NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

REPORT No. 315

AERODYNAMIC CHARACTERISTICS OF AIRFOILS—VI

By

NATIONAL ADVISORY COMMITTEE
FOR AERONAUTICS

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1929

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	sec	second (or hour)	sec. (or hr.)
Force	F	weight of one kilogram	kg	weight of one pound	lb.
Power	P	kg/m/sec		horsepower	HP.
Speed		km/hr		mi./hr	M. P. H.
		m/sec		ft./sec	f. p. s.

2. GENERAL SYMBOLS, ETC.

W, Weight, $=mg$

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

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

ρ, Density (mass per unit volume).

Standard density of dry air, 0.12497 (kg-m^{-4} sec.^{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 length.

b/c, Aspect ratio.

f, Distance from $c.\ g.$ to elevator hinge.

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 $C_D=\frac{D}{qS}$

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

R, Resultant force. (Note that these coefficients are twice as large as the old coefficients L_C, D_C.)

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

i_t, Angle of stabilizer setting with reference to thrust line.

γ, Dihedral angle.

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

e. g., for a model airfoil 3 in. chord, 100 mi./hr. normal pressure, 0° C: 255,000 and at 15° C., 230,000;

or for a model of 10 cm chord 40 m/sec, corresponding numbers are 299,000 and 270,000.

C_p, Center of pressure coefficient (ratio of distance of $C.\ P.$ from leading edge to chord length).

β, Angle of stabilizer setting with reference to lower wing, $=(i_t-i_w)$.

α, Angle of attack.

ϵ, Angle of downwash.

REPORT No. 315

AERODYNAMIC CHARACTERISTICS OF AIRFOILS—VI

CONTINUATION OF REPORTS Nos. 93, 124, 182, 244, and 286

By

NATIONAL ADVISORY COMMITTEE
FOR AERONAUTICS

39331—29——1

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REPORT No. 315

AERODYNAMIC CHARACTERISTICS OF AIRFOILS—VI

CONTINUATION OF REPORTS NOS. 93, 124, 182, 244, AND 286

By NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

INTRODUCTION

This collection of data on airfoils has been made from the published reports of a number of the leading aerodynamic laboratories of this country and Europe.[1] The information which was originally expressed according to the different customs of the several laboratories is here presented in a uniform series of charts and tables suitable for the use of designing engineers and for purposes of general reference.

It is a well-known fact that the results obtained in different laboratories, because of their individual methods of testing, are not strictly comparable even if proper scale corrections for size of model and speed of test are supplied. It is, therefore, unwise to compare too closely the coefficients of two wing sections tested in different laboratories. Tests of different wing sections from the same source, however, may be relied on to give true relative values.

The absolute system of coefficients has been used, since it is thought by the National Advisory Committee for Aeronautics that this system is the one most suited for international use and yet it is one from which a desired transformation can be easily made. For this purpose a set of transformation constants is given.

Each airfoil section is given a reference number, and the test data are presented in the form of curves from which the coefficients can be read with sufficient accuracy for designing purposes. The dimensions of the profile of each section are given at various stations along the chord in per cent of the chord length, the latter also serving as the datum line. The shape of the section is also shown with reasonable accuracy in order to enable one to more clearly visualize the section under consideration, the outside of the heavy line representing the profile.

The authority for the results here presented is given as the name of the laboratory at which the experiments were conducted, as explained under abbreviations, with the size of model, wind velocity, and year of test.

TRANSFORMATION CONSTANTS

For the convenience of those who prefer to use a system of units other than the absolute system, there is given below a table of transformation constants based on the standard condition adopted by the National Advisory Committee for Aeronautics of—

Temperature	= 15° C	= 59° F.
Pressure	= 760 mm Hg	= 29.92 in. Hg.
Humidity	= 0	
Gravity	= 9.80665 m/s^2	= 32.1740 ft./sec.^{2}

thus giving values of specific weight of air

$$W = 1.2255 \text{ kg/m}^3 = 0.07651 \text{ lb./cu. ft.}$$

[1] A previous collection of airfoil sections numbered 1 to 759 and Charts 1 to 20 may be found in N. A. C. A. Reports Nos. 93, 124, 182, 244, and 286.

and of density

$\rho = 0.12497$ kg-m^{-4}s^2 in the French engineering or kilogram, meter, second system.

Or

$\rho = 0.002378$ lb.-ft.$^{-4}$sec.^{2} in the English or pound, foot, second system.

In absolute units	$P = CV^2\rho/2$
In kg/m^2 (m/s)	$P = .0625\ CV^2$
In kg/m^2 (km/h)	$P = .004822\ CV^2$
In lb./sq. ft. (ft./sec.)	$P = .001189\ CV^2$
In lb./sq. ft. (mi./hr.)	$P = .002558\ CV^2$

(Note that these constants are half as large as those used in Reports Nos. 93 and 124 and that the absolute coefficients used in this report are twice as large as the old coefficients. See Report No. 240 regarding change in absolute coefficients.)

INDEX

Four separate types of indexes are given—chart indexes which make it possible for a designer to select the wing section most suitable for the particular design in which he is interested; a group index which is arranged by countries and laboratories at which tests were conducted, each section also being designated by a reference number; an index of abbreviations, used on the characteristic sheets, to indicate the laboratories at which the tests were made; and an alphabetical index.

CHART INDEX

In order that the designer may easily pick out a wing section which is suited to the type of airplane on which he is working, four index charts are given which classify the wings according to their aerodynamic and structural properties. In the charts of this report a lower-case letter is placed adjacent to the reference number giving Vl values, so that a comparison can be made without referring to the individual drawings. In this value V represents the wind velocity in feet per second and l a linear dimension, the chord length in feet.

In chart No. 21 the minimum drag C_D, is plotted against the L/D at one-fourth the maximum lift C_L. This chart should be used in choosing a wing section for a high-speed airplane, the wing sections being more suited for this use the farther they are from the lower left-hand corner.

In chart No. 22 the mean spar depth is plotted against the maximum lift C_L, in order to show the possible strength and lightness of the wing structure. The higher the maximum lift coefficient is, the smaller will be the wing area and the lighter the structural weight, and in the same way the greater the depth of the spars the lighter will be their weight, so that the sections the greatest distance from the lower left-hand corner will give the lightest and strongest wings. The "mean spar depth" is obtained by assuming the spars to be located, respectively, at 15 and 60 per cent of the chord, and by dividing the sum of their thicknesses, in per cent of chord length at these points, by 2.

In chart No. 23 the maximum L/D is plotted against the maximum lift C_L, which is of use in choosing the wing section for a slow and efficient airplane. In the same way as before the sections farthest from the lower left-hand corner are the best for this purpose.

In chart No. 24 the L/D at two-thirds the maximum lift C_L, is plotted against the maximum lift C_L. This chart can be used for choosing a section that will give an efficient climb or a long range at cruising speed. The best sections for this purpose will be farthest from the lower left-hand corner of the chart.

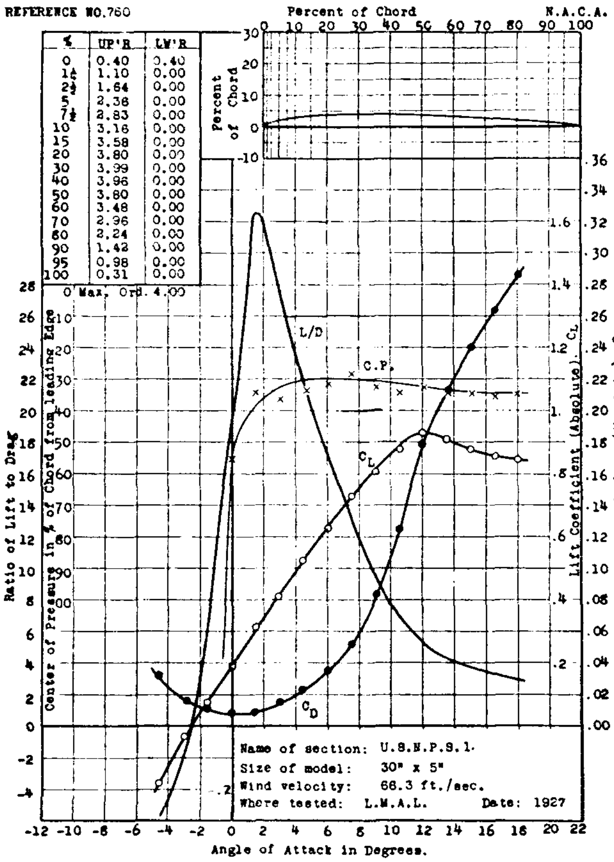
CHART INDEX

INDEX OF ABBREVIATIONS

Name of laboratory at which tests were made	Abbreviations used on figures
Langley Memorial Aeronautical Laboratory of the National Advisory Committee for Aeronautics, U. S. A.	L. M. A. L.
Washington Navy Yard, U. S. A.	W. N. Y.
Engineering Division, McCook Field, U. S. A.	McC. F.
Ergebnisse der Aerodynamischen Versuchsanstalt zu Göttingen, Germany	Göttingen.
Service Technique de l'Aéronautique, France	S. T. Aé.
Laboratoire Aerotechnique de Rhode St. Genese-Bruxelles, Belgium	Rhode St. Genese.
Instituto Sperimentale Aeronautico, Italy	I. S. A.

GROUP INDEX

ALPHABETICAL INDEX



%	UP'R	LW'R
0	0.40	0.40
1¼	1.10	0.00
2½	1.64	0.00
5	2.36	0.00
7½	2.83	0.00
10	3.16	0.00
15	3.58	0.00
20	3.80	0.00
30	3.99	0.00
40	3.96	0.00
50	3.80	0.00
60	3.48	0.00
70	2.96	0.00
80	2.24	0.00
90	1.43	0.00
95	0.98	0.00
100	0.31	0.00
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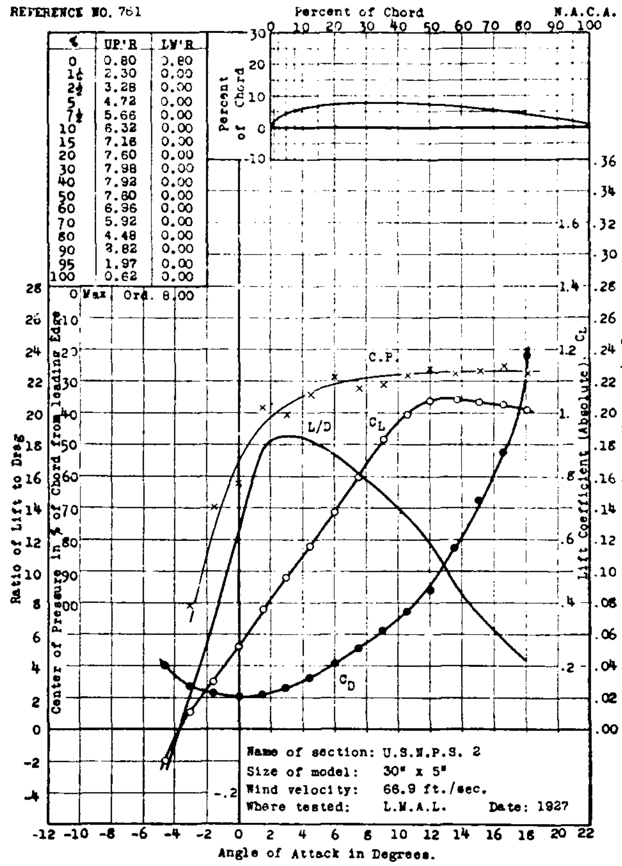
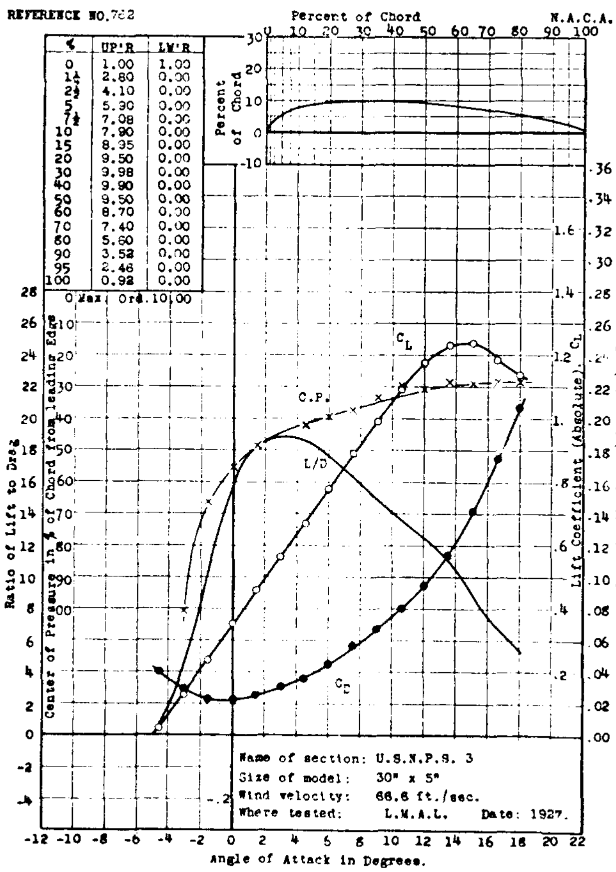


%	UP'R	LW'R
0	0.80	0.80
1¼	2.30	0.00
2½	3.28	0.00
5	4.72	0.00
7½	5.66	0.00
10	6.32	0.00
15	7.16	0.00
20	7.60	0.00
30	7.98	0.00
40	7.93	0.00
50	7.60	0.00
60	6.96	0.00
70	5.92	0.00
80	4.48	0.00
90	3.82	0.00
95	1.97	0.00
100	0.62	0.00
Max. Ord. 8.00		



%	UP'R	LW'R
0	1.00	1.00
1¼	2.80	0.00
2½	4.10	0.00
5	5.30	0.00
7½	7.08	0.00
10	7.90	0.00
15	8.35	0.00
20	9.50	0.00
30	9.98	0.00
40	9.90	0.00
50	9.50	0.00
60	8.70	0.00
70	7.40	0.00
80	5.60	0.00
90	3.52	0.00
95	2.46	0.00
100	0.92	0.00
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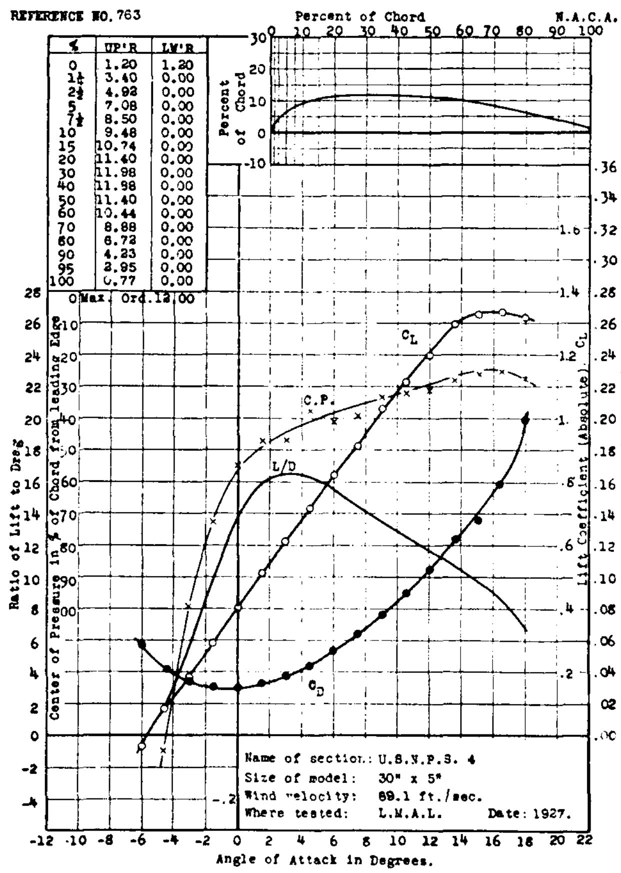
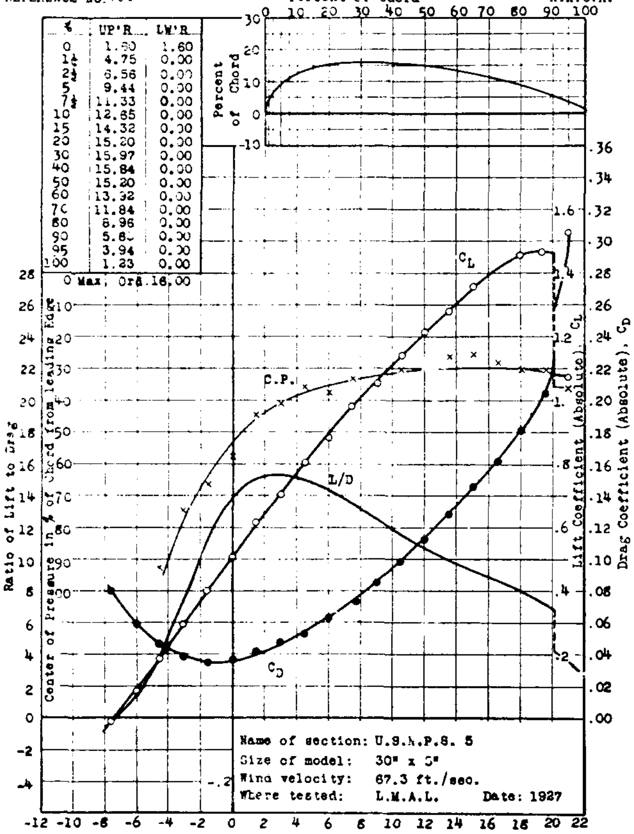


%	UP'R	LW'R
0	1.20	1.20
1¼	3.40	0.00
2½	4.92	0.00
5	7.08	0.00
7½	8.50	0.00
10	9.48	0.00
15	10.74	0.00
20	11.40	0.00
30	11.98	0.00
40	11.98	0.00
50	11.40	0.00
60	10.44	0.00
70	8.88	0.00
80	6.72	0.00
90	4.23	0.00
95	2.95	0.00
100	0.77	0.00
Max. Ord. 12.00		

REFERENCE NO. 764 — N.A.C.A.



%	UP'R	LW'R
0	1.60	1.60
1¼	4.75	0.00
2½	6.56	0.00
5	9.44	0.00
7½	11.33	0.00
10	12.85	0.00
15	14.32	0.00
20	15.20	0.00
30	15.97	0.00
40	15.84	0.00
50	15.20	0.00
60	13.92	0.00
70	11.84	0.00
80	8.96	0.00
90	5.60	0.00
95	3.94	0.00
100	1.23	0.00

Max. Ord. 16.00

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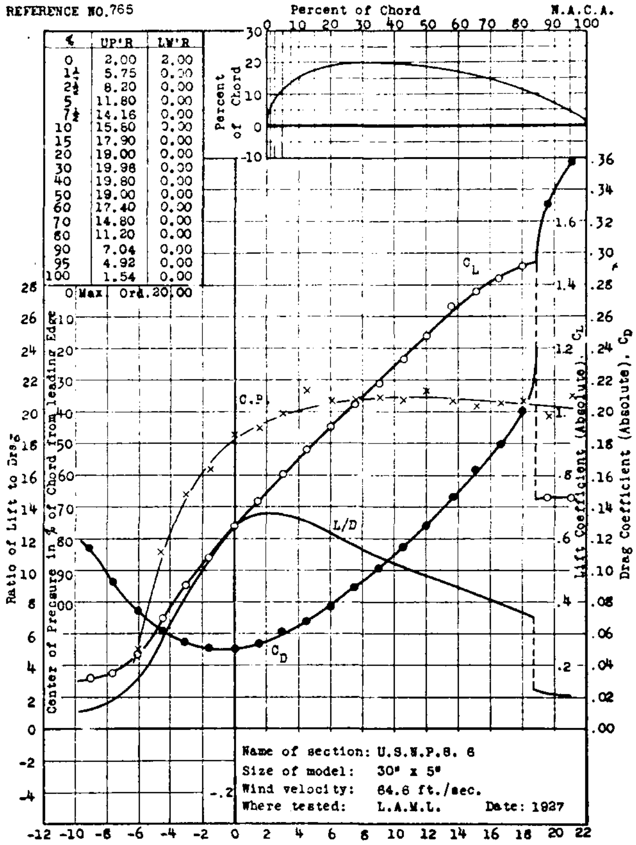

%	UP'R	LW'R
0	2.00	2.00
1¼	5.75	0.00
2½	8.20	0.00
5	11.80	0.00
7½	14.16	0.00
10	15.60	0.00
15	17.90	0.00
20	19.00	0.00
30	19.98	0.00
40	19.80	0.00
50	19.00	0.00
60	17.40	0.00
70	14.80	0.00
80	11.20	0.00
90	7.04	0.00
95	4.92	0.00
100	1.54	0.00

Max. Ord. 20.00

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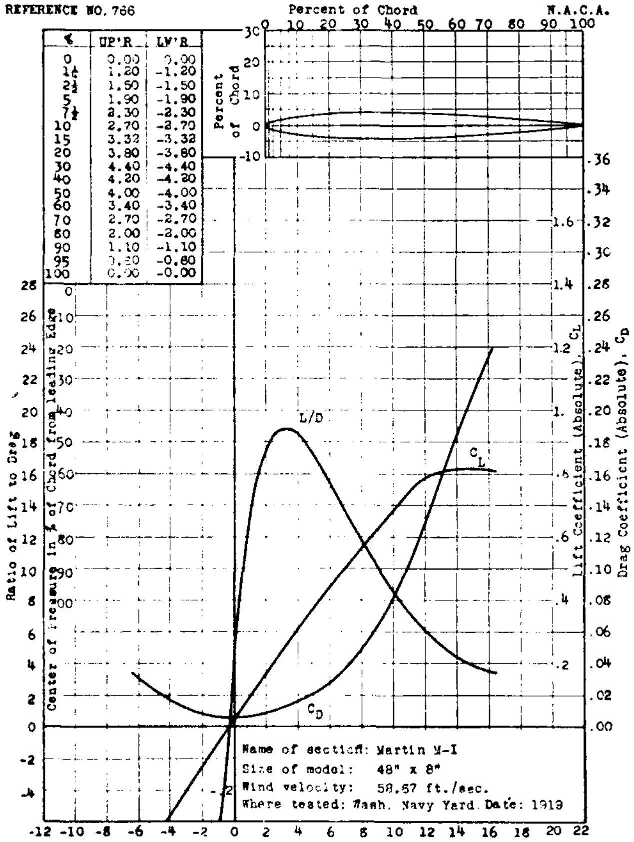
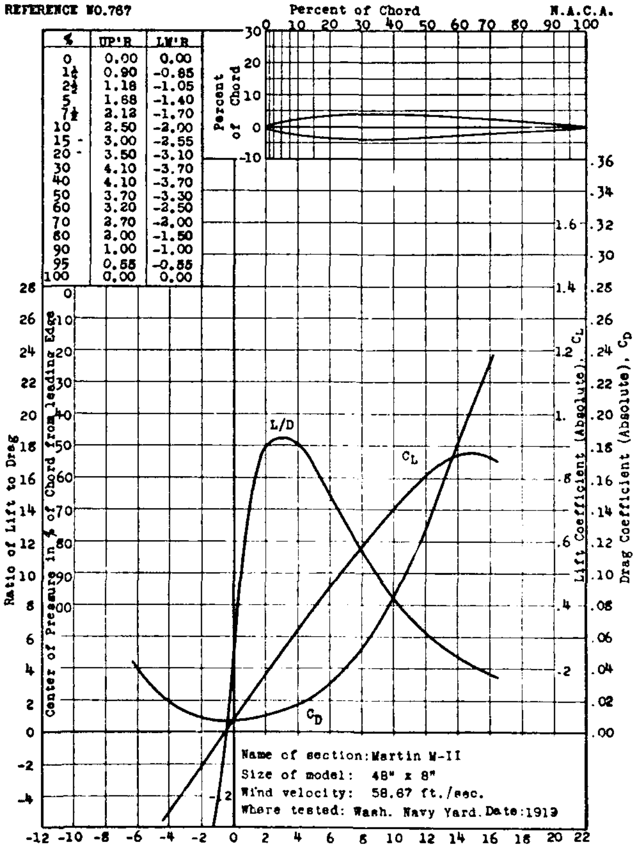
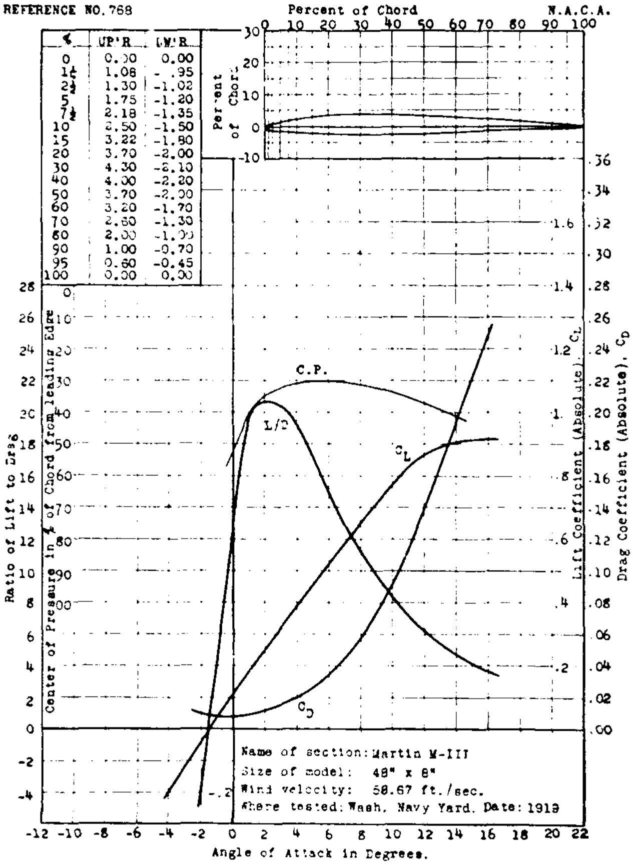


%	UP'R	LW'R
0	0.00	0.00
1¼	1.20	-1.20
2½	1.50	-1.50
5	1.90	-1.90
7½	2.30	-2.30
10	2.70	-2.70
15	3.32	-3.32
20	3.80	-3.80
30	4.40	-4.40
40	4.20	-4.20
50	4.00	-4.00
60	3.40	-3.40
70	2.70	-2.70
80	2.00	-2.00
90	1.10	-1.10
95	0.80	-0.80
100	0.00	-0.00

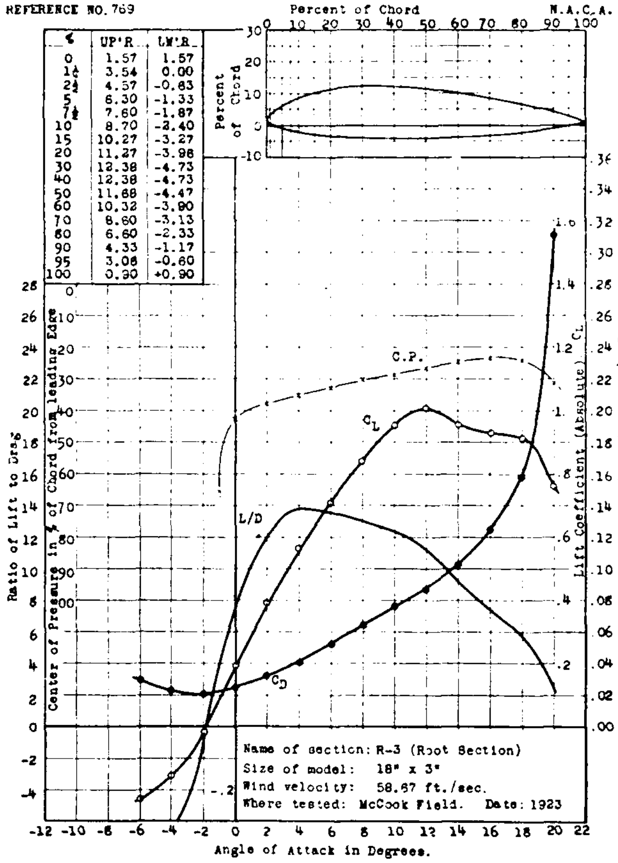
REFERENCE NO. 767 — N.A.C.A.



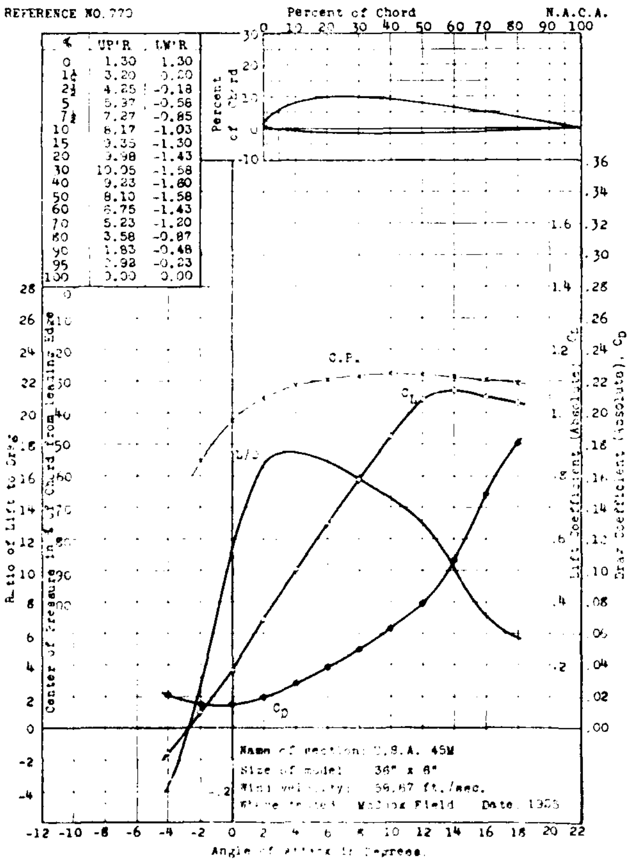
%	UP'R	LW'R
0	0.00	0.00
1¼	0.90	-0.85
2½	1.18	-1.05
5	1.68	-1.40
7½	2.12	-1.70
10	2.50	-2.00
15	3.00	-2.55
20	3.50	-3.10
30	4.10	-3.70
40	4.10	-3.70
50	3.70	-3.30
60	3.20	-2.50
70	2.70	-2.00
80	2.00	-1.50
90	1.00	-1.00
95	0.55	-0.55
100	0.00	0.00



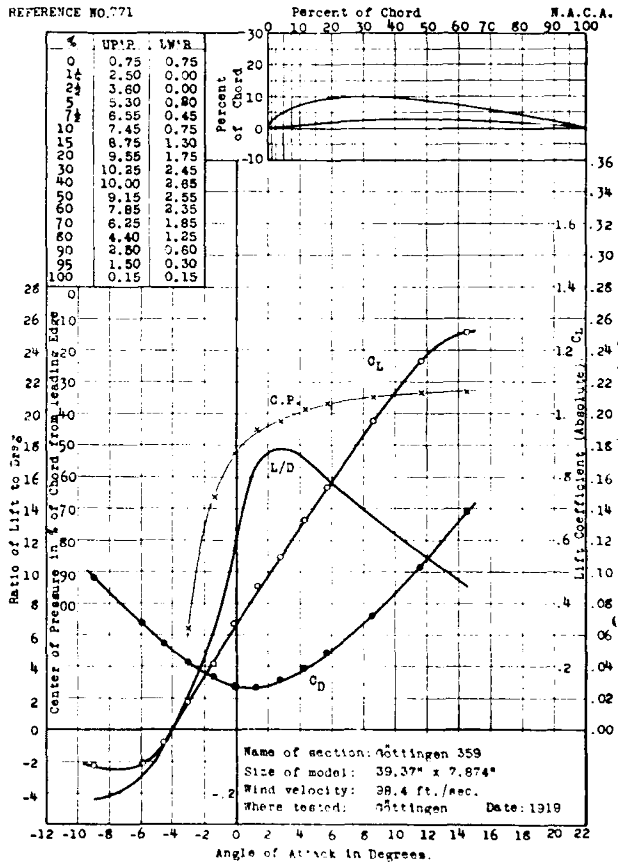
%	UP'R	LW'R
0	0.00	0.00
1¼	1.08	- .95
2½	1.30	-1.02
5	1.75	-1.20
7½	2.18	-1.35
10	2.50	-1.50
15	3.22	-1.80
20	3.70	-2.00
30	4.30	-2.10
40	4.00	-2.20
50	3.70	-2.00
60	3.20	-1.70
70	2.60	-1.30
80	2.00	-1.00
90	1.00	-0.70
95	0.60	-0.45
100	0.00	0.00



%	UP'R	LW'R
0	1.57	1.57
1¼	3.54	0.00
2½	4.57	-0.83
5	6.30	-1.33
7½	7.60	-1.87
10	8.70	-2.40
15	10.27	-3.27
20	11.27	-3.98
30	12.38	-4.73
40	12.38	-4.73
50	11.68	-4.47
60	10.32	-3.90
70	8.60	-3.13
80	6.60	-2.33
90	4.33	-1.17
95	3.08	-0.60
100	0.90	+0.90



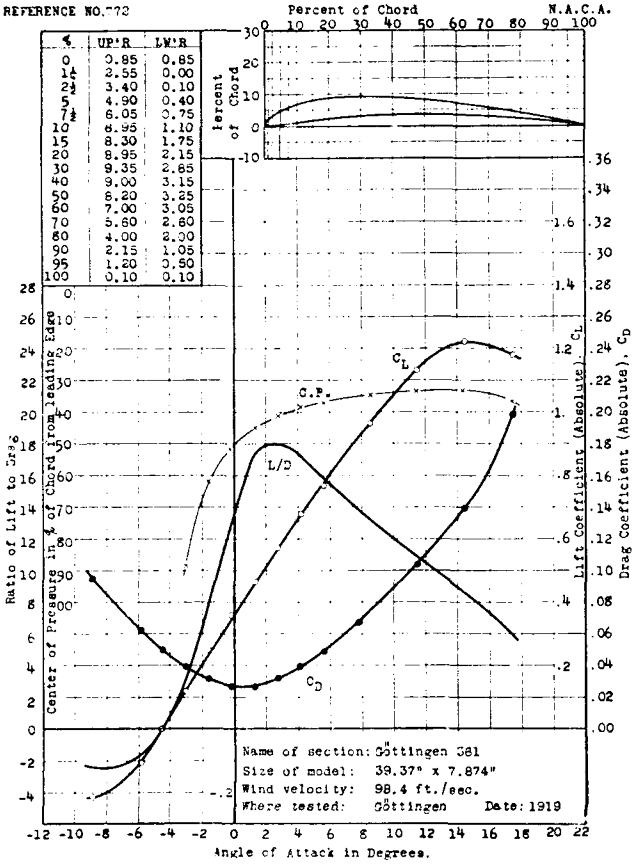
%	UP'R	LW'R
0	1.30	1.30
1¼	3.20	0.20
2½	4.25	-0.18
5	5.37	-0.56
7½	7.27	-0.85
10	8.17	-1.03
15	9.35	-1.30
20	9.98	-1.43
30	10.05	-1.58
40	9.23	-1.60
50	8.10	-1.58
60	6.75	-1.43
70	5.23	-1.20
80	3.58	-0.87
90	1.83	-0.48
95	0.98	-0.23
100	0.00	0.00



%	UP'R	LW'R
0	0.75	0.75
1¼	2.50	0.00
2½	3.60	0.00
5	5.30	0.80
7½	6.55	0.45
10	7.45	0.75
15	8.75	1.30
20	9.55	1.75
30	10.25	2.45
40	10.00	2.85
50	9.15	2.55
60	7.85	2.35
70	6.25	1.85
80	4.40	1.25
90	2.80	0.60
95	1.50	0.30
100	0.15	0.15

REFERENCE NO. 772

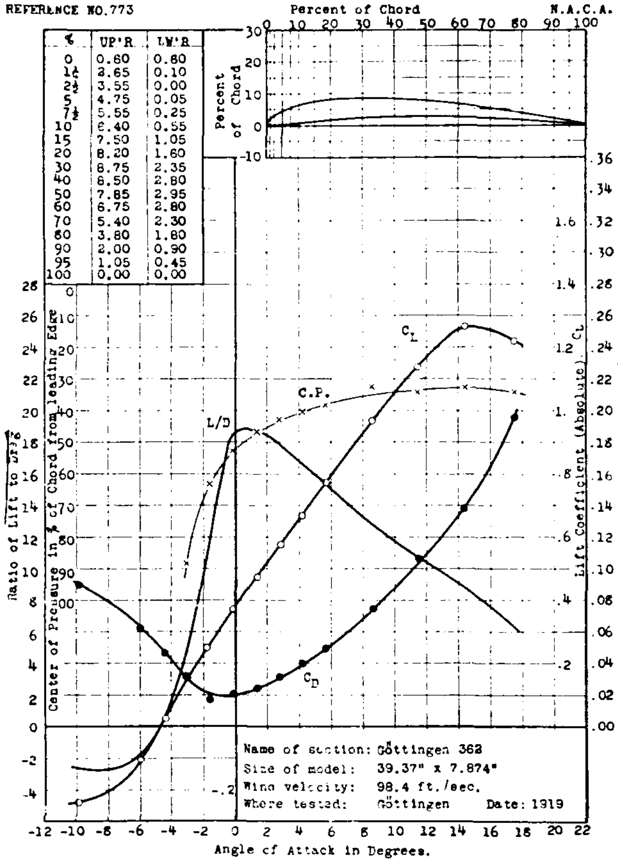
%	UP'R	LW'R
0	0.85	0.85
1¼	2.55	0.00
2½	3.40	0.10
5	4.90	0.40
7½	6.05	0.75
10	6.95	1.10
15	8.30	1.75
20	8.95	2.15
30	9.35	2.85
40	9.00	3.15
50	8.20	3.25
60	7.00	3.05
70	5.60	2.60
80	4.00	2.00
90	2.15	1.05
95	1.20	0.50
100	0.10	0.10



Name of section: Göttingen 381
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

REFERENCE NO. 773

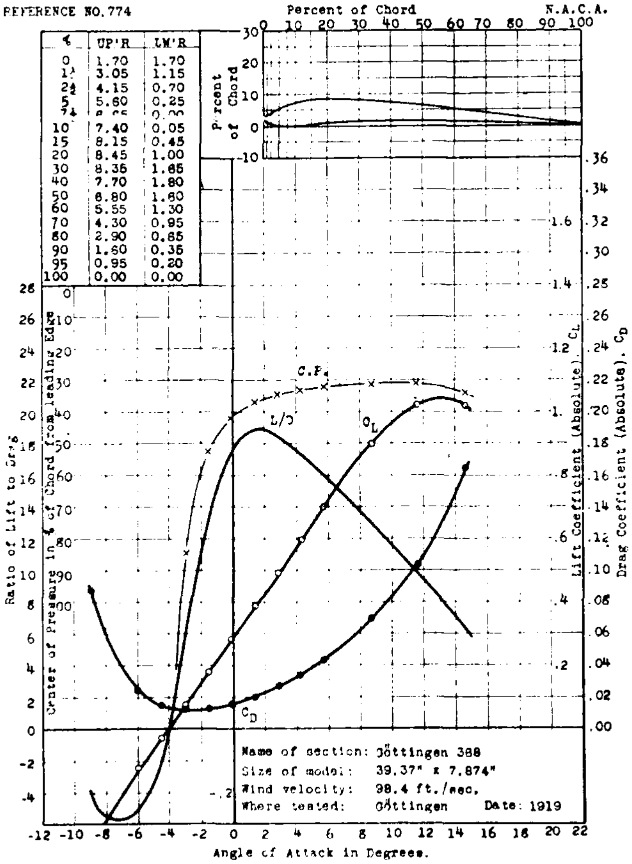
%	UP'R	LW'R
0	0.60	0.60
1¼	2.65	0.10
2½	3.55	0.00
5	4.75	0.05
7½	5.55	0.25
10	6.40	0.55
15	7.50	1.05
20	8.20	1.60
30	8.75	2.35
40	8.50	2.80
50	7.85	2.95
60	6.75	2.80
70	5.40	2.30
80	3.80	1.80
90	2.00	0.90
95	1.05	0.45
100	0.00	0.00



Name of section: Göttingen 382
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

REFERENCE NO. 774

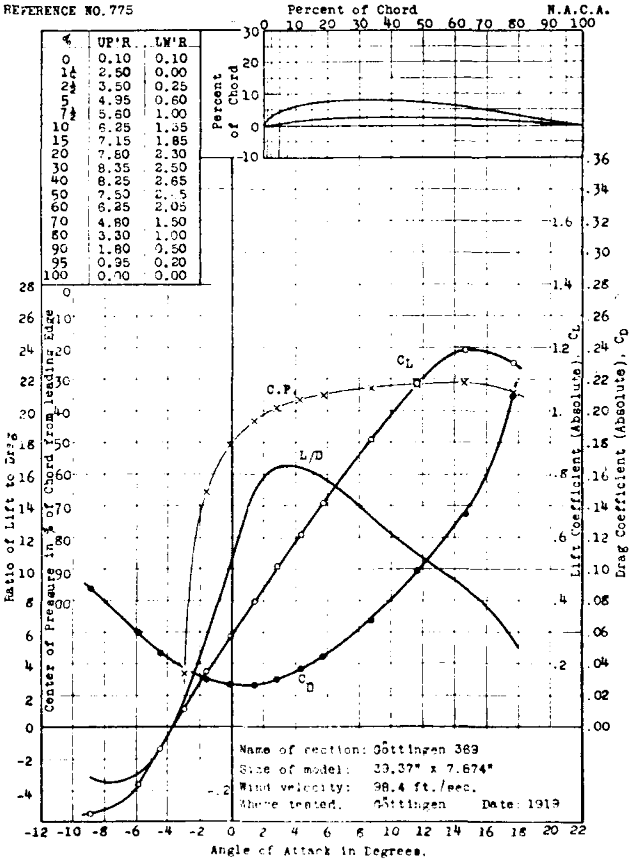
%	UP'R	LW'R
0	1.70	1.70
1¼	3.05	1.15
2½	4.15	0.70
5	5.60	0.25
7½	[illegible]	[illegible]
10	7.40	0.05
15	8.15	0.45
20	8.45	1.00
30	8.35	1.85
40	7.70	1.80
50	6.80	1.60
60	5.55	1.30
70	4.30	0.95
80	2.90	0.65
90	1.60	0.35
95	0.95	0.20
100	0.00	0.00



Name of section: Göttingen 388
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

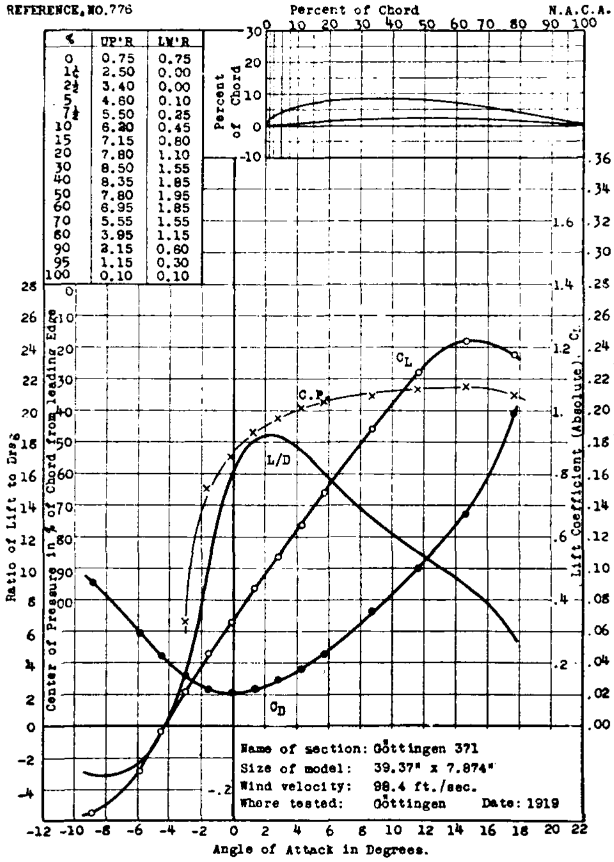
REFERENCE NO. 775

%	UP'R	LW'R
0	0.10	0.10
1¼	2.50	0.00
2½	3.50	0.25
5	4.95	0.60
7½	5.60	1.00
10	6.25	1.35
15	7.15	1.85
20	7.80	2.30
30	8.35	2.50
40	8.25	2.65
50	7.50	[illegible]
60	6.25	2.05
70	4.80	1.50
80	3.30	1.00
90	1.80	0.50
95	0.95	0.20
100	0.00	0.00



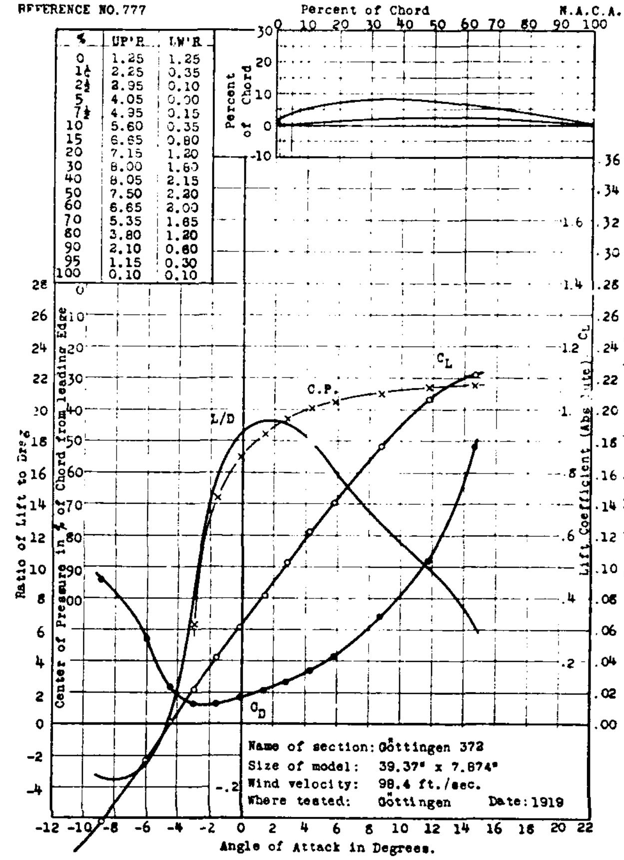
Name of section: Göttingen 389
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

REFERENCE, NO. 776



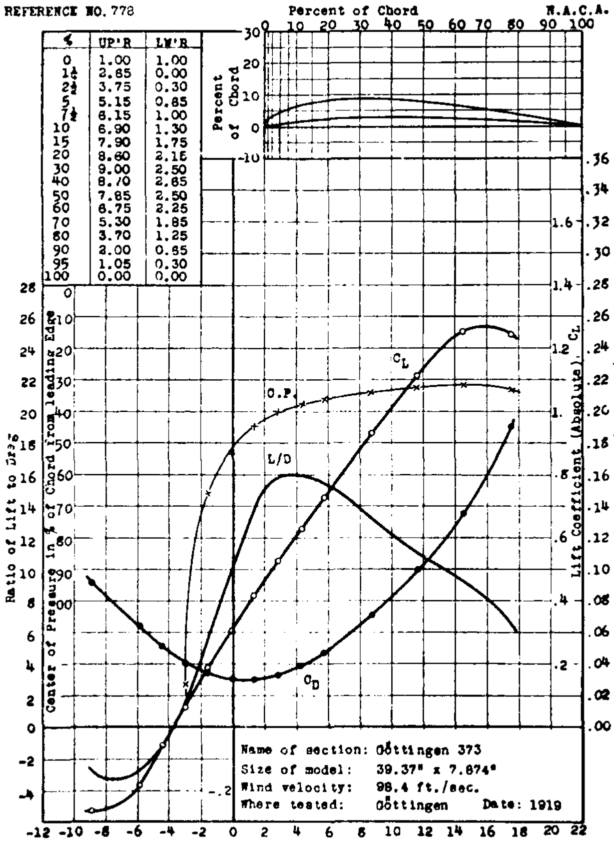
%	UP'R	LW'R
0	0.75	0.75
1¼	2.50	0.00
2½	3.40	0.00
5	4.60	0.10
7½	5.50	0.25
10	6.20	0.45
15	7.15	0.80
20	7.80	1.10
30	8.50	1.55
40	8.35	1.85
50	7.80	1.95
60	6.95	1.85
70	5.55	1.55
80	3.95	1.15
90	2.15	0.60
95	1.15	0.30
100	0.10	0.10

REFERENCE NO. 777



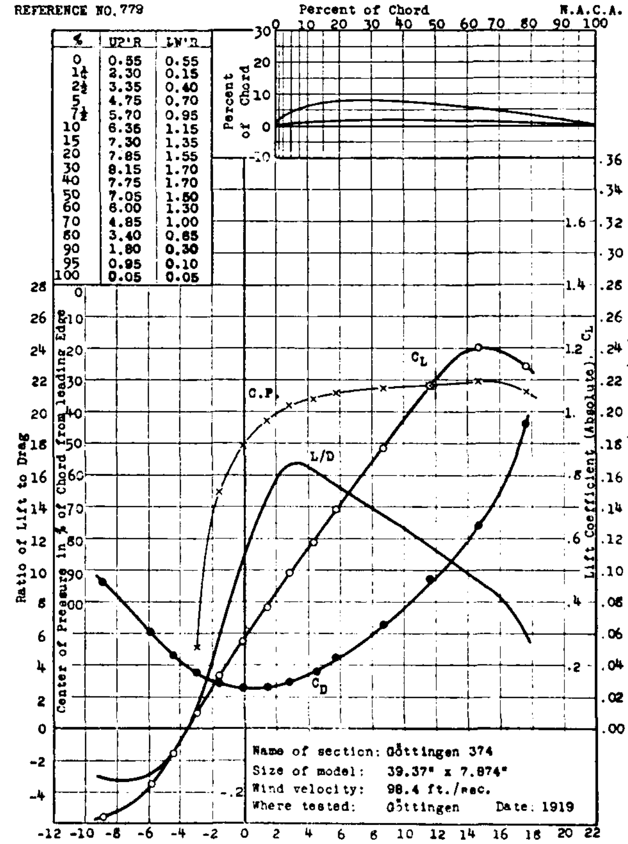
%	UP'R	LW'R
0	1.25	1.25
1¼	2.25	0.35
2½	2.95	0.10
5	4.05	0.00
7½	4.95	0.15
10	5.60	0.35
15	6.65	0.80
20	7.15	1.20
30	8.00	1.60
40	8.05	2.15
50	7.50	2.20
60	6.65	2.00
70	5.35	1.65
80	3.80	1.20
90	2.10	0.60
95	1.15	0.30
100	0.10	0.10

REFERENCE NO. 778



%	UP'R	LW'R
0	1.00	1.00
1¼	2.65	0.00
2½	3.75	0.30
5	5.15	0.65
7½	6.15	1.00
10	6.90	1.30
15	7.90	1.75
20	8.60	2.15
30	9.00	2.50
40	8.70	2.65
50	7.85	2.50
60	6.75	2.25
70	5.30	1.85
80	3.70	1.25
90	2.00	0.55
95	1.05	0.30
100	0.00	0.00

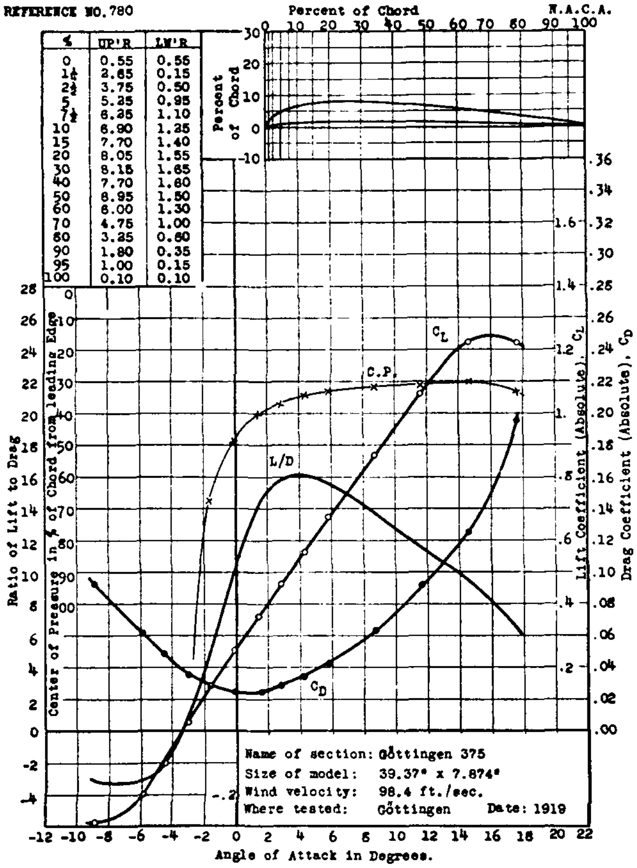
REFERENCE NO. 779



%	UP'R	LW'R
0	0.55	0.55
1¼	2.30	0.15
2½	3.35	0.40
5	4.75	0.70
7½	5.70	0.95
10	6.35	1.15
15	7.30	1.35
20	7.85	1.55
30	8.15	1.70
40	7.75	1.70
50	7.05	1.50
60	6.00	1.30
70	4.85	1.00
80	3.40	0.65
90	1.80	0.30
95	0.95	0.10
100	0.05	0.05

REFERENCE NO. 780

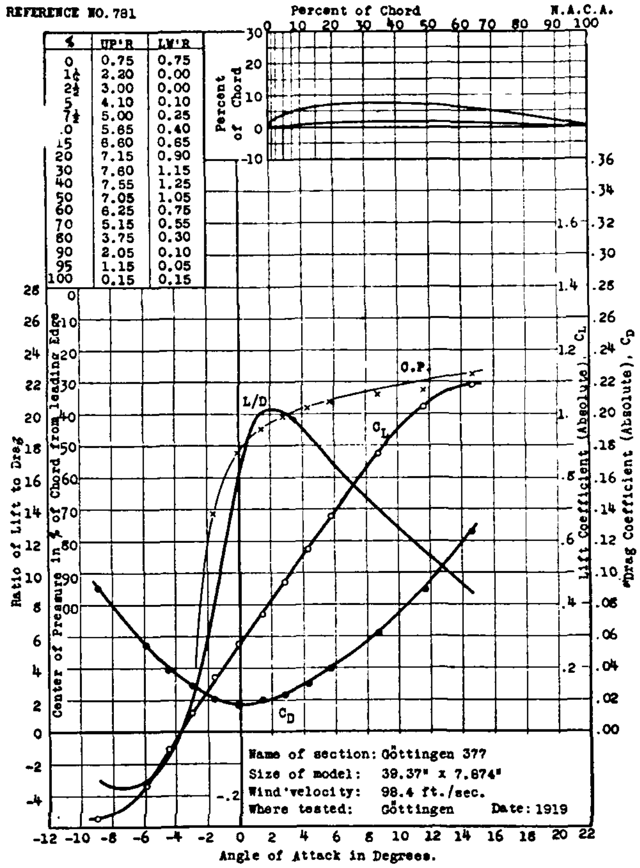
%	UP'R	LW'R
0	0.55	0.55
1¼	2.65	0.15
2½	3.75	0.50
5	5.25	0.95
7½	6.25	1.10
10	6.90	1.25
15	7.70	1.40
20	8.05	1.55
30	8.15	1.65
40	7.70	1.60
50	6.95	1.50
60	6.00	1.30
70	4.75	1.00
80	3.25	0.60
90	1.80	0.35
95	1.00	0.15
100	0.10	0.10



Name of section: Göttingen 375
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

REFERENCE NO. 781

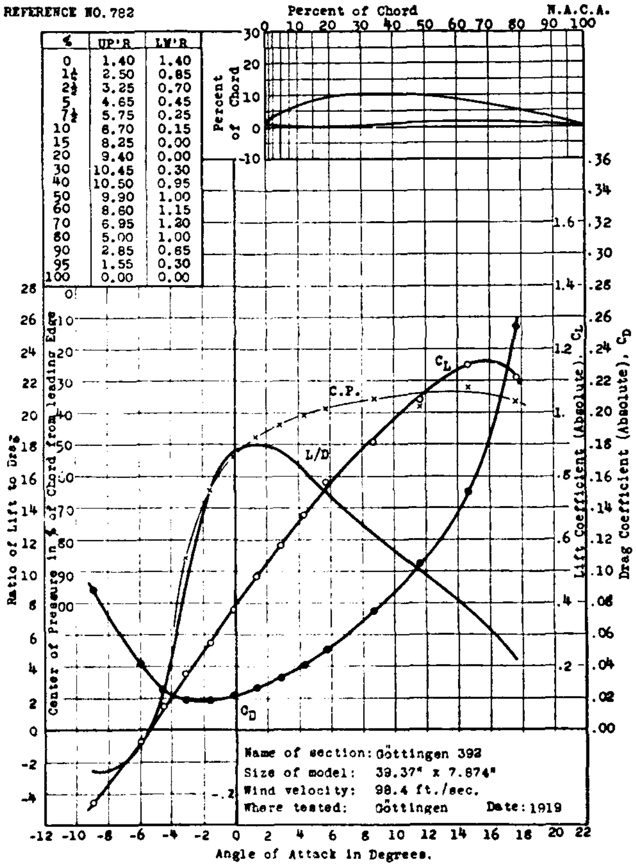
%	UP'R	LW'R
0	0.75	0.75
1¼	2.20	0.00
2½	3.00	0.00
5	4.10	0.10
7½	5.00	0.25
10	5.65	0.40
15	6.60	0.65
20	7.15	0.90
30	7.60	1.15
40	7.55	1.25
50	7.05	1.05
60	6.25	0.75
70	5.15	0.55
80	3.75	0.30
90	2.05	0.10
95	1.15	0.05
100	0.15	0.15



Name of section: Göttingen 377
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

REFERENCE NO. 782

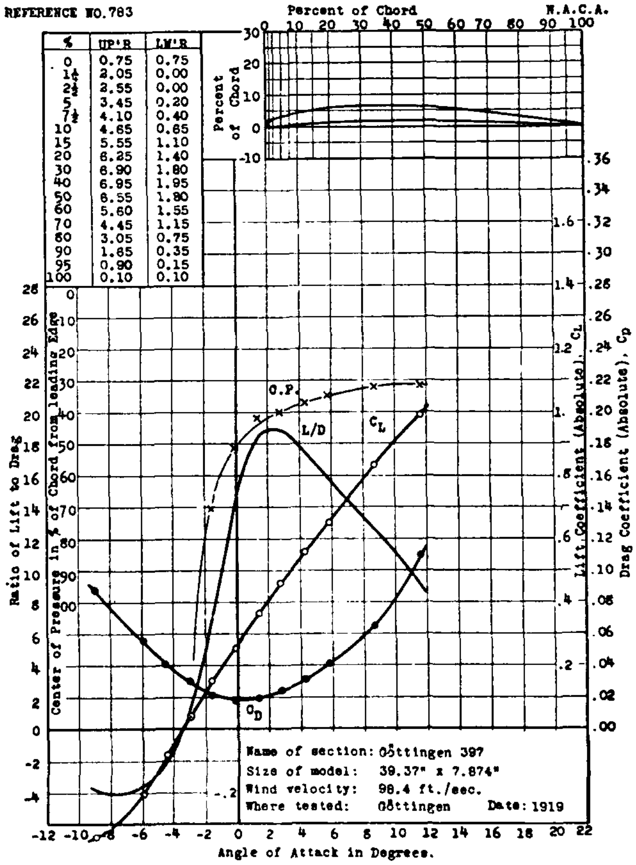
%	UP'R	LW'R
0	1.40	1.40
1¼	2.50	0.85
2½	3.25	0.70
5	4.65	0.45
7½	5.75	0.25
10	6.70	0.15
15	8.25	0.00
20	9.40	0.00
30	10.45	0.30
40	10.50	0.95
50	9.90	1.00
60	8.60	1.15
70	6.95	1.20
80	5.00	1.00
90	2.85	0.65
95	1.55	0.30
100	0.00	0.00



Name of section: Göttingen 392
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

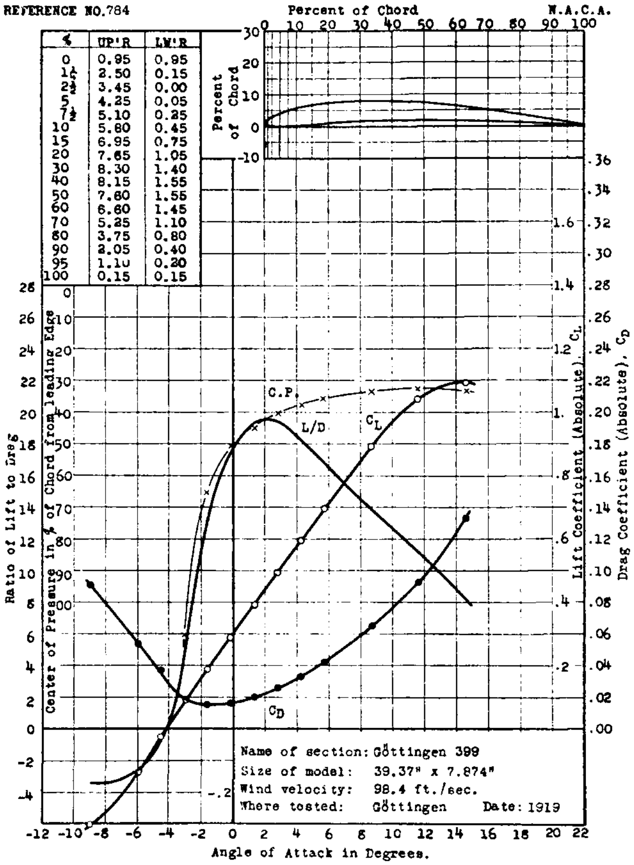
REFERENCE NO. 783

%	UP'R	LW'R
0	0.75	0.75
1¼	2.05	0.00
2½	2.55	0.00
5	3.45	0.20
7½	4.10	0.40
10	4.65	0.65
15	5.55	1.10
20	6.25	1.40
30	6.90	1.80
40	6.95	1.85
50	6.55	1.80
60	5.60	1.55
70	4.45	1.15
80	3.05	0.75
90	1.65	0.35
95	0.90	0.15
100	0.10	0.10



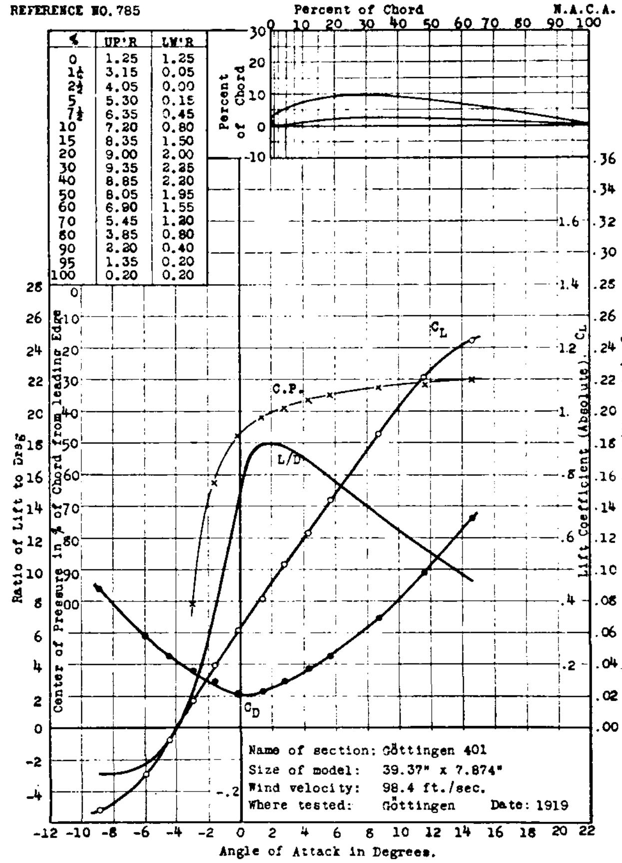
Name of section: Göttingen 397
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

REFERENCE NO. 784



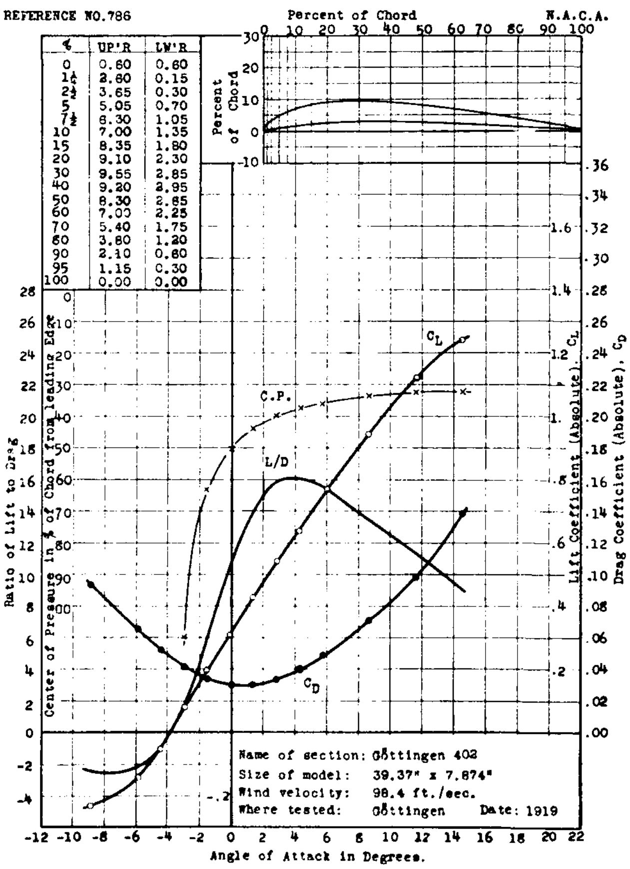
%	UP'R	LW'R
0	0.95	0.95
1¼	2.50	0.15
2½	3.45	0.00
5	4.25	0.05
7½	5.10	0.25
10	5.80	0.45
15	6.95	0.75
20	7.65	1.05
30	8.30	1.40
40	8.15	1.55
50	7.60	1.55
60	6.60	1.45
70	5.25	1.10
80	3.75	0.80
90	2.05	0.40
95	1.10	0.20
100	0.15	0.15

REFERENCE NO. 785



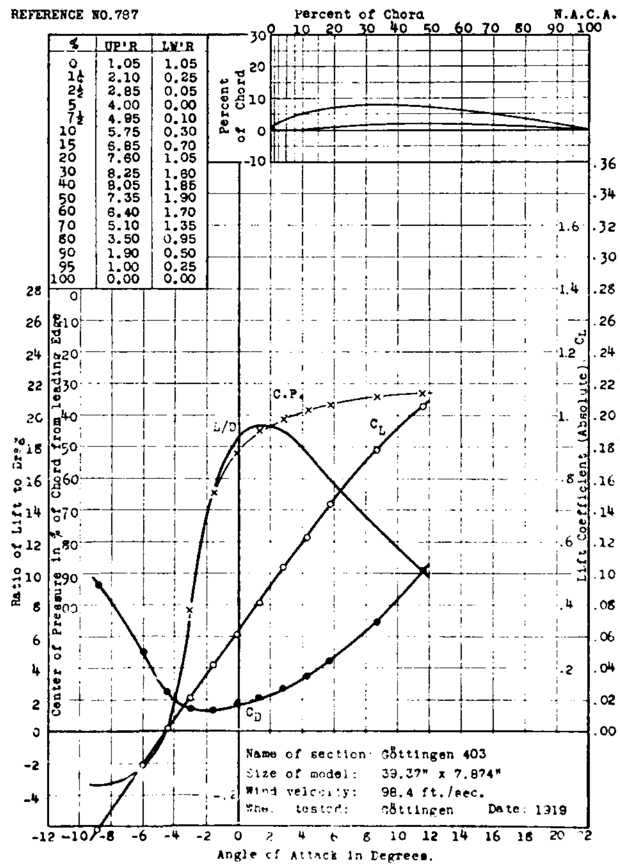
%	UP'R	LW'R
0	1.25	1.25
1¼	3.15	0.05
2½	4.05	0.00
5	5.30	0.15
7½	6.35	0.45
10	7.20	0.80
15	8.35	1.50
20	9.00	2.00
30	9.35	2.25
40	8.85	2.20
50	8.05	1.95
60	6.90	1.55
70	5.45	1.20
80	3.85	0.80
90	2.20	0.40
95	1.35	0.20
100	0.20	0.20

REFERENCE NO. 786



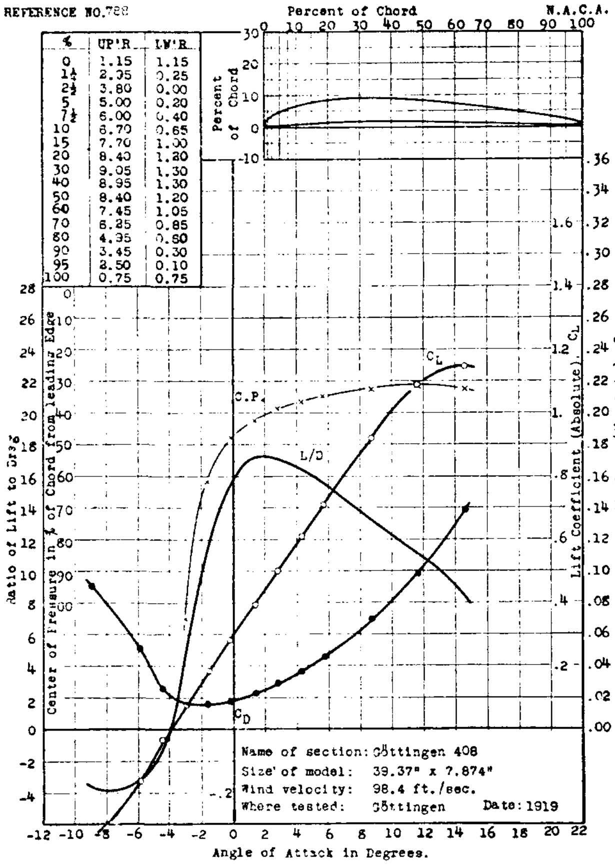
%	UP'R	LW'R
0	0.60	0.60
1¼	2.60	0.15
2½	3.65	0.30
5	5.05	0.70
7½	6.30	1.05
10	7.00	1.35
15	8.35	1.80
20	9.10	2.30
30	9.55	2.85
40	9.20	2.95
50	8.30	2.85
60	7.00	2.25
70	5.40	1.75
80	3.80	1.20
90	2.10	0.60
95	1.15	0.30
100	0.00	0.00

REFERENCE NO. 787



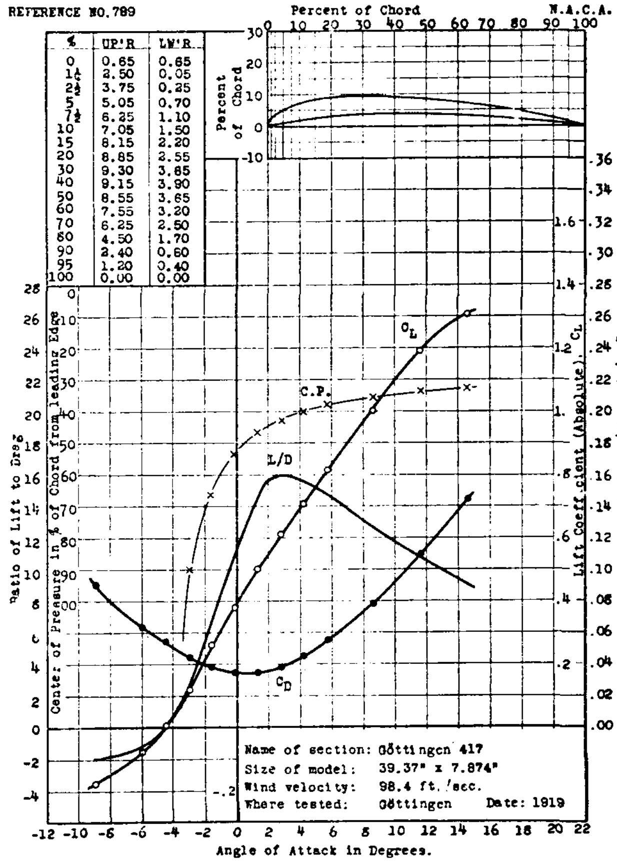
%	UP'R	LW'R
0	1.05	1.05
1¼	2.10	0.25
2½	2.85	0.05
5	4.00	0.00
7½	4.95	0.10
10	5.75	0.30
15	6.85	0.70
20	7.60	1.05
30	8.25	1.80
40	8.05	1.85
50	7.35	1.90
60	6.40	1.70
70	5.10	1.35
80	3.50	0.95
90	1.90	0.50
95	1.00	0.25
100	0.00	0.00

REFERENCE NO. 788



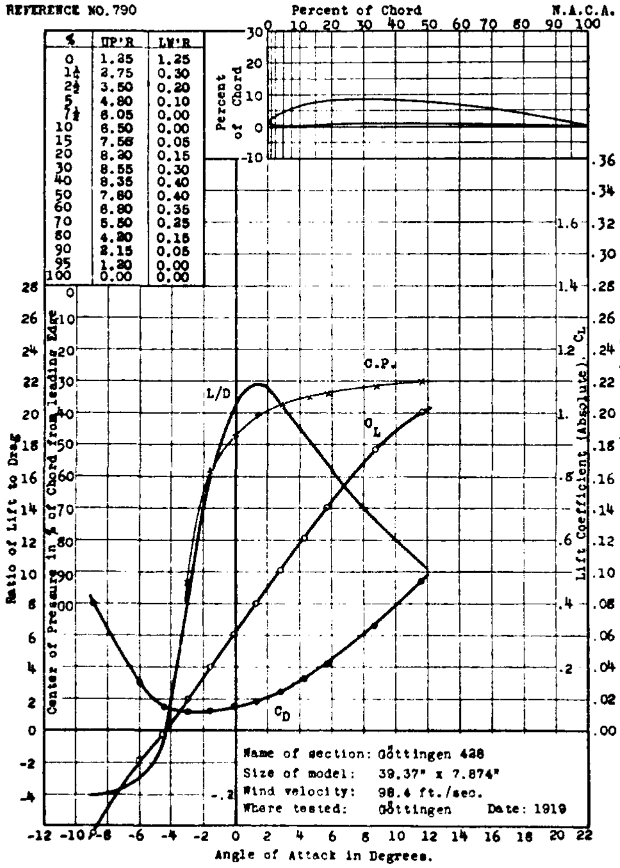
%	UP'R	LW'R
0	1.15	1.15
1¼	2.35	0.25
2½	3.80	0.00
5	5.00	0.20
7½	6.00	0.40
10	6.70	0.65
15	7.70	1.00
20	8.40	1.20
30	9.05	1.30
40	8.95	1.30
50	8.40	1.20
60	7.45	1.05
70	6.25	0.85
80	4.35	0.60
90	3.45	0.30
95	2.50	0.10
100	0.75	0.75

REFERENCE NO. 789



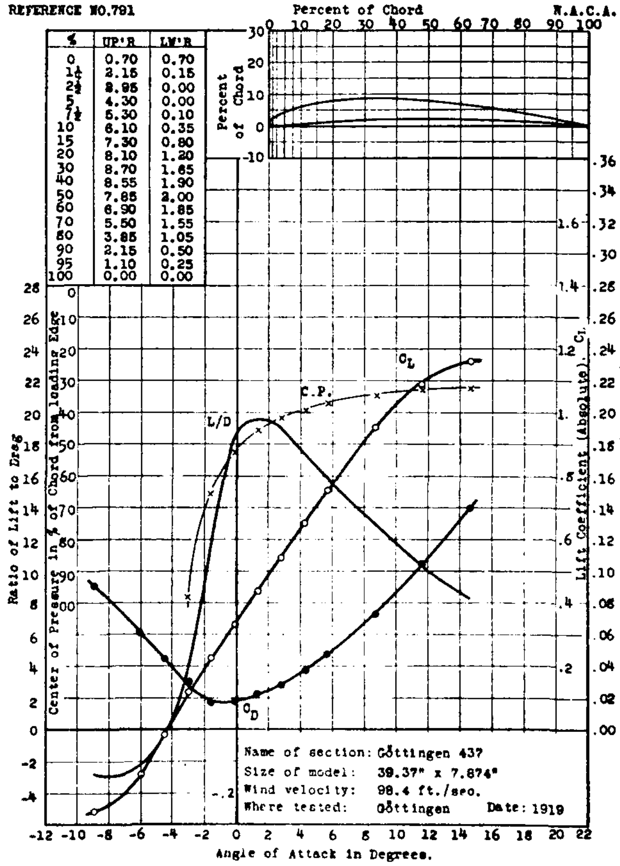
%	UP'R	LW'R
0	0.65	0.65
1¼	2.50	0.05
2½	3.75	0.25
5	5.05	0.70
7½	6.25	1.10
10	7.05	1.50
15	8.15	2.20
20	8.85	2.55
30	9.30	3.85
40	9.15	3.90
50	8.55	3.65
60	7.55	3.20
70	6.25	2.50
80	4.50	1.70
90	2.40	0.60
95	1.20	0.40
100	0.00	0.00

REFERENCE NO. 790



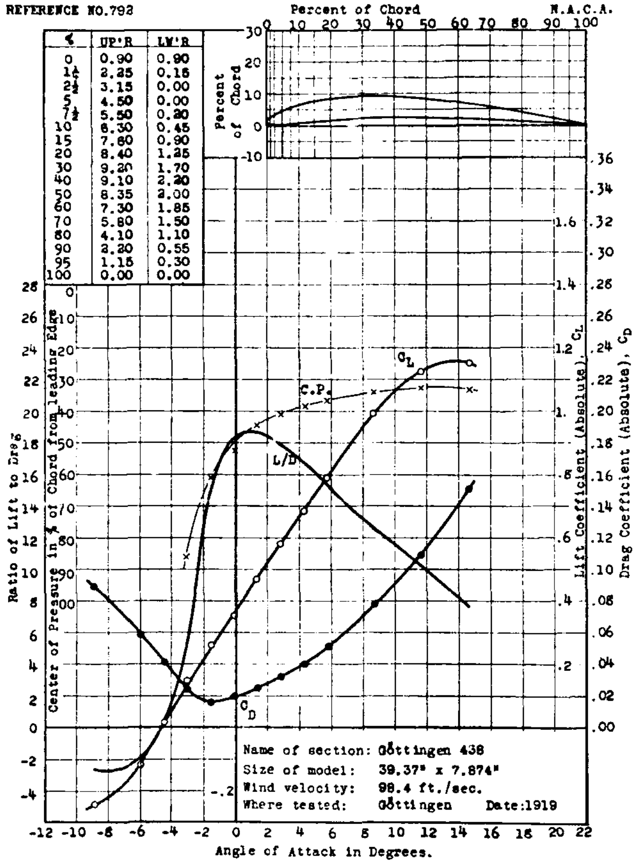
%	UP'R	LW'R
0	1.25	1.25
1¼	2.75	0.30
2½	3.50	0.20
5	4.80	0.10
7½	6.05	0.00
10	6.50	0.00
15	7.55	0.05
20	8.30	0.15
30	8.55	0.30
40	8.35	0.40
50	7.80	0.40
60	6.80	0.35
70	5.50	0.25
80	4.20	0.15
90	2.15	0.05
95	1.20	0.00
100	0.00	0.00

REFERENCE NO. 791



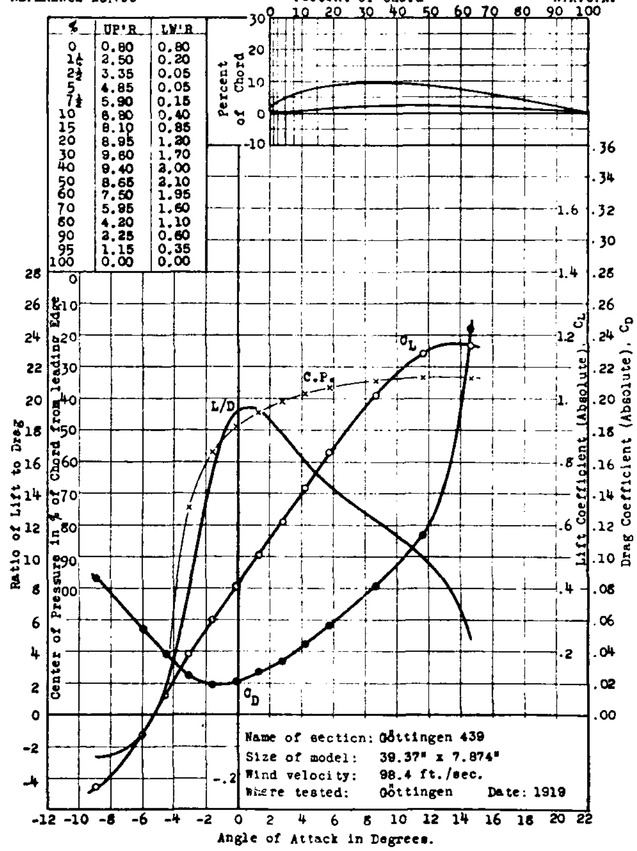
%	UP'R	LW'R
0	0.70	0.70
1¼	2.15	0.15
2½	2.95	0.00
5	4.30	0.00
7½	5.30	0.10
10	6.10	0.35
15	7.30	0.80
20	8.10	1.20
30	8.70	1.65
40	8.55	1.90
50	7.85	2.00
60	6.90	1.85
70	5.50	1.55
80	3.85	1.05
90	2.15	0.50
95	1.10	0.25
100	0.00	0.00

REFERENCE NO.792



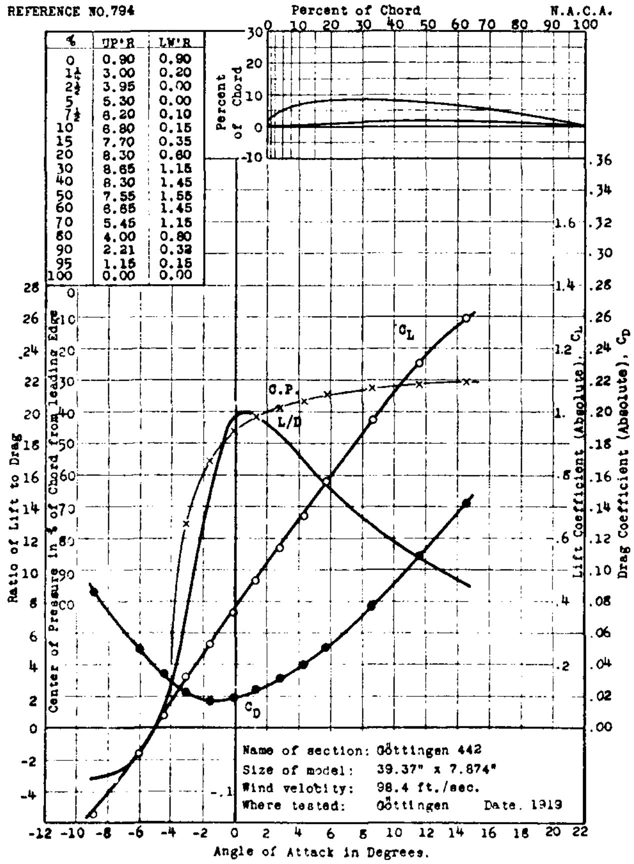
%	UP'R	LW'R
0	0.90	0.90
1¼	2.25	0.15
2½	3.15	0.00
5	4.50	0.00
7½	5.50	0.20
10	6.30	0.45
15	7.60	0.90
20	8.40	1.25
30	9.20	1.70
40	9.10	2.20
50	8.35	2.00
60	7.30	1.85
70	5.80	1.50
80	4.10	1.10
90	2.20	0.55
95	1.15	0.30
100	0.00	0.00

REFERENCE NO.793



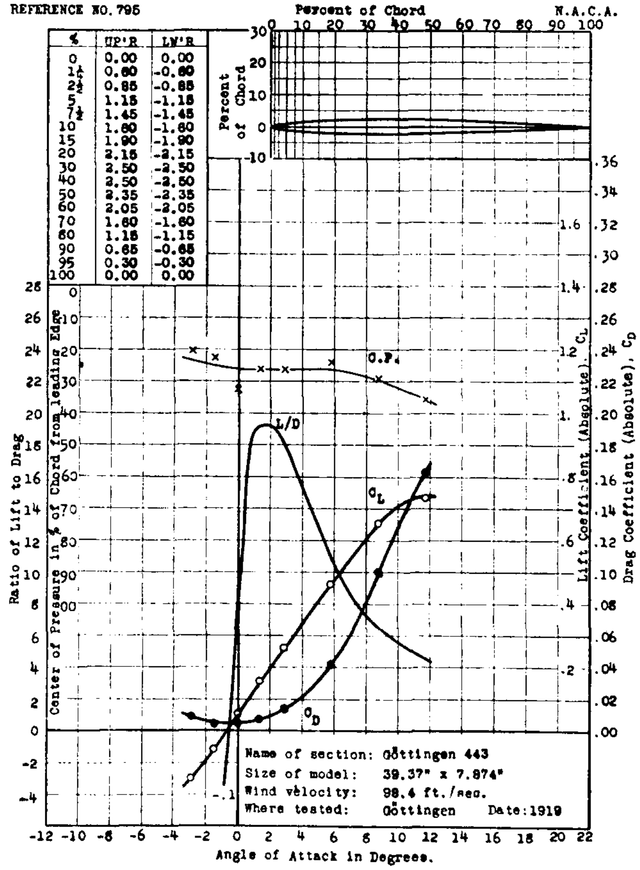
%	UP'R	LW'R
0	0.80	0.80
1¼	2.50	0.20
2½	3.35	0.05
5	4.85	0.05
7½	5.90	0.15
10	6.80	0.40
15	8.10	0.85
20	8.95	1.20
30	9.60	1.70
40	9.40	2.00
50	8.65	2.10
60	7.50	1.95
70	5.95	1.60
80	4.20	1.10
90	2.25	0.60
95	1.15	0.35
100	0.00	0.00

REFERENCE NO.794



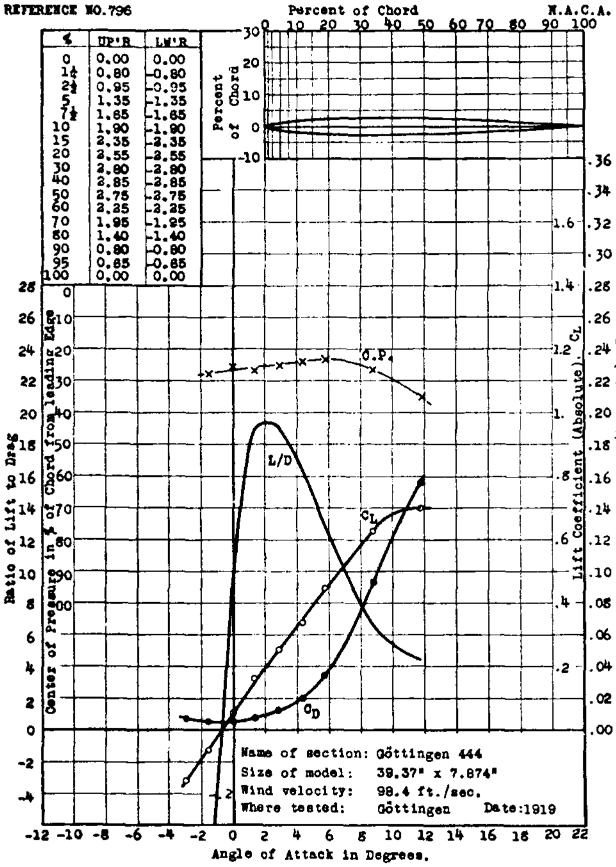
%	UP'R	LW'R
0	0.90	0.90
1¼	3.00	0.20
2½	3.95	0.00
5	5.30	0.00
7½	6.20	0.10
10	6.80	0.15
15	7.70	0.35
20	8.30	0.60
30	8.65	1.15
40	8.30	1.45
50	7.55	1.55
60	6.65	1.45
70	5.45	1.15
80	4.00	0.80
90	2.21	0.32
95	1.15	0.15
100	0.00	0.00

REFERENCE NO.795



%	UP'R	LW'R
0	0.00	0.00
1¼	0.60	-0.60
2½	0.85	-0.85
5	1.15	-1.15
7½	1.45	-1.45
10	1.60	-1.60
15	1.90	-1.90
20	2.15	-2.15
30	2.50	-2.50
40	2.50	-2.50
50	2.35	-2.35
60	2.05	-2.05
70	1.60	-1.60
80	1.15	-1.15
90	0.65	-0.65
95	0.30	-0.30
100	0.00	0.00

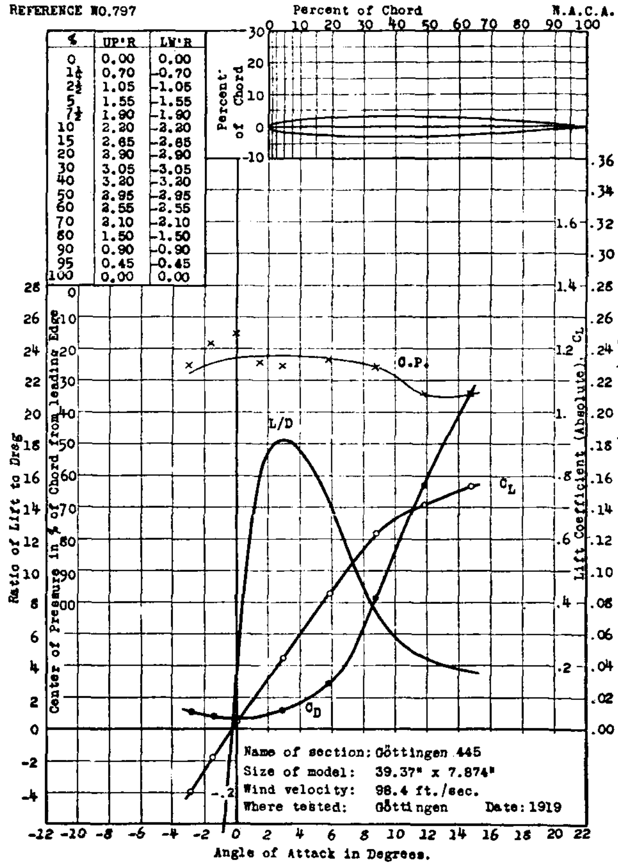
REFERENCE NO.796



%	UP'R	LW'R
0	0.00	0.00
1¼	0.80	-0.80
2½	0.95	-0.95
5	1.35	-1.35
7½	1.65	-1.65
10	1.90	-1.90
15	2.35	-2.35
20	2.55	-2.55
30	2.80	-2.80
40	2.85	-2.85
50	2.75	-2.75
60	2.25	-2.25
70	1.95	-1.95
80	1.40	-1.40
90	0.80	-0.80
95	0.65	-0.65
100	0.00	0.00

Name of section: Göttingen 444
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date:1919

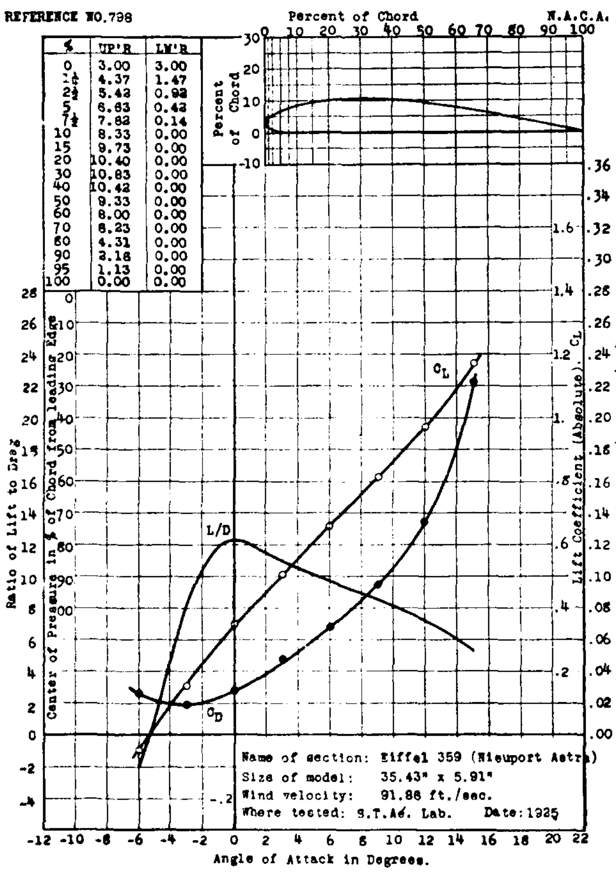
REFERENCE NO.797



%	UP'R	LW'R
0	0.00	0.00
1¼	0.70	-0.70
2½	1.05	-1.05
5	1.55	-1.55
7½	1.90	-1.90
10	2.20	-2.20
15	2.65	-2.65
20	2.90	-2.90
30	3.05	-3.05
40	3.20	-3.20
50	2.95	-2.95
60	2.55	-2.55
70	2.10	-2.10
80	1.50	-1.50
90	0.90	-0.90
95	0.45	-0.45
100	0.00	0.00

Name of section: Göttingen 445
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Göttingen Date: 1919

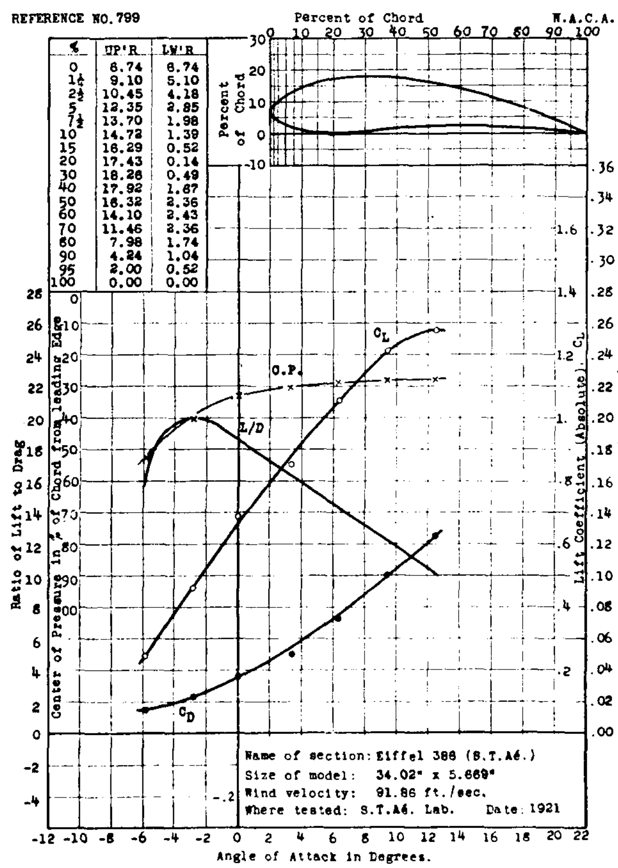
REFERENCE NO.798



%	UP'R	LW'R
0	3.00	3.00
1¼	4.37	1.47
2½	5.42	0.92
5	6.63	0.42
7½	7.62	0.14
10	8.33	0.00
15	9.73	0.00
20	10.40	0.00
30	10.83	0.00
40	10.42	0.00
50	9.33	0.00
60	8.00	0.00
70	6.23	0.00
80	4.31	0.00
90	2.18	0.00
95	1.13	0.00
100	0.00	0.00

Name of section: Eiffel 359 (Nieuport Astra)
Size of model: 35.43" x 5.91"
Wind velocity: 91.86 ft./sec.
Where tested: S.T.Aé. Lab. Date:1925

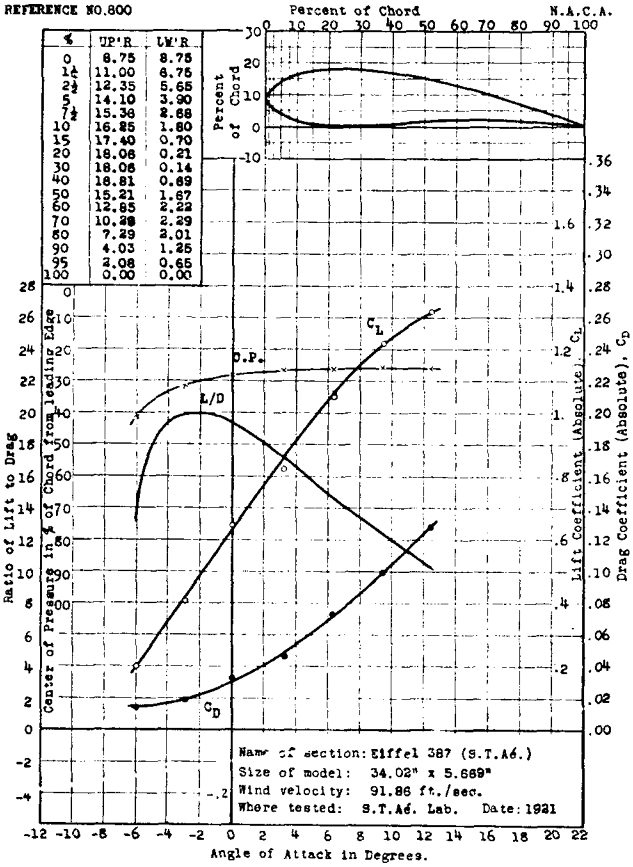
REFERENCE NO.799



%	UP'R	LW'R
0	8.74	8.74
1¼	9.10	5.10
2½	10.45	4.18
5	12.35	2.85
7½	13.70	1.98
10	14.72	1.39
15	16.29	0.52
20	17.43	0.14
30	18.26	0.49
40	17.92	1.67
50	16.32	2.36
60	14.10	2.43
70	11.46	2.36
80	7.98	1.74
90	4.24	1.04
95	2.00	0.52
100	0.00	0.00

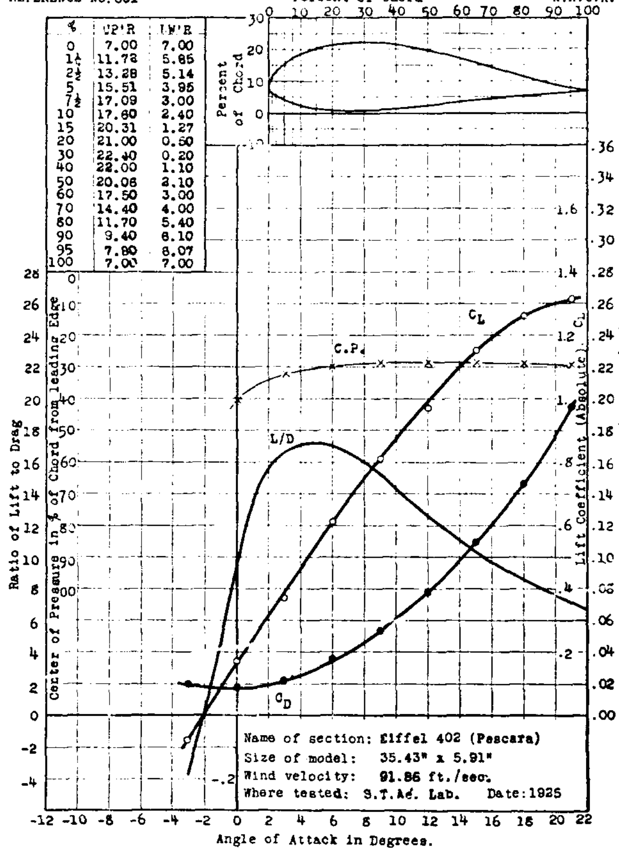
Name of section: Eiffel 388 (S.T.Aé.)
Size of model: 34.02" x 5.669"
Wind velocity: 91.86 ft./sec.
Where tested: S.T.Aé. Lab. Date: 1921

REFERENCE NO. 800



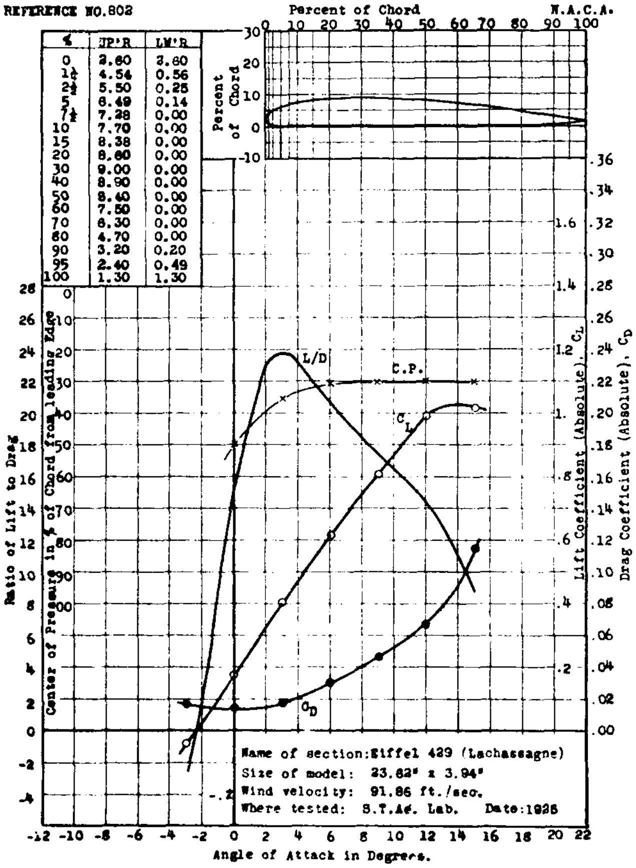
%	UP'R	LW'R
0	8.75	8.75
1¼	11.00	6.75
2½	12.35	5.65
5	14.10	3.90
7½	15.38	2.68
10	16.85	1.80
15	17.40	0.70
20	18.06	0.21
30	18.06	0.14
40	18.81	0.69
50	15.21	1.67
60	12.85	2.22
70	10.28	2.29
80	7.29	2.01
90	4.03	1.25
95	2.08	0.65
100	0.00	0.00

REFERENCE NO. 801



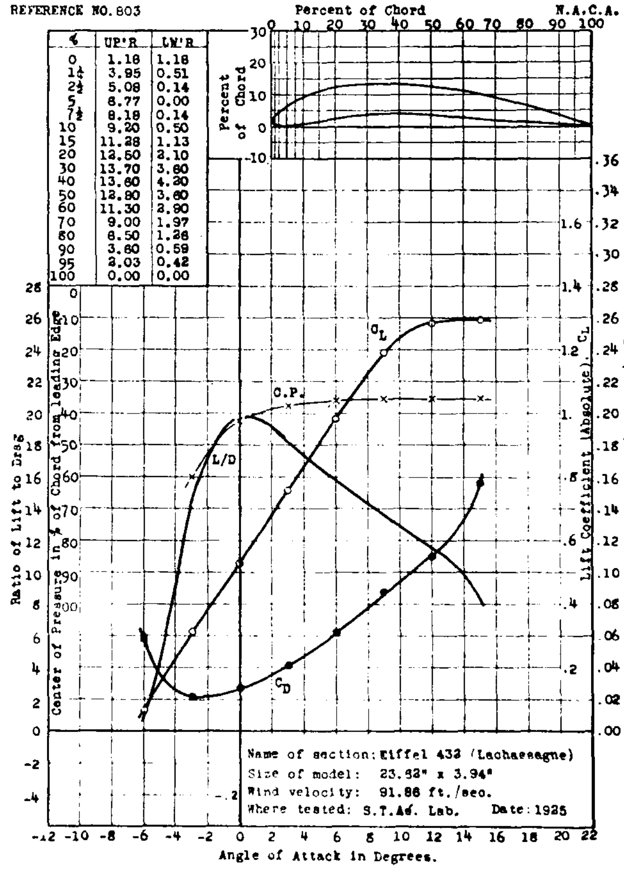
%	UP'R	LW'R
0	7.00	7.00
1¼	11.72	5.85
2½	13.28	5.14
5	15.51	3.95
7½	17.09	3.00
10	17.80	2.40
15	20.31	1.27
20	21.00	0.50
30	22.40	0.20
40	22.00	1.10
50	20.06	2.10
60	17.50	3.00
70	14.40	4.00
80	11.70	5.40
90	9.40	6.10
95	7.80	6.07
100	7.00	7.00

REFERENCE NO. 802



%	UP'R	LW'R
0	2.60	2.60
1¼	4.54	0.56
2½	5.50	0.25
5	6.49	0.14
7½	7.28	0.00
10	7.70	0.00
15	8.38	0.00
20	8.60	0.00
30	9.00	0.00
40	8.90	0.00
50	8.40	0.00
60	7.50	0.00
70	6.30	0.00
80	4.70	0.00
90	3.20	0.20
95	2.40	0.49
100	1.30	1.30

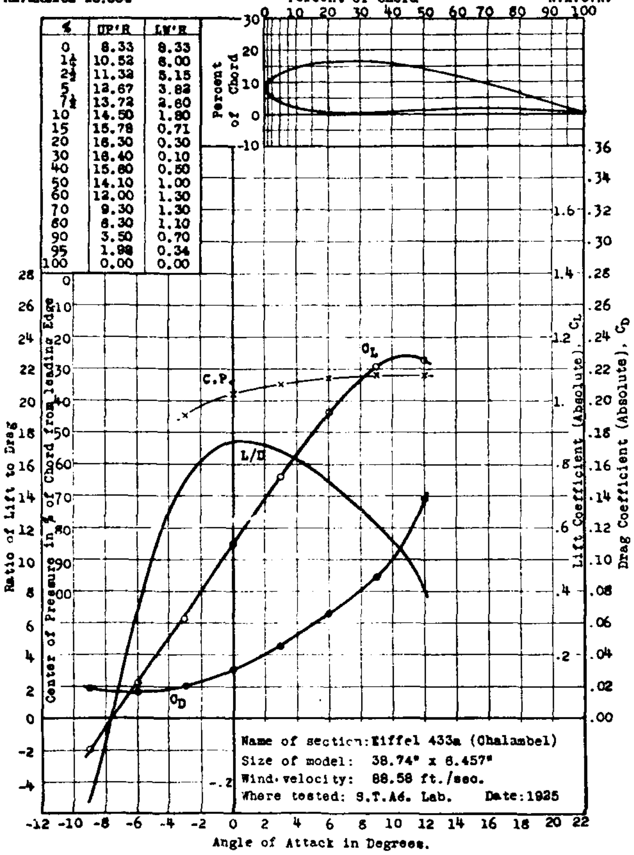
REFERENCE NO. 803



%	UP'R	LW'R
0	1.18	1.18
1¼	3.95	0.51
2½	5.08	0.14
5	6.77	0.00
7½	8.18	0.14
10	9.20	0.50
15	11.28	1.13
20	12.60	2.10
30	13.70	3.80
40	13.60	4.20
50	12.80	3.60
60	11.30	2.90
70	9.00	1.97
80	6.50	1.28
90	3.60	0.59
95	2.03	0.42
100	0.00	0.00

REFERENCE NO.804 N.A.C.A.

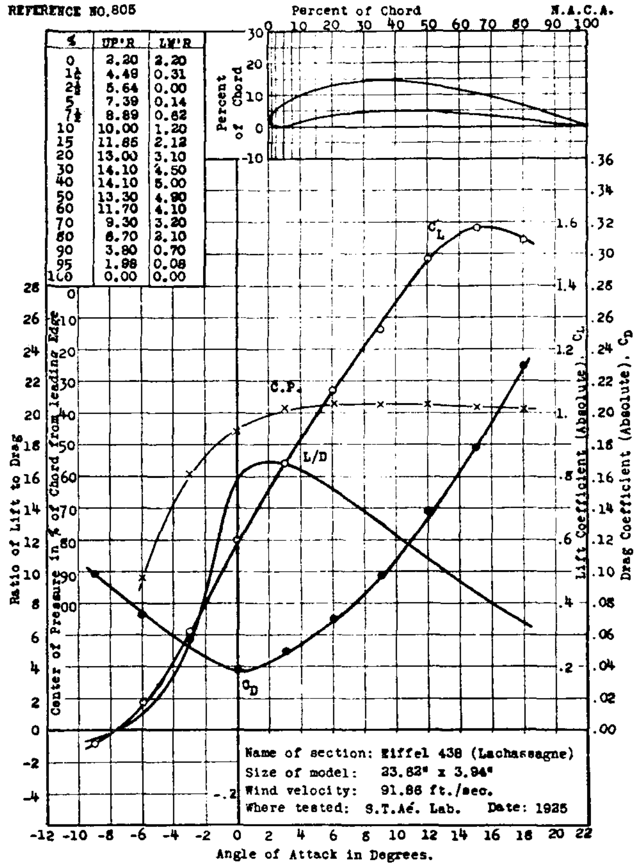
%	UP'R	LW'R
0	8.33	8.33
1¼	10.52	6.00
2½	11.32	5.15
5	12.67	3.82
7½	13.72	2.60
10	14.50	1.80
15	15.78	0.71
20	16.30	0.30
30	16.40	0.10
40	15.80	0.50
50	14.10	1.00
60	12.00	1.30
70	9.30	1.30
80	6.30	1.10
90	3.50	0.70
95	1.88	0.34
100	0.00	0.00



Name of section: Eiffel 433a (Chalambel)
Size of model: 38.74" x 6.457"
Wind velocity: 88.58 ft./sec.
Where tested: S.T.Aé. Lab. Date: 1925

REFERENCE NO.805 N.A.C.A.

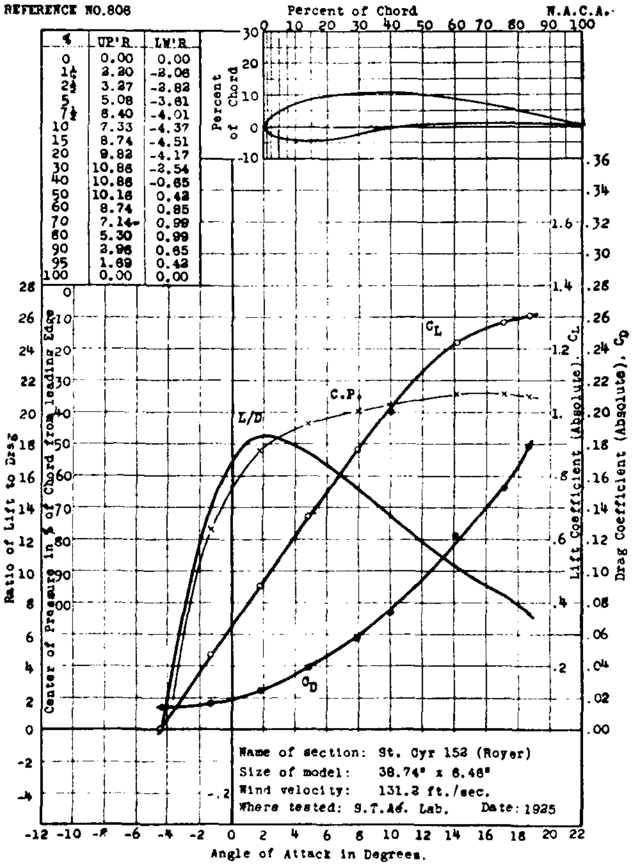
%	UP'R	LW'R
0	2.20	2.20
1¼	4.48	0.31
2½	5.64	0.00
5	7.39	0.14
7½	8.89	0.62
10	10.00	1.20
15	11.85	2.12
20	13.00	3.10
30	14.10	4.50
40	14.10	5.00
50	13.30	4.90
60	11.70	4.10
70	9.30	3.20
80	6.70	2.10
90	3.80	0.70
95	1.98	0.08
100	0.00	0.00



Name of section: Eiffel 438 (Lachassagne)
Size of model: 23.62" x 3.94"
Wind velocity: 91.86 ft./sec.
Where tested: S.T.Aé. Lab. Date: 1925

REFERENCE NO.806 N.A.C.A.

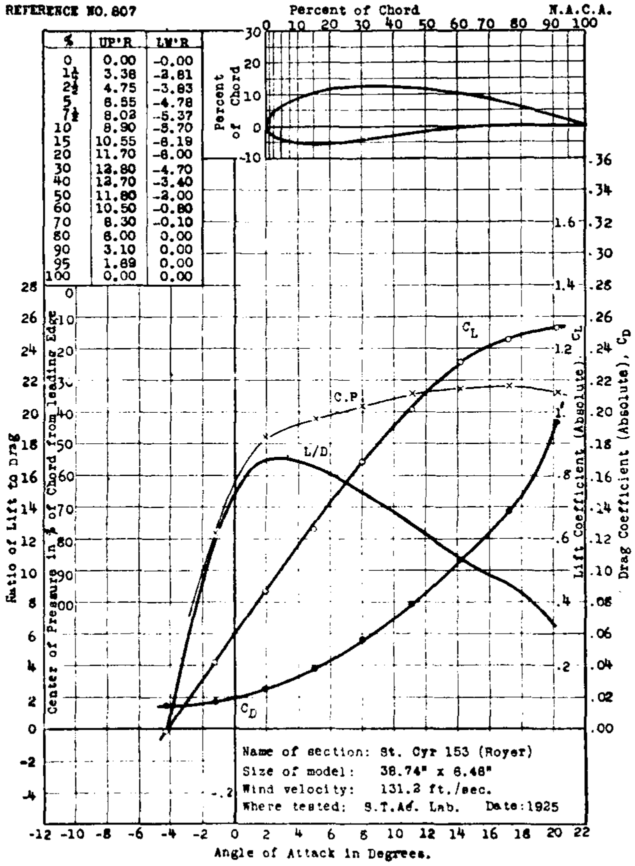
%	UP'R	LW'R
0	0.00	0.00
1¼	2.20	-2.06
2½	3.27	-2.82
5	5.08	-3.61
7½	6.40	-4.01
10	7.33	-4.37
15	8.74	-4.51
20	9.82	-4.17
30	10.86	-2.54
40	10.86	-0.65
50	10.16	0.42
60	8.74	0.85
70	7.14	0.98
80	5.30	0.99
90	2.96	0.65
95	1.69	0.42
100	0.00	0.00



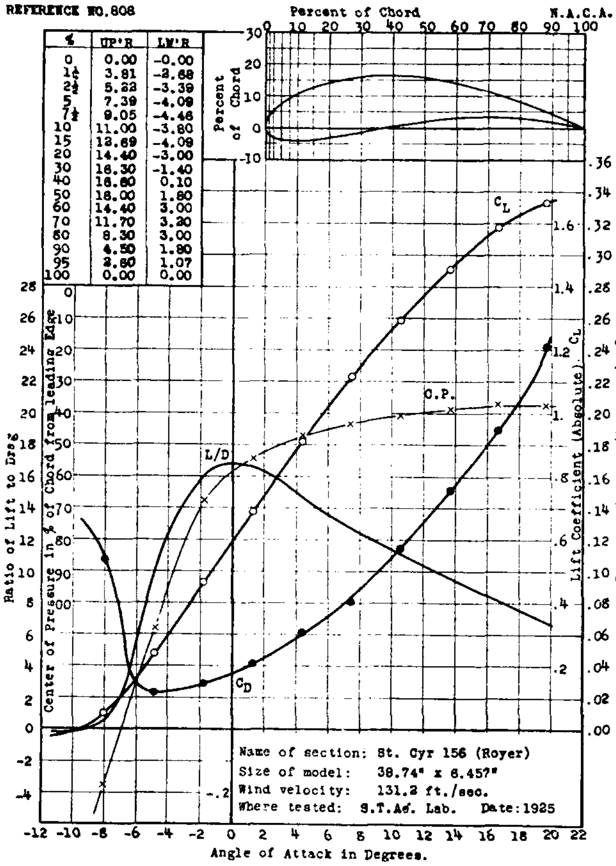
Name of section: St. Cyr 152 (Royer)
Size of model: 38.74" x 6.46"
Wind velocity: 131.2 ft./sec.
Where tested: S.T.Aé. Lab. Date: 1925

REFERENCE NO.807 N.A.C.A.

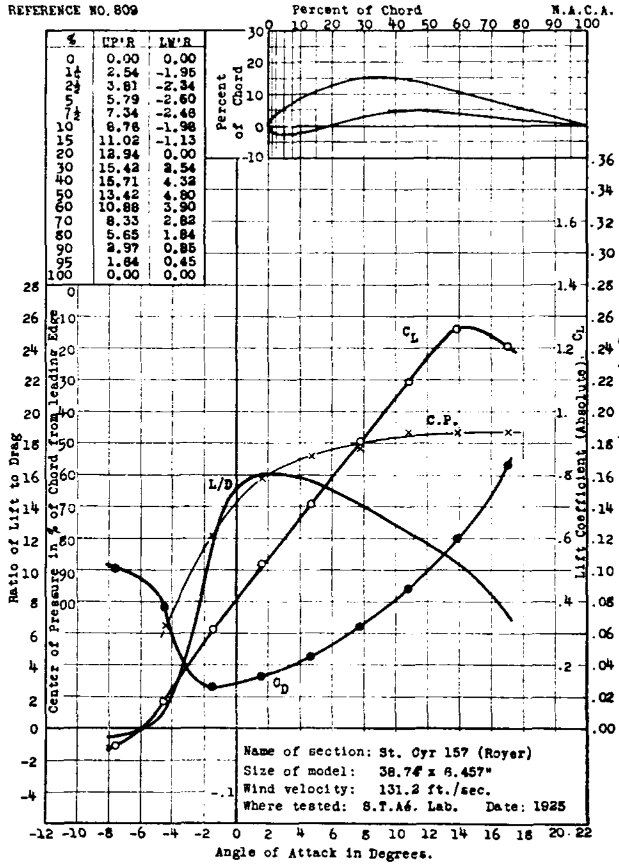
%	UP'R	LW'R
0	0.00	-0.00
1¼	3.38	-2.81
2½	4.75	-3.83
5	6.55	-4.78
7½	8.02	-5.37
10	8.90	-5.70
15	10.55	-6.19
20	11.70	-6.00
30	12.80	-4.70
40	12.70	-3.40
50	11.80	-2.00
60	10.50	-0.80
70	8.30	-0.10
80	6.00	0.00
90	3.10	0.00
95	1.69	0.00
100	0.00	0.00



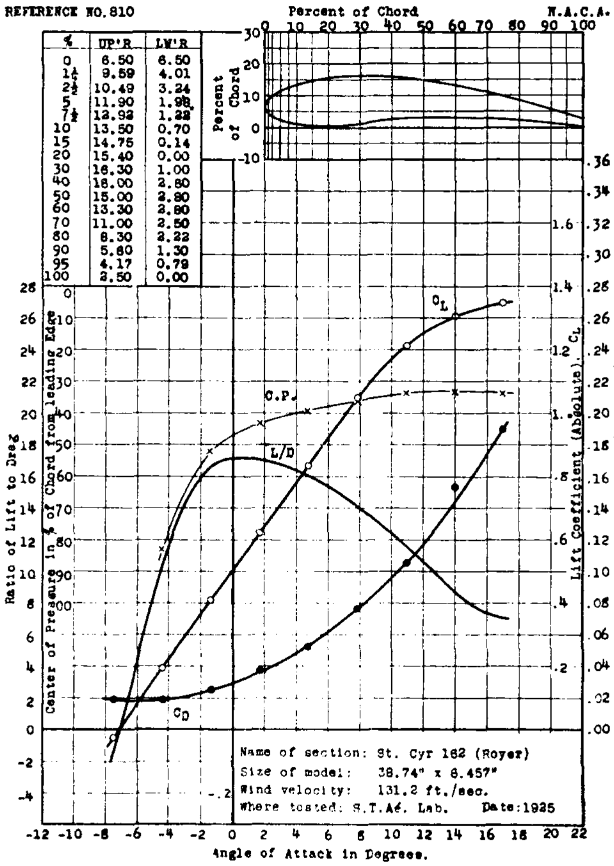
Name of section: St. Cyr 153 (Royer)
Size of model: 38.74" x 6.46"
Wind velocity: 131.2 ft./sec.
Where tested: S.T.Aé. Lab. Date: 1925



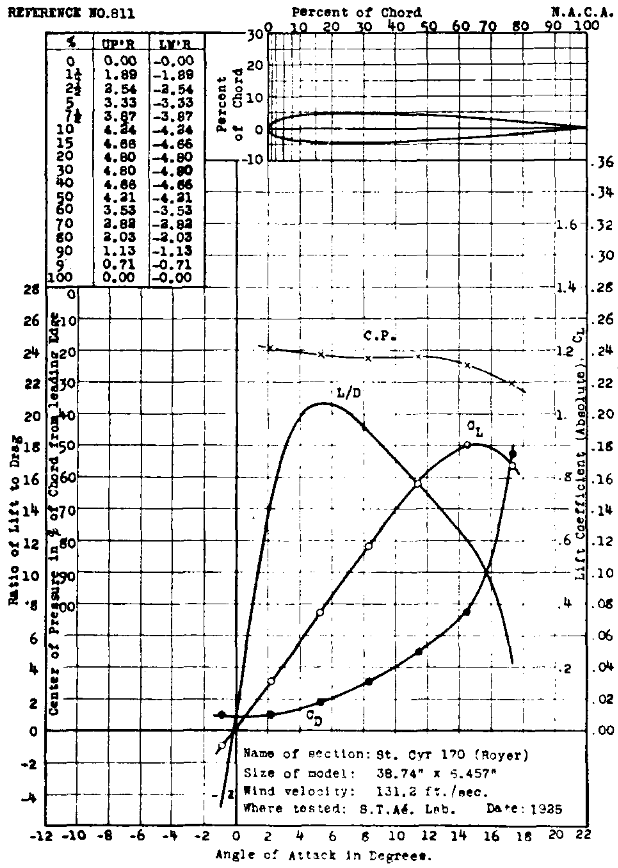
%	UP'R	LW'R
0	0.00	-0.00
1¼	3.81	-2.68
2½	5.22	-3.39
5	7.39	-4.09
7½	9.05	-4.46
10	11.00	-3.80
15	12.69	-4.09
20	14.40	-3.00
30	16.30	-1.40
40	16.60	0.10
50	16.00	1.60
60	14.40	3.00
70	11.70	3.20
80	8.30	3.00
90	4.50	1.80
95	2.60	1.07
100	0.00	0.00



%	UP'R	LW'R
0	0.00	0.00
1¼	2.54	-1.95
2½	3.81	-2.34
5	5.79	-2.60
7½	7.34	-2.46
10	8.76	-1.98
15	11.02	-1.13
20	12.94	0.00
30	15.42	2.54
40	15.71	4.32
50	13.42	4.80
60	10.88	3.90
70	8.33	2.82
80	5.65	1.84
90	2.97	0.85
95	1.64	0.45
100	0.00	0.00



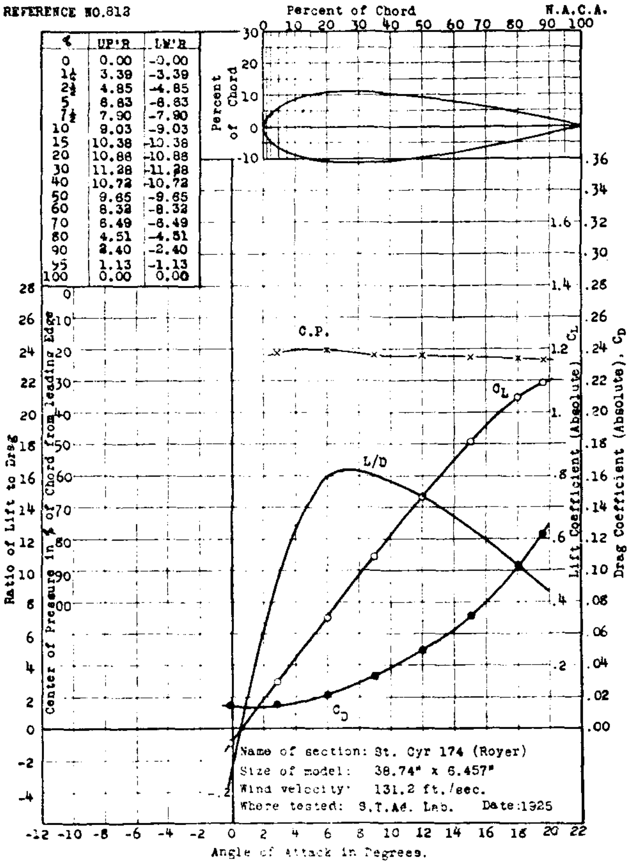
%	UP'R	LW'R
0	6.50	6.50
1¼	9.59	4.01
2½	10.49	3.24
5	11.90	1.98
7½	12.92	1.22
10	13.50	0.70
15	14.75	0.14
20	15.40	0.00
30	16.30	1.00
40	16.00	2.80
50	15.00	2.80
60	13.30	2.80
70	11.00	2.50
80	8.30	2.22
90	5.60	1.30
95	4.17	0.78
100	2.50	0.00



%	UP'R	LW'R
0	0.00	-0.00
1¼	1.89	-1.89
2½	2.54	-2.54
5	3.33	-3.33
7½	3.87	-3.87
10	4.24	-4.24
15	4.66	-4.66
20	4.80	-4.80
30	4.80	-4.80
40	4.66	-4.66
50	4.21	-4.21
60	3.53	-3.53
70	2.82	-2.82
80	2.03	-2.03
90	1.13	-1.13
9	0.71	-0.71
100	0.00	-0.00

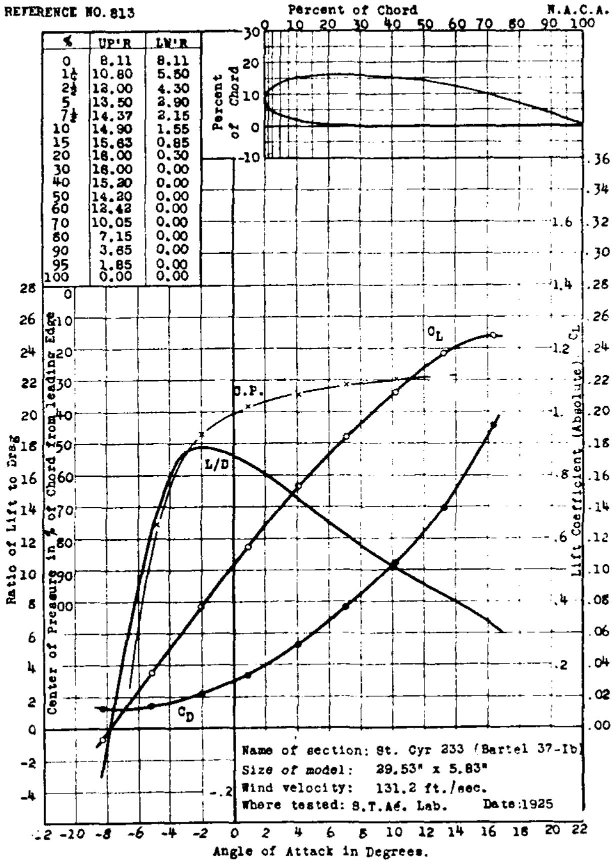
REFERENCE NO.812

%	UP'R	LW'R
0	0.00	-0.00
1¼	3.39	-3.39
2½	4.85	-4.85
5	6.63	-6.63
7½	7.90	-7.90
10	9.03	-9.03
15	10.38	-10.38
20	10.88	-10.88
30	11.28	-11.28
40	10.72	-10.72
50	9.65	-9.65
60	8.32	-8.32
70	6.49	-6.49
80	4.51	-4.51
90	2.40	-2.40
95	1.13	-1.13
100	0.00	0.00



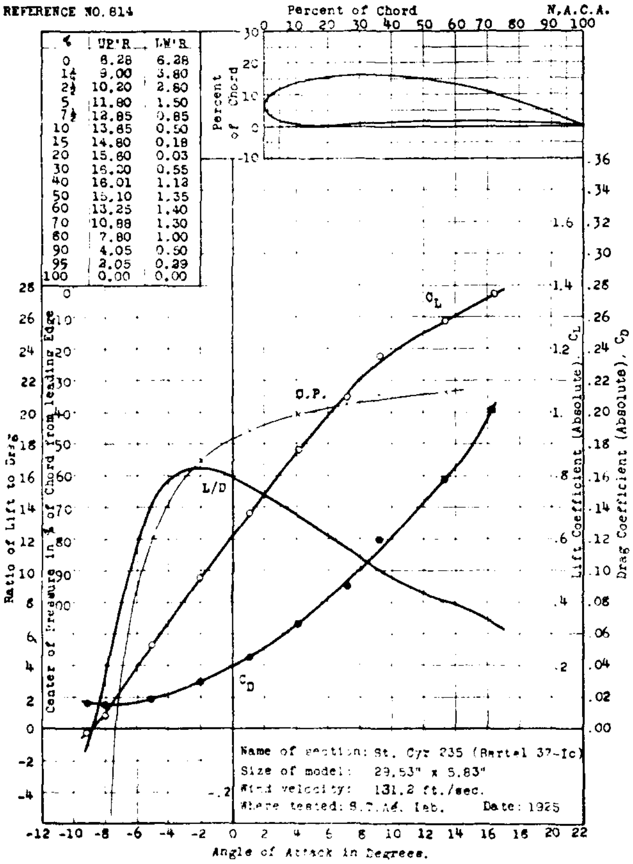
REFERENCE NO. 813

%	UP'R	LW'R
0	8.11	8.11
1¼	10.80	5.60
2½	12.00	4.30
5	13.50	2.90
7½	14.37	2.15
10	14.90	1.55
15	15.63	0.85
20	16.00	0.30
30	16.00	0.00
40	15.20	0.00
50	14.20	0.00
60	12.42	0.00
70	10.05	0.00
80	7.15	0.00
90	3.65	0.00
95	1.85	0.00
100	0.00	0.00



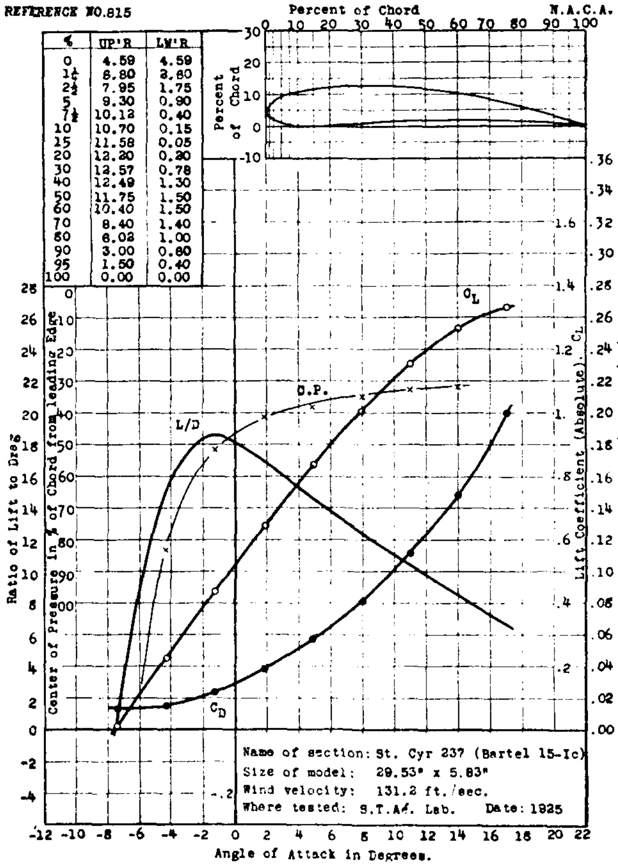
REFERENCE NO. 814

%	UP'R	LW'R
0	8.28	6.28
1¼	9.00	3.80
2½	10.20	2.60
5	11.80	1.50
7½	12.85	0.85
10	13.85	0.50
15	14.80	0.18
20	15.60	0.03
30	16.20	0.55
40	16.01	1.12
50	15.10	1.35
60	13.25	1.40
70	10.88	1.30
80	7.80	1.00
90	4.05	0.50
95	2.05	0.29
100	0.00	0.00



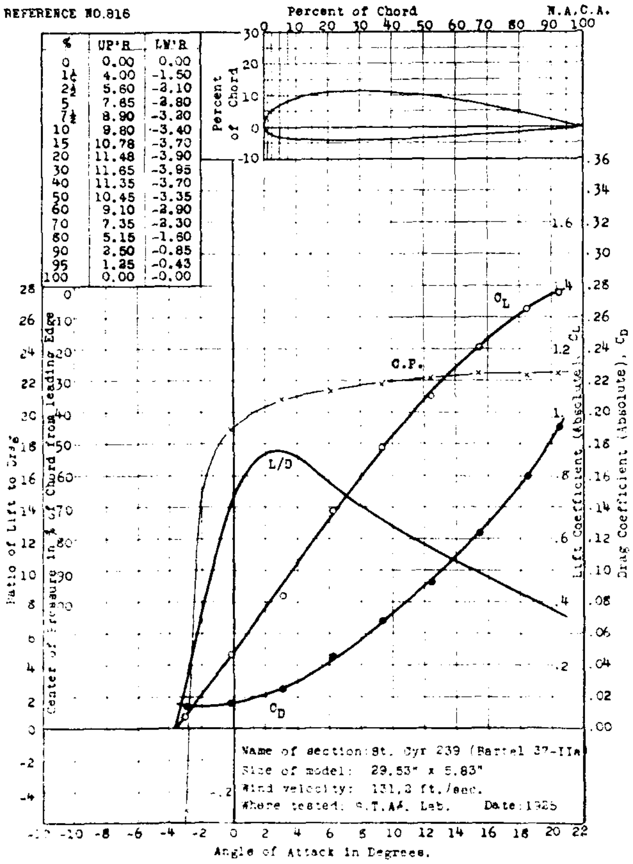
REFERENCE NO.815

%	UP'R	LW'R
0	4.59	4.59
1¼	6.80	2.80
2½	7.95	1.75
5	9.30	0.90
7½	10.12	0.40
10	10.70	0.15
15	11.58	0.05
20	12.20	0.20
30	12.57	0.78
40	12.49	1.30
50	11.75	1.50
60	10.40	1.50
70	8.40	1.40
80	6.02	1.00
90	3.00	0.80
95	1.50	0.40
100	0.00	0.00



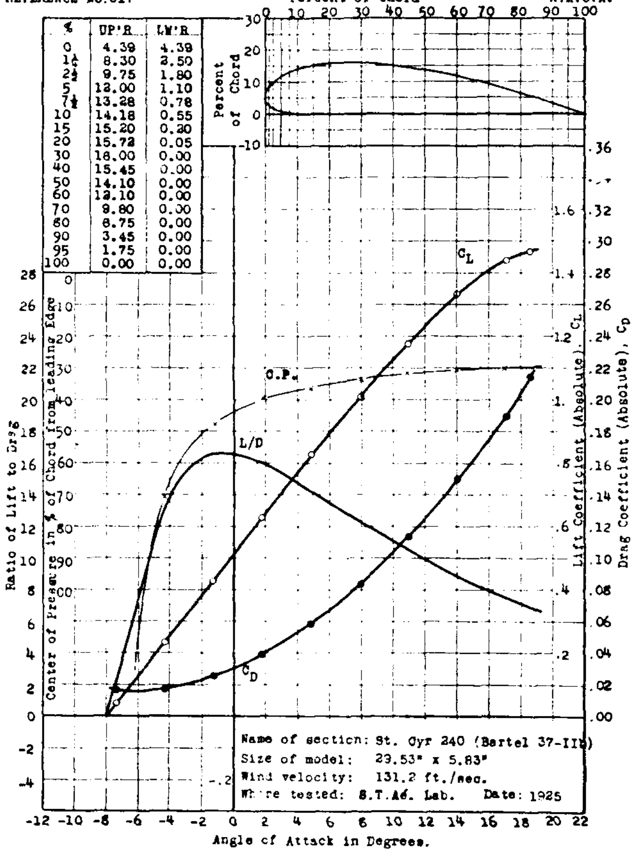
REFERENCE NO.816

%	UP'R	LW'R
0	0.00	0.00
1¼	4.00	-1.50
2½	5.60	-2.10
5	7.85	-2.80
7½	8.90	-3.20
10	9.80	-3.40
15	10.78	-3.70
20	11.48	-3.90
30	11.65	-3.85
40	11.35	-3.70
50	10.45	-3.35
60	9.10	-2.90
70	7.35	-2.30
80	5.15	-1.60
90	2.50	-0.85
95	1.25	-0.43
100	0.00	-0.00



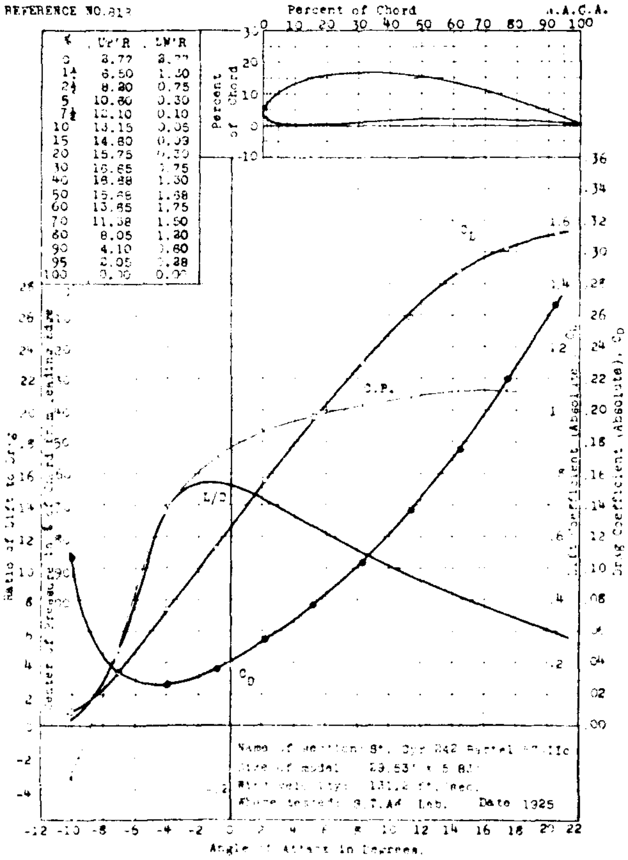
REFERENCE NO.817

%	UP'R	LW'R
0	4.39	4.39
1¼	8.30	2.50
2½	9.75	1.80
5	12.00	1.10
7½	13.28	0.78
10	14.18	0.55
15	15.20	0.20
20	15.72	0.05
30	16.00	0.00
40	15.45	0.00
50	14.10	0.00
60	12.10	0.00
70	9.80	0.00
80	6.75	0.00
90	3.45	0.00
95	1.75	0.00
100	0.00	0.00



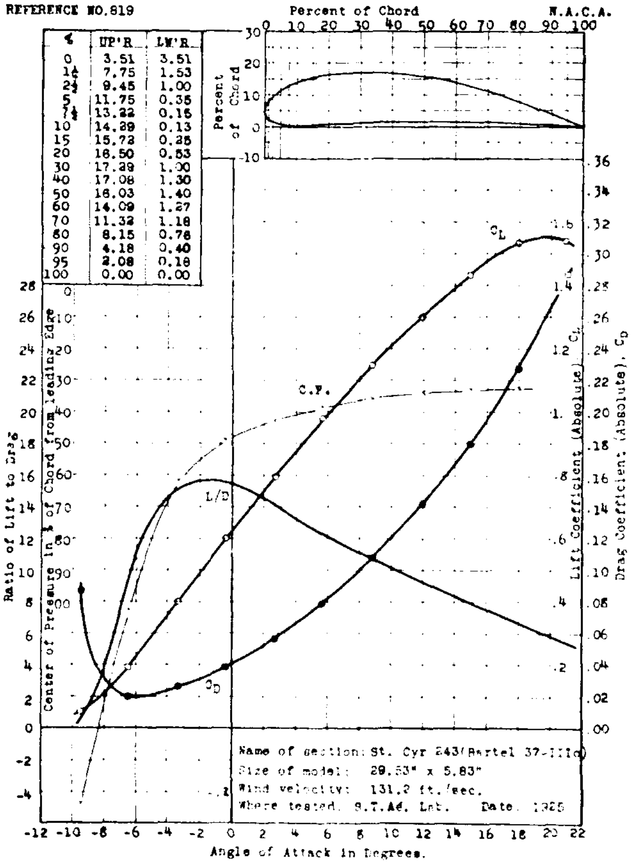
REFERENCE NO.81?

%	UP'R	LW'R
0	2.77	2.77
1¼	6.50	1.50
2½	8.20	0.75
5	10.80	0.30
7½	12.10	0.10
10	13.15	0.05
15	14.80	0.03
20	15.75	[illegible]
30	16.65	[illegible]
40	18.88	1.30
50	[illegible]	1.68
60	13.85	1.75
70	11.38	1.50
80	8.05	1.20
90	4.10	0.80
95	2.05	0.28
100	0.00	[illegible]

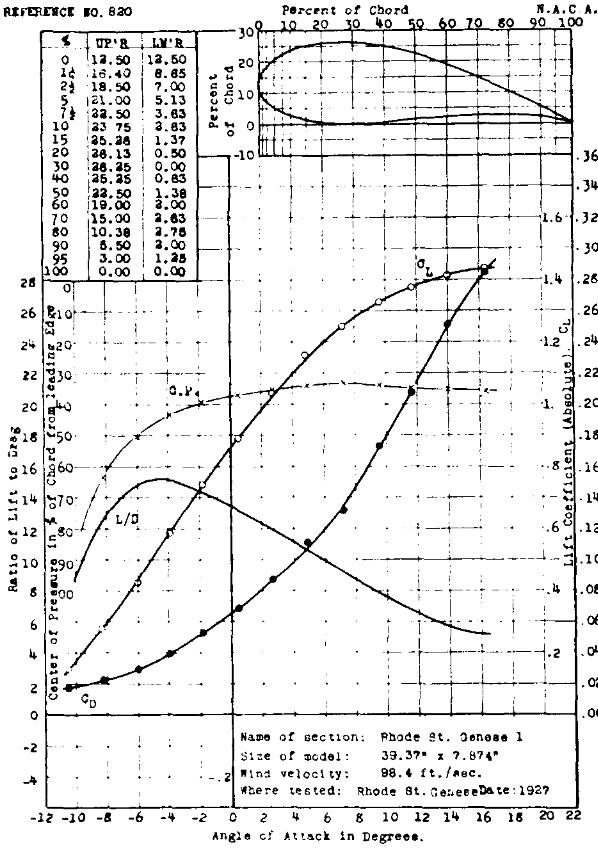


REFERENCE NO.819

%	UP'R	LW'R
0	3.51	3.51
1¼	7.75	1.53
2½	9.45	1.00
5	11.75	0.35
7½	13.22	0.15
10	14.29	0.13
15	15.72	0.25
20	16.50	0.53
30	17.29	1.00
40	17.08	1.30
50	16.03	1.40
60	14.09	1.27
70	11.32	1.18
80	8.15	0.78
90	4.18	0.40
95	2.08	0.18
100	0.00	0.00



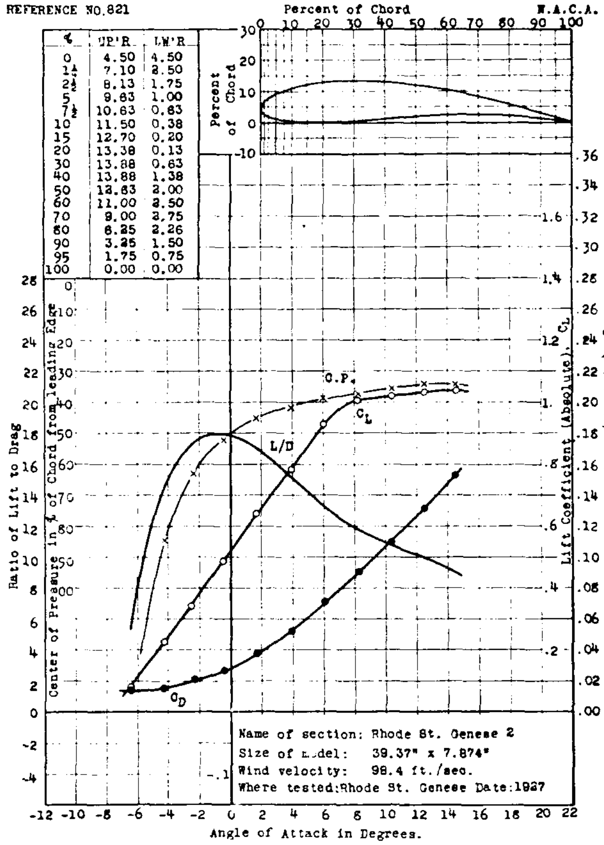
REFERENCE NO. 820 N.A.C.A.



%	UP'R	LW'R
0	12.50	12.50
1¼	16.40	8.65
2½	18.50	7.00
5	21.00	5.13
7½	22.50	3.63
10	23 75	2.83
15	25.28	1.37
20	26.13	0.50
30	26.25	0.00
40	25.25	0.83
50	22.50	1.38
60	19.00	2.00
70	15.00	2.63
80	10.38	2.78
90	6.50	2.00
95	3.00	1.25
100	0.00	0.00

Name of section: Rhode St. Genese 1
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Rhode St. Genese Date: 1927

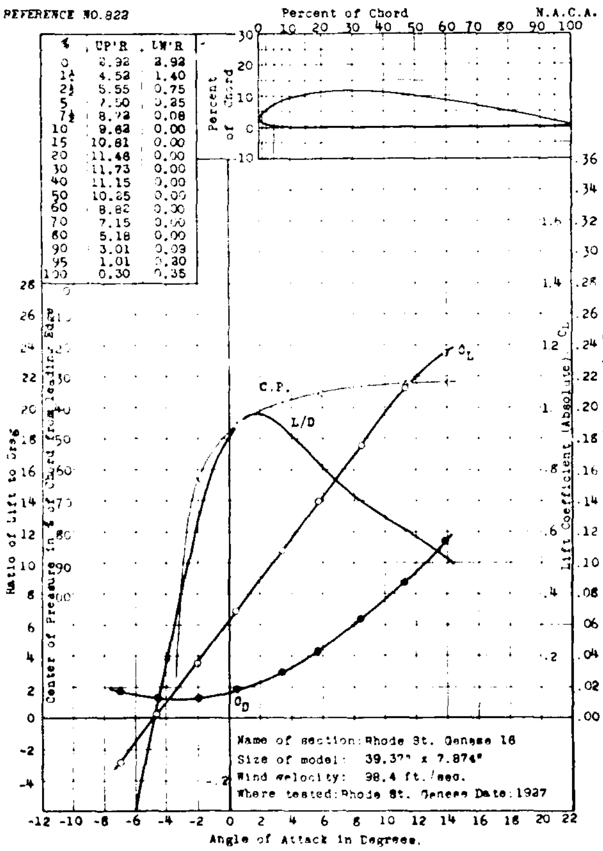
REFERENCE NO. 821 N.A.C.A.



%	UP'R	LW'R
0	4.50	4.50
1¼	7.10	2.50
2½	8.13	1.75
5	9.63	1.00
7½	10.63	0.63
10	11.50	0.38
15	12.70	0.20
20	13.38	0.13
30	13.88	0.63
40	13.88	1.38
50	12.63	2.00
60	11.00	2.50
70	9.00	2.75
80	6.25	2.26
90	3.25	1.50
95	1.75	0.75
100	0.00	0.00

Name of section: Rhode St. Genese 2
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Rhode St. Genese Date: 1927

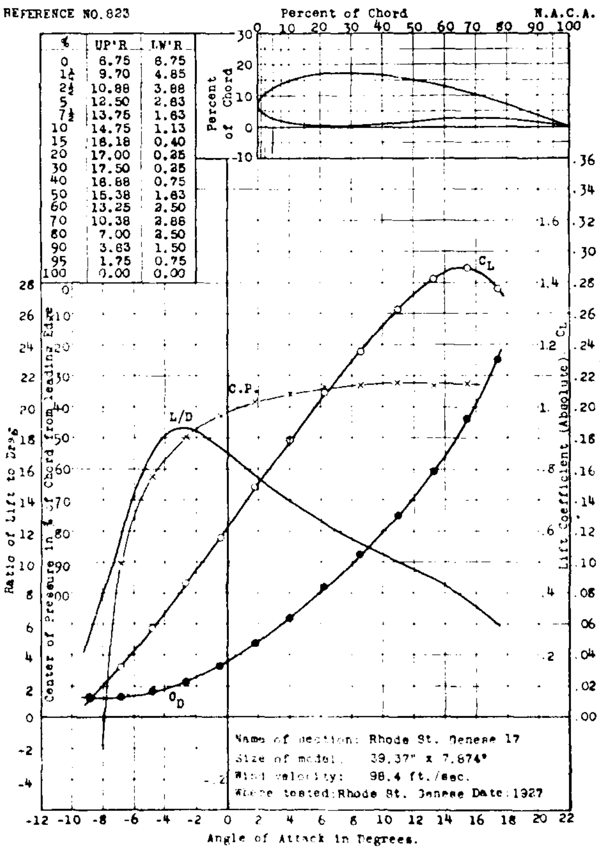
REFERENCE NO. 822 N.A.C.A.



%	UP'R	LW'R
0	2.92	2.92
1¼	4.52	1.40
2½	5.55	0.75
5	7.50	0.25
7½	8.72	0.08
10	9.62	0.00
15	10.81	0.00
20	11.48	0.00
30	11.73	0.00
40	11.15	0.00
50	10.25	0.00
60	8.82	0.00
70	7.15	0.00
80	5.18	0.00
90	3.01	0.09
95	1.01	0.20
100	0.30	0.35

Name of section: Rhode St. Genese 16
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Rhode St. Genese Date: 1927

REFERENCE NO. 823 N.A.C.A.

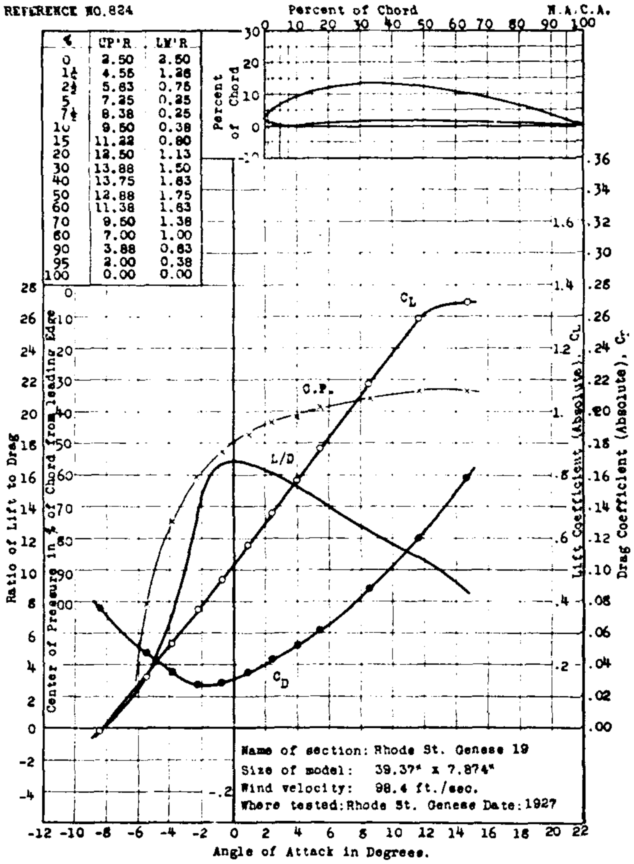


%	UP'R	LW'R
0	6.75	6.75
1¼	9.70	4.85
2½	10.88	3.88
5	12.50	2.83
7½	13.75	1.63
10	14.75	1.13
15	16.18	0.40
20	17.00	0.25
30	17.50	0.25
40	16.88	0.75
50	15.38	1.63
60	13.25	2.50
70	10.38	2.86
80	7.00	2.50
90	3.63	1.50
95	1.75	0.75
100	0.00	0.00

Name of section: Rhode St. Genese 17
Size of model: 39.37" x 7.874"
Wind velocity: 98.4 ft./sec.
Where tested: Rhode St. Genese Date: 1927

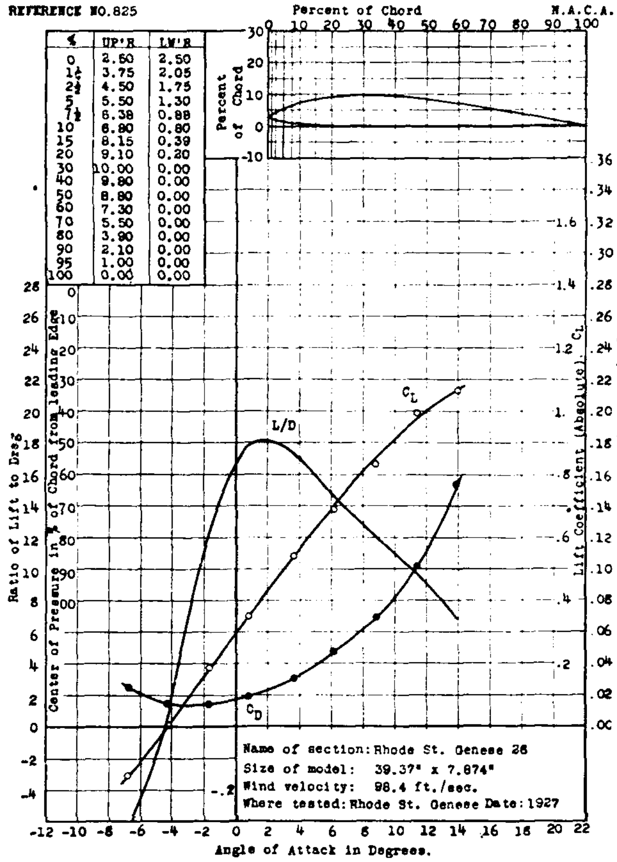
REFERENCE NO. 824

%	UP'R	LW'R
0	2.50	2.50
1¼	4.56	1.26
2½	5.63	0.76
5	7.25	0.25
7½	8.38	0.25
10	9.50	0.38
15	11.22	0.80
20	12.50	1.13
30	13.88	1.50
40	13.75	1.63
50	12.88	1.75
60	11.38	1.63
70	9.50	1.38
80	7.00	1.00
90	3.88	0.63
95	2.00	0.38
100	0.00	0.00



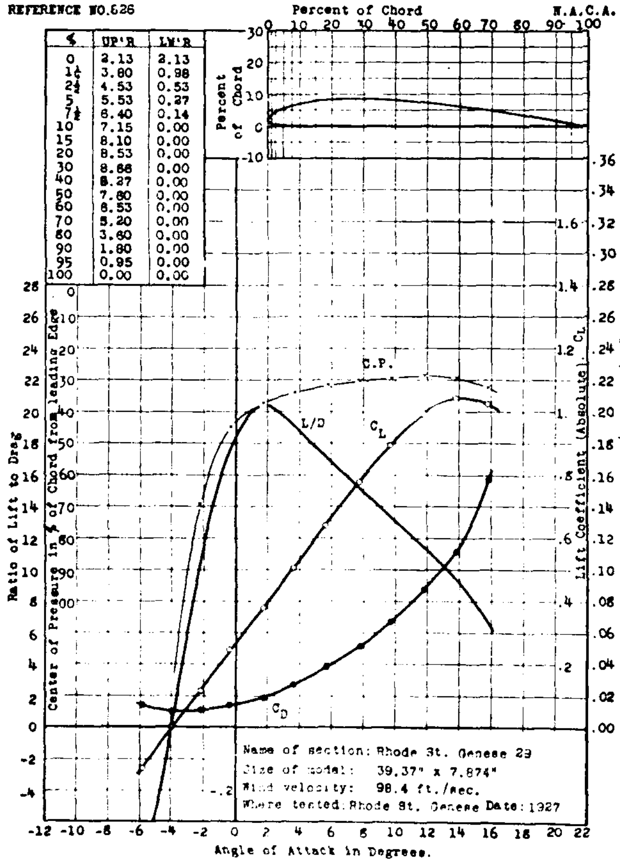
REFERENCE NO. 825

%	UP'R	LW'R
0	2.50	2.50
1¼	3.75	2.05
2½	4.50	1.75
5	5.50	1.30
7½	6.38	0.88
10	6.80	0.60
15	8.15	0.39
20	9.10	0.20
30	10.00	0.00
40	9.80	0.00
50	8.80	0.00
60	7.30	0.00
70	5.50	0.00
80	3.90	0.00
90	2.10	0.00
95	1.00	0.00
100	0.00	0.00



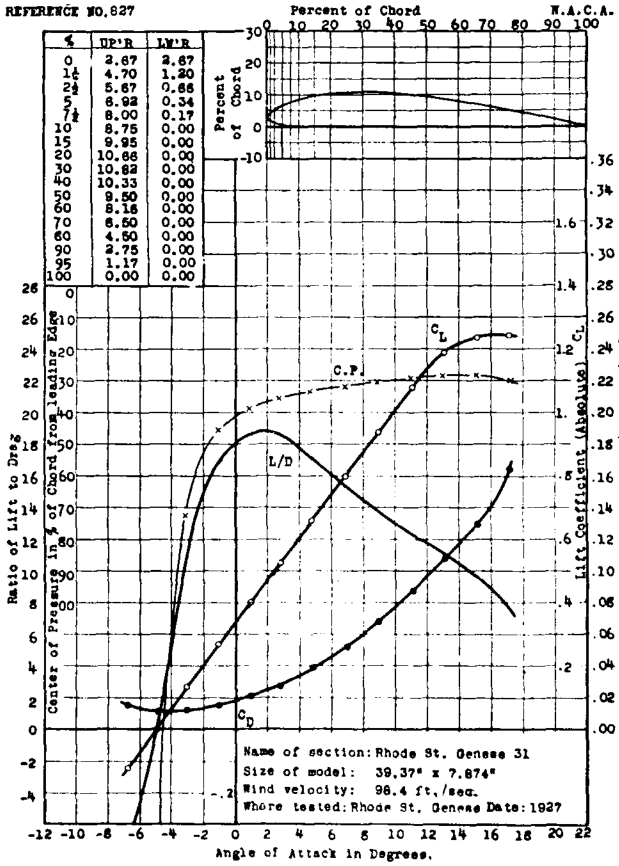
REFERENCE NO. 826

%	UP'R	LW'R
0	2.13	2.13
1¼	3.80	0.98
2½	4.53	0.53
5	5.53	0.27
7½	6.40	0.14
10	7.15	0.00
15	8.10	0.00
20	8.53	0.00
30	8.68	0.00
40	8.27	0.00
50	7.60	0.00
60	6.53	0.00
70	5.20	0.00
80	3.60	0.00
90	1.80	0.00
95	0.95	0.00
100	0.00	0.00



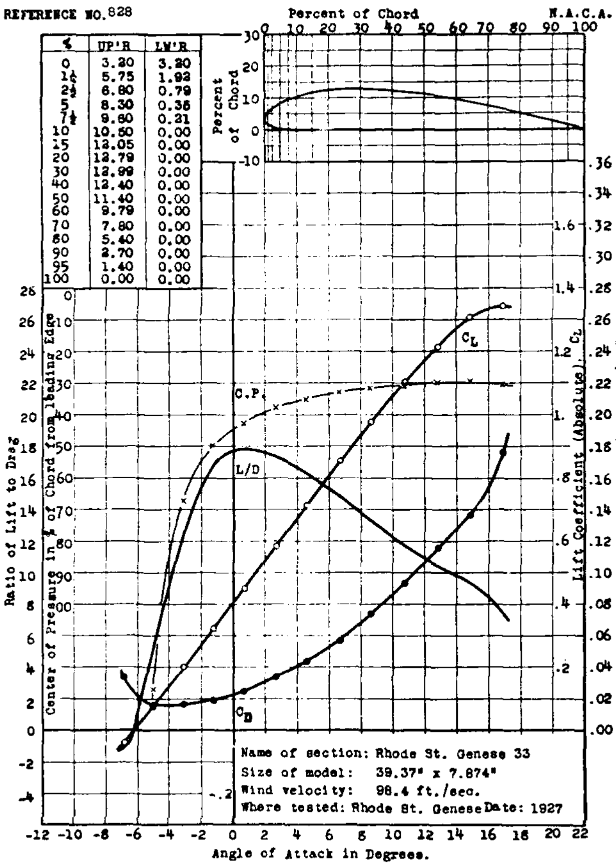
REFERENCE NO. 827

%	UP'R	LW'R
0	2.67	2.67
1¼	4.70	1.20
2½	5.67	0.66
5	6.92	0.34
7½	8.00	0.17
10	8.75	0.00
15	9.95	0.00
20	10.66	0.00
30	10.82	0.00
40	10.33	0.00
50	9.50	0.00
60	8.16	0.00
70	6.50	0.00
80	4.50	0.00
90	2.75	0.00
95	1.17	0.00
100	0.00	0.00



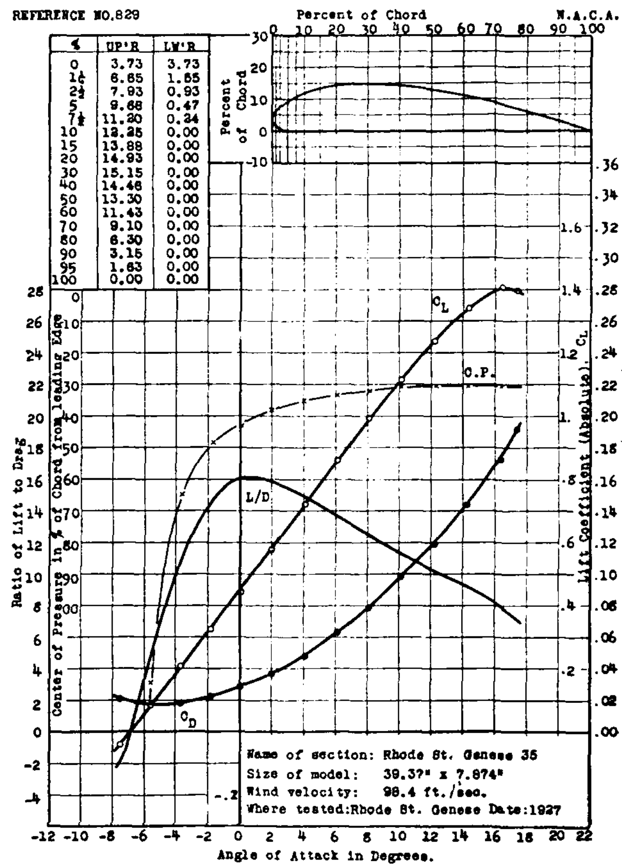
REFERENCE NO. 828

%	UP'R	LW'R
0	3.20	3.20
1¼	5.75	1.92
2½	6.80	0.79
5	8.30	0.36
7½	9.60	0.21
10	10.50	0.00
15	12.05	0.00
20	12.79	0.00
30	12.99	0.00
40	12.40	0.00
50	11.40	0.00
60	9.79	0.00
70	7.80	0.00
80	5.40	0.00
90	2.70	0.00
95	1.40	0.00
100	0.00	0.00



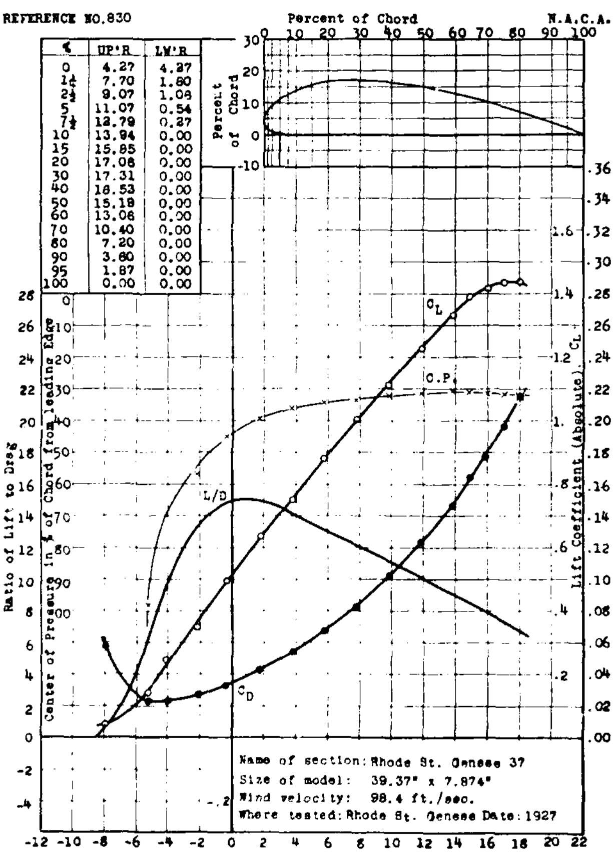
REFERENCE NO. 829

%	UP'R	LW'R
0	3.73	3.73
1¼	6.65	1.65
2½	7.93	0.93
5	9.68	0.47
7½	11.20	0.24
10	12.25	0.00
15	13.88	0.00
20	14.93	0.00
30	15.15	0.00
40	14.46	0.00
50	13.30	0.00
60	11.43	0.00
70	9.10	0.00
80	6.30	0.00
90	3.15	0.00
95	1.63	0.00
100	0.00	0.00



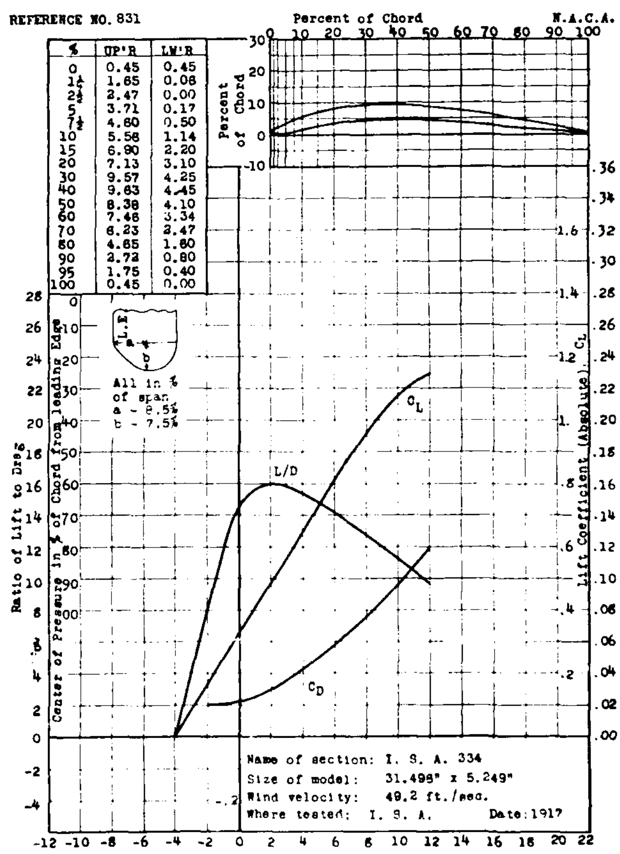
REFERENCE NO. 830

%	UP'R	LW'R
0	4.27	4.27
1¼	7.70	1.60
2½	9.07	1.08
5	11.07	0.54
7½	12.79	0.27
10	13.94	0.00
15	15.85	0.00
20	17.06	0.00
30	17.31	0.00
40	16.53	0.00
50	15.19	0.00
60	13.06	0.00
70	10.40	0.00
80	7.20	0.00
90	3.60	0.00
95	1.87	0.00
100	0.00	0.00

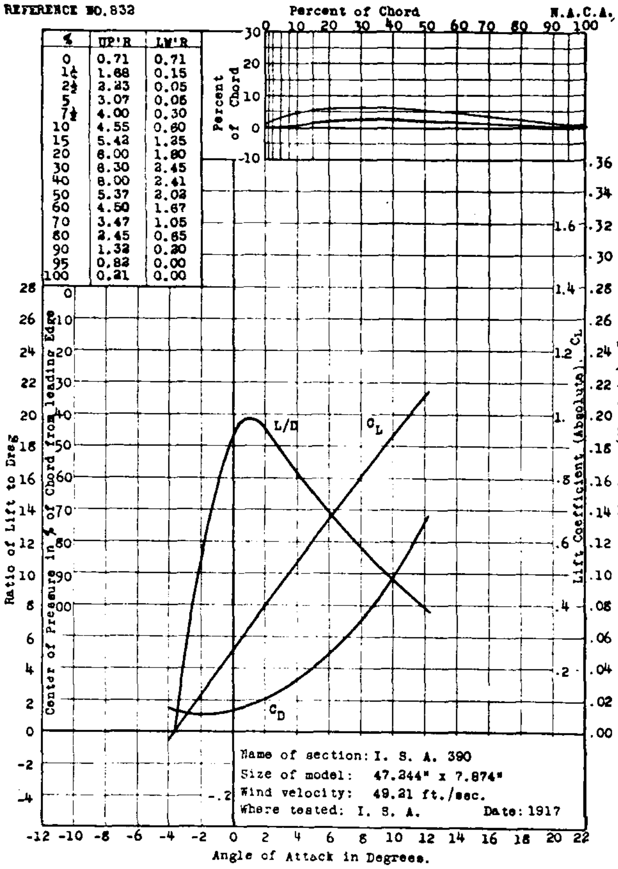


REFERENCE NO. 831

%	UP'R	LW'R
0	0.45	0.45
1¼	1.65	0.08
2½	2.47	0.00
5	3.71	0.17
7½	4.60	0.50
10	5.58	1.14
15	6.90	2.20
20	7.13	3.10
30	9.57	4.25
40	9.63	4.45
50	8.38	4.10
60	7.46	3.34
70	6.23	2.47
80	4.65	1.60
90	2.72	0.80
95	1.75	0.40
100	0.45	0.00



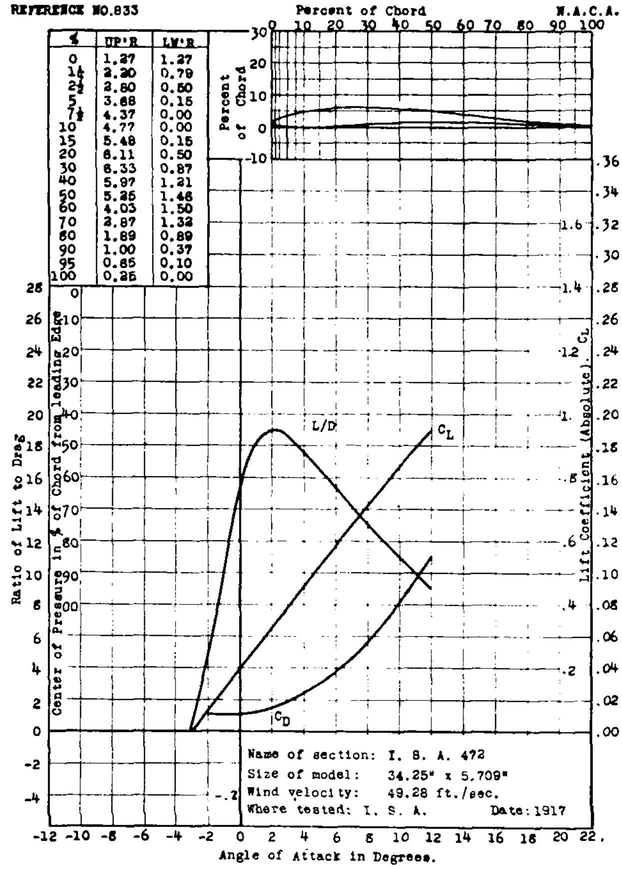
REFERENCE NO. 832



%	UP'R	LW'R
0	0.71	0.71
1¼	1.68	0.15
2½	2.23	0.05
5	3.07	0.06
7½	4.00	0.30
10	4.55	0.60
15	5.42	1.35
20	8.00	1.80
30	8.30	2.45
40	8.00	2.41
50	5.37	2.02
60	4.50	1.67
70	3.47	1.05
80	2.45	0.65
90	1.32	0.20
95	0.82	0.00
100	0.21	0.00

Name of section: I. S. A. 390
Size of model: 47.244" x 7.874"
Wind velocity: 49.21 ft./sec.
Where tested: I. S. A. Date: 1917

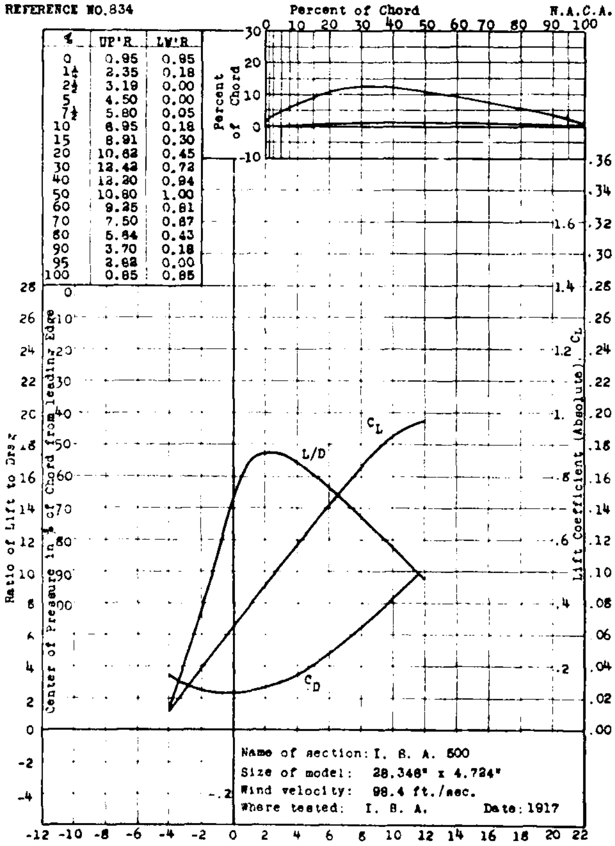
REFERENCE NO. 833



%	UP'R	LW'R
0	1.27	1.27
1¼	2.20	0.79
2½	2.80	0.50
5	3.68	0.15
7½	4.37	0.00
10	4.77	0.00
15	5.48	0.15
20	6.11	0.50
30	8.33	0.87
40	5.97	1.21
50	5.26	1.46
60	4.03	1.50
70	2.87	1.32
80	1.89	0.89
90	1.00	0.37
95	0.65	0.10
100	0.26	0.00

Name of section: I. S. A. 472
Size of model: 34.25" x 5.709"
Wind velocity: 49.28 ft./sec.
Where tested: I. S. A. Date: 1917

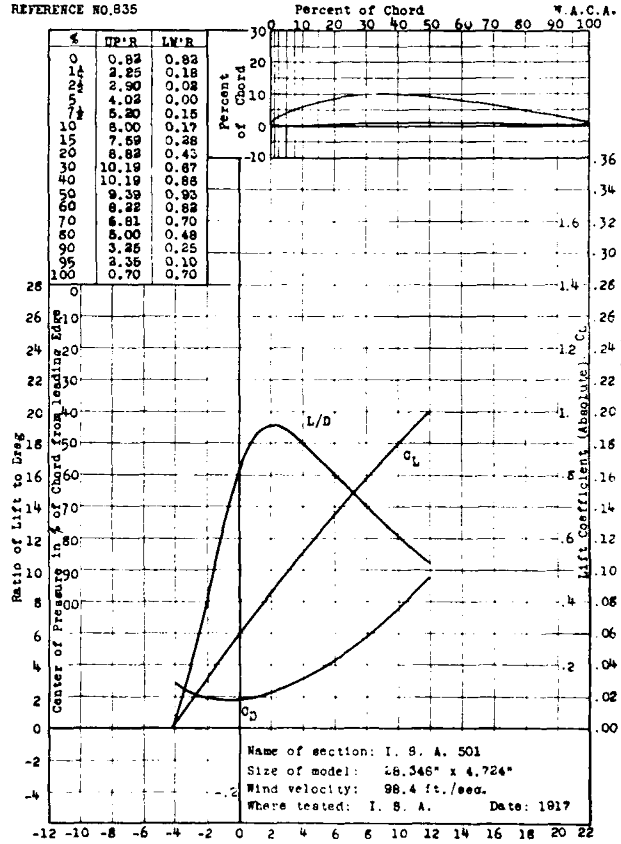
REFERENCE NO. 834



%	UP'R	LW'R
0	0.95	0.95
1¼	2.35	0.18
2½	3.19	0.00
5	4.50	0.00
7½	5.80	0.05
10	6.95	0.18
15	8.91	0.30
20	10.62	0.45
30	12.42	0.72
40	12.20	0.94
50	10.80	1.00
60	9.25	0.81
70	7.50	0.67
80	5.64	0.43
90	3.70	0.18
95	2.82	0.00
100	0.85	0.85

Name of section: I. S. A. 500
Size of model: 28.348" x 4.724"
Wind velocity: 98.4 ft./sec.
Where tested: I. S. A. Date: 1917

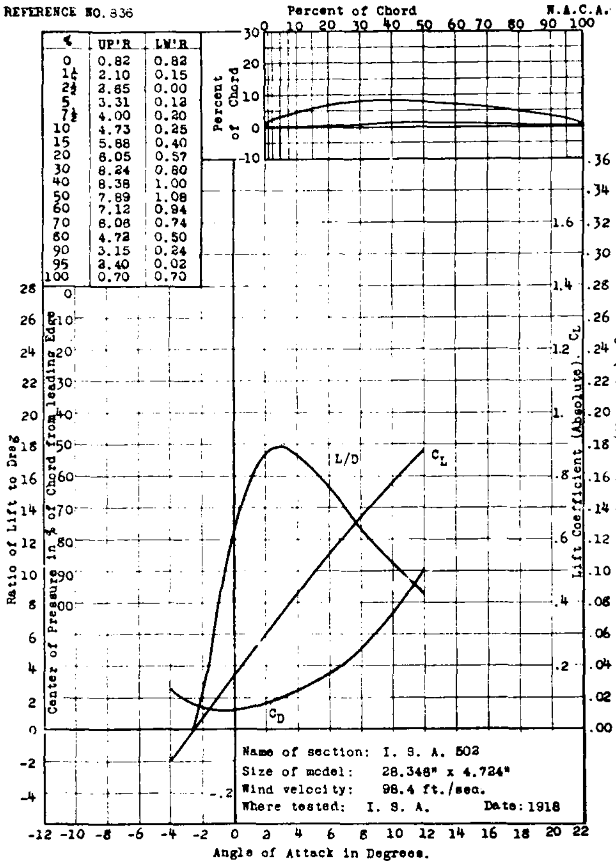
REFERENCE NO. 835



%	UP'R	LW'R
0	0.82	0.82
1¼	2.25	0.18
2½	2.90	0.02
5	4.02	0.00
7½	5.20	0.15
10	6.00	0.17
15	7.59	0.28
20	8.82	0.43
30	10.19	0.67
40	10.19	0.86
50	9.39	0.93
60	8.22	0.82
70	6.81	0.70
80	5.00	0.48
90	3.25	0.25
95	2.35	0.10
100	0.70	0.70

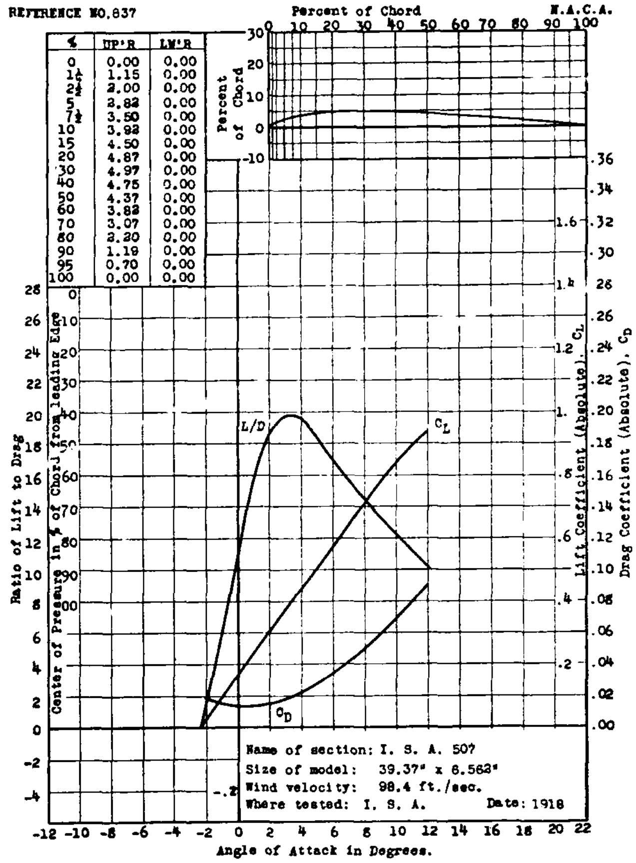
Name of section: I. S. A. 501
Size of model: 28.346" x 4.724"
Wind velocity: 98.4 ft./sec.
Where tested: I. S. A. Date: 1917

REFERENCE NO. 836



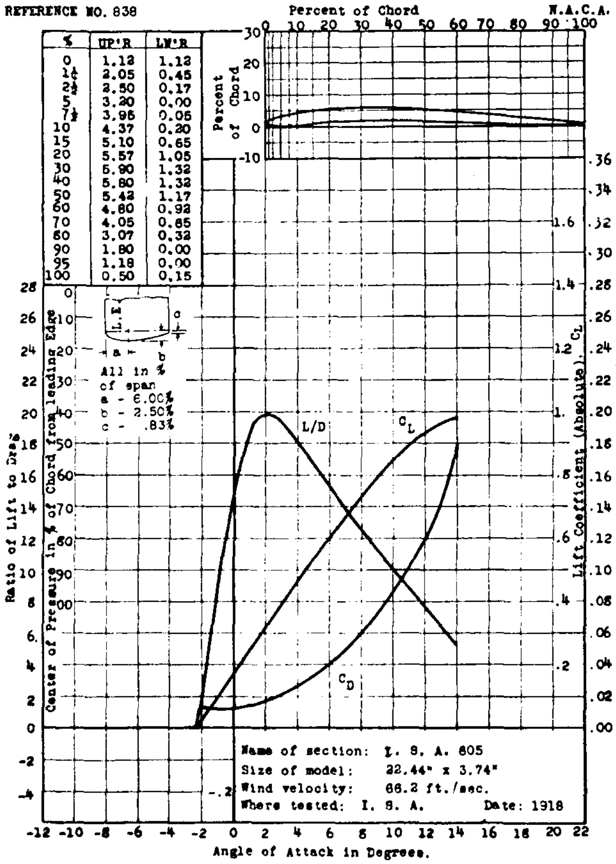
%	UP'R	LW'R
0	0.82	0.82
1¼	2.10	0.15
2½	2.65	0.00
5	3.31	0.12
7½	4.00	0.20
10	4.73	0.25
15	5.88	0.40
20	8.05	0.57
30	8.24	0.80
40	8.38	1.00
50	7.89	1.08
60	7.12	0.94
70	6.08	0.74
80	4.72	0.50
90	3.15	0.24
95	2.40	0.02
100	0.70	0.70

REFERENCE NO. 837



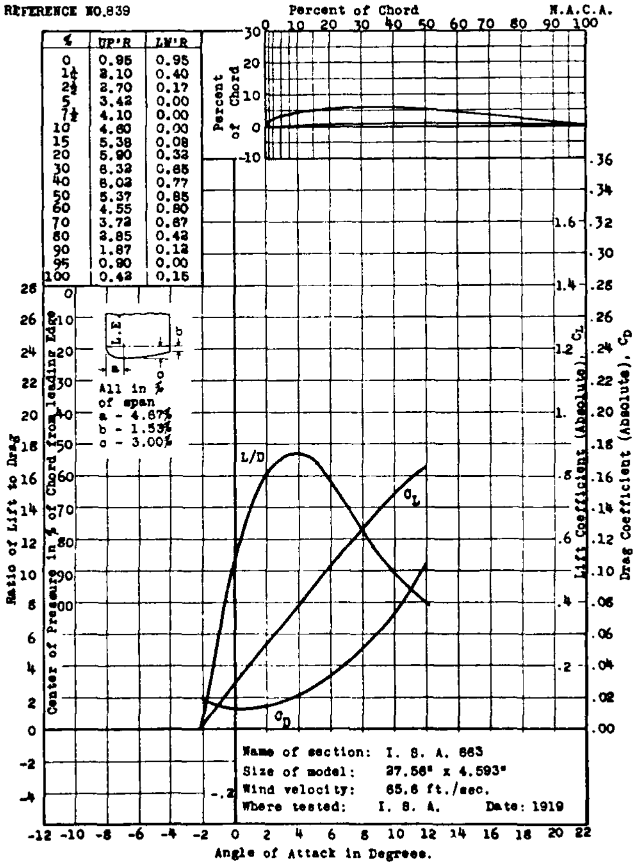
%	UP'R	LW'R
0	0.00	0.00
1¼	1.15	0.00
2½	2.00	0.00
5	2.82	0.00
7½	3.50	0.00
10	3.92	0.00
15	4.50	0.00
20	4.87	0.00
30	4.97	0.00
40	4.75	0.00
50	4.37	0.00
60	3.82	0.00
70	3.07	0.00
80	2.20	0.00
90	1.19	0.00
95	0.70	0.00
100	0.00	0.00

REFERENCE NO. 838



%	UP'R	LW'R
0	1.12	1.12
1¼	2.05	0.45
2½	2.50	0.17
5	3.20	0.00
7½	3.96	0.05
10	4.37	0.20
15	5.10	0.65
20	5.57	1.05
30	5.90	1.32
40	5.80	1.32
50	5.42	1.17
60	4.80	0.92
70	4.05	0.65
80	3.07	0.32
90	1.80	0.00
95	1.18	0.00
100	0.50	0.15

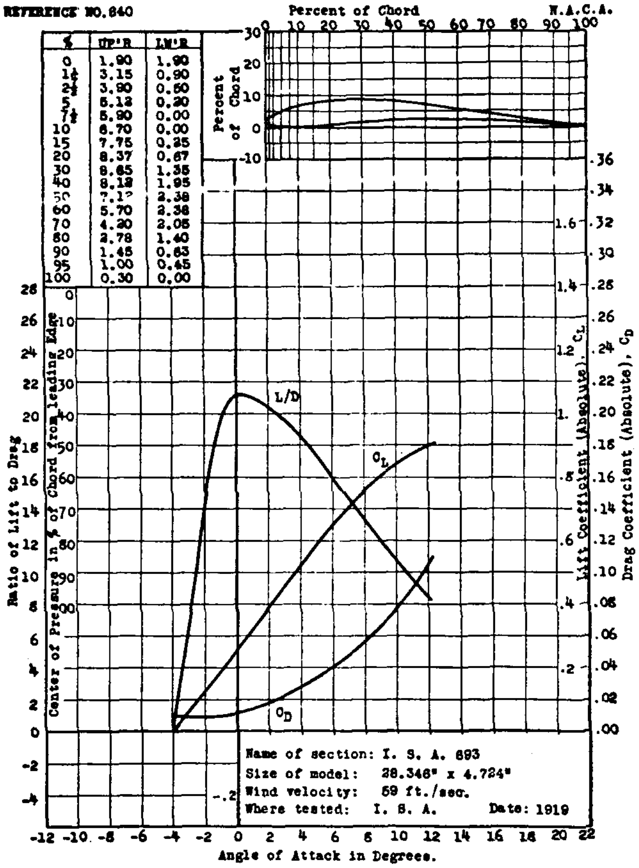
REFERENCE NO. 839



%	UP'R	LW'R
0	0.95	0.95
1¼	2.10	0.40
2½	2.70	0.17
5	3.42	0.00
7½	4.10	0.00
10	4.60	0.00
15	5.38	0.08
20	5.90	0.32
30	6.32	0.65
40	6.02	0.77
50	5.37	0.85
60	4.55	0.80
70	3.72	0.67
80	2.85	0.42
90	1.87	0.12
95	0.90	0.00
100	0.42	0.16

REFERENCE NO. 840

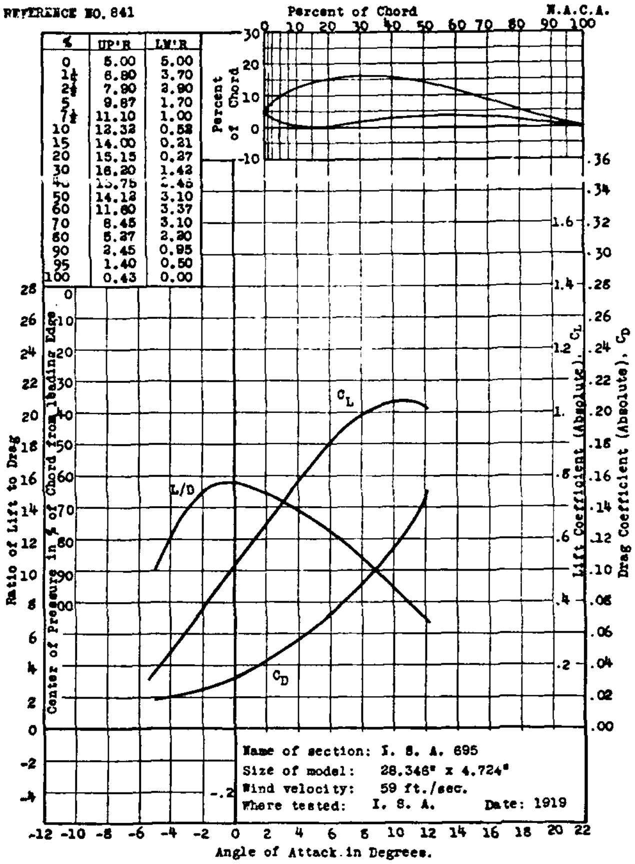
%	UP'R	LW'R
0	1.90	1.90
1¼	3.15	0.90
2½	3.80	0.60
5	5.12	0.20
7½	5.90	0.00
10	6.70	0.00
15	7.75	0.25
20	8.37	0.67
30	8.65	1.35
40	8.12	1.95
50	7.12	2.38
60	5.70	2.38
70	4.20	2.05
80	2.78	1.40
90	1.45	0.63
95	1.00	0.45
100	0.30	0.00



Name of section: I. S. A. 693
Size of model: 28.346" x 4.724"
Wind velocity: 59 ft./sec.
Where tested: I. S. A. Date: 1919

REFERENCE NO. 841

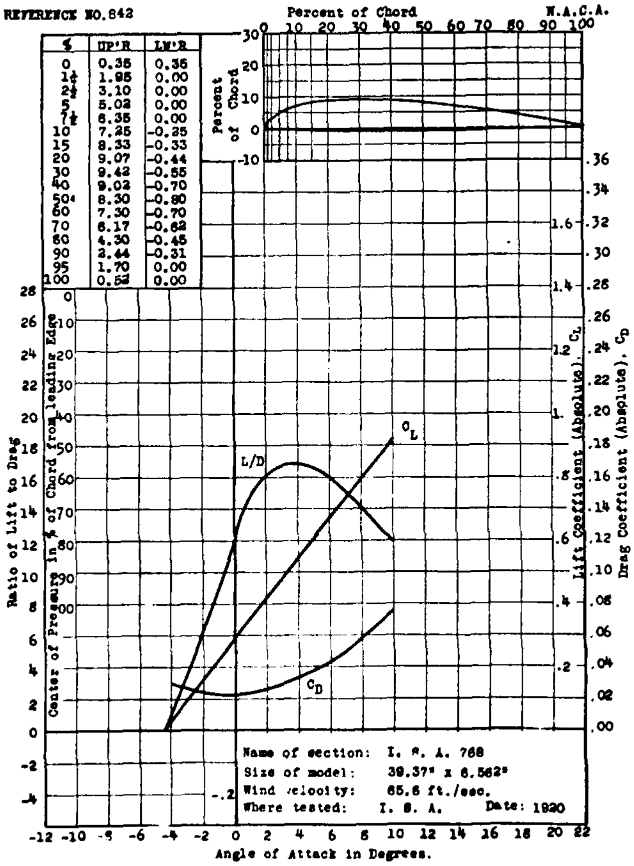
%	UP'R	LW'R
0	5.00	5.00
1¼	6.80	3.70
2½	7.90	2.90
5	9.87	1.70
7½	11.10	1.00
10	12.32	0.52
15	14.00	0.21
20	15.15	0.27
30	16.20	1.42
40	15.75	2.45
50	14.12	3.10
60	11.60	3.37
70	8.45	3.10
80	5.27	2.20
90	2.45	0.95
95	1.40	0.50
100	0.43	0.00



Name of section: I. S. A. 695
Size of model: 28.346" x 4.724"
Wind velocity: 59 ft./sec.
Where tested: I. S. A. Date: 1919

REFERENCE NO. 842

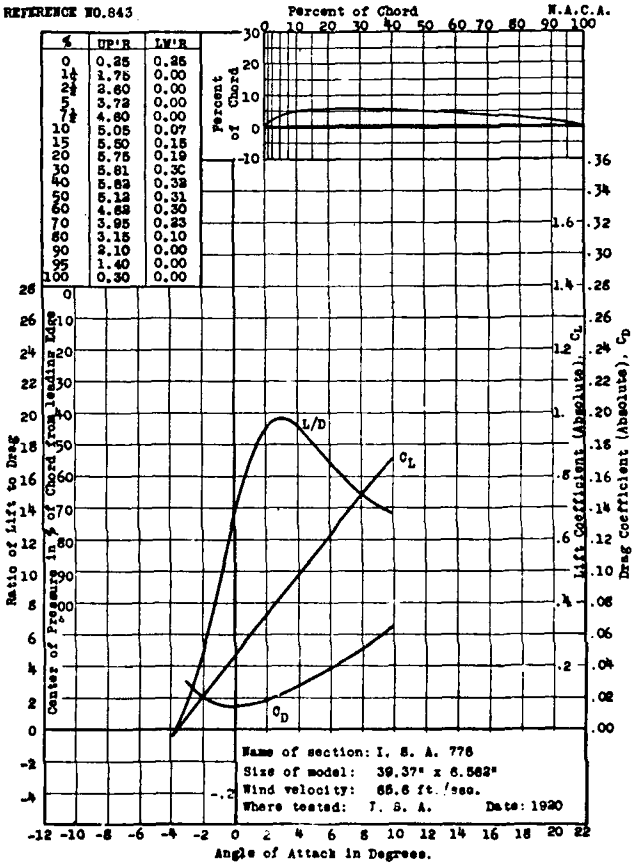
%	UP'R	LW'R
0	0.35	0.35
1¼	1.95	0.00
2½	3.10	0.00
5	5.02	0.00
7½	6.35	0.00
10	7.25	-0.25
15	8.33	-0.33
20	9.07	-0.44
30	9.42	-0.55
40	9.02	-0.70
50	8.30	-0.80
60	7.30	-0.70
70	6.17	-0.62
80	4.30	-0.45
90	2.44	-0.31
95	1.70	0.00
100	0.52	0.00



Name of section: I. S. A. 768
Size of model: 39.37" x 6.562"
Wind velocity: 65.6 ft./sec.
Where tested: I. S. A. Date: 1920

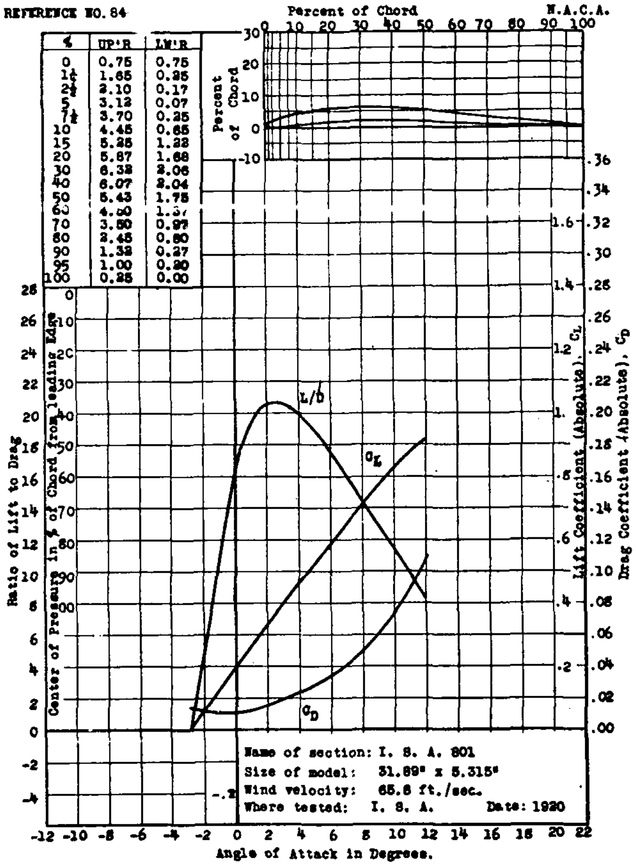
REFERENCE NO. 843

%	UP'R	LW'R
0	0.25	0.25
1¼	1.75	0.00
2½	2.60	0.00
5	3.72	0.00
7½	4.60	0.00
10	5.05	0.07
15	5.50	0.15
20	5.75	0.19
30	5.81	0.30
40	5.82	0.32
50	5.12	0.31
60	4.62	0.30
70	3.95	0.23
80	3.15	0.10
90	2.10	0.00
95	1.40	0.00
100	0.30	0.00



Name of section: I. S. A. 776
Size of model: 39.37" x 6.562"
Wind velocity: 65.6 ft./sec.
Where tested: I. S. A. Date: 1920

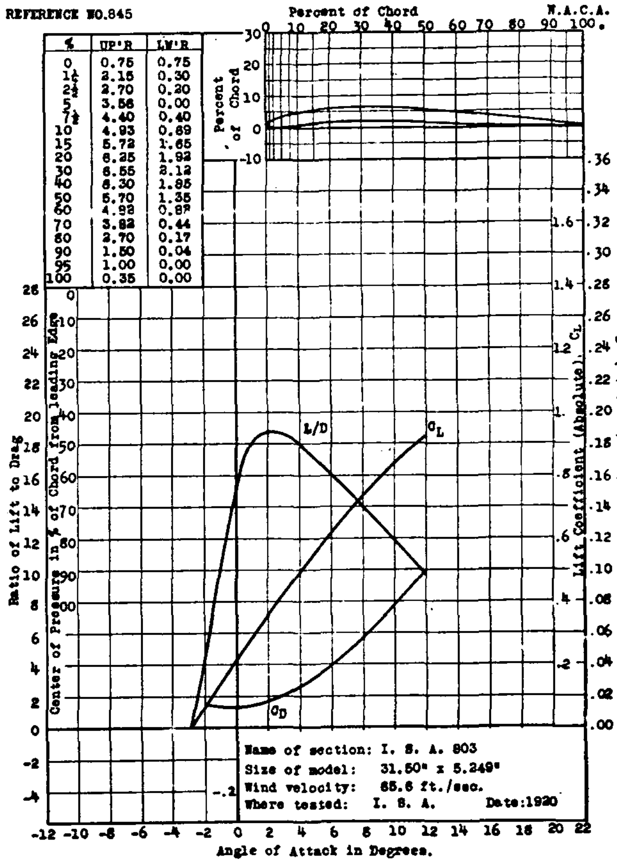
REFERENCE NO. 84



%	UP'R	LW'R
0	0.75	0.75
1¼	1.65	0.25
2½	2.10	0.17
5	3.12	0.07
7½	3.70	0.25
10	4.45	0.65
15	5.25	1.22
20	5.87	1.68
30	6.32	2.06
40	6.07	2.04
50	5.43	1.75
60	4.60	1.37
70	3.50	0.97
80	2.45	0.60
90	1.32	0.27
95	1.00	0.20
100	0.25	0.00

Name of section: I. S. A. 801
Size of model: 31.89" x 5.315"
Wind velocity: 65.6 ft./sec.
Where tested: I. S. A. Date: 1920

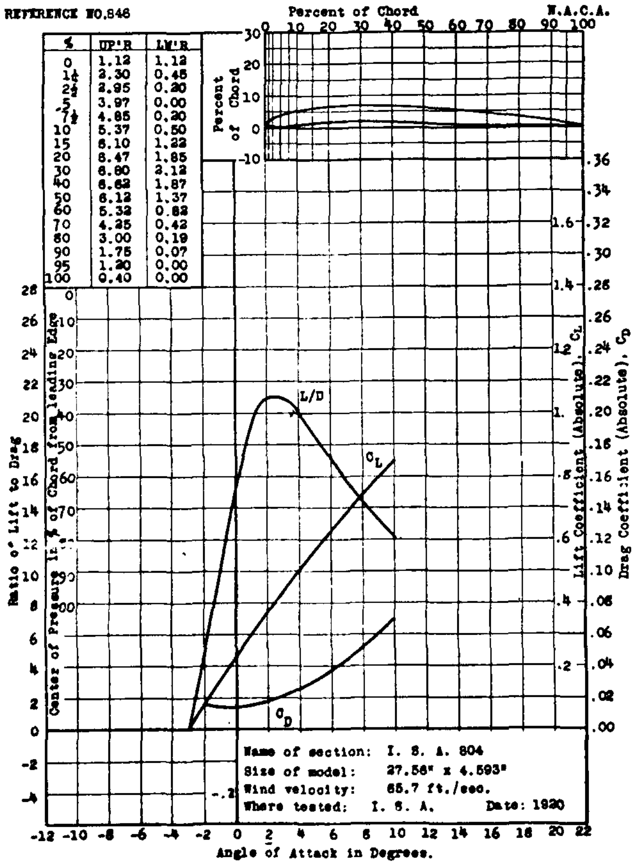
REFERENCE NO.845



%	UP'R	LW'R
0	0.75	0.75
1¼	2.15	0.30
2½	2.70	0.20
5	3.56	0.00
7½	4.40	0.40
10	4.93	0.89
15	5.72	1.65
20	6.25	1.92
30	6.55	2.12
40	6.30	1.85
50	5.70	1.35
60	4.92	0.87
70	3.82	0.44
80	2.70	0.17
90	1.50	0.04
95	1.00	0.00
100	0.35	0.00

Name of section: I. S. A. 803
Size of model: 31.50" x 5.249"
Wind velocity: 65.6 ft./sec.
Where tested: I. S. A. Date:1920

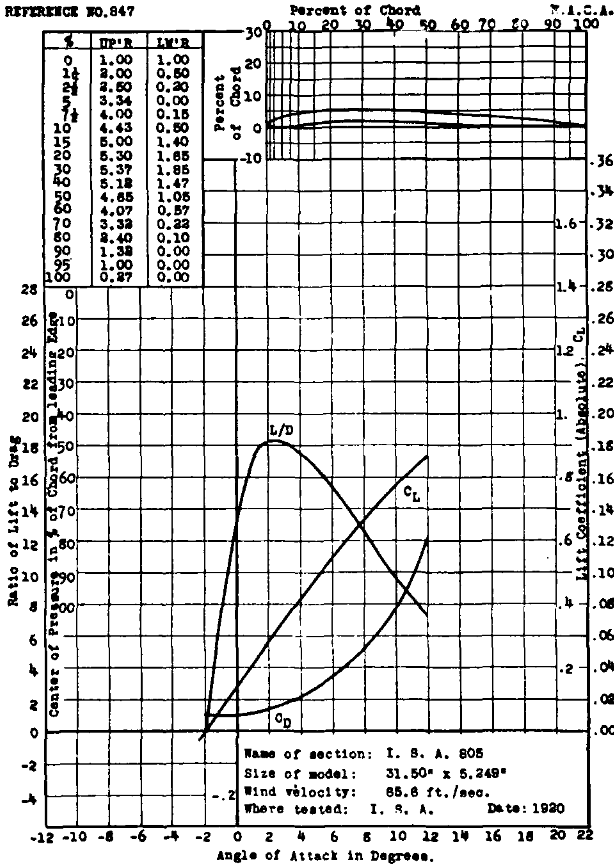
REFERENCE NO.846



%	UP'R	LW'R
0	1.12	1.12
1¼	2.30	0.45
2½	2.95	0.20
5	3.97	0.00
7½	4.85	0.20
10	5.37	0.50
15	6.10	1.22
20	6.47	1.85
30	6.80	2.12
40	6.62	1.87
50	6.12	1.37
60	5.32	0.82
70	4.25	0.42
80	3.00	0.19
90	1.75	0.07
95	1.20	0.00
100	0.40	0.00

Name of section: I. S. A. 804
Size of model: 27.56" x 4.593"
Wind velocity: 65.7 ft./sec.
Where tested: I. S. A. Date: 1920

REFERENCE NO.847

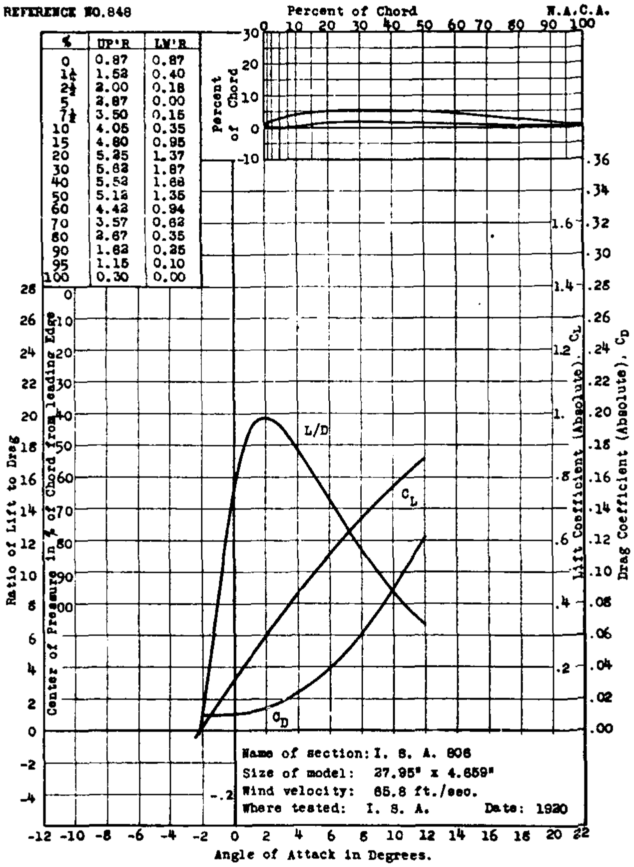


%	UP'R	LW'R
0	1.00	1.00
1¼	2.00	0.50
2½	2.50	0.20
5	3.34	0.00
7½	4.00	0.15
10	4.43	0.50
15	5.00	1.40
20	5.30	1.65
30	5.37	1.85
40	5.18	1.47
50	4.65	1.05
60	4.07	0.57
70	3.32	0.22
80	2.40	0.10
90	1.38	0.00
95	1.00	0.00
100	0.27	0.00

Name of section: I. S. A. 805
Size of model: 31.50" x 5.249"
Wind velocity: 65.6 ft./sec.
Where tested: I. S. A. Date: 1920

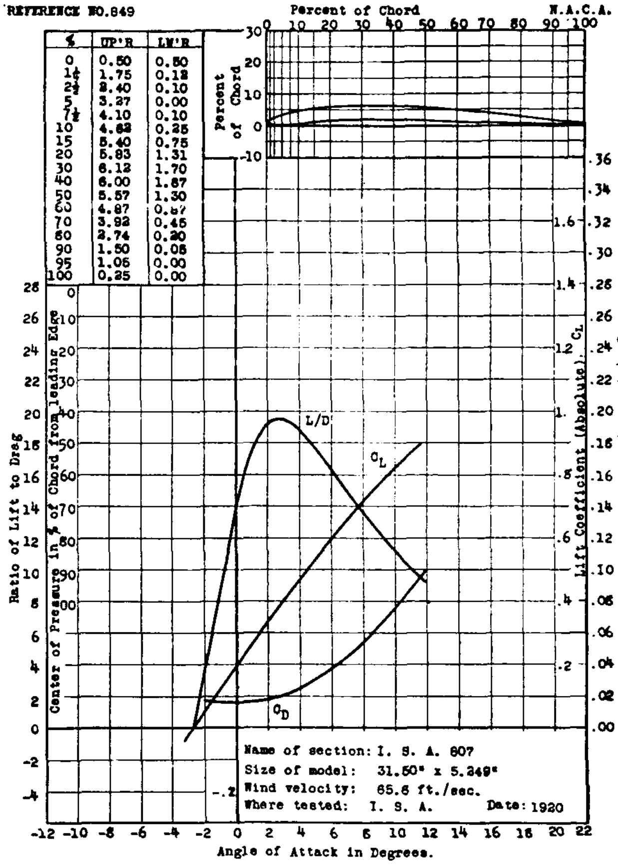
REFERENCE NO. 848

%	UP'R	LW'R
0	0.87	0.87
1¼	1.52	0.40
2½	2.00	0.18
5	2.87	0.00
7½	3.50	0.15
10	4.05	0.35
15	4.80	0.95
20	5.25	1.37
30	5.62	1.87
40	5.53	1.68
50	5.12	1.35
60	4.42	0.94
70	3.57	0.62
80	2.67	0.35
90	1.82	0.25
95	1.15	0.10
100	0.30	0.00



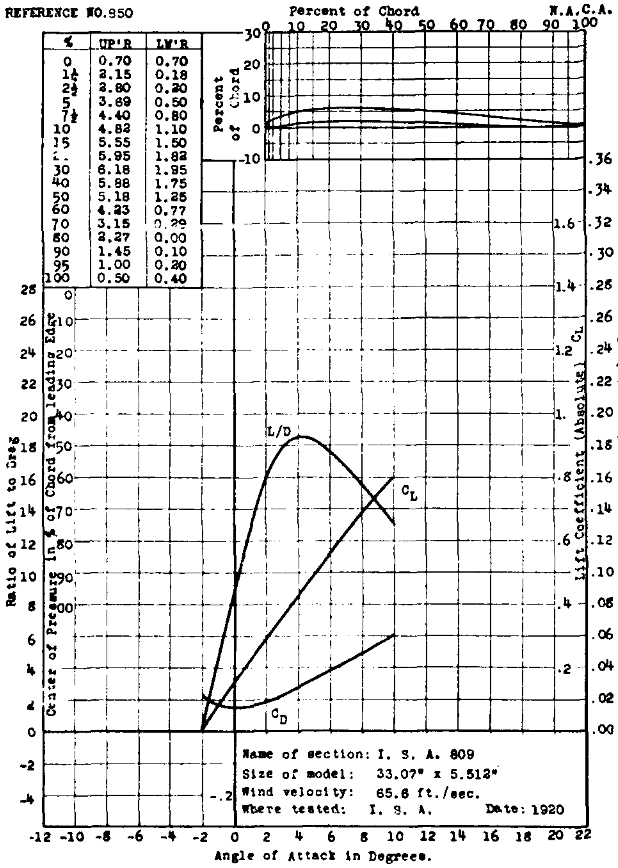
REFERENCE NO. 849

%	UP'R	LW'R
0	0.50	0.50
1¼	1.75	0.12
2½	2.40	0.10
5	3.27	0.00
7½	4.10	0.10
10	4.82	0.25
15	5.40	0.75
20	5.83	1.31
30	6.12	1.70
40	6.00	1.87
50	5.57	1.30
60	4.87	0.67
70	3.92	0.45
80	2.74	0.20
90	1.50	0.05
95	1.06	0.00
100	0.25	0.00



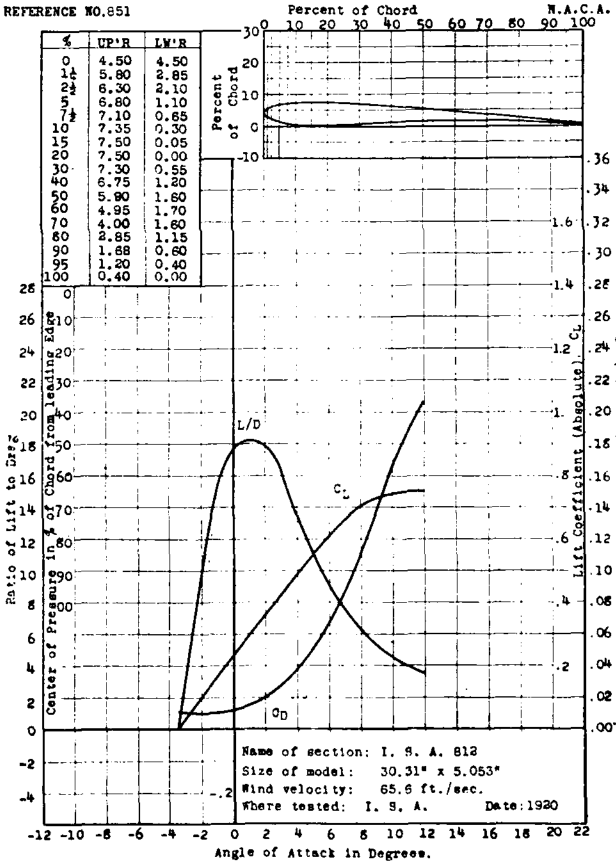
REFERENCE NO. 850

%	UP'R	LW'R
0	0.70	0.70
1¼	2.15	0.18
2½	2.80	0.20
5	3.69	0.50
7½	4.40	0.80
10	4.82	1.10
15	5.55	1.50
20	5.95	1.82
30	6.18	1.95
40	5.88	1.75
50	5.18	1.25
60	4.23	0.77
70	3.15	0.29
80	2.27	0.00
90	1.45	0.10
95	1.00	0.20
100	0.50	0.40

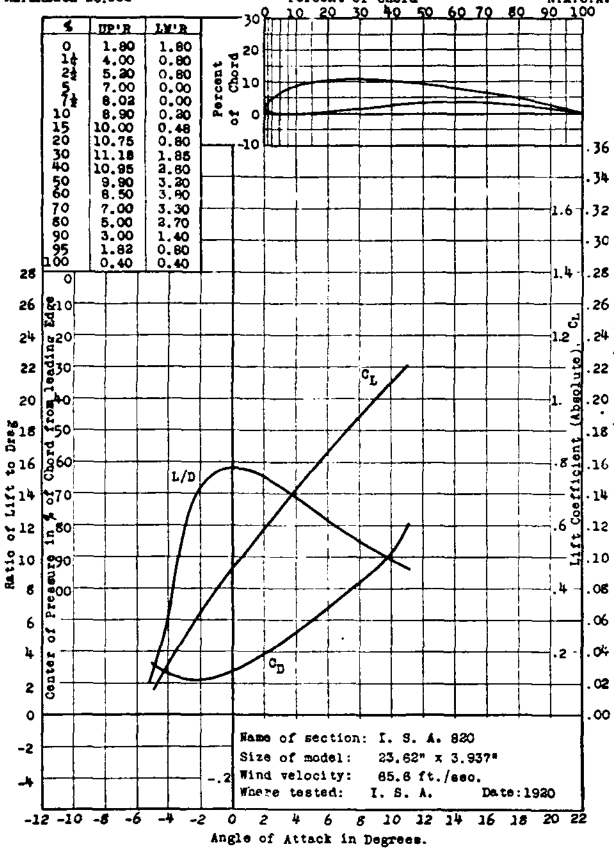


REFERENCE NO. 851

%	UP'R	LW'R
0	4.50	4.50
1¼	5.80	2.85
2½	6.30	2.10
5	6.80	1.10
7½	7.10	0.65
10	7.35	0.30
15	7.50	0.05
20	7.50	0.00
30	7.30	0.55
40	6.75	1.20
50	5.80	1.60
60	4.95	1.70
70	4.00	1.60
80	2.85	1.15
90	1.68	0.60
95	1.20	0.40
100	0.40	0.00

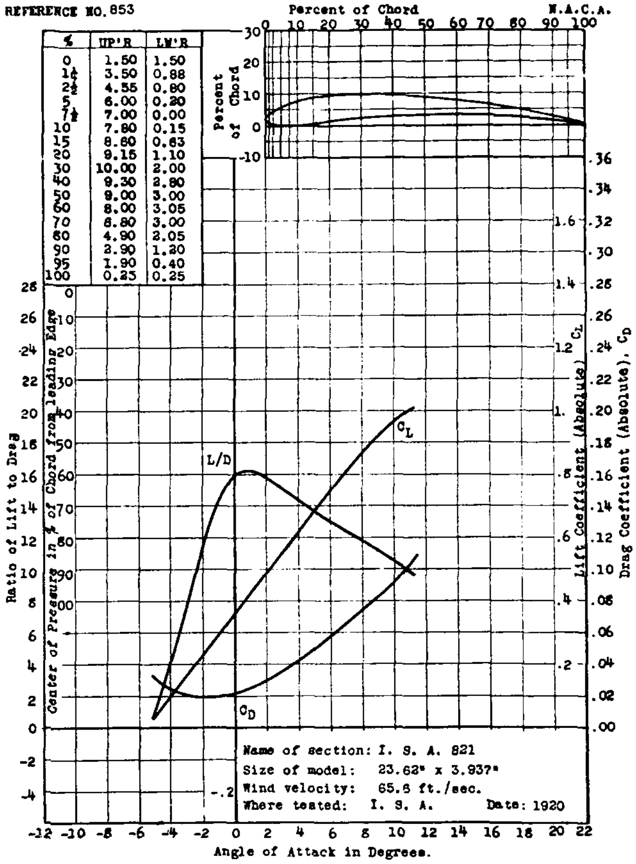


REFERENCE NO. 852 N.A.C.A.



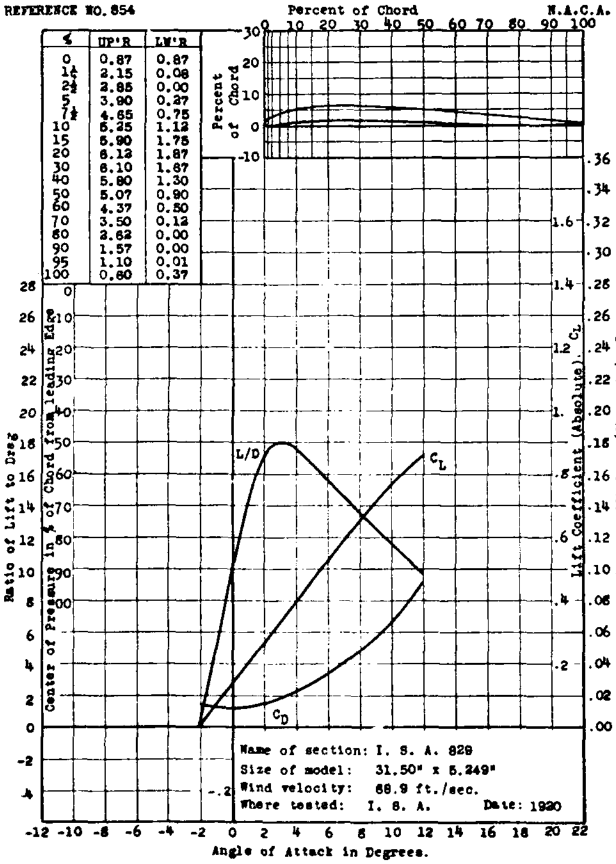
%	UP'R	LW'R
0	1.80	1.80
1¼	4.00	0.80
2½	5.20	0.80
5	7.00	0.00
7½	8.02	0.00
10	8.90	0.20
15	10.00	0.48
20	10.75	0.80
30	11.18	1.85
40	10.95	2.60
50	9.90	3.20
60	8.50	3.90
70	7.00	3.30
80	5.00	2.70
90	3.00	1.40
95	1.82	0.80
100	0.40	0.40

REFERENCE NO. 853 N.A.C.A.



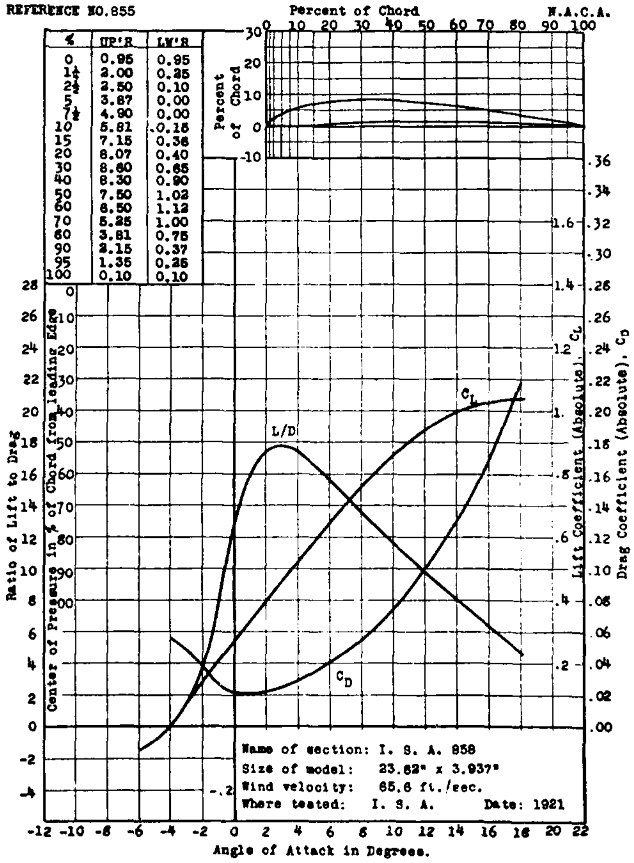
%	UP'R	LW'R
0	1.50	1.50
1¼	3.50	0.88
2½	4.55	0.80
5	6.00	0.20
7½	7.00	0.00
10	7.80	0.15
15	8.60	0.63
20	9.15	1.10
30	10.00	2.00
40	9.30	2.80
50	9.00	3.00
60	8.00	3.05
70	6.80	3.00
80	4.90	2.05
90	2.90	1.20
95	1.90	0.40
100	0.25	0.25

REFERENCE NO. 854 N.A.C.A.



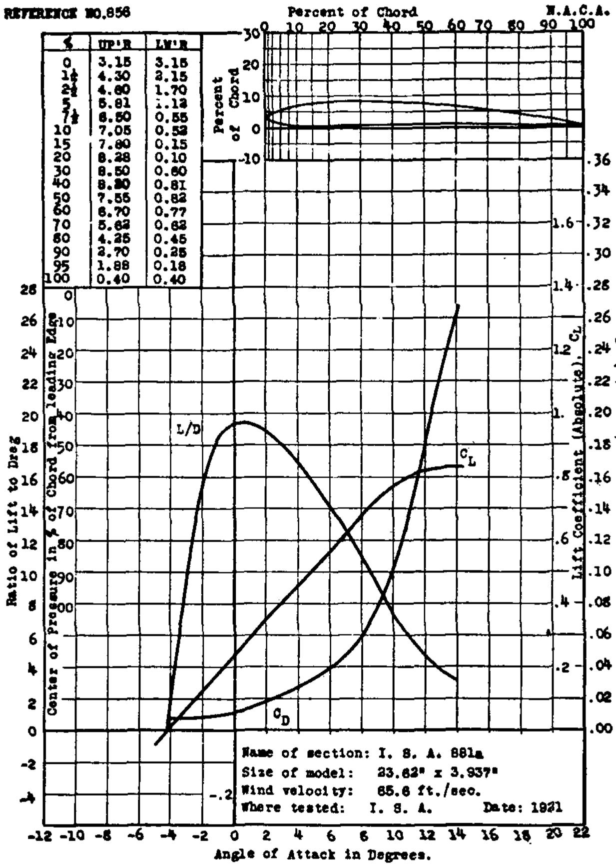
%	UP'R	LW'R
0	0.87	0.87
1¼	2.15	0.08
2½	2.85	0.00
5	3.90	0.27
7½	4.65	0.75
10	5.25	1.12
15	5.90	1.75
20	6.12	1.87
30	6.10	1.67
40	5.80	1.30
50	5.07	0.90
60	4.37	0.50
70	3.50	0.12
80	2.62	0.00
90	1.57	0.00
95	1.10	0.01
100	0.60	0.37

REFERENCE NO. 855 N.A.C.A.



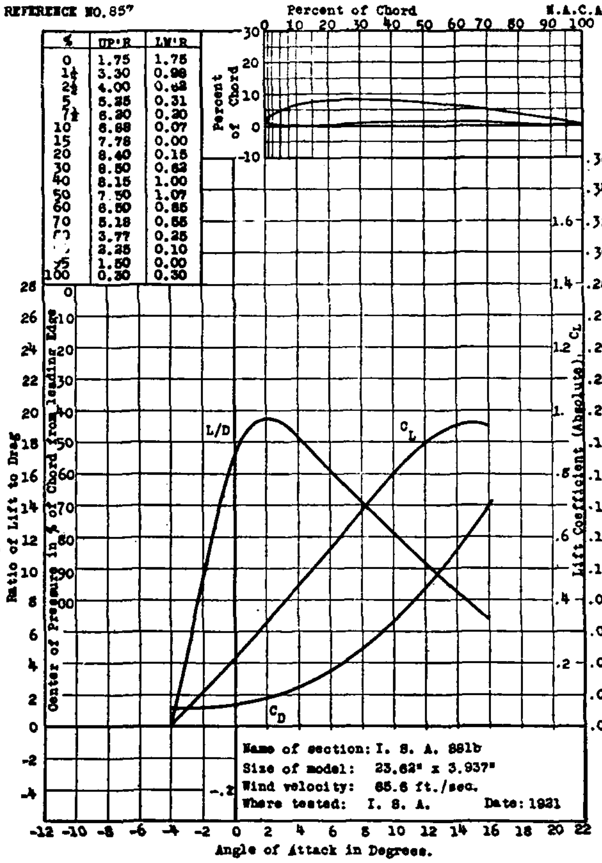
%	UP'R	LW'R
0	0.95	0.95
1¼	2.00	0.25
2½	2.50	0.10
5	3.87	0.00
7½	4.90	0.00
10	5.81	-0.15
15	7.15	0.36
20	8.07	0.40
30	8.60	0.65
40	8.30	0.90
50	7.50	1.02
60	6.50	1.12
70	5.25	1.00
80	3.81	0.75
90	2.15	0.37
95	1.35	0.25
100	0.10	0.10

REFERENCE NO. 856



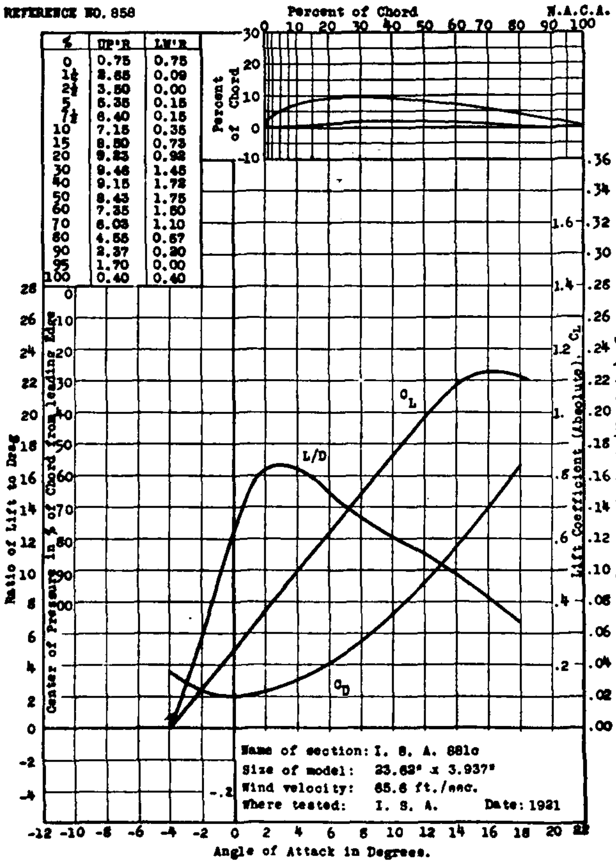
%	UP'R	LW'R
0	3.15	3.15
1¼	4.30	2.15
2½	4.60	1.70
5	5.81	1.12
7½	6.50	0.55
10	7.05	0.52
15	7.80	0.15
20	8.28	0.10
30	8.50	0.60
40	8.30	0.81
50	7.55	0.82
60	6.70	0.77
70	5.62	0.62
80	4.25	0.45
90	2.70	0.25
95	1.88	0.18
100	0.40	0.40

REFERENCE NO. 857



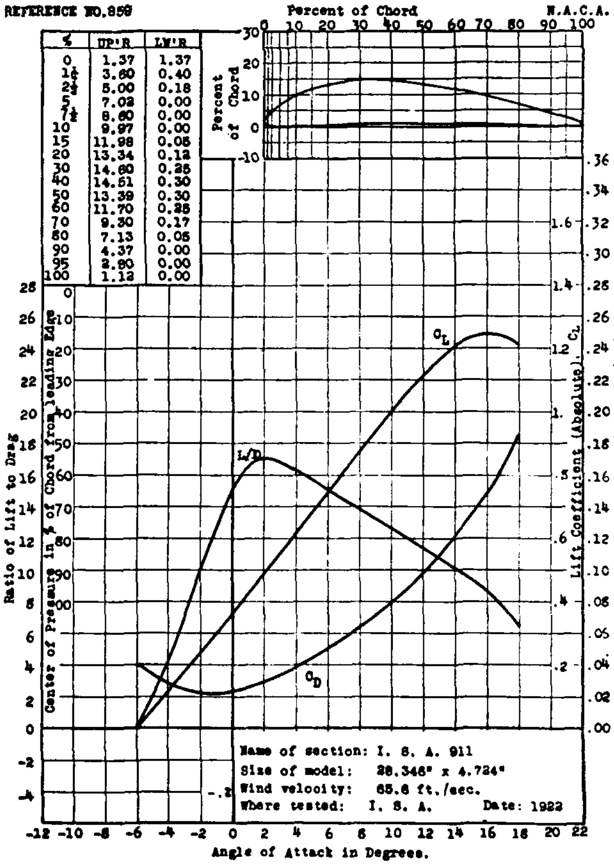
%	UP'R	LW'R
0	1.75	1.75
1¼	3.30	0.98
2½	4.00	0.62
5	5.25	0.31
7½	6.20	0.20
10	6.88	0.07
15	7.78	0.00
20	8.40	0.15
30	8.50	0.62
40	8.15	1.00
50	7.50	1.07
60	6.50	0.85
70	5.18	0.55
[illegible]	3.77	0.25
[illegible]	2.25	0.10
95	1.50	0.00
100	0.30	0.30

REFERENCE NO. 858

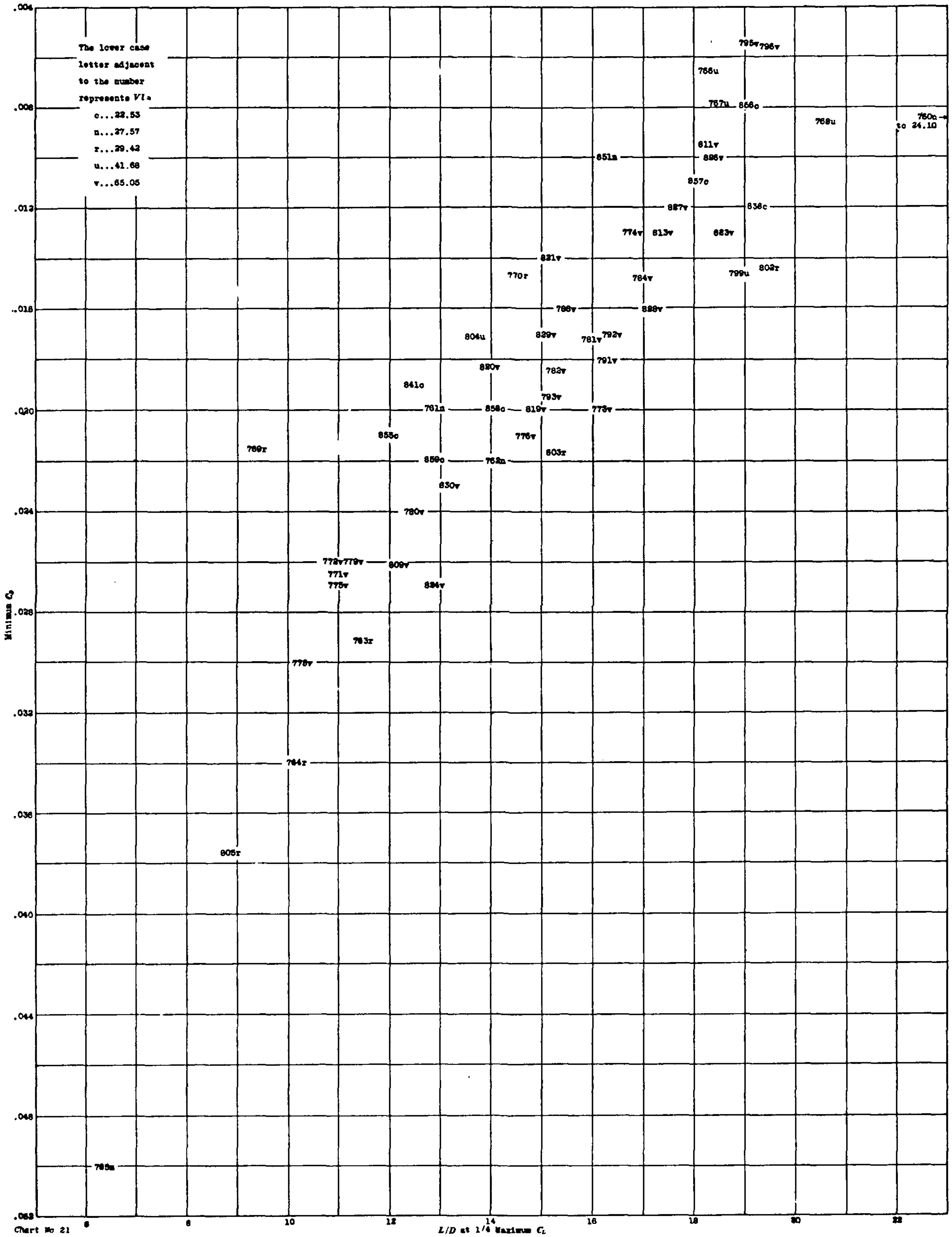


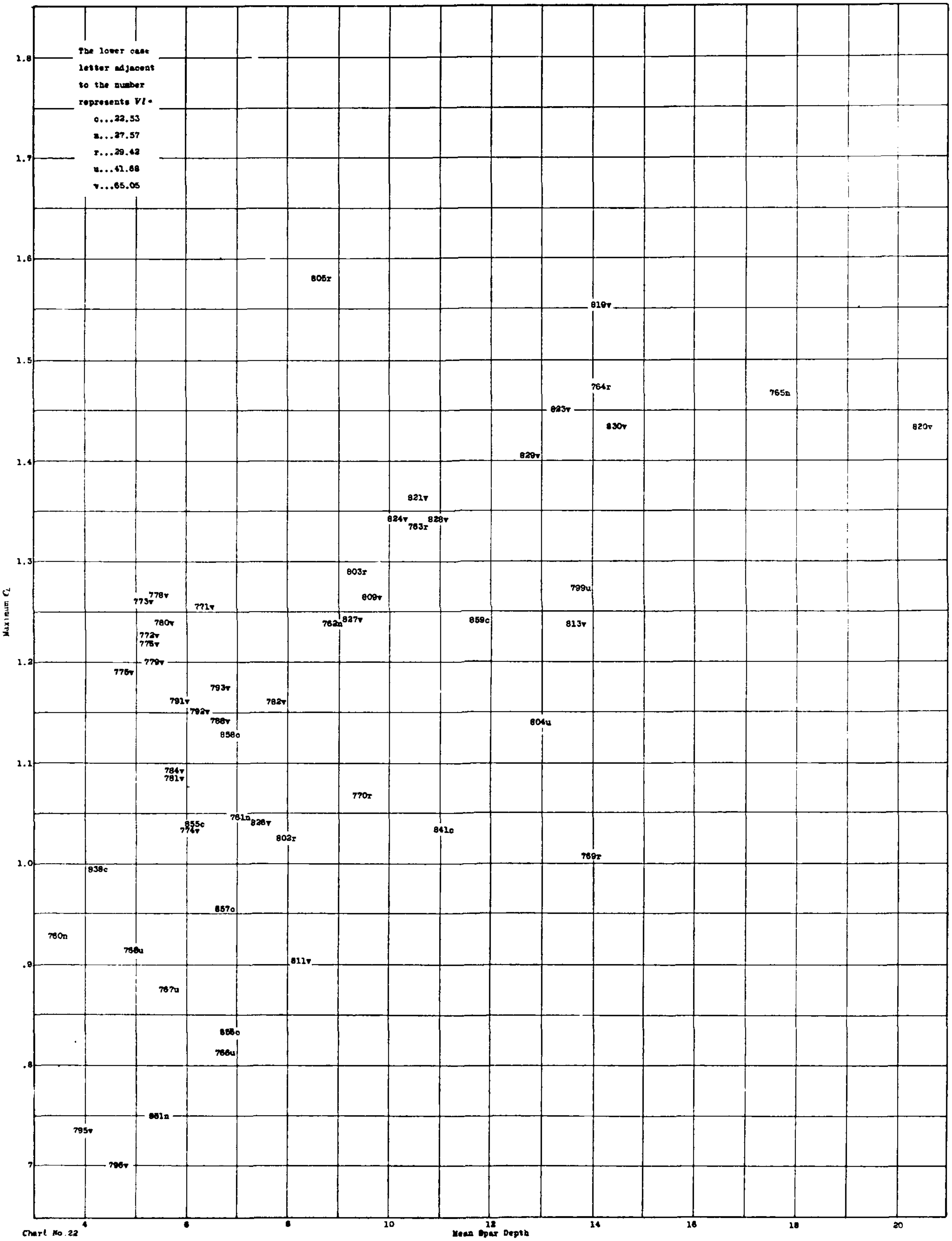
%	UP'R	LW'R
0	0.75	0.75
1¼	2.65	0.09
2½	3.50	0.00
5	5.35	0.15
7½	6.40	0.15
10	7.15	0.35
15	8.50	0.73
20	9.23	0.92
30	9.46	1.45
40	9.15	1.72
50	8.43	1.75
60	7.35	1.50
70	6.03	1.10
80	4.55	0.57
90	2.37	0.20
95	1.70	0.00
100	0.40	0.40

REFERENCE NO. 859



%	UP'R	LW'R
0	1.37	1.37
1¼	3.60	0.40
2½	5.00	0.18
5	7.02	0.00
7½	8.60	0.00
10	9.97	0.00
15	11.98	0.05
20	13.34	0.12
30	14.60	0.25
40	14.51	0.30
50	13.39	0.30
60	11.70	0.25
70	9.30	0.17
80	7.13	0.05
90	4.37	0.00
95	2.80	0.00
100	1.12	0.00


The lower case letter adjacent to the number represents VI =
c...22.53
n...27.57
r...29.42
u...41.68
v...65.05
Minimum C_D
L/D at 1/4 Maximum C_L
760n → to 24.10
Chart No 21



The lower case letter adjacent to the number represents VI =
c...22.53
n...27.57
r...29.42
u...41.88
v...65.05
Maximum C_L
Mean Spar Depth
805r
819v
764r
765n
823v
830v
820v
829v
821v
824v
828v
783r
803r
799u
778v
773v
771v
809v
762n
827v
859c
813v
780v
772v
776v
779v
775v
793v
782v
791v
792v
788v
856c
804u
784v
781v
770r
761n
826v
855c
774v
802r
841c
769r
838c
857c
760n
768u
811v
787u
858c
766u
851n
795v
796v

Chart No. 22

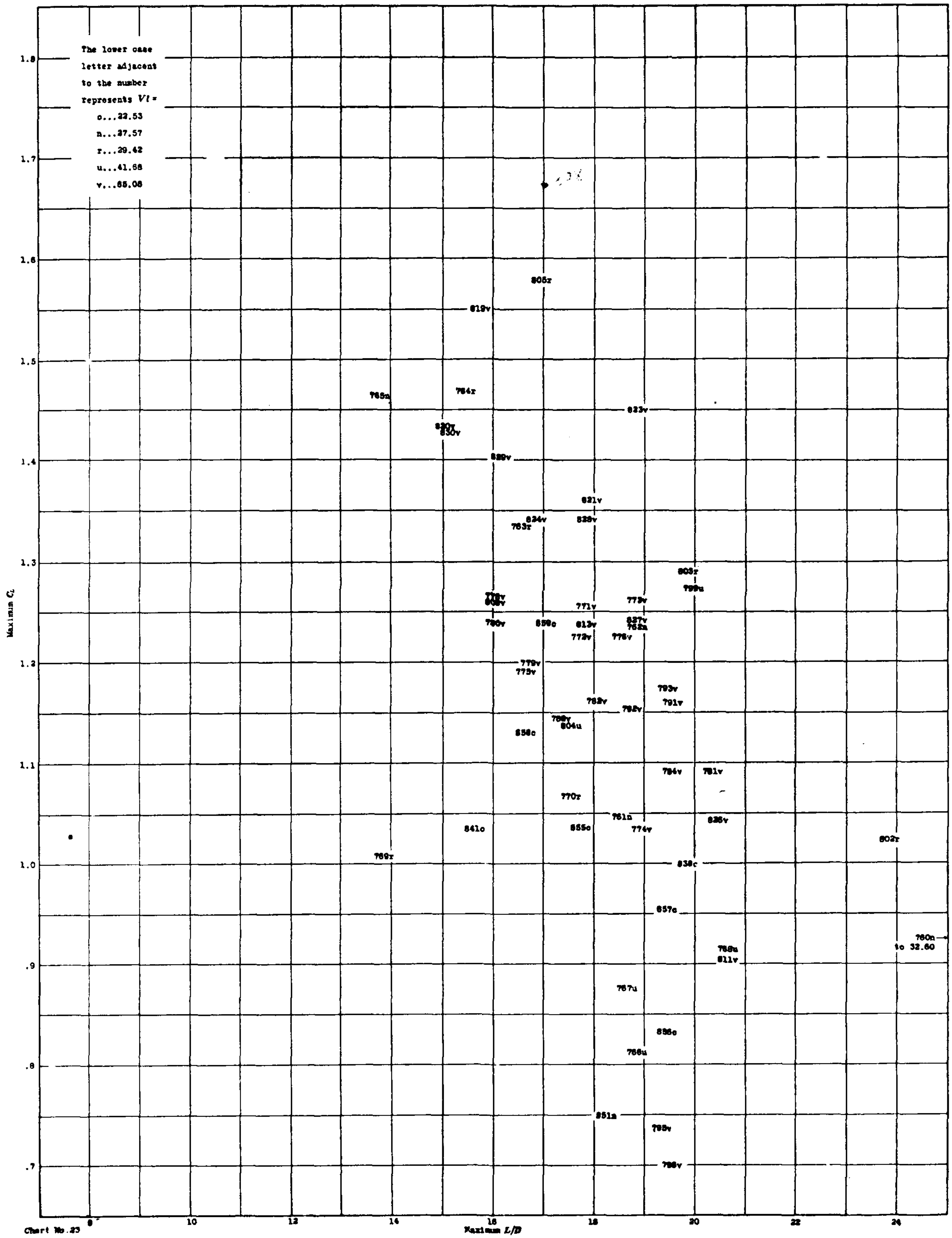

The lower case letter adjacent to the number represents Vl =
o...22.53
n...27.57
r...29.42
u...41.68
v...65.08
Maximum C_L
Maximum L/D
760n to 32.60

Chart No. 23

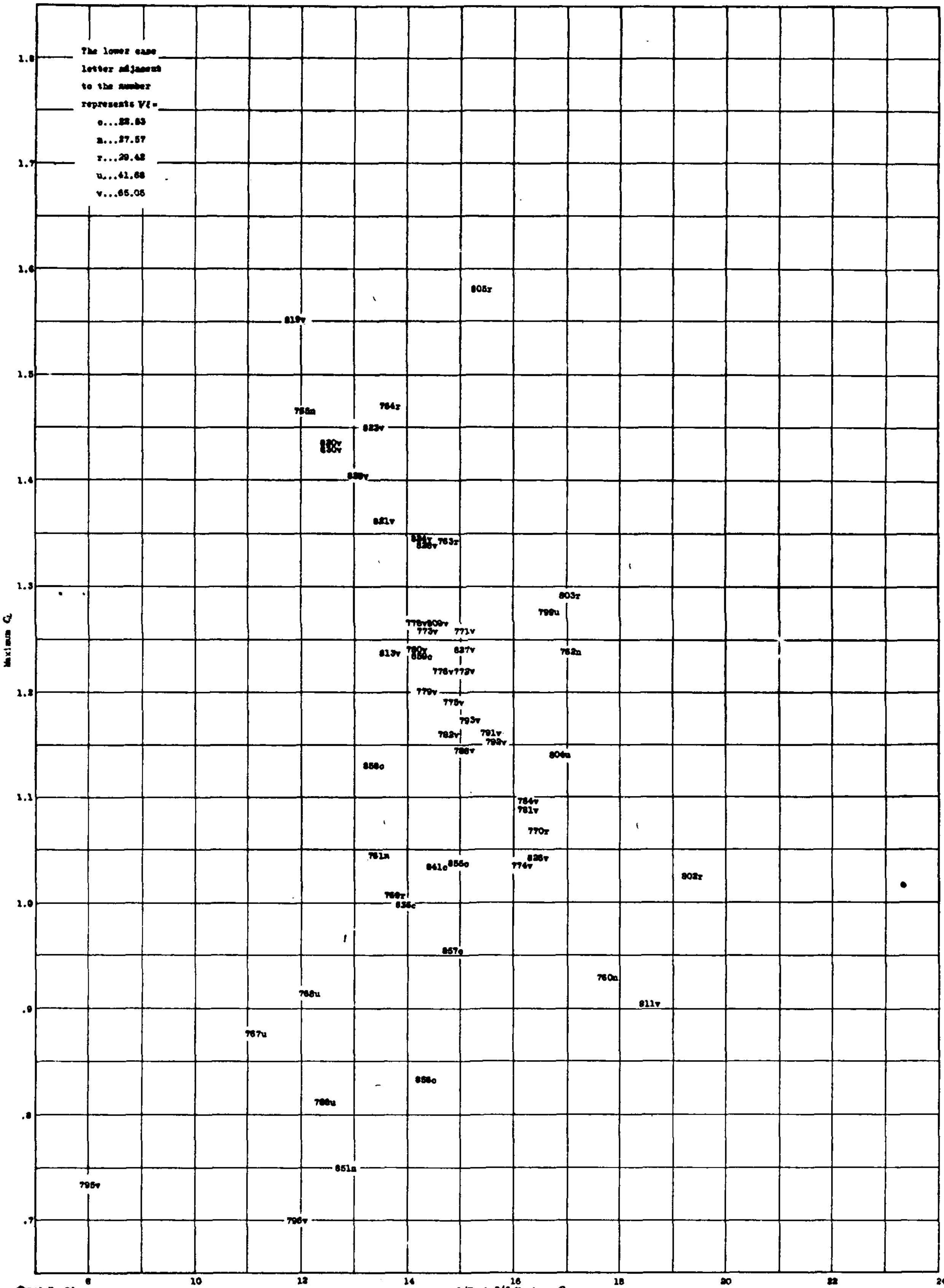

The lower case
letter adjacent
to the number
represents Vl =
n...27.57
r...29.42
u...41.68
v...65.05
Maximum C_L
L/D at 2/3 Maximum C_L

Chart No. 24

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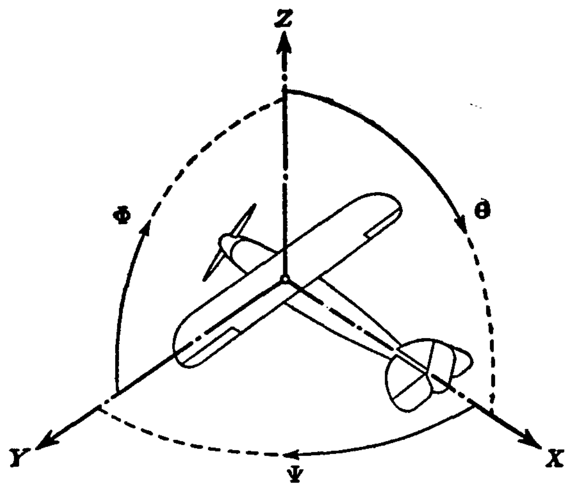

Positive directions of axes and angles (forces and moments) are shown by arrows

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

$$C_L=\frac{L}{qbS}\quad C_M=\frac{M}{qcS}\quad C_N=\frac{N}{qfS}$$

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

4. PROPELLER SYMBOLS

D, Diameter.
p_e, Effective pitch
p_g, Mean geometric pitch.
p_s, Standard pitch.
p_v, Zero thrust.
p_a, Zero torque.
p/D, Pitch ratio.
V', Inflow velocity.
V_s, Slip stream velocity.

T, Thrust.
Q, Torque.
P, Power.
(If "coefficients" are introduced all units used must be consistent.)
η, Efficiency $= T\,V/P$.
n, Revolutions per sec., r. p. s.
N, Revolutions per minute., R. P. M.
Φ, Effective helix angle $=\tan^{-1}\left(\frac{V}{2\pi rn}\right)$

5. NUMERICAL RELATIONS

1 HP = 76.04 kg/m/sec. = 550 lb./ft./sec.
1 kg/m/sec. = 0.01315 HP.
1 mi./hr. = 0.44704 m/sec.
1 m/sec. = 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.