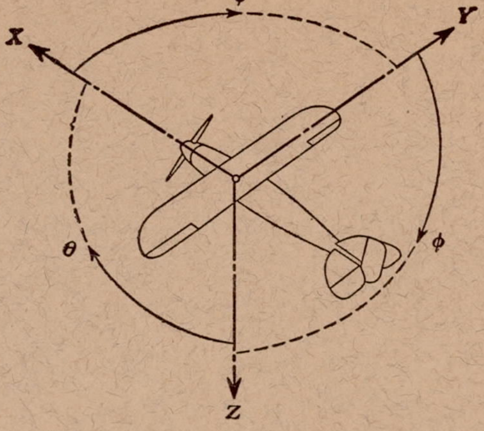

Positive directions of axes and angles (forces and moments) are shown by arrows

Axis		Force (parallel to axis) symbol	Moment about axis			Angle		Velocities	
Designation	Symbol		Designation	Symbol	Positive direction	Designation	Symbol	Linear (component along axis)	Angular
Longitudinal	X	X	rolling	L	$Y \longrightarrow Z$	roll	ϕ	u	p
Lateral	Y	Y	pitching	M	$Z \longrightarrow X$	pitch	θ	v	q
Normal	Z	Z	yawing	N	$X \longrightarrow Y$	yaw	ψ	w	r

Absolute coefficients of moment

$$C_l = \frac{L}{qbS} \qquad C_m = \frac{M}{qcS} \qquad C_n = \frac{N}{qbS}$$

Angle of set of control surface (relative to neutral position), δ. (Indicate surface by proper subscript.)

4. PROPELLER SYMBOLS

D, Diameter.

p, Geometric pitch.

p/D, Pitch ratio.

V', Inflow velocity.

V_s, Slipstream velocity.

T, Thrust, absolute coefficient $C_T = \frac{T}{\rho n^2 D^4}$

Q, Torque, absolute coefficient $C_Q = \frac{Q}{\rho n^2 D^5}$

P, Power, absolute coefficient $C_P = \frac{P}{\rho n^3 D^5}$.

C_S, Speed power coefficient $= \sqrt[5]{\frac{\rho V^5}{P n^2}}$.

η, Efficiency.

n, Revolutions per second, r. p. s.

Φ, Effective helix angle $= \tan^{-1}\left(\frac{V}{2\pi r n}\right)$

5. NUMERICAL RELATIONS

1 hp = 76.04 kg/m/s = 550 lb./ft./sec.

1 kg/m/s = 0.01315 hp

1 mi./hr. = 0.44704 m/s

1 m/s = 2.23693 mi./hr.

1 lb. = 0.4535924277 kg.

1 kg = 2.2046224 lb.

1 mi. = 1609.35 m = 5280 ft.

1 m = 3.2808333 ft.