# Report No. 331

## COLLECTION OF WIND-TUNNEL DATA ON COMMONLY USED WING SECTIONS

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Navy Department

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### SUMMARY

*This report was prepared at the request of the National Advisory Committee for Aeronautics in the Bureau of Aeronautics of the Navy Department in order to group in a uniform manner the aerodynamic properties of commonly used wing sections as determined from tests in various wind tunnels.*

*The data have been collected from reports of a number of laboratories. Where necessary, transformation has been made to the absolute system of coefficients and tunnel wall interference corrections have been applied. Tables and graphs present the data in the various forms useful to the engineer in the selection of a wing section.*

### INTRODUCTION

The wing sections most commonly used in this country are the Clark Y, Clark Y–15, Gottingen G–387, G–398, G–436, N. A. C. A. M–6, M–12, Navy N–9, N–10, N–22, R. A. F.–15, Sloane, U. S. A.–27, U. S. A.–35A, U. S. A.–35B. Data were obtained from References 1 to 14 on all of these airfoils that had been tested in the following wind tunnels:

- Large wind tunnel, Göttingen Laboratory.
- Variable density wind tunnel, Langley Memorial Aeronautical Laboratory.
- 7½-foot wind tunnel, Massachusetts Institute of Technology.
- 5-foot wind tunnel, McCook Field.
- 8-by-8-foot wind tunnel, Washington Navy Yard.

Some of the airfoils selected had been tested in as many as four of the five tunnels, others in only one of the tunnels.

The results obtained in the different laboratories are not directly comparable, because of the differences in the methods of testing; in the ordinates, size, and aspect ratio of the models tested and in the test speed. The purpose of this report is not to compare results from different laboratories but to present the data in a uniform manner and to compare different wing sections tested in the same laboratory at the same Reynolds Number.

In the individual laboratory reports, the data in some cases were presented in engineering rather than absolute coefficients; in most cases, the tunnel wall interference corrections had not been applied; for some tests the center of pressure had not been determined; the moment coefficient was given with respect to various axes; the data were presented by some laboratories in polar diagrams and by others in angle-of-attack graphs.

In the present report the collected data have been corrected for tunnel wall interference, the absolute system of coefficients is used, and the data are plotted and tabulated in various forms for the convenience of the engineer.

### ABSOLUTE SYSTEM OF COEFFICIENTS

The absolute lift and drag coefficients $C_L$ and $C_D$ are defined by dividing the lift $L$ and the drag $D$ by the dynamic pressure $q = \frac{1}{2} \rho V^2$ and the wing area $S$.

$$C_L = L/qS \qquad C_D = D/qS.$$

The absolute moment coefficient $C_M$ is the moment $M$ about the leading edge divided by $qS$ times the chord length $c$ and is positive when the moment tends to make the leading edge rise.

$$C_M = M/qSc.$$

The center of pressure coefficient $C_p$ is the fraction of the chord length along the chord from the leading edge to the line of action of the resultant force. This distance is equal to the moment coefficient divided by the normal force coefficient $C_N$.

$$C_p = C.P./c = C_M/C_N$$

where $C_N = C_L \cos \alpha + C_D \sin \alpha$.

The induced drag coefficient $C_{D_i}$ is equal to $C_L^2$ divided by $\pi$ times the aspect ratio.

$$C_{D_i} = C_L^2/\pi\ A.R. = C_L^2 S/\pi b^2$$

where $b$ is the span.

The profile drag coefficient $C_{D_0}$ is the difference between the coefficients of total drag and induced drag

$$C_{D_0} = C_D - C_{D_i}$$

## TUNNEL WALL INTERFERENCE CORRECTIONS

A large share of the data taken from References 1 to 14 had not been corrected for tunnel wall interference. The following Prandtl corrections have been applied where necessary:

$$\Delta\ \alpha = \delta \frac{C_L S}{A} \text{radians} \qquad \Delta\ C_D = \delta \frac{C_L^2 S}{A}.$$

$A$ is the cross-sectional tunnel area and $\delta$ is equal to 0.125 for a tunnel having a circular cross section. For a tunnel of square cross section, Glauert has shown that $\delta$ increases to 0.137.

## ORDINATES OF THE AIRFOILS

Table I gives the general shape of the various wing sections. The faired ordinates used by the Bureau of Aeronautics have been given and are called the specified ordinates. These ordinates may be slightly different from those in general use as exact specifications for the various sections do not exist. For this reason, a wing section at one laboratory might be expected to vary to some extent from the same section at another laboratory. The variation becomes greater in the measured ordinates due to the different materials used in airfoil construction and different methods of measuring the ordinates.

The maximum thickness of the airfoils and their thickness for front and rear spar depths are given in Table II. Since the spar depths for a wing to be selected are approximately known, a glance at this table will limit the number of wings for further consideration.

## TEST CONDITIONS

No attempt will be made in this report to describe the various wind tunnels or their methods of testing. Only the conditions for the tests selected will be given.

The Göttingen Laboratory tests were made on 20 by 100 centimeter (7.874 × 39.37 inches) models at a test speed of 30 meters (98.4 feet) per second. This gives a test $Vl$ of 64.58 square feet per second, where $l$ is taken as the chord length. Since the elements of air density and viscosity were not determined, the exact Reynolds Number of the tests is not known. Assuming air of standard density $\rho$ and the coefficient of viscosity $\mu$ at standard temperature, $\rho/\mu = 6{,}378$ sq.ft./sec., and the approximate Reynolds Number $\rho\ Vl/\mu$ is 412,000.

The Langley Memorial Aeronautical Laboratory (L. M. A. L.) tests were made on 5 by 30 inch models at a test speed of approximately 76 feet per second. Tests on most of the models were made at several pressures, but only the tests at a pressure of about 20 atmospheres are considered here. The average Reynolds Number for each test was determined and is in the neighborhood of 3,600,000 corresponding to full-scale conditions.

The Massachusetts Institute of Technology (M. I. T.) tests were made on 6 by 36 inch models at a test speed of 40 miles an hour. The test $Vl$ is 29.33 sq. ft./sec.; approximate Reynolds Number, 187,000.

The McCook Field (McC. F.) tests were made on 6 by 36 inch models at various air speeds. Only the tests at 80 miles an hour are considered here, giving a test $Vl$ of 58.67 sq. ft./sec.; approximate Reynolds Number, 374,000.

The Washington Navy Yard (W. N. Y.) tests were made on 5 by 30 inch models at a test speed of 40 miles an hour; test $Vl$, 24.44 sq. ft./sec.; approximate Reynolds Number, 156,000.

With the exception of the Göttingen airfoils of aspect ratio 5, all of the models had the normal aspect ratio of 6. The experimental results of the Göttingen tests could be corrected to an aspect ratio of 6, but since the results from the different laboratories are not directly comparable, it was thought best to leave the data in the original form.

## PRESENTATION OF DATA

The data from the Göttingen tests are given separately for each airfoil in Tables III to VI; L. M. A. L. tests, Tables VII to XIV; M. I. T. tests, Tables XV to XXII; McC. F. tests, Tables XXIII to XXV; W. N. Y. tests, Tables XXVI to XXXVII.

The usual $C_L$, $C_D$, and $C_L/C_D$ versus angle of attack curves for the 15 wing sections are presented in Figures 1 to 15, and a table is inserted on each figure giving the test conditions. It might have been preferable to have plotted the data from each laboratory in one figure but this was not practical on account of the interference in the numerous curves.

In Figures 16 to 30 are plotted the Lilienthal polar diagrams, $C_D$ and $C_M$ versus $C_L$, together with the induced drag polar curves.

$C_L/C_D$ is replotted against speed ratio $V/V_s$ in Figures 31 to 45. The center of pressure is also plotted against speed ratio as the curves are approximately straight lines and are easier to read than the usual plots of center of pressure against angle of attack.

Graphs of the profile drag coefficient $C_{DO}$ versus lift coefficient are presented in Figures 46 to 50. For these graphs it was possible to plot the data from each laboratory in one diagram and therefore the curves in each group are comparable. This same method is followed in Figures 51 to 55 which give the ratio of the faired profile drag coefficient to the maximum lift coefficient plotted against speed ratio.

## AIRFOIL CHARACTERISTICS AND CRITERIA

Various characteristic values and criteria for the wing sections derivable from the data and graphs are tabulated in Tables XXXVIII to XLIX. When convenient, the tabulation of the criteria are made with respect to the merit of the wing section and a note to that effect is under the heading to the table.

The above-mentioned tables are self-explanatory and derivations of the criteria can be found elsewhere, but a few brief remarks regarding the meaning of some of the criteria appears desirable.

$C_L$ maximum, Table XLI, is the criterion for minimum speed with a given wing loading or if the minimum speed is given, it is the criterion for the load which can be carried per unit area of wing.

The maximum ratio $C_L/C_D$, Table XLIII, is well known as a criterion for airfoil efficiency, greatest weight carried for a given thrust. It being also a criterion for maximum speed regardless of minimum, flattest glide, and maximum range. The value of $C_L$ at maximum $C_L/C_D$ is also tabulated and should be considered along with the maximum ratio of lift to drag. The ratio of lift to drag is given for various fractions of $C_L$ maximum in Table XLIV. These data show the effectiveness for speed and climb.

The ratio of $C_L$ maximum to $C_D$ minimum, Table XLV, is the criterion for maximum speed with a given minimum. With constant loading, $(C_L^3/C_D^2)$ maximum, Table XLVI, is an index of minimum power, maximum rate of climb, maximum ceiling, maximum duration; the ratio of $C_L^3$ maximum to $C_D^2$ minimum, Table XLVII, is the criterion for maximum speed range. For additional detail on the above-mentioned criteria, the reader is referred to Reference 15.

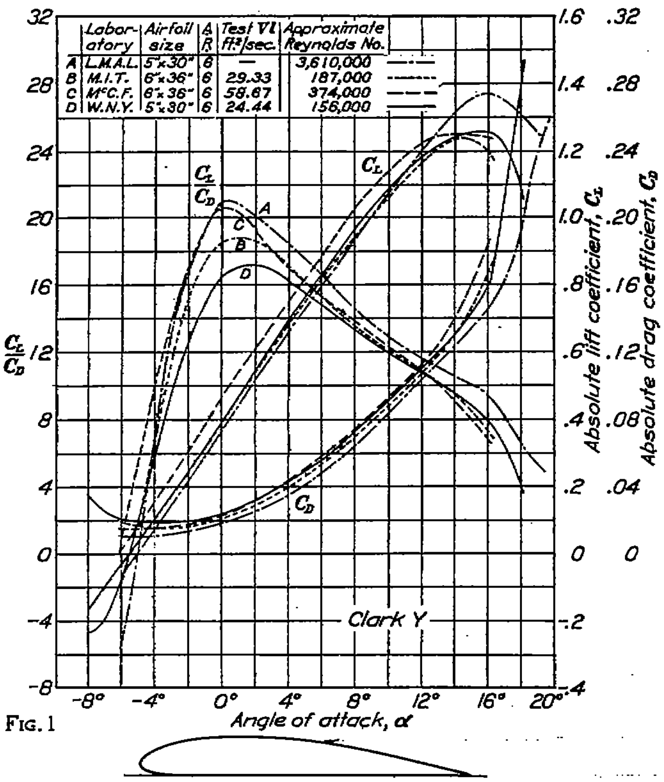

FIG. 1

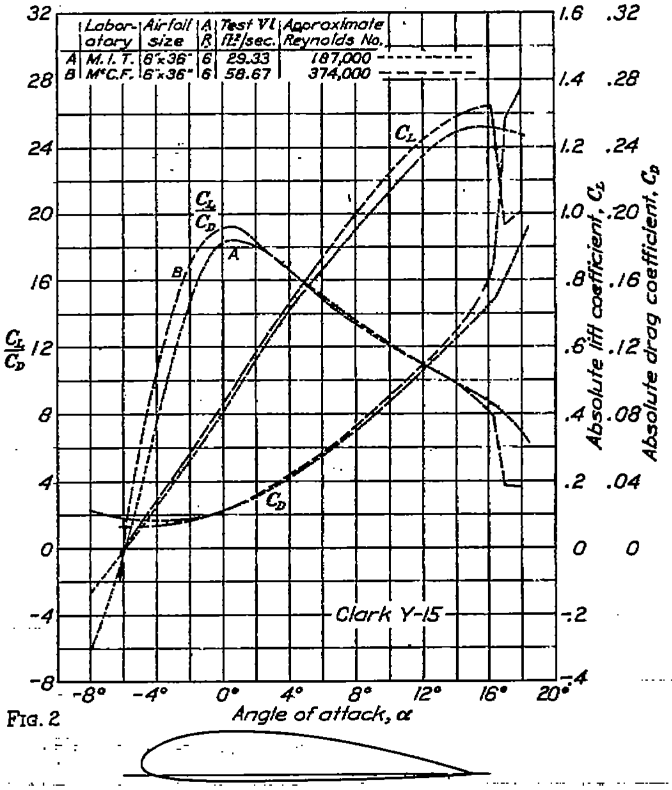

FIG. 2

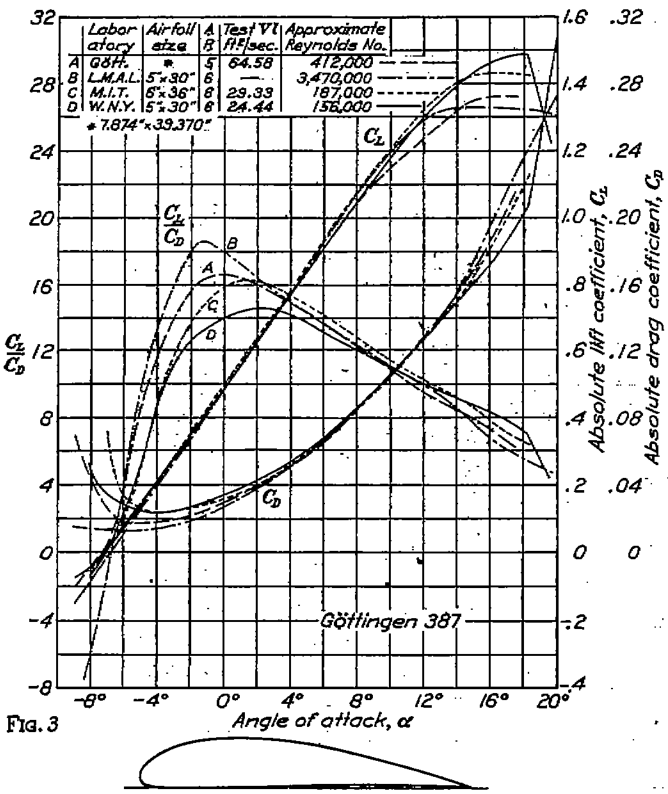

FIG. 3

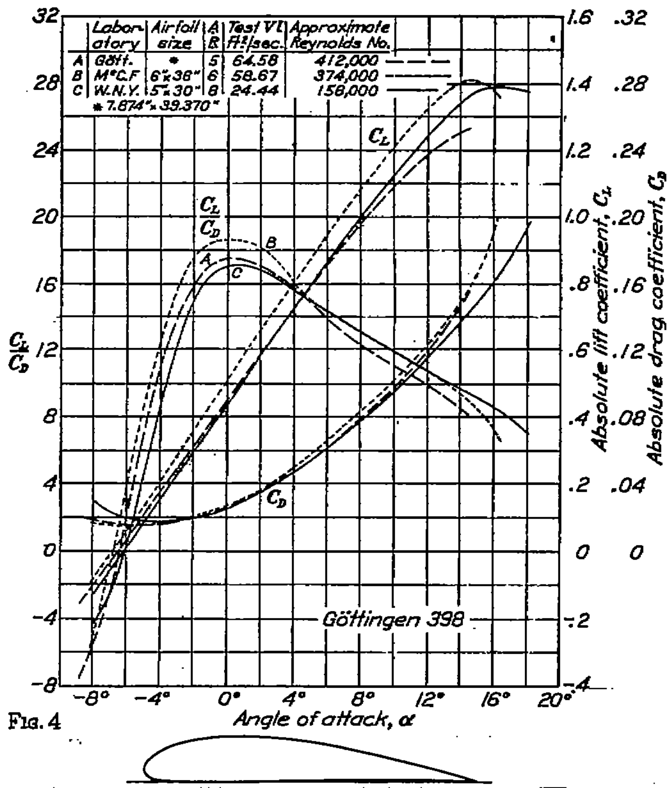

FIG. 4

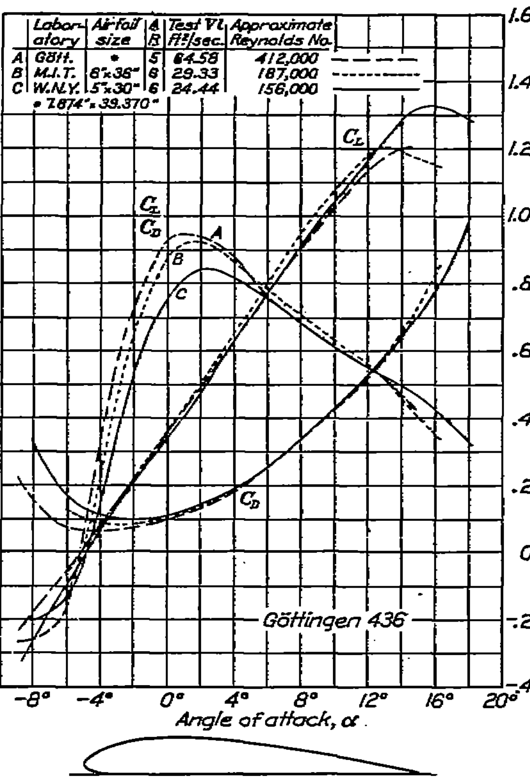


FIG. 5

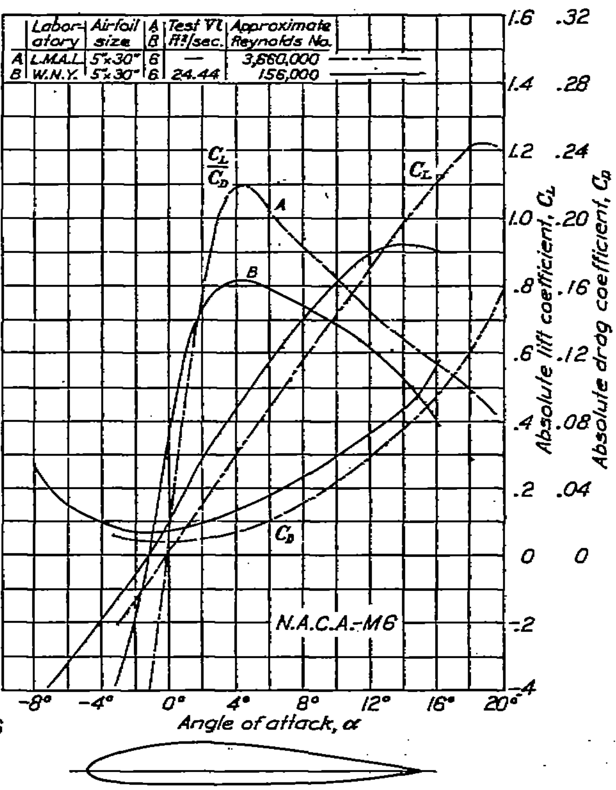


FIG. 6

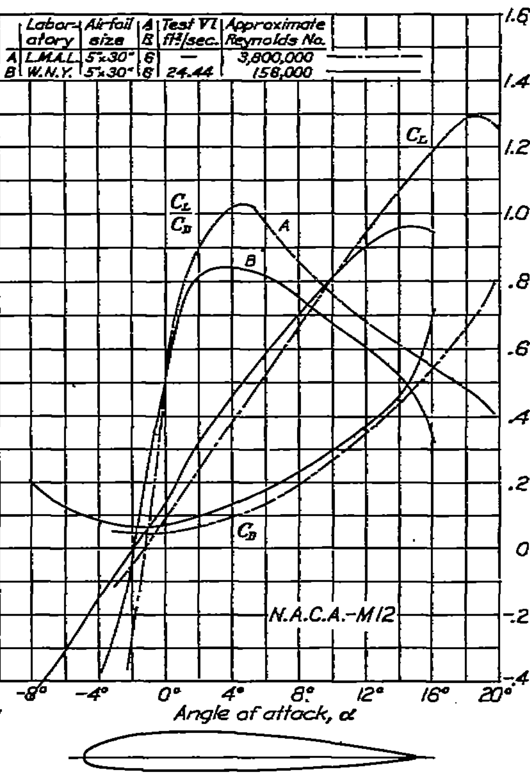


FIG. 7

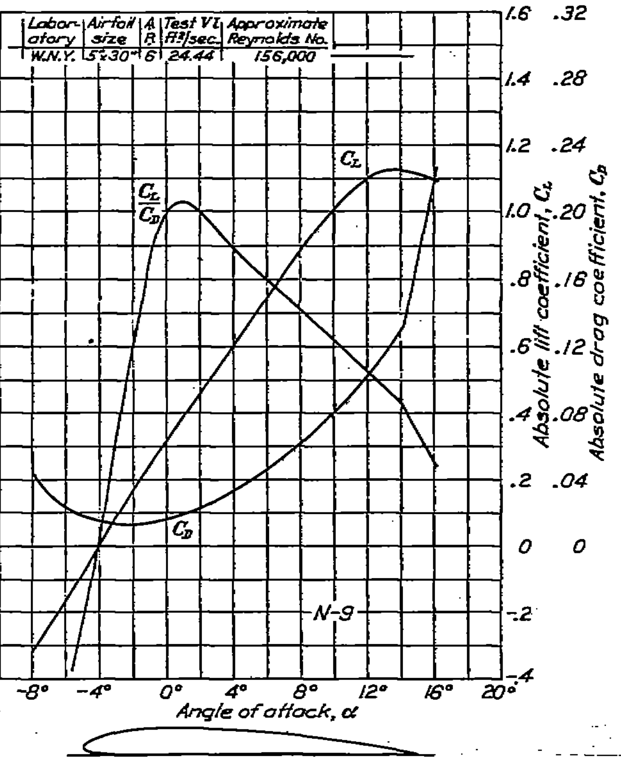


FIG. 8

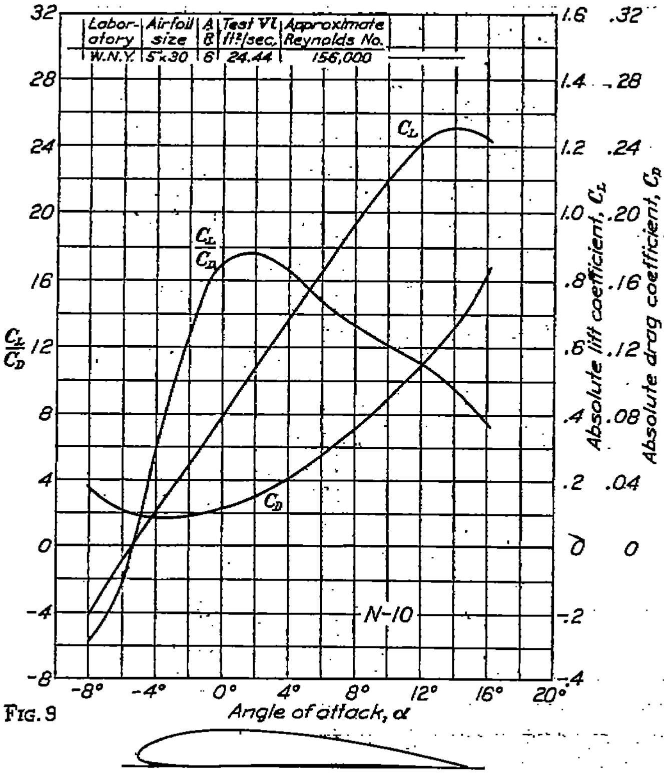


FIG. 9

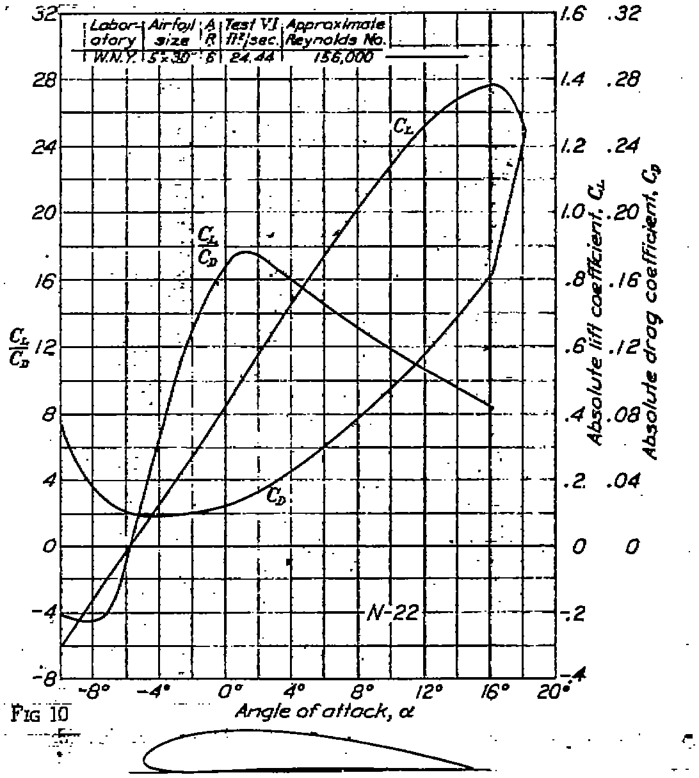


FIG. 10

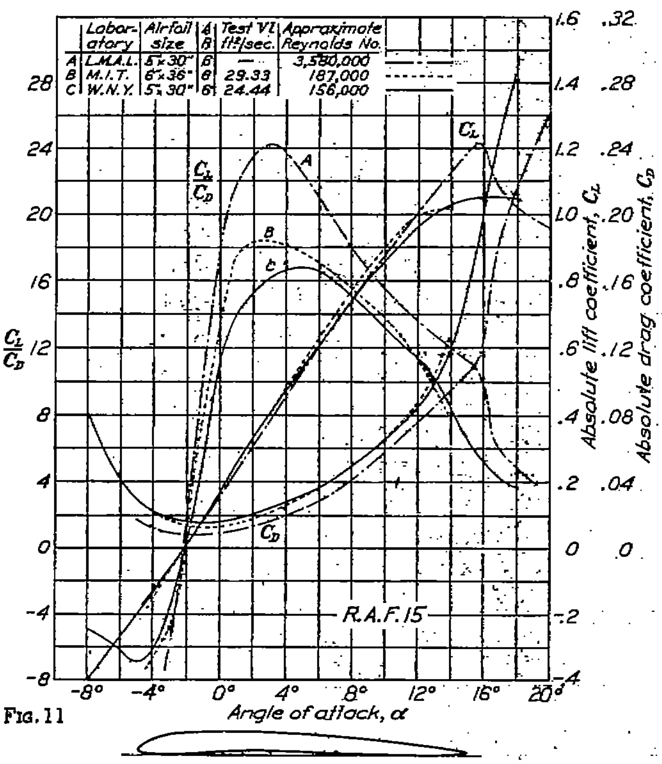


FIG. 11

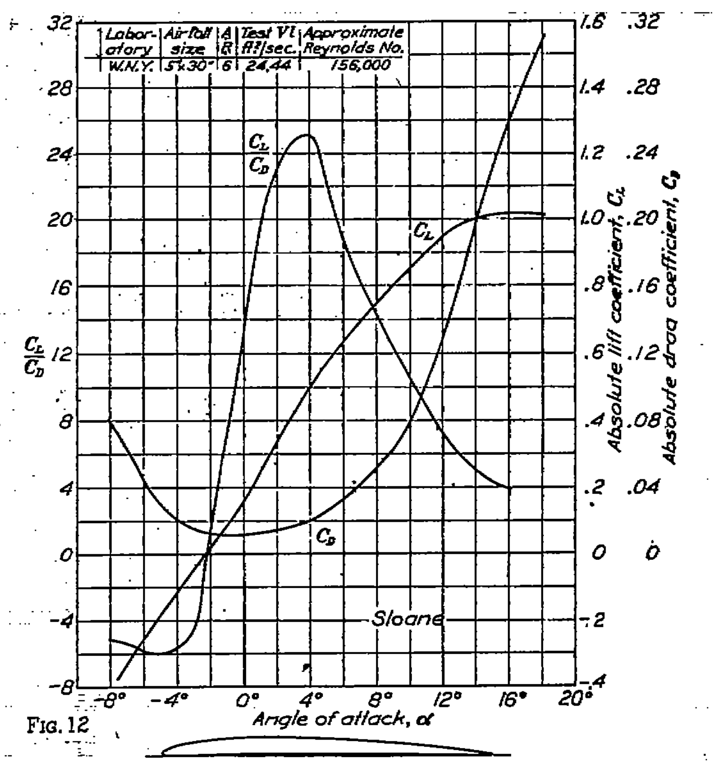


FIG. 12

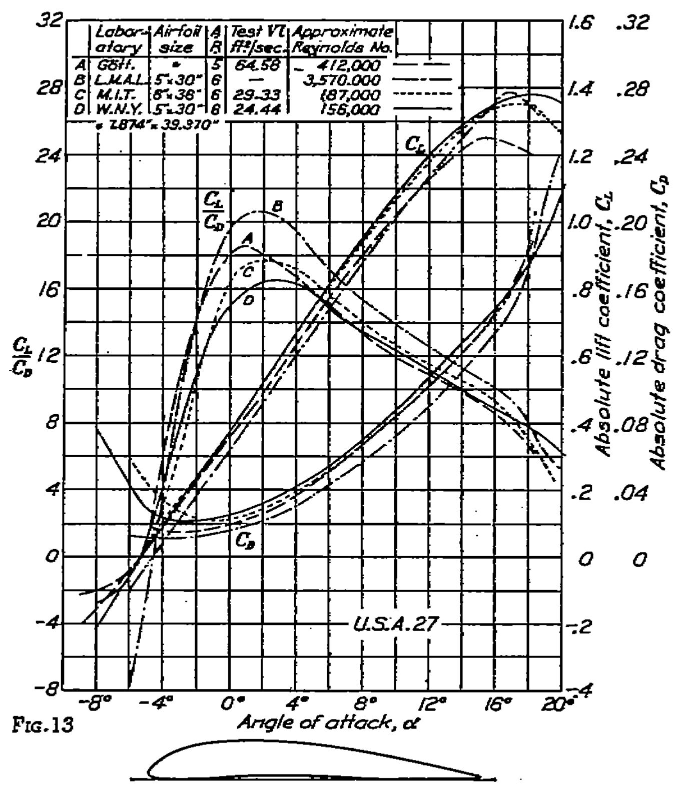


FIG. 13

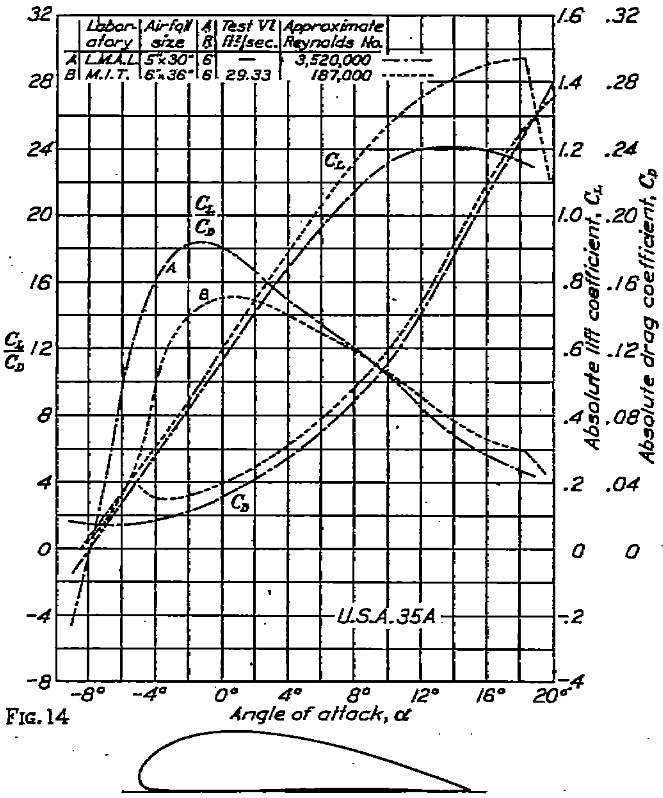


FIG. 14

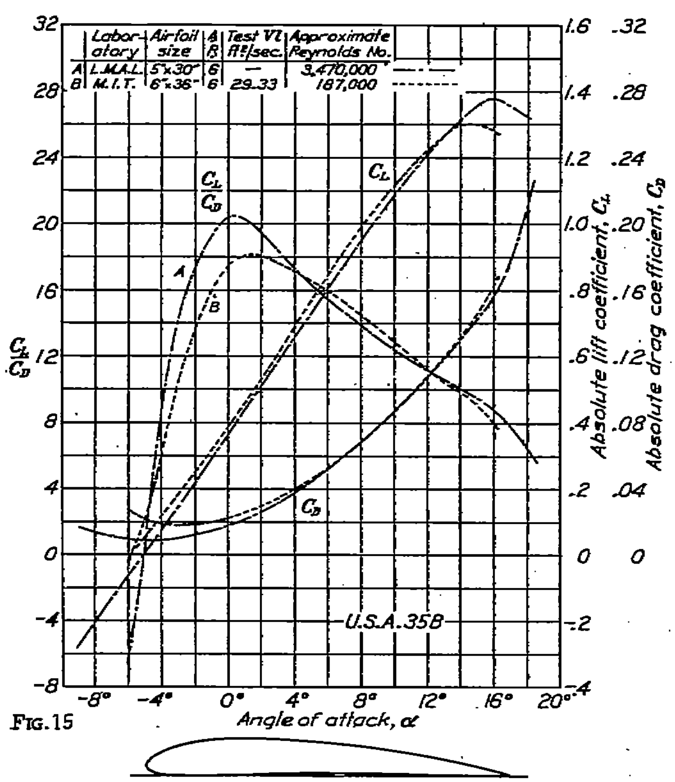


FIG. 15

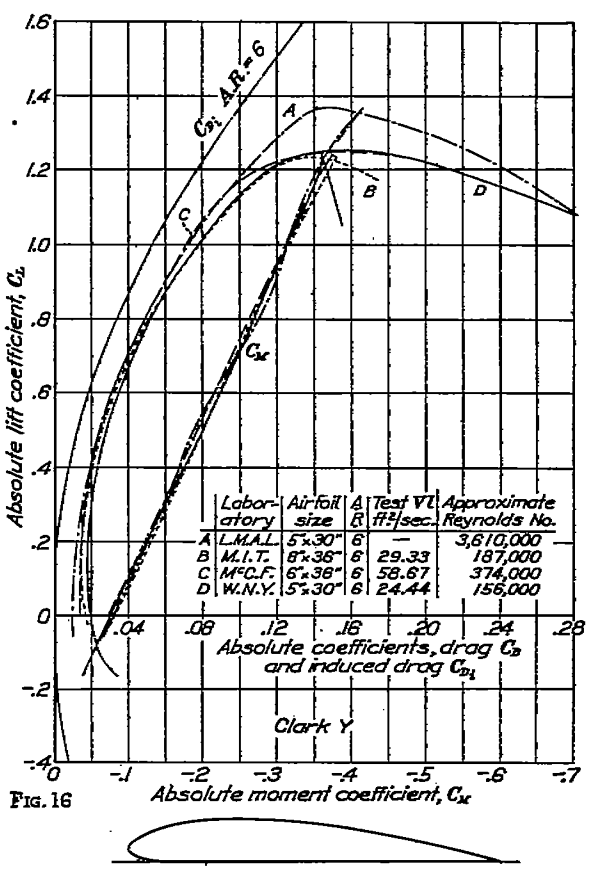


FIG. 16

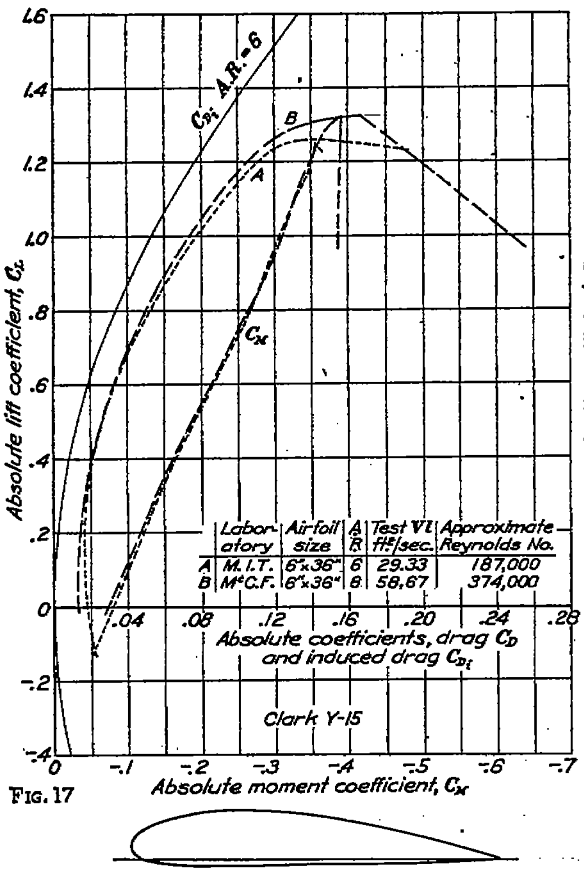


FIG. 17

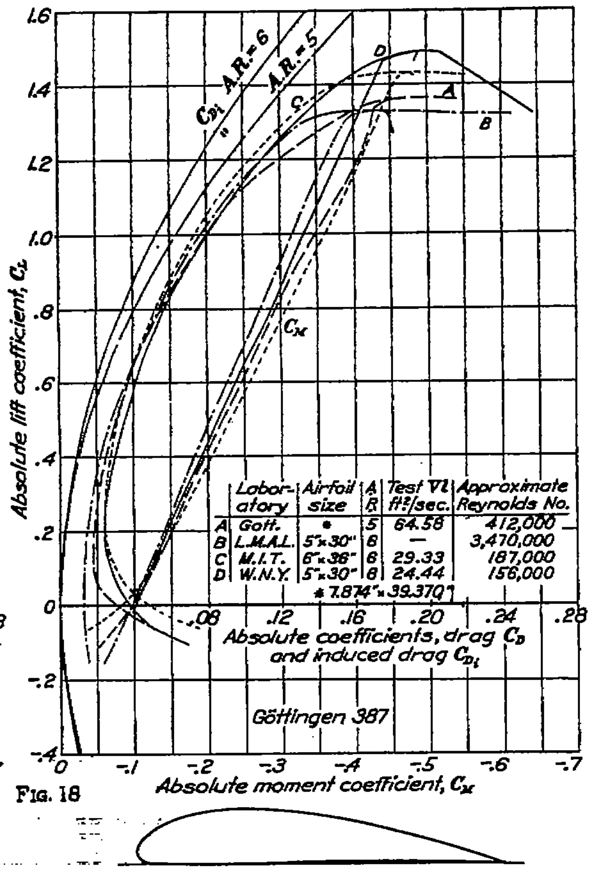


FIG. 18

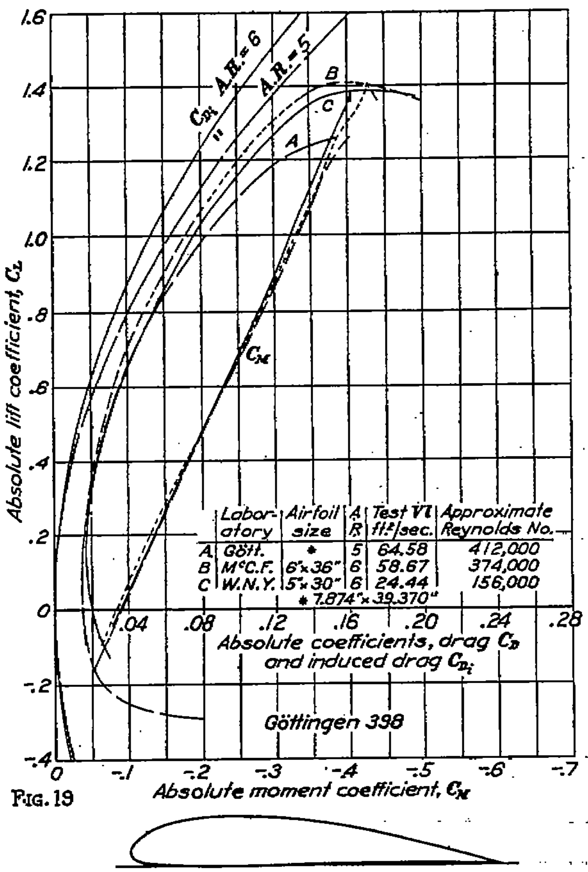


FIG. 19

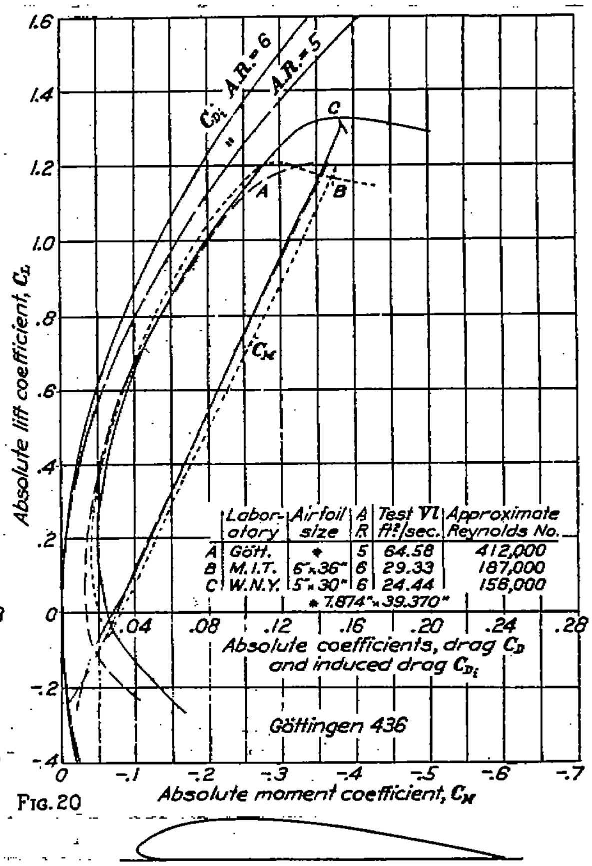


FIG. 20

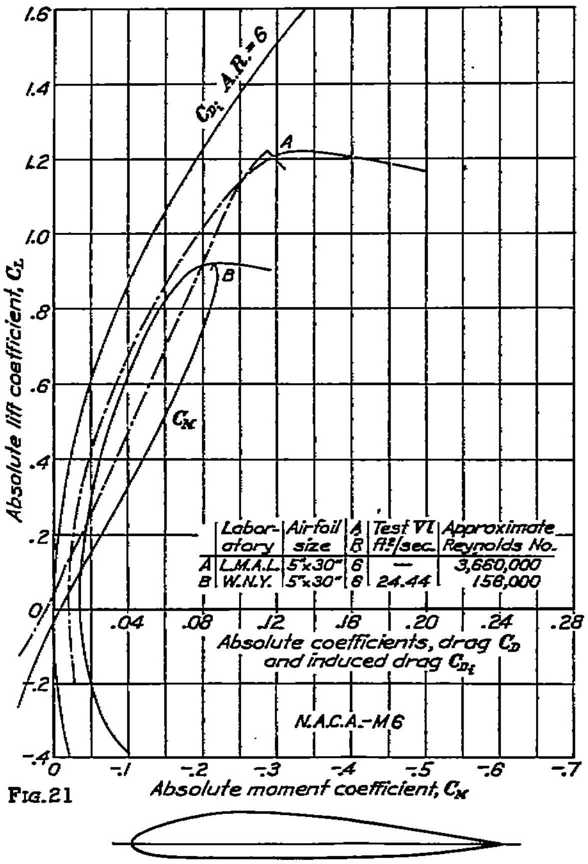


FIG. 21

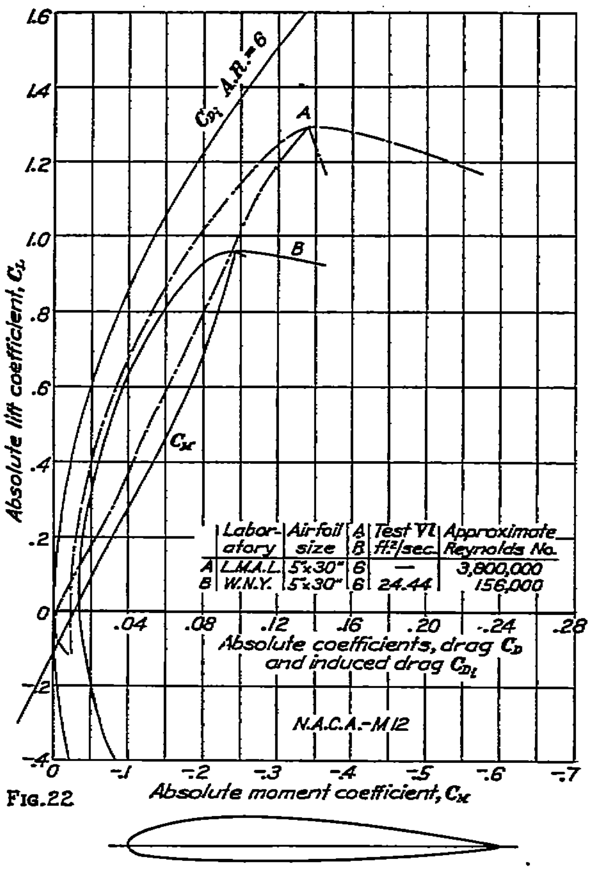


FIG. 22

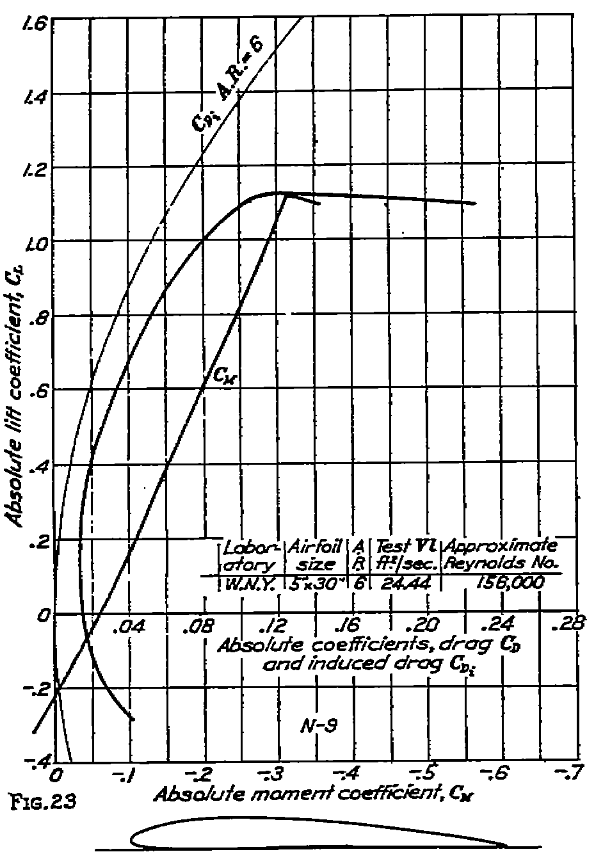


FIG. 23

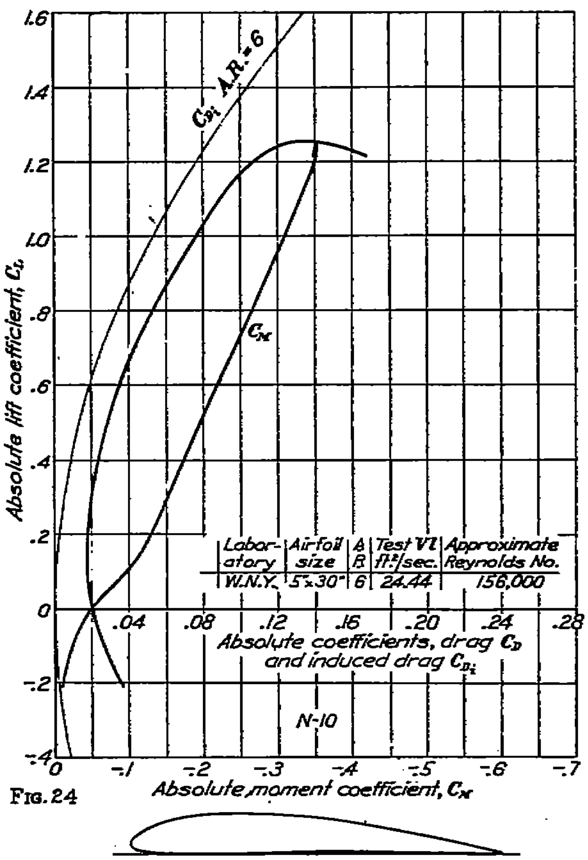


FIG. 24

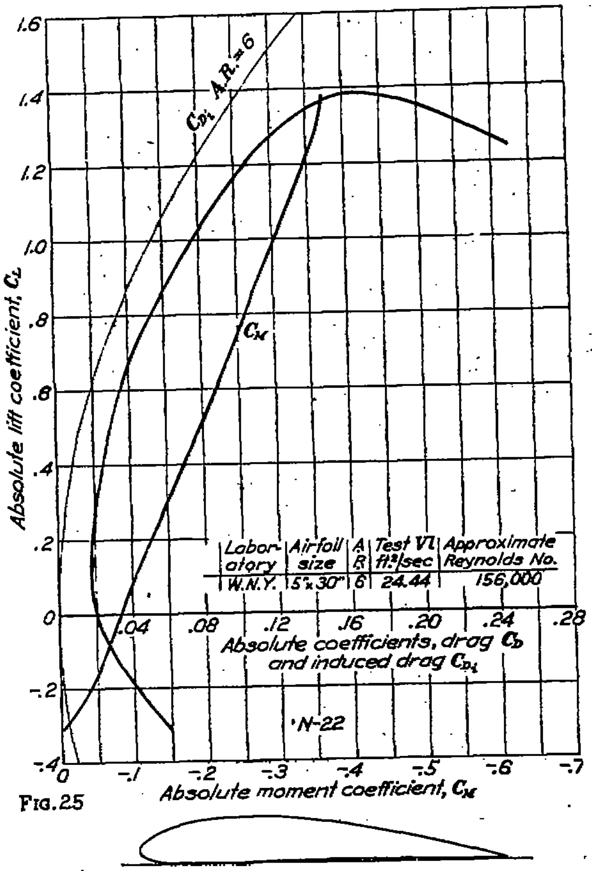


FIG. 25

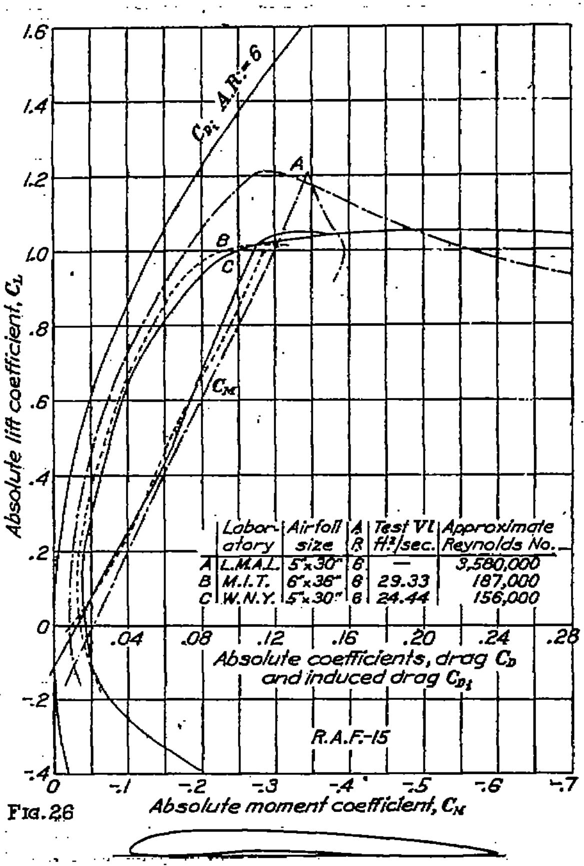


FIG. 26

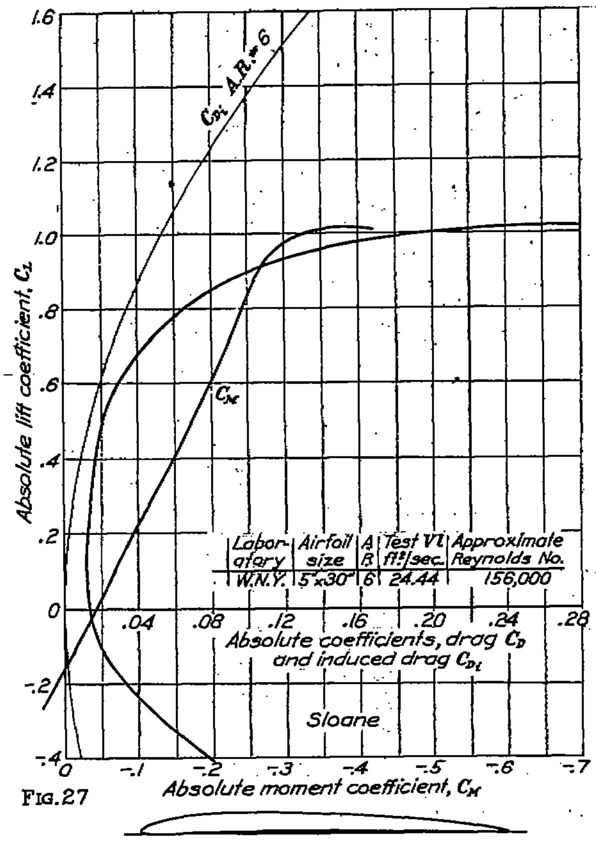


FIG. 27

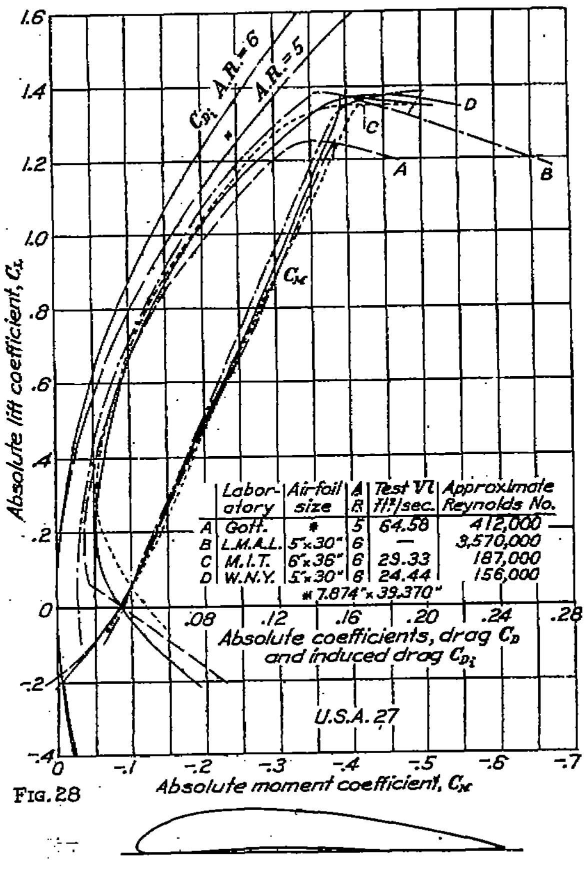


FIG. 28

Table XLIX and Figures 51 to 55 compare the data on the basis of total profile drag for constant load and stalling speed. It is shown in Reference 16 that the section selected will vary with major requirements as follows:

*Maximum speed.*—Section having least value of $C_{D0}/C_L$ maximum at high speed ratios, $V/V_s > 2.5$.

*Maximum climb and ceiling.*—Section having least value of $C_{D0}/C_L$ maximum between $V/V_s = 1.10$ and $V/V_s = 1.5$.

*Maximum endurance.*—Section having least value of $C_{D0}/C_L$ maximum at $V/V_s = 1.10$.

*General performance.*—Section having least average value of $C_{D0}/C_L$ maximum at all values of $V/V_s$.

## SCALE EFFECT

The same conclusions regarding scale effect can be drawn from Figures 1 to 30 as have been drawn from previous test data. The following conclusions are quoted from Reference 17:

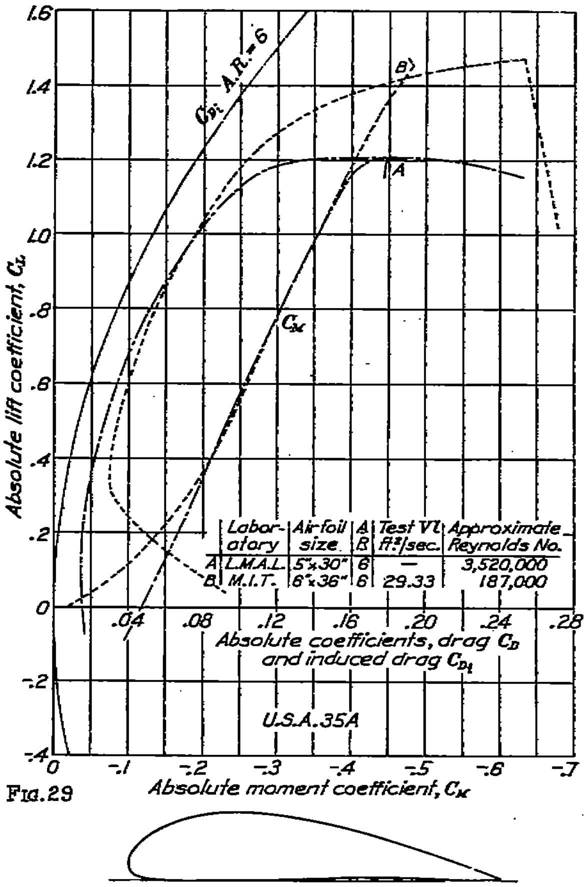


FIG. 29

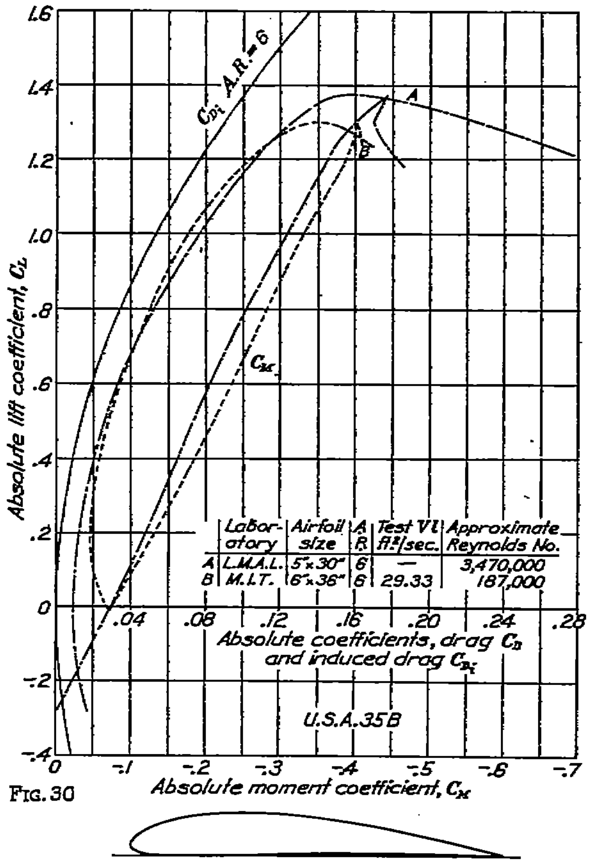


FIG. 30

The scale effects depend on the airfoil section and are in general similar for similar sections.

All airfoil sections may be roughly divided into three general classes as follows:

(*a*) The highly cambered or very thick section having a very high lift at Reynolds Numbers within the testing range of the average wind tunnel. This class usually shows a decrease in $C_L$ maximum with increase in Reynolds Number.

(*b*) The moderately cambered, medium lift section. This class usually has a moderate, and favorable scale effect on $C_L$ with a fairly low and favorable scale effect on $C_D$.

(*c*) The thin, to moderately thick, double cambered section of low lift at normal test Reynolds Numbers. This class usually shows a large increase in $C_L$ maximum and a moderate decrease in $C_D$ minimum with increase in Reynolds Number.

Airfoils such as the G–387 and U. S. A.–35A come in class (*a*); the R. A. F.–15 and Clark Y in class (*b*); the M–6 and M–12 in class (*c*).

## USE OF THE DATA

The diagrams and tables enable an engineer to make a logical selection of a wing section.

The full-scale data from the L. M. A. L. tests should be used whenever possible since free-flight tests have verified the validity of these data.

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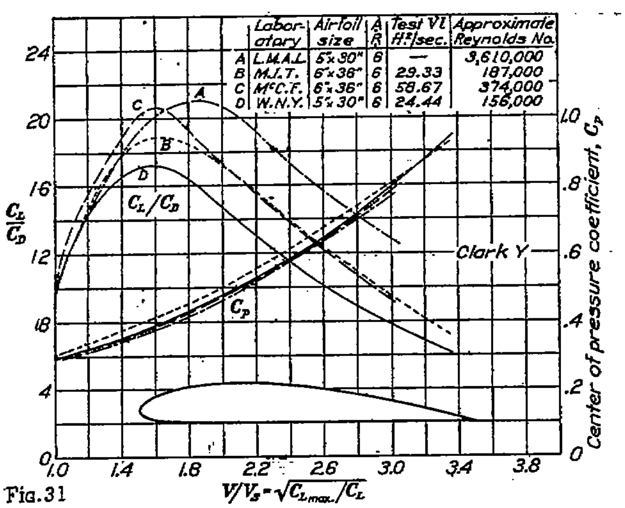

FIG. 31

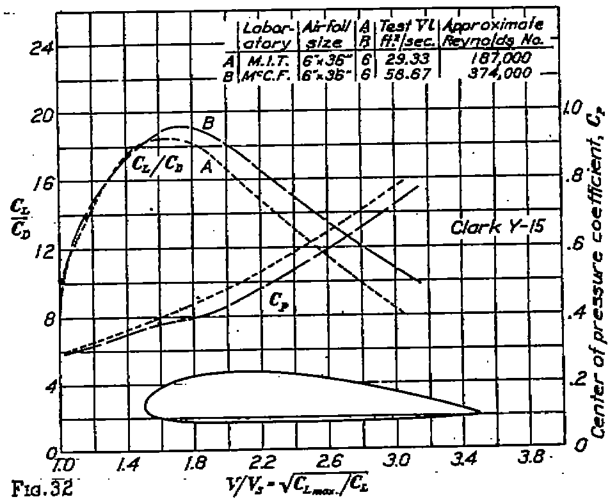

FIG. 32

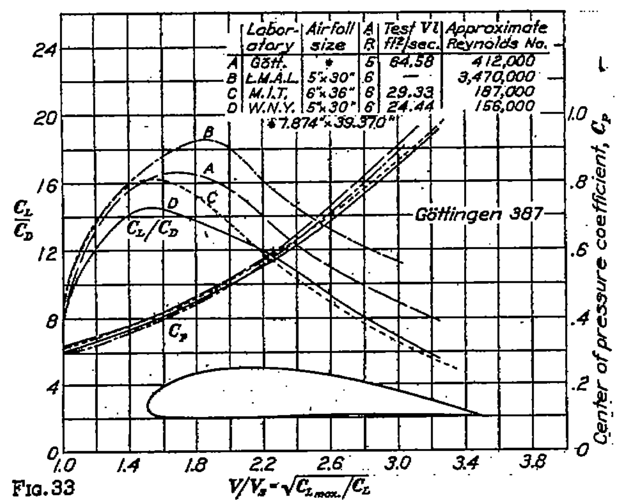

FIG. 33

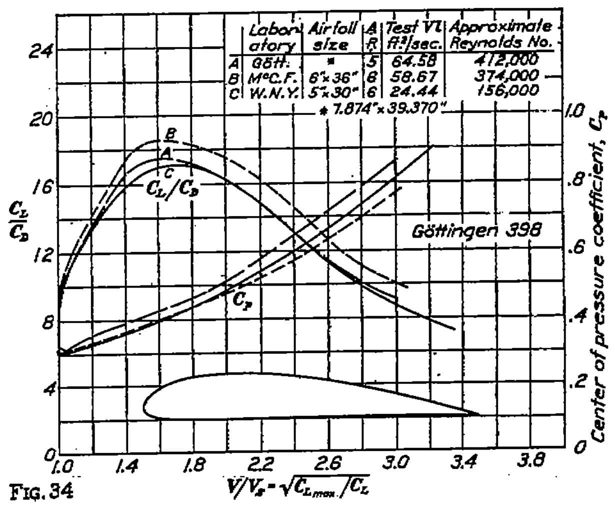

FIG. 34

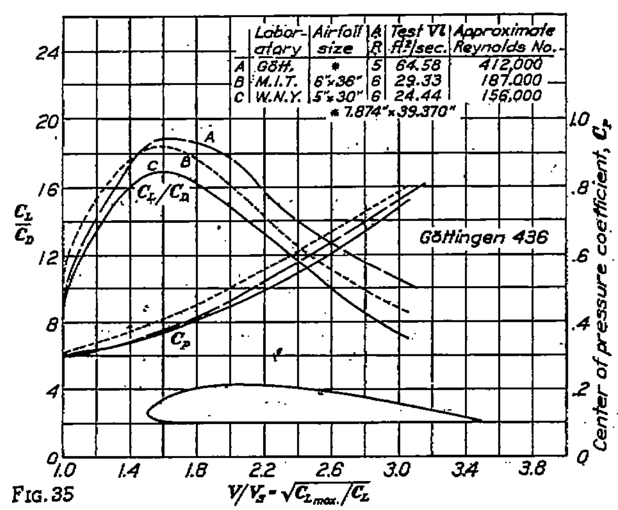

FIG. 35

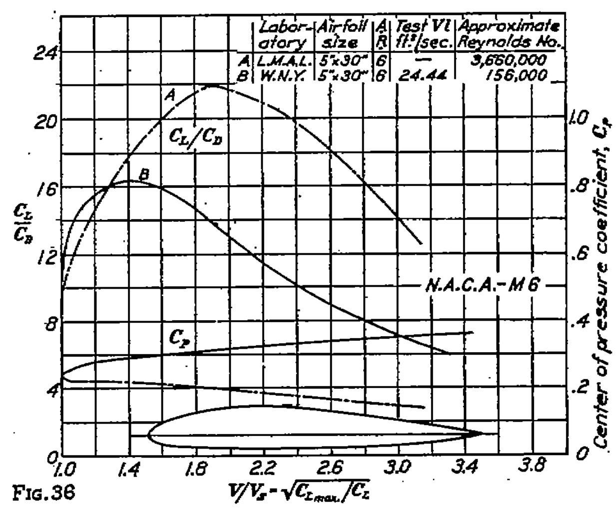

FIG. 36

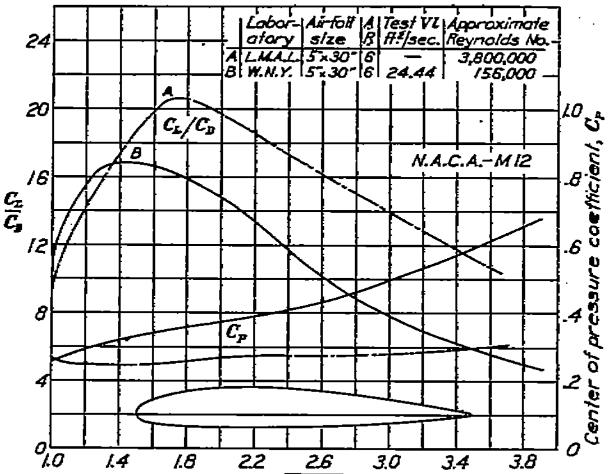

FIG. 37

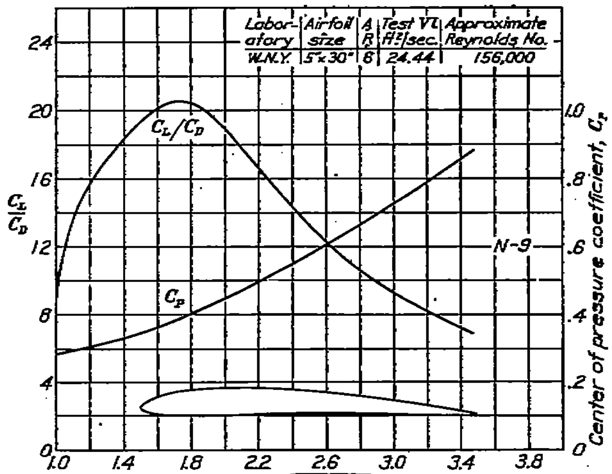

FIG. 38

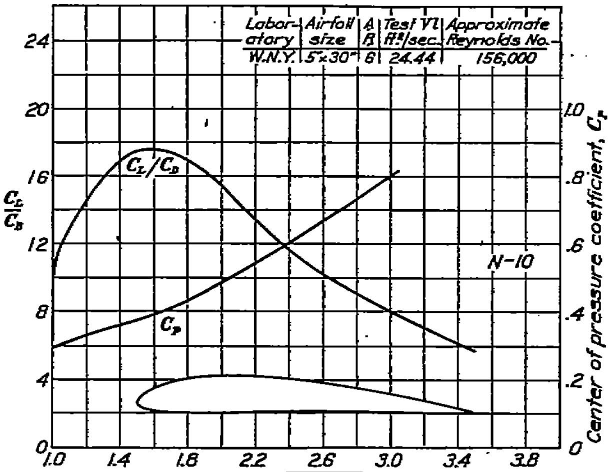

FIG. 39

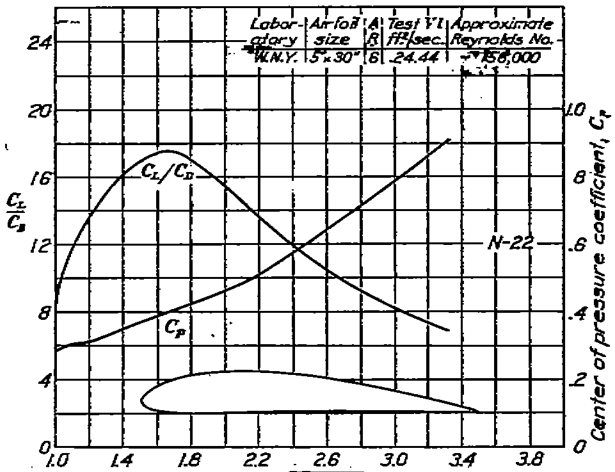

FIG. 40

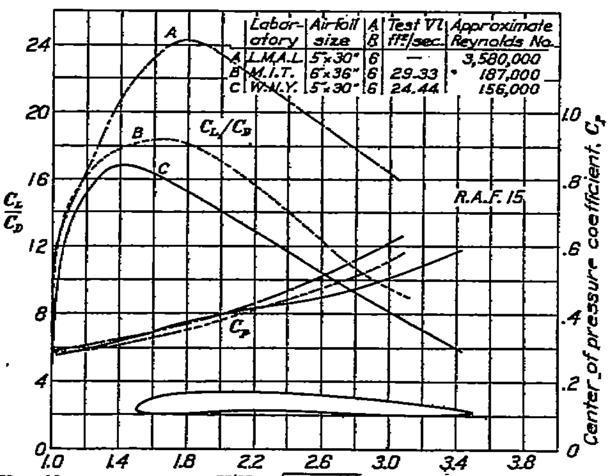

FIG. 41

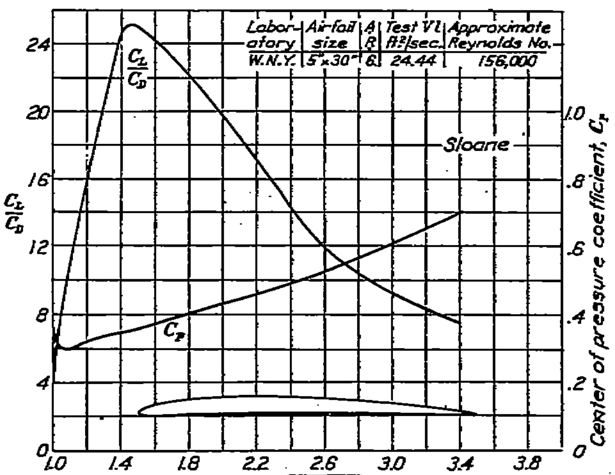

FIG. 42

Since the scale effect is in general similar for similar sections, it is to be expected that certain wing sections such as the G-398 and N-22 which show up well in an atmospheric tunnel would have good characteristics at full Reynolds Number. This has been verified by the flight test data on airplanes with these wing sections.

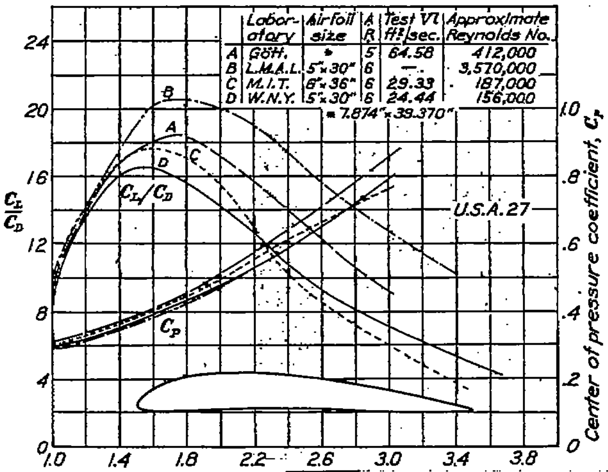


FIG. 43

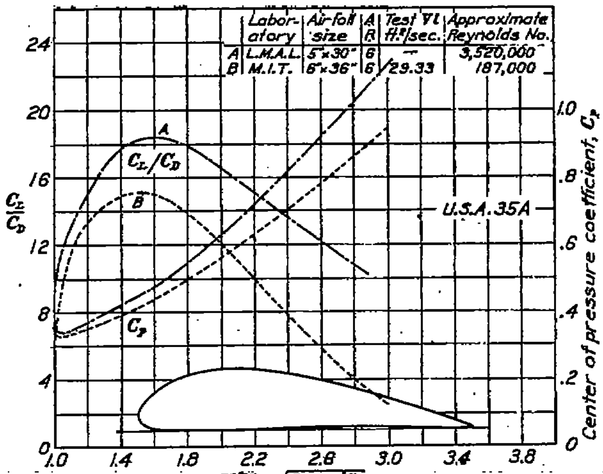


FIG. 44

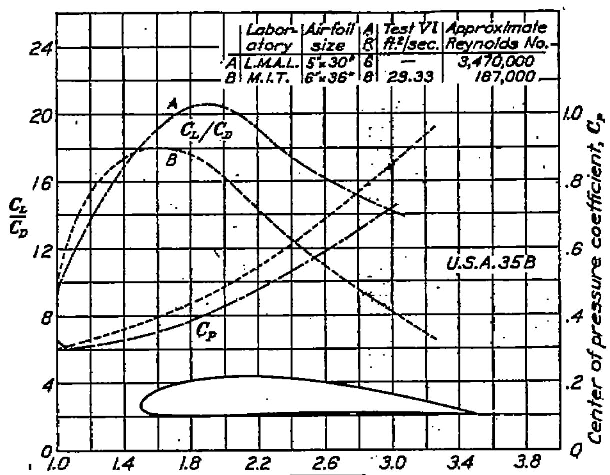


FIG. 45

## CONCLUSIONS

The following conclusions can be drawn from this collection of airfoil data:

Direct comparison of the data should be made only when the Reynolds Numbers of the tests are the same. True relative values are then obtained at that Reynolds Number.

Allowance for the scale effect should be made when the tests are at different Reynolds Numbers.

The scale effect is in general similar for similar airfoil sections.

Test data at high Reynolds Numbers show better accord with free-flight data. Preference should therefore be given to data from the variable density tunnel.

More wings which show up well in an atmospheric tunnel should be tested at full scale. It is understood that this is now being done for a group of sections including the G-398.

BUREAU OF AERONAUTICS,
NAVY DEPARTMENT, *April 18, 1929.*

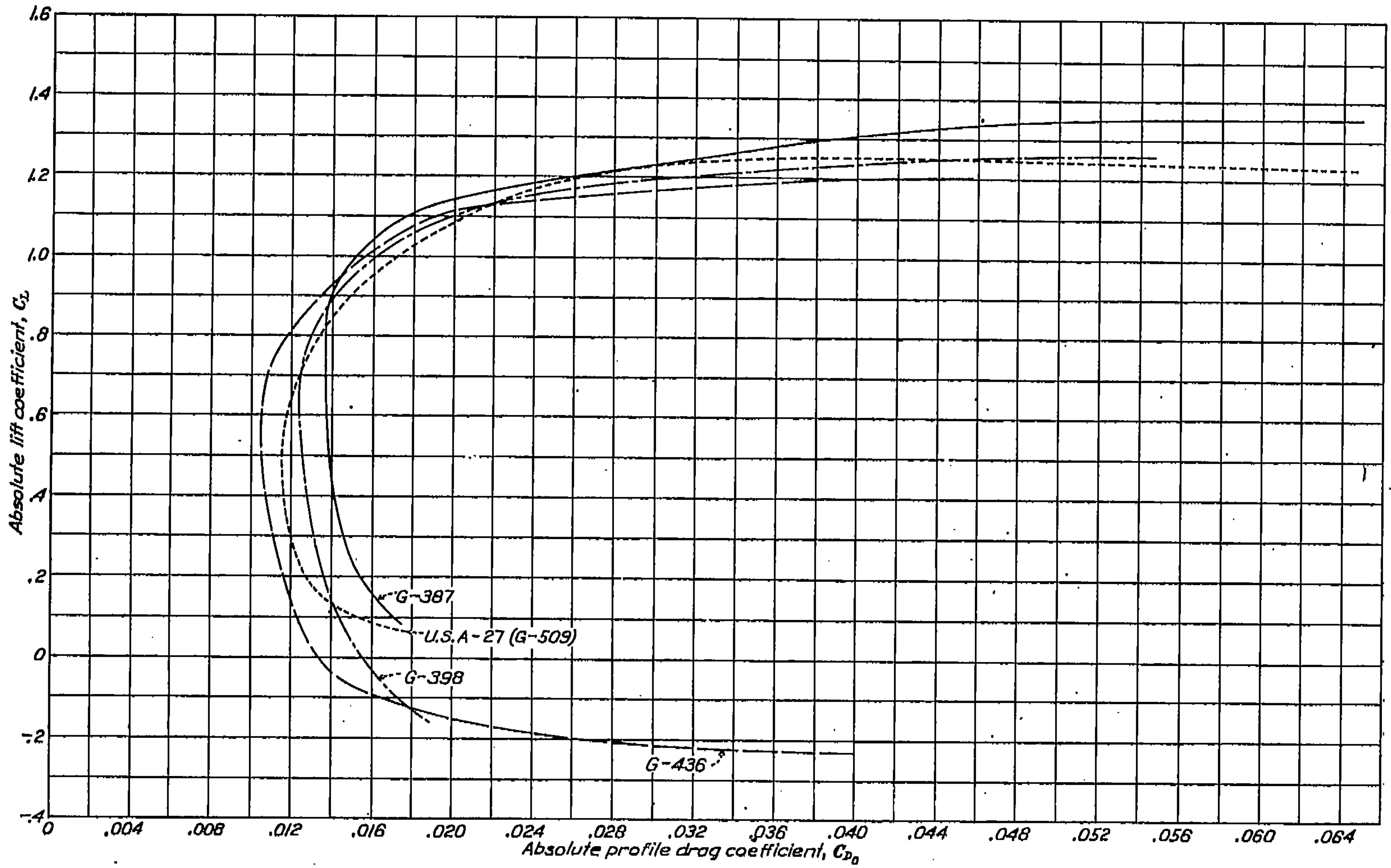


FIGURE 46.—Göttingen Laboratory tests. Airfoil size, 7.874×39.370 inches; aspect ratio, 5; test, $Vl$=64.58 square feet per second; approximate Reynolds Number, 412,000

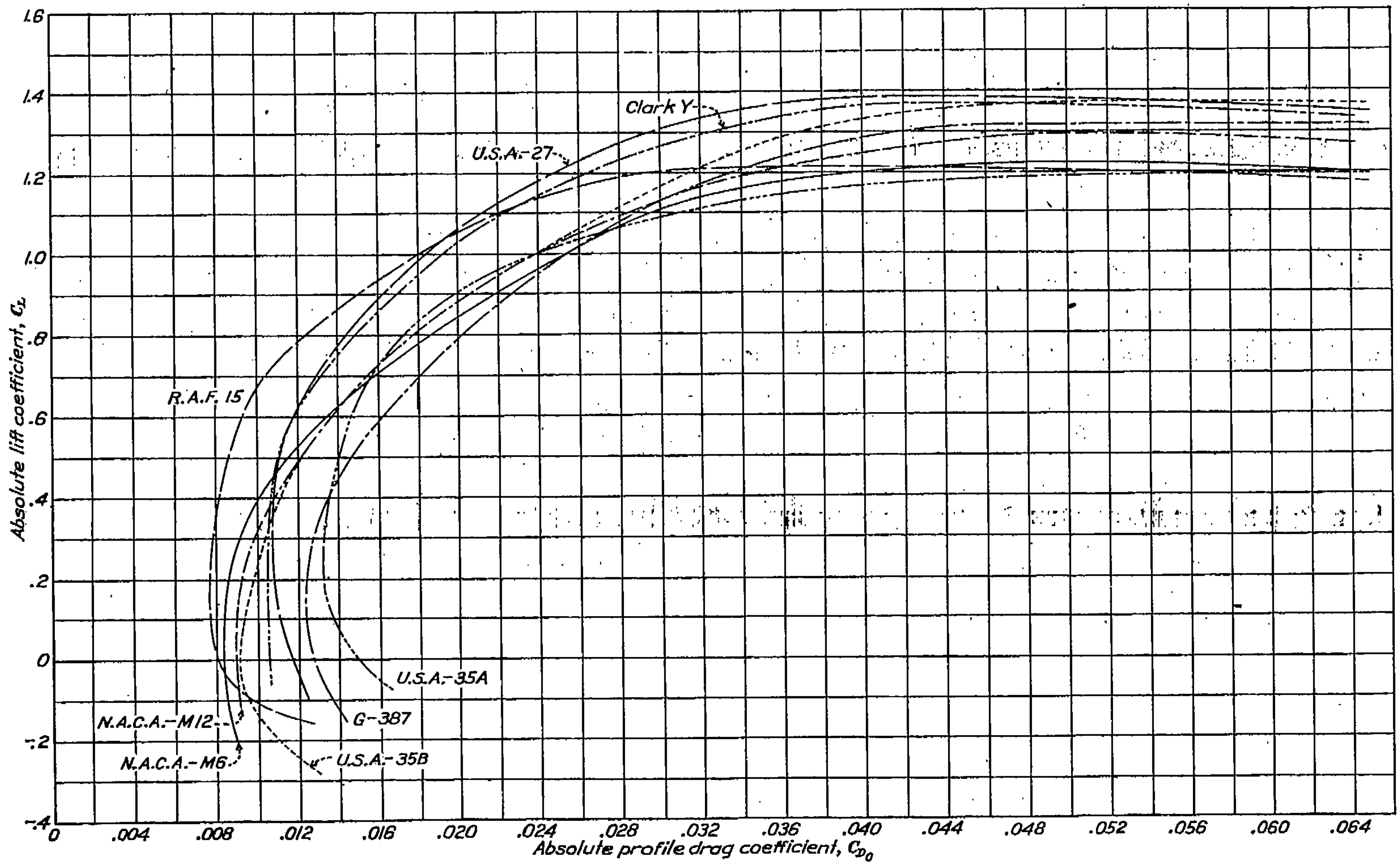


FIGURE 47.—Langley Memorial Aeronautical Laboratory tests. Airfoil size 5×30 inches; aspect ratio, 6. Airfoil, Clark Y, average Reynolds Number, 3,610,000; G-387, average Reynolds Number, 3,470,000; M-6, average Reynolds Number, 3,600,000; M-12, average Reynolds Number, 3,800,000; R. A. F.-15, average Reynolds Number, 3,580,000; U. S. A.-27, average Reynolds Number, 3,570,000; U. S. A.-35A, average Reynolds Number, 3,520,000; U. S. A.-35B, average Reynolds Number, 3,470,000

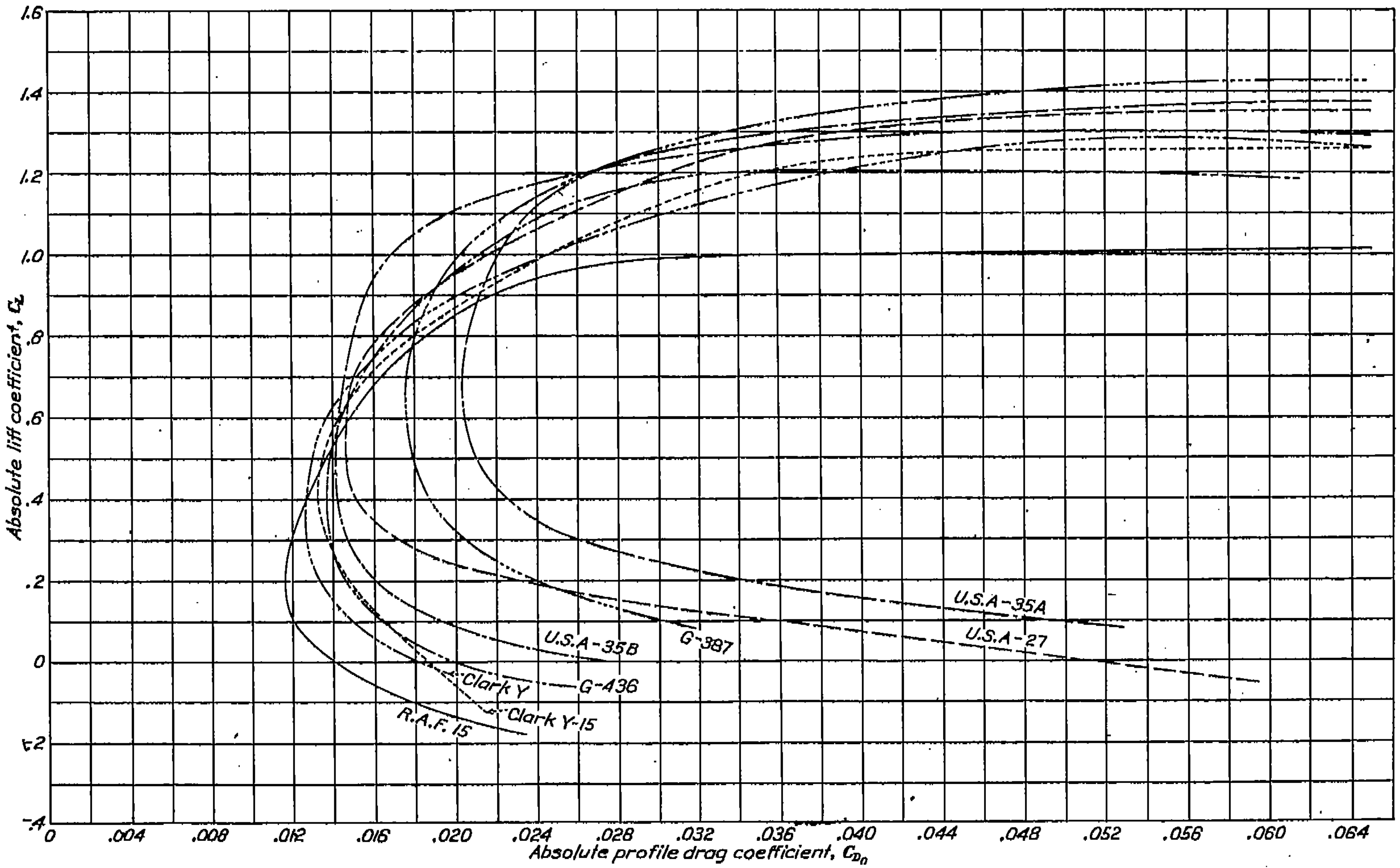


FIGURE 48.—Massachusetts Institute of Technology tests. Airfoil size 6×36 inches; aspect ratio, 6; test $Vl$=29.33 square feet per second; approximate Reynolds Number, 187,000

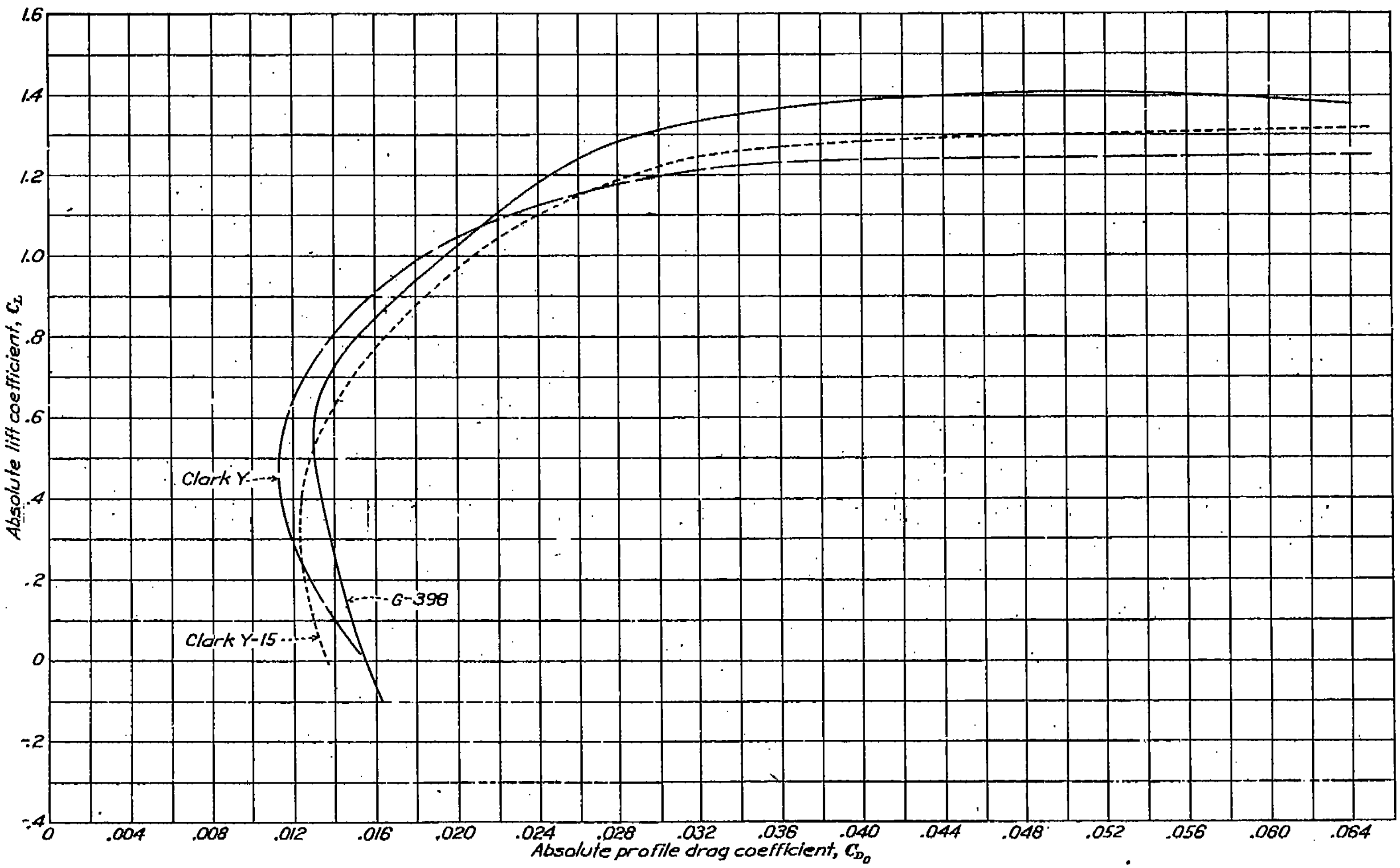


FIGURE 49.—McCook Field tests. Airfoil size, 6×36 inches; aspect ratio, 6; test VI=58.67 square feet per second; approximate Reynolds Number, 374,000

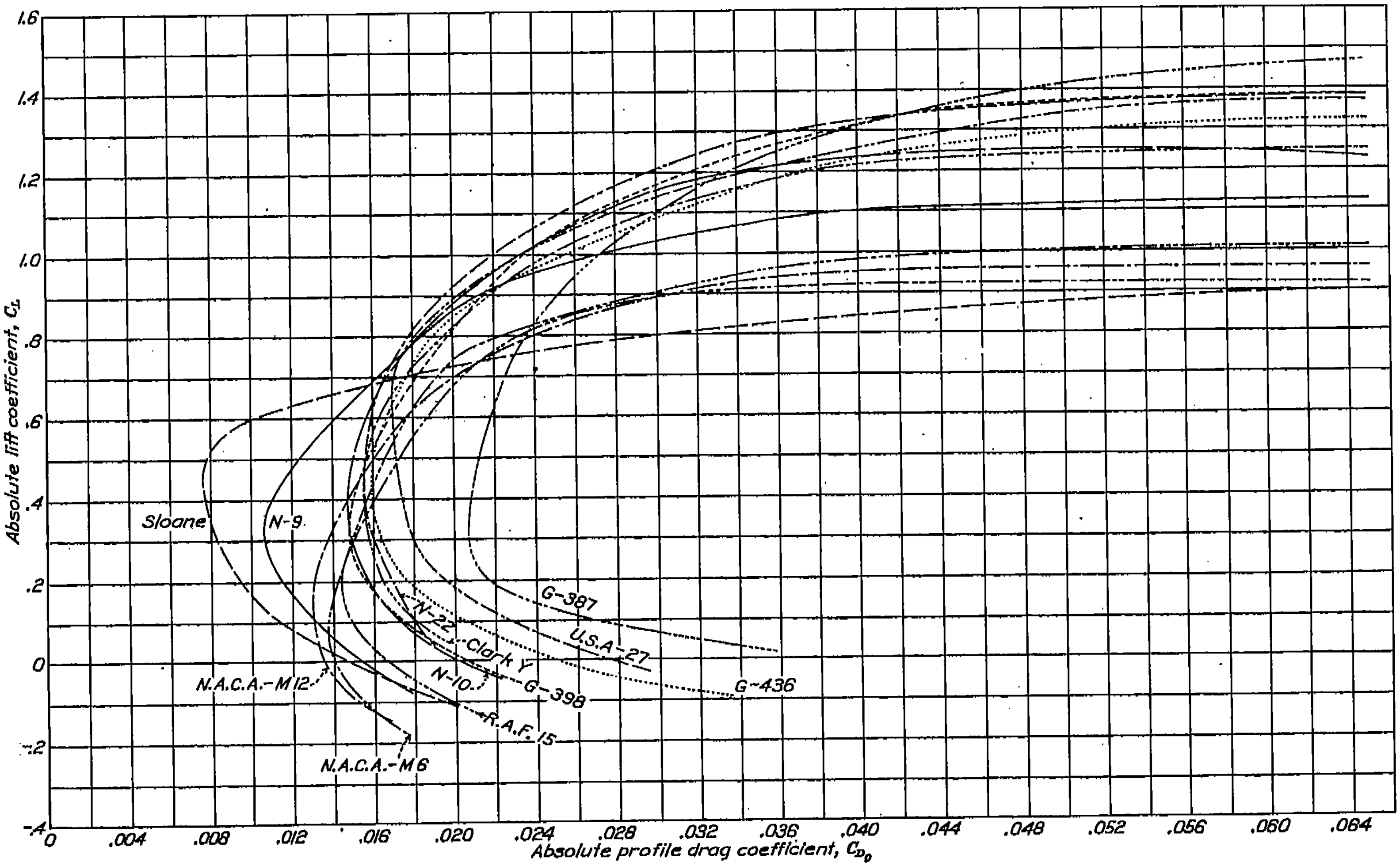


FIGURE 50.—Washington Navy Yard tests. Airfoil size, 5×30 inches; aspect ratio, 6; test, $Vl$=24.44 square feet per second; approximate Reynolds Number, 156,000

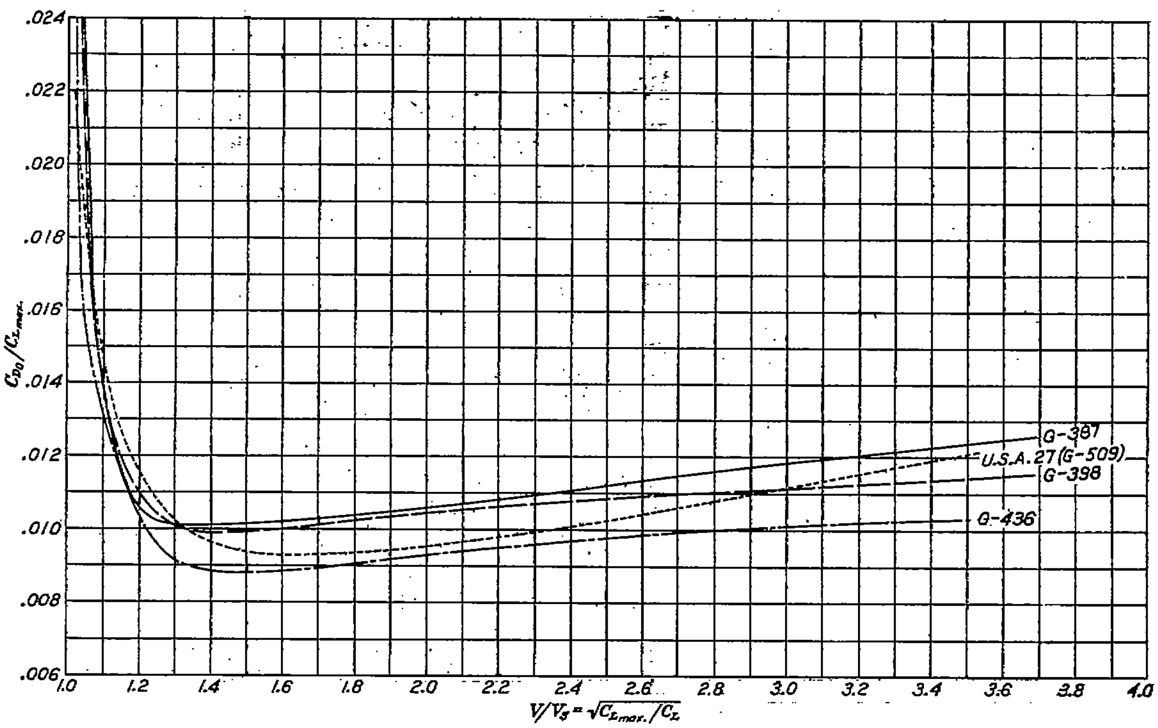


FIGURE 51.—Gottingen Laboratory tests. Airfoil size, 7.874×39.370 inches; aspect ratio, 5; test $VI$=64.58 square feet per second; approximate Reynolds Number, 412,000

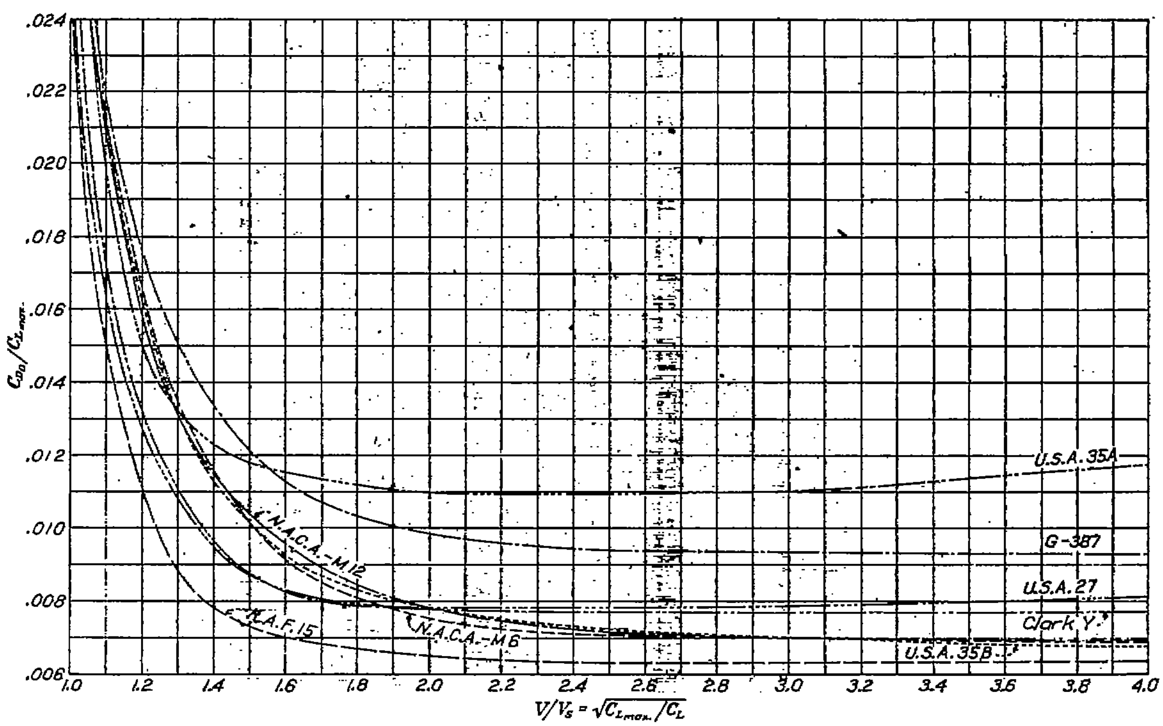


FIGURE 52.—Langley Memorial Aeronautical Laboratory tests. Airfoil size, 5×30 inches; aspect ratio, 6; approximate Reynolds Number, 3,600,000

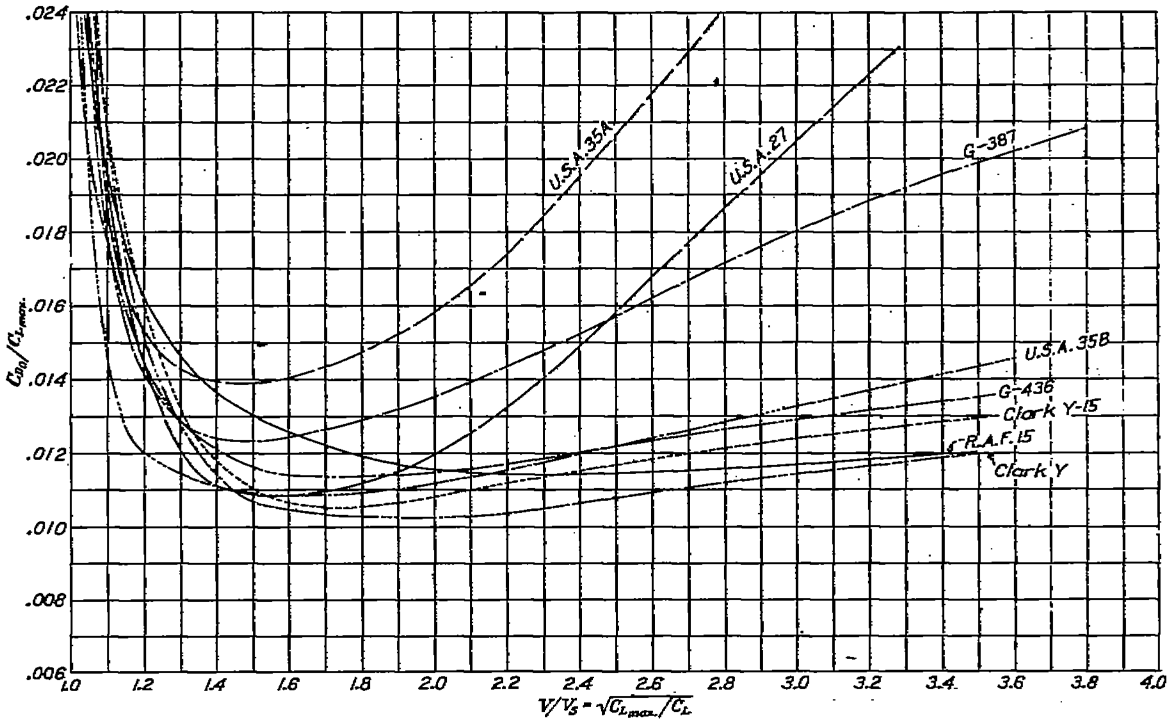


FIGURE 53.—Massachusetts Institute of Technology tests. Airfoil size, 6×36 inches; aspect ratio, 6; test $VI$×29.33 square feet per second; approximate Reynolds Number, 187,000

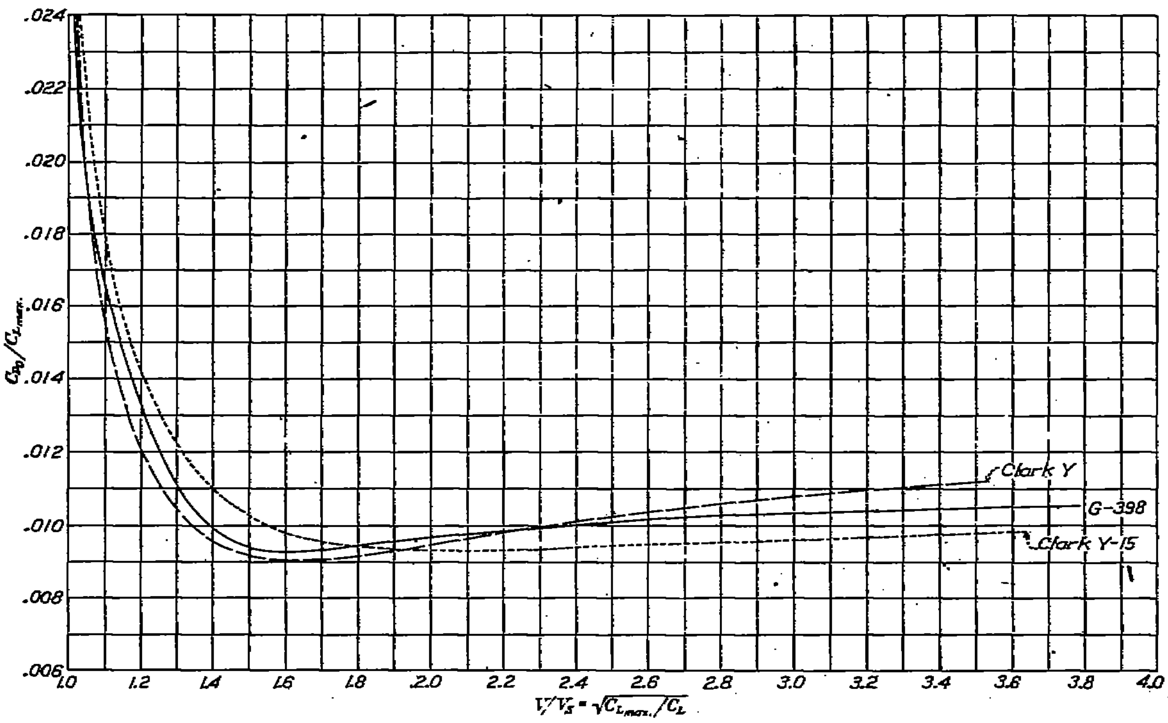


FIGURE 54.—McCook Field tests. Airfoil size, 6×36 inches; aspect ratio, 6; test, $VI$=58.67 square feet per second; approximate Reynolds Number, 374,000

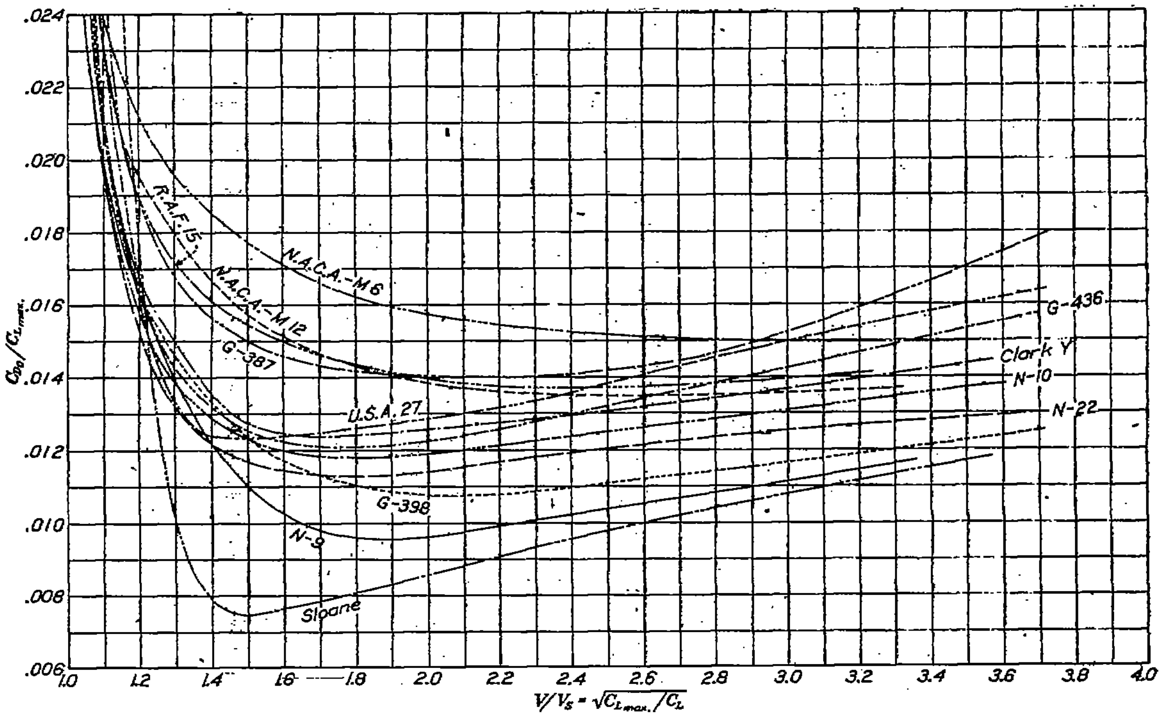


FIGURE 55.—Washington Navy Yard tests. Airfoil size, 5×30 inches; aspect ratio, 6; test, $Vl$=24.44 square feet per second; approximate Reynolds Number, 156,000

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## TABLE I

### SPECIFIED ORDINATES OF AIRFOIL SECTIONS

All dimensions are given in per cent of chord length

| Distance from leading edge in percentage of chord | Clark Y | | Clark Y-15 | | G-387 | | G-398 | |
|---|---|---|---|---|---|---|---|---|
| | Upper camber | Lower camber | Upper camber | Lower camber | Upper camber | Lower camber | Upper camber | Lower camber |
| 0 | 3.49 | 3.49 | 3.50 | 3.50 | 3.78 | 3.78 | 3.74 | 3.74 |
| 1.25 | 5.53 | 1.94 | 5.98 | 1.43 | 6.53 | 1.43 | 6.20 | 1.89 |
| 2.5 | 6.50 | 1.46 | 7.21 | .76 | 7.91 | .93 | 7.40 | 1.28 |
| 5 | 7.87 | .94 | 8.86 | −.06 | 9.89 | .40 | 9.17 | .69 |
| 7.5 | 8.86 | .61 | 10.01 | −.50 | 11.32 | .15 | 10.37 | .35 |
| 10 | 9.63 | .40 | 10.89 | −.87 | 12.40 | .03 | 11.25 | .18 |
| 15 | 10.74 | .15 | 12.17 | −1.38 | 13.84 | 0 | 12.53 | .03 |
| 20 | 11.35 | .04 | 12.96 | −1.57 | 14.71 | .05 | 13.34 | 0 |
| 30 | 11.73 | 0 | 13.35 | −1.65 | 15.34 | .23 | 13.80 | .05 |
| 40 | 11.40 | 0 | 13.00 | −1.60 | 14.85 | .38 | 13.34 | .17 |
| 50 | 10.52 | 0 | 11.99 | −1.48 | 13.47 | .50 | 12.27 | .27 |
| 60 | 9.18 | 0 | 10.44 | −1.29 | 11.54 | .57 | 10.63 | .33 |
| 70 | 7.52 | 0 | 8.39 | −1.04 | 9.21 | .58 | 8.53 | .35 |
| 80 | 5.54 | 0 | 5.95 | −.73 | 6.58 | .49 | 6.12 | .27 |
| 90 | 3.22 | 0 | 3.19 | −.39 | 3.61 | .28 | 3.40 | .13 |
| 95 | 1.88 | 0 | 1.75 | −.25 | 2.02 | .16 | 1.92 | .06 |
| 100 | .25 | .25 | .14 | −.01 | .25 | .25 | .25 | .25 |

| Distance from leading edge in percentage of chord | G-436 | | M-6 | | M-12 | | N-9 | |
|---|---|---|---|---|---|---|---|---|
| | Upper camber | Lower camber | Upper camber | Lower camber | Upper camber | Lower camber | Upper camber | Lower camber |
| 0 | 2.66 | 2.66 | 0 | 0 | 0 | 0 | 2.25 | 2.25 |
| 1.25 | 4.53 | 1.21 | 1.97 | −1.76 | 2.03 | −1.65 | 3.72 | 1.14 |
| 2.5 | 5.54 | .79 | 2.81 | −2.20 | 2.86 | −2.14 | 4.50 | .77 |
| 5 | 7.00 | .37 | 4.03 | −2.73 | 4.01 | −2.72 | 5.51 | .39 |
| 7.5 | 8.11 | .15 | 4.94 | −3.03 | 4.89 | −3.07 | 6.22 | .21 |
| 10 | 8.98 | .05 | 5.71 | −3.24 | 5.59 | −3.31 | 6.75 | .11 |
| 15 | 10.16 | 0 | 6.82 | −3.47 | 6.61 | −3.62 | 7.52 | .01 |
| 20 | 10.82 | 0 | 7.55 | −3.62 | 7.30 | −3.80 | 8.00 | 0 |
| 30 | 11.08 | 0 | 8.22 | −3.79 | 7.95 | −3.93 | 8.26 | .03 |
| 40 | 10.55 | 0 | 8.05 | −3.90 | 7.86 | −3.96 | 8.00 | .10 |
| 50 | 9.60 | 0 | 7.26 | −3.94 | 7.25 | −3.82 | 7.38 | .16 |
| 60 | 8.28 | 0 | 6.03 | −3.82 | 6.27 | −3.50 | 6.38 | .20 |
| 70 | 6.60 | 0 | 4.58 | −3.48 | 4.98 | −3.00 | 5.13 | .21 |
| 80 | 4.70 | 0 | 3.06 | −2.83 | 3.50 | −2.31 | 3.67 | .16 |
| 90 | 2.64 | 0 | 1.55 | −1.77 | 1.89 | −1.37 | 2.07 | .08 |
| 95 | 1.54 | 0 | .88 | −1.08 | 1.07 | −.81 | 1.26 | .04 |
| 100 | .25 | .25 | 0 | 0 | 0 | 0 | .25 | 0 |

| Distance from leading edge in percentage of chord | N-10 | | N-22 | | R. A. F.-15 | | Sloane | |
|---|---|---|---|---|---|---|---|---|
| | Upper camber | Lower camber | Upper camber | Lower camber | Upper camber | Lower camber | Upper camber | Lower camber |
| 0 | 2.99 | 2.99 | 3.37 | 3.37 | 1.50 | 1.50 | 0.82 | 0.82 |
| 1.25 | 4.96 | 1.51 | 5.58 | 1.70 | 3.14 | .76 | 1.89 | .24 |
| 2.5 | 5.92 | 1.02 | 6.66 | 1.15 | 3.94 | .50 | 2.56 | .06 |
| 5 | 7.33 | .55 | 8.25 | .62 | 5.00 | .18 | 3.37 | .01 |
| 7.5 | 8.28 | .28 | 9.33 | .32 | 5.67 | .02 | 3.95 | .05 |
| 10 | 8.99 | .14 | 10.13 | .16 | 6.09 | .02 | 4.38 | .12 |
| 15 | 10.04 | .01 | 11.28 | .03 | 6.67 | .18 | 4.95 | .32 |
| 20 | 10.67 | .00 | 12.01 | 0 | 6.96 | .53 | 5.29 | .50 |
| 30 | 11.01 | .04 | 12.42 | .05 | 6.94 | 1.02 | 5.62 | .63 |
| 40 | 10.73 | .14 | 12.01 | .15 | 6.63 | 1.02 | 5.63 | .57 |
| 50 | 9.85 | .22 | 11.04 | .24 | 6.13 | .71 | 5.39 | .48 |
| 60 | 8.50 | .27 | 9.57 | .30 | 5.52 | .33 | 4.88 | .38 |
| 70 | 6.83 | .28 | 7.68 | .32 | 4.79 | .06 | 4.11 | .30 |
| 80 | 4.90 | .22 | 5.51 | .24 | 3.91 | .04 | 3.16 | .21 |
| 90 | 2.74 | .10 | 3.06 | .12 | 2.81 | .21 | 2.00 | .10 |
| 95 | 1.60 | .05 | 1.73 | .05 | 2.17 | .32 | 1.32 | .04 |
| 100 | .25 | .25 | .25 | .25 | .94 | .94 | .25 | .25 |

## TABLE I—Continued

SPECIFIED ORDINATES OF AIRFOIL SECTIONS—Continued

| Distance from leading edge in percentage of chord | U. S. A.-27 | | U. S. A.-35A | | U. S. A.-35B | |
|---|---|---|---|---|---|---|
| | Upper camber | Lower camber | Upper camber | Lower camber | Upper camber | Lower camber |
| 0 | 1.77 | 1.77 | 4.33 | 4.33 | 2.84 | 2.84 |
| 1.25 | 3.89 | .61 | 8.09 | 1.62 | 5.15 | 1.03 |
| 2.5 | 5.15 | .35 | 9.58 | .96 | 6.21 | .63 |
| 5 | 6.95 | .10 | 11.83 | .42 | 7.62 | .28 |
| 7.5 | 8.23 | .01 | 13.58 | .22 | 8.65 | .14 |
| 10 | 9.19 | 0 | 14.88 | .10 | 9.45 | .07 |
| 15 | 10.52 | .13 | 16.60 | 0 | 10.56 | 0 |
| 20 | 11.32 | .37 | 17.72 | .08 | 11.28 | .05 |
| 30 | 11.87 | .91 | 18.43 | .25 | 11.76 | .15 |
| 40 | 11.59 | 1.03 | 17.86 | .44 | 11.41 | .28 |
| 50 | 10.78 | .78 | 16.16 | .60 | 10.34 | .39 |
| 60 | 9.57 | .35 | 13.91 | .67 | 8.91 | .45 |
| 70 | 7.97 | .07 | 11.12 | .65 | 7.05 | .42 |
| 80 | 5.92 | .01 | 7.88 | .55 | 5.02 | .35 |
| 90 | 3.65 | .19 | 4.33 | .32 | 2.72 | .20 |
| 95 | 2.33 | .33 | 2.39 | .19 | 1.52 | .12 |
| 100 | .74 | .74 | .43 | 0 | .25 | .25 |

## TABLE II

SPECIFIED THICKNESS OF AIRFOIL SECTIONS

All dimensions are given in per cent of chord length

| Airfoil section | Maximum thickness | Thickness at— | | | |
|---|---|---|---|---|---|
| | | 10 per cent from leading edge | 15 per cent from leading edge | 60 per cent from leading edge | 70 per cent from leading edge |
| Clark Y | 11.73 | 9.23 | 10.59 | 9.18 | 7.52 |
| Clark Y-15 | 15.00 | 11.76 | 13.55 | 11.73 | 9.43 |
| G-387 | 15.11 | 12.37 | 13.84 | 10.97 | 8.63 |
| G-398 | 13.75 | 11.07 | 12.50 | 10.30 | 8.18 |
| G-436 | 11.08 | 8.93 | 10.16 | 8.28 | 6.60 |
| M-6 | 12.01 | 8.95 | 10.29 | 9.85 | 8.06 |
| M-12 | 11.93 | 8.90 | 10.23 | 9.77 | 7.98 |
| N-9 | 8.23 | 6.64 | 7.51 | 6.18 | 4.92 |
| N-10 | 10.97 | 8.85 | 10.03 | 8.23 | 6.55 |
| N-22 | 12.37 | 9.97 | 11.25 | 9.27 | 7.30 |
| R. A. F.-15 | 6.49 | 6.07 | 6.49 | 5.19 | 4.73 |
| Sloane | 5.06 | 4.26 | 4.63 | 4.50 | 3.81 |
| U. S. A.-27 | 10.96 | 9.19 | 10.39 | 9.22 | 7.90 |
| U. S. A.-35A | 18.18 | 14.78 | 16.60 | 13.24 | 10.37 |
| U. S. A.-35B | 11.61 | 9.38 | 10.56 | 8.46 | 6.63 |

## TABLE III

G-387 AIRFOIL — GÖTTINGEN TEST

Airfoil size, 7.874 x 39.370 inches.
Aspect ratio, 5.

Test speed, 98.42 ft./sec.
Test $Vl$, 64.58 sq. ft./sec.

Data with tunnel wall interference corrections applied are taken from Reference 3

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −9.0 | −0.104 | 0.0690 | −0.058 | ---------- | −1.51 | ---------- | 0.0683 |
| −6.0 | .082 | .0180 | −.123 | ---------- | 4.55 | ---------- | .0175 |
| −4.6 | .182 | .0179 | −.146 | 0.79 | 10.2 | 2.74 | .0157 |
| −3.1 | .280 | .0201 | −.167 | .60 | 13.9 | 2.21 | .0151 |
| −1.6 | .380 | .0235 | −.192 | .50 | 16.2 | 1.89 | .0148 |
| −0.2 | .468 | .0291 | −.218 | .45 | 16.1 | 1.71 | .0151 |
| 1.3 | .581 | .0357 | −.242 | .41 | 16.3 | 1.53 | .0141 |
| 2.7 | .681 | .0438 | −.265 | .38 | 15.6 | 1.41 | .0142 |
| 4.2 | .789 | .0531 | −.288 | .37 | 14.8 | 1.32 | .0135 |
| 5.7 | .872 | .0631 | −.310 | .36 | 12.4 | 1.25 | .0146 |
| 8.6 | 1.085 | .0921 | −.375 | .34 | 11.8 | 1.12 | .0171 |
| 11.6 | 1.218 | .124 | −.410 | .33 | 9.81 | 1.06 | .0294 |
| 14.5 | 1.340 | .162 | −.429 | .32 | 8.27 | 1.01 | .0476 |
| 17.5 | 1.360 | .217 | −.452 | .34 | 6.27 | 1.00 | .0992 |

## TABLE IV

G-398 AIRFOIL — GÖTTINGEN TEST

Airfoil sizes, 7.874x39.370 inches.
Aspect ratio, 5.

Test speed, 98.42 ft./sec.
Test $Vl$ 64.58 sq. ft./sec.

Data with tunnel wall interference corrections applied are taken from Reference 3

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −11.9 | −0.297 | 0.101 | 0.031 | ---------- | −2.94 | ---------- | 0.0954 |
| −8.9 | −.159 | .0205 | −.054 | ---------- | −7.76 | ---------- | .0188 |
| −6.0 | .037 | .0152 | −.100 | ---------- | 2.43 | ---------- | .0151 |
| −4.6 | .138 | .0152 | −.122 | 0.87 | 9.08 | 3.02 | .0140 |
| −3.1 | .232 | .0170 | −.143 | .63 | 13.7 | 2.33 | .0135 |
| −1.6 | .340 | .0205 | −.170 | .49 | 16.6 | 1.93 | .0132 |
| −0.2 | .435 | .0249 | −.192 | .45 | 17.5 | 1.70 | .0128 |
| 2.8 | .640 | .0386 | −.245 | .39 | 16.6 | 1.40 | .0124 |
| 5.7 | .840 | .0597 | −.295 | .36 | 14.1 | 1.23 | .0147 |
| 8.6 | 1.015 | .0851 | −.337 | .34 | 11.9 | 1.12 | .0193 |
| 11.6 | 1.170 | .1150 | −.371 | .31 | 10.2 | 1.04 | .0278 |
| 14.5 | 1.260 | .1560 | −.403 | .32 | 8.08 | 1.00 | .0547 |

## TABLE V

G-436 AIRFOIL — GÖTTINGEN TEST

Airfoil size, 7.874×39.370 inches.
Aspect ratio, 5.

Test speed, 98.42 ft./sec.
Test $Vl$, 64.58 sq. ft./sec.

Data with tunnel wall interference corrections applied is taken from Reference 3

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.9 | −0.236 | 0.0437 | −0.009 | ---------- | −5.40 | ---------- | 0.0401 |
| −6.0 | −.050 | .0144 | −.063 | ---------- | −3.47 | ---------- | .0142 |
| −4.5 | .050 | .0130 | −.084 | ---------- | 3.84 | ---------- | .0128 |
| −3.0 | .150 | .0133 | −.107 | 0.71 | 11.3 | 2.84 | .0119 |
| −1.6 | .246 | .0159 | −.130 | .53 | 15.5 | 2.22 | .0121 |
| −0.1 | .349 | .0189 | −.154 | .44 | 18.5 | 1.86 | .0111 |
| 1.3 | .451 | .0247 | −.182 | .39 | 18.3 | 1.64 | .0117 |
| 2.8 | .548 | .0294 | −.202 | .36 | 18.6 | 1.49 | .0101 |
| 4.3 | .647 | .0382 | −.226 | .34 | 16.9 | 1.37 | .0092 |
| 5.7 | .751 | .0488 | −.248 | .32 | 15.4 | 1.27 | .0129 |
| 8.7 | .945 | .0728 | −.301 | .31 | 13.0 | 1.13 | .0159 |
| 11.6 | 1.120 | .0999 | −.343 | .30 | 11.2 | 1.04 | .0200 |
| 14.6 | 1.204 | .138 | −.365 | .31 | 8.73 | 1.00 | .0457 |

## TABLE VI

USA-27 AIRFOIL — GÖTTINGEN TEST

Airfoil size, 7.874×39.370 inches.
Aspect ratio, 5.

Test speed, 98.42 ft./sec.
Test $Vl$, 64.58 sq. ft./sec.

Data with tunnel wall interference corrections applied is taken from Reference 4.(G-509)

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −9.0 | −0.203 | 0.0919 | 0.019 | ---------- | −2.21 | ---------- | 0.0893 |
| −6.0 | −.037 | .0468 | −.072 | ---------- | −.79 | ---------- | .0467 |
| −4.5 | .063 | .0179 | −.106 | ---------- | 3.52 | ---------- | .0177 |
| −3.0 | .164 | .0150 | −.126 | 0.77 | 10.9 | 2.76 | .0133 |
| −1.4 | .264 | .0166 | −.149 | .57 | 15.9 | 2.18 | .0122 |
| 0.0 | .364 | .0201 | −.171 | .47 | 18.1 | 1.85 | .0116 |
| 1.6 | .457 | .0251 | −.193 | .42 | 18.2 | 1.65 | .0117 |
| 3.1 | .559 | .0317 | −.214 | .39 | 17.6 | 1.50 | .0117 |
| 4.7 | .695 | .0432 | −.258 | .36 | 16.1 | 1.34 | .0124 |
| 6.2 | .794 | .0536 | −.280 | .35 | 14.8 | 1.25 | .0134 |
| 9.2 | .967 | .0781 | −.319 | .33 | 12.4 | 1.14 | .0185 |
| 12.2 | 1.140 | .1050 | −.356 | .32 | 10.9 | 1.05 | .0221 |
| 15.3 | 1.253 | .1380 | −.384 | .31 | 9.09 | 1.00 | .0379 |
| 18.2 | 1.200 | .1890 | −.380 | .32 | 6.35 | 1.02 | .0973 |

## TABLE VII

CLARK Y AIRFOIL L. M. A. L. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Average Reynolds Number, 3,610,000.

Data from Reference 2 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.02 | −0.060 | 0.0108 | −0.068 | ----- | −5.55 | ----- | 0.0106 |
| −4.48 | .045 | .0107 | −.091 | ----- | 4.21 | ----- | .0106 |
| −2.94 | .167 | .0121 | −.120 | 0.720 | 13.8 | 2.86 | .0106 |
| −1.40 | .268 | .0144 | −.145 | .541 | 18.6 | 2.26 | .0106 |
| .15 | .384 | .0182 | −.166 | .432 | 21.1 | 1.89 | .0103 |
| 1.69 | .501 | .0245 | −.185 | .368 | 20.4 | 1.65 | .0111 |
| 3.23 | .602 | .0312 | −.224 | .371 | 19.3 | 1.51 | .0119 |
| 6.31 | .819 | .0508 | −.284 | .346 | 16.1 | 1.29 | .0152 |
| 9.39 | 1.034 | .0770 | −.312 | .302 | 13.4 | 1.15 | .0201 |
| 12.47 | 1.231 | .1085 | −.360 | .294 | 11.4 | 1.05 | .0280 |
| 15.52 | 1.367 | .1395 | −.415 | .306 | 9.80 | 1.00 | .0403 |
| 18.49 | 1.283 | .2217 | −.378 | .294 | 5.80 | 1.03 | .1342 |
| 21.41 | 1.081 | .3023 | −.328 | .293 | 3.58 | 1.12 | .2402 |

## TABLE VIII

G-387 AIRFOIL L. M. A. L. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Average Reynolds Number, 3,470,000.

Data from Reference 2 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −9.06 | −0.156 | 0.0156 | −0.058 | ----- | −10.0 | ----- | 0.0143 |
| −5.98 | .061 | .0126 | −.106 | ----- | 4.85 | ----- | .0124 |
| −4.44 | .168 | .0139 | −.135 | 0.807 | 12.1 | 2.82 | .0124 |
| −2.89 | .280 | .0172 | −.168 | .602 | 16.3 | 2.18 | .0130 |
| −1.35 | .390 | .0210 | −.176 | .452 | 18.6 | 1.85 | .0129 |
| .19 | .504 | .0283 | −.202 | .401 | 17.8 | 1.62 | .0148 |
| 1.73 | .612 | .0368 | −.234 | .381 | 16.6 | 1.47 | .0168 |
| 3.28 | .725 | .0468 | −.255 | .351 | 15.5 | 1.35 | .0188 |
| 6.36 | .960 | .0712 | −.285 | .296 | 13.5 | 1.18 | .0222 |
| 9.44 | 1.146 | .1004 | −.348 | .304 | 11.4 | 1.08 | .0307 |
| 12.50 | 1.308 | .1340 | −.392 | .301 | 9.75 | 1.01 | .0431 |
| 15.50 | 1.328 | .1848 | −.441 | .332 | 7.18 | 1.00 | .0911 |
| 18.50 | 1.320 | .2462 | −.448 | .337 | 5.36 | 1.01 | .1537 |
| 21.49 | 1.276 | .3002 | −.453 | .350 | 4.25 | 1.02 | .2138 |

## TABLE IX

N. A. C. A.-M6 AIRFOIL L. M. A. L. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Average Reynolds number, 3,660,000.

Data from Reference 1 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −3.08 | −0.202 | 0.0111 | 0.064 | ----- | −18.2 | ----- | 0.0089 |
| −1.54 | −.097 | .0094 | .035 | ----- | −10.3 | ----- | .0089 |
| .01 | .016 | .0080 | .008 | ----- | 2.0 | ----- | .0080 |
| 1.55 | .126 | .0098 | −.017 | 0.141 | 12.9 | 3.12 | .0090 |
| 3.09 | .237 | .0115 | −.045 | .187 | 20.6 | 2.27 | .0085 |
| 4.63 | .340 | .0155 | −.064 | .187 | 21.9 | 1.90 | .0093 |
| 6.17 | .456 | .0226 | −.096 | .211 | 20.2 | 1.64 | .0115 |
| 9.25 | .665 | .0385 | −.145 | .218 | 17.3 | 1.36 | .0150 |
| 12.33 | .875 | .0616 | −.192 | .221 | 14.2 | 1.18 | .0209 |
| 15.41 | 1.073 | .0892 | −.232 | .219 | 12.0 | 1.07 | .0281 |
| 18.46 | 1.222 | .1287 | −.286 | .238 | 9.52 | 1.00 | .0494 |
| 21.44 | 1.169 | .1981 | −.312 | .269 | 5.89 | 1.02 | .1256 |

## TABLE X

N. A. C. A.-M12 AIRFOIL — L. M. A. L. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Average Reynolds number, 3,800,000.

Data from Reference 1 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −3.05 | −0.118 | 0.0098 | −0.019 | ---------- | −12.0 | ---------- | 0.0091 |
| −1.51 | −.017 | .0069 | −.001 | ---------- | −1.91 | ---------- | .0089 |
| .04 | .096 | .0092 | −.029 | 0.302 | 10.4 | 3.66 | .0087 |
| 1.58 | .207 | .0123 | −.057 | .274 | 16.8 | 2.50 | .0100 |
| 3.12 | .318 | .0163 | −.088 | .275 | 19.5 | 2.02 | .0109 |
| 4.66 | .417 | .0203 | −.107 | .257 | 20.6 | 1.76 | .0110 |
| 6.20 | .537 | .0280 | −.131 | .244 | 19.2 | 1.55 | .0126 |
| 9.29 | .760 | .0479 | −.192 | .253 | 15.9 | 1.30 | .0172 |
| 12.37 | .971 | .0724 | −.241 | .250 | 13.4 | 1.15 | .0223 |
| 15.44 | 1.155 | .1022 | −.287 | .251 | 11.3 | 1.06 | .0313 |
| 18.49 | 1.293 | .1388 | −.342 | .269 | 9.32 | 1.00 | .0501 |
| 21.44 | 1.165 | .2293 | −.364 | .312 | 5.09 | 1.05 | .1572 |

## TABLE XI

R. A. F.-15 AIRFOIL — L. M. A. L. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Average Reynolds number, 3,580,000.

Data from Reference 2 corrected for tunnel-wall interference.

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −4.56 | −0.162 | 0.0141 | −0.013 | ---------- | −11.5 | ---------- | 0.0127 |
| −3.02 | −.052 | .0067 | −.039 | ---------- | −5.98 | ---------- | .0085 |
| −1.48 | .052 | .0083 | −.066 | 1.270 | 6.27 | 4.82 | .0081 |
| 0.06 | .166 | .0090 | −.090 | 0.539 | 18.5 | 2.70 | .0075 |
| 1.61 | .285 | .0124 | −.116 | .408 | 23.0 | 2.06 | .0081 |
| 3.15 | .398 | .0164 | −.158 | .360 | 24.3 | 1.74 | .0079 |
| 4.69 | .507 | .0222 | −.176 | .347 | 22.8 | 1.55 | .0085 |
| 6.24 | .629 | .0306 | −.202 | .322 | 20.6 | 1.39 | .0095 |
| 9.32 | .850 | .0525 | −.260 | .307 | 16.2 | 1.19 | .0141 |
| 12.41 | 1.063 | .0809 | −.313 | .296 | 13.2 | 1.06 | .0203 |
| 15.46 | 1.209 | .1098 | −.344 | .289 | 11.0 | 1.00 | .0317 |
| 16.43 | 1.127 | .1611 | −.358 | .318 | 6.98 | 1.04 | .0937 |
| 18.38 | 1.004 | .2248 | −.394 | .385 | 4.46 | 1.10 | .1712 |
| 21.35 | 0.924 | .2928 | −.379 | .392 | 3.15 | 1.14 | .2474 |

## TABLE XII

U. S. A.-27 AIRFOIL — L. M. A. L. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Average Reynolds number, 3,570,000.

Data from Reference 2 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.04 | −0.100 | 0.0128 | −0.061 | ---------- | −7.82 | ---------- | 0.0123 |
| −4.50 | .007 | .0117 | −.090 | ---------- | .60 | ---------- | .0117 |
| −2.95 | .120 | .0118 | −.112 | 0.940 | 10.2 | 3.40 | .0110 |
| −1.42 | .221 | .0134 | −.137 | .621 | 16.5 | 2.60 | .0106 |
| 0.13 | .332 | .0167 | −.164 | .494 | 19.9 | 2.04 | .0108 |
| 1.67 | .439 | .0211 | −.183 | .416 | 20.6 | 1.78 | .0108 |
| 3.21 | .553 | .0275 | −.190 | .360 | 20.1 | 1.58 | .0112 |
| 4.75 | .654 | .0353 | −.233 | .363 | 18.5 | 1.46 | .0125 |
| 6.29 | .768 | .0456 | −.256 | .333 | 16.8 | 1.35 | .0143 |
| 9.37 | .972 | .0678 | −.307 | .316 | 14.3 | 1.20 | .0175 |
| 12.44 | 1.165 | .0953 | −.342 | .295 | 12.2 | 1.09 | .0232 |
| 15.50 | 1.326 | .1285 | −.385 | .293 | 10.3 | 1.02 | .0352 |
| 16.53 | 1.386 | .1417 | −.504 | .368 | 9.79 | 1.00 | .0397 |
| 18.50 | 1.324 | .1931 | −.482 | .367 | 6.87 | 1.02 | .1001 |
| 21.45 | 1.181 | .2712 | −.491 | .411 | 4.36 | 1.08 | .1972 |

## TABLE XIII

U. S. A.-35A AIRFOIL — L. M. A. L. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Average Reynolds number, 3,520,000.

Data from Reference 2 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −9.03 | −0.075 | 0.0168 | −0.098 | ---------- | −4.46 | ---------- | 0.0165 |
| −5.94 | .146 | .0143 | −.154 | ---------- | 10.2 | 2.88 | .0132 |
| −4.40 | .252 | .0166 | −.178 | 0.714 | 15.2 | 2.19 | .0132 |
| −2.86 | .365 | .0205 | −.203 | .558 | 17.8 | 1.82 | .0134 |
| −1.32 | .468 | .0255 | −.224 | .479 | 18.4 | 1.61 | .0138 |
| .22 | .586 | .0327 | −.254 | .434 | 18.0 | 1.44 | .0144 |
| 1.76 | .692 | .0410 | −.280 | .404 | 16.9 | 1.32 | .0155 |
| 3.30 | .798 | .0510 | −.304 | .380 | 15.6 | 1.23 | .0172 |
| 4.84 | .884 | .0616 | −.322 | .364 | 14.3 | 1.17 | .0201 |
| 6.37 | .984 | .0741 | −.356 | .361 | 13.3 | 1.11 | .0226 |
| 9.43 | 1.142 | .1042 | −.392 | .342 | 11.0 | 1.03 | .0350 |
| 12.46 | 1.203 | .1495 | −.430 | .355 | 8.05 | 1.00 | .0727 |
| 15.46 | 1.201 | .2029 | −.447 | .368 | 5.93 | 1.00 | .1263 |
| 18.44 | 1.152 | .2512 | −.443 | .378 | 4.59 | 1.03 | .1808 |
| 21.42 | 1.097 | .2956 | −.405 | .359 | 3.72 | 1.05 | .2316 |

## TABLE XIV

U. S. A.-35B AIRFOIL — L. M. A. L. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Average Reynolds number, 3,470,000.

Data from Reference 2 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −9.11 | −0.285 | 0.0173 | −0.001 | ---------- | −16.5 | ---------- | 0.0130 |
| −6.02 | −.062 | .0094 | −.058 | ---------- | −6.60 | ---------- | .0092 |
| −4.48 | .044 | .0093 | −.082 | ---------- | 4.73 | ---------- | .0092 |
| −2.94 | .157 | .0109 | −.109 | 0.699 | 14.4 | 2.96 | .0096 |
| −1.40 | .263 | .0143 | −.136 | .516 | 18.4 | 2.28 | .0106 |
| .14 | .378 | .0183 | −.147 | .388 | 20.6 | 1.91 | .0107 |
| 1.69 | .488 | .0247 | −.176 | .361 | 19.8 | 1.68 | .0120 |
| 3.23 | .603 | .0332 | −.212 | .351 | 18.1 | 1.51 | .0138 |
| 6.31 | .823 | .0542 | −.259 | .314 | 15.2 | 1.29 | .0182 |
| 9.40 | 1.045 | .0818 | −.320 | .307 | 12.8 | 1.15 | .0265 |
| 12.47 | 1.235 | .1131 | −.372 | .302 | 10.9 | 1.06 | .0321 |
| 15.52 | 1.374 | .1490 | −.440 | .323 | 9.23 | 1.00 | .0488 |
| 18.50 | 1.304 | .2261 | −.423 | .323 | 5.77 | 1.03 | .1359 |
| 21.45 | 1.181 | .3057 | −.465 | .375 | 3.87 | 1.08 | .2317 |

## TABLE XV

CLARK Y AIRFOIL — M. I. T. TEST

Airfoil size, 6×36 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 6 changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.01 | −0.031 | 0.0196 | −0.075 | ---------- | −1.58 | ---------- | 0.0195 |
| −3.97 | .110 | .0154 | −.110 | 0.930 | 7.15 | 8.36 | .0147 |
| −1.94 | .252 | .0163 | −.144 | .562 | 15.5 | 2.22 | .0129 |
| .10 | .401 | .0214 | −.177 | .448 | 18.7 | 1.76 | .0129 |
| 2.13 | .553 | .0295 | −.211 | .397 | 18.7 | 1.50 | .0132 |
| 4.17 | .696 | .0409 | −.243 | .364 | 17.0 | 1.33 | .0152 |
| 6.20 | .835 | .0550 | −.274 | .343 | 15.2 | 1.22 | .0179 |
| 8.23 | .960 | .0720 | −.306 | .329 | 13.3 | 1.14 | .0229 |
| 10.26 | 1.077 | .0905 | −.337 | .316 | 11.9 | 1.07 | .0289 |
| 12.29 | 1.179 | .1103 | −.363 | .309 | 10.7 | 1.03 | .0365 |
| 14.30 | 1.239 | .1347 | −.380 | .308 | 9.21 | 1.00 | .0531 |
| 16.29 | 1.177 | .1740 | −.401 | .340 | 6.90 | 1.03 | .1005 |

## TABLE XVI

CLARK Y-15 AIRFOIL — M. I. T. TEST

Airfoil size, 6×36 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 6 changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −7.96 | −0.135 | 0.0224 | −0.051 | ---------- | −6.02 | ---------- | 0.0214 |
| −5.93 | .000 | .0180 | −.079 | ---------- | 0 | ---------- | .0180 |
| −3.90 | .135 | .0169 | −.108 | 0.790 | 7.99 | 8.05 | .0159 |
| −1.86 | .272 | .0179 | −.137 | .517 | 15.2 | 2.15 | .0139 |
| .17 | .416 | .0226 | −.170 | .411 | 18.4 | 1.74 | .0133 |
| 2.21 | .591 | .0328 | −.216 | .371 | 18.0 | 1.45 | .0142 |
| 4.25 | .727 | .0444 | −.249 | .346 | 16.4 | 1.32 | .0163 |
| 6.28 | .852 | .0582 | −.276 | .327 | 14.6 | 1.22 | .0196 |
| 8.31 | .970 | .0736 | −.300 | .314 | 13.2 | 1.14 | .0235 |
| 10.33 | 1.087 | .0910 | −.325 | .302 | 11.9 | 1.08 | .0263 |
| 12.36 | 1.191 | .1092 | −.350 | .296 | 10.9 | 1.03 | .0340 |
| 14.37 | 1.251 | .1252 | −.356 | .291 | 9.75 | 1.00 | .0451 |
| 16.38 | 1.259 | .1482 | −.356 | .290 | 8.49 | 1.00 | .0639 |
| 18.37 | 1.230 | .1921 | −.364 | .300 | 6.40 | 1.01 | .1117 |

## TABLE XVII

G-387 AIRFOIL — M. I. T. TEST

Airfoil size, 6×36 inches.
Aspect ratio, 6.

Test Speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 6 changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.02 | −0.065 | 0.0715 | −0.035 | ---------- | −0.91 | ---------- | 0.0713 |
| −5.98 | .076 | .0321 | −.117 | ---------- | 2.37 | 4.38 | .0318 |
| −3.95 | .221 | .0237 | −.156 | 0.678 | 9.32 | 2.54 | .0211 |
| −1.91 | .368 | .0264 | −.195 | .507 | 13.9 | 1.97 | .0192 |
| .12 | .512 | .0320 | −.234 | .431 | 16.0 | 1.67 | .0181 |
| 2.16 | .657 | .0405 | −.270 | .395 | 16.2 | 1.49 | .0175 |
| 4.20 | .805 | .0527 | −.308 | .370 | 15.3 | 1.38 | .0182 |
| 6.23 | .962 | .0689 | −.351 | .349 | 14.0 | 1.22 | .0197 |
| 8.27 | 1.103 | .0876 | −.386 | .336 | 12.6 | 1.14 | .0229 |
| 10.30 | 1.228 | .1088 | −.417 | .325 | 11.3 | 1.08 | .0267 |
| 12.30 | 1.339 | .1315 | −.440 | .317 | 10.2 | 1.03 | .0363 |
| 14.34 | 1.414 | .1567 | −.458 | .310 | 9.06 | 1.01 | .0506 |
| 16.35 | 1.431 | .1890 | −.473 | .312 | 7.57 | 1.00 | .0804 |
| 18.35 | 1.423 | .2217 | −.481 | .323 | 6.44 | 1.00 | .1142 |

## TABLE XVIII

G-436 AIRFOIL — M. I. T. TEST

Airfoil size, 6×36 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 6 changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.02 | −0.065 | 0.0258 | −0.063 | ---------- | 2.52 | ---------- | 0.0256 |
| −3.98 | .080 | .0172 | −.099 | 1.020 | 4.65 | 3.88 | .0169 |
| −1.95 | .225 | .0170 | −.134 | .593 | 13.2 | 2.32 | .0143 |
| .09 | .372 | .0219 | −.169 | .452 | 17.7 | 1.80 | .0136 |
| 2.13 | .516 | .0281 | −.207 | .400 | 18.4 | 1.58 | .0139 |
| 4.16 | .665 | .0387 | −.243 | .366 | 17.2 | 1.35 | .0151 |
| 6.20 | .821 | .0529 | −.282 | .342 | 15.5 | 1.21 | .0171 |
| 8.24 | .973 | .0701 | −.320 | .329 | 13.9 | 1.11 | .0198 |
| 10.27 | 1.097 | .0884 | −.356 | .319 | 12.4 | 1.05 | .0244 |
| 12.29 | 1.198 | .1085 | −.375 | .310 | 11.0 | 1.00 | .0324 |
| 14.29 | 1.183 | .1361 | −.371 | .313 | 8.70 | 1.01 | .0619 |
| 16.28 | 1.146 | .1717 | −.371 | .322 | 6.69 | 1.03 | .1020 |

## TABLE XIX

R. A. F.-15 AIRFOIL — M. I. T. TEST

Airfoil size, 6 × 36 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 5 changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −4.44 | −0.184 | 0.0251 | | | −7.23 | | 0.0238 |
| −2.40 | −.018 | .0145 | −0.015 | | −1.21 | | .0145 |
| −0.37 | .143 | .0122 | −.072 | 0.490 | 11.7 | 2.67 | .0111 |
| 1.67 | .303 | .0168 | −.115 | .359 | 18.0 | 1.83 | .0119 |
| 3.71 | .460 | .0254 | −.147 | .320 | 18.1 | 1.49 | .0141 |
| 5.75 | .610 | .0348 | −.184 | .300 | 17.5 | 1.29 | .0149 |
| 7.78 | .755 | .0481 | −.226 | .290 | 15.7 | 1.16 | .0175 |
| 9.82 | .895 | .0640 | −.259 | .287 | 14.0 | 1.07 | .0214 |
| 11.84 | .995 | .0867 | −.282 | .289 | 11.5 | 1.01 | .0339 |
| 13.85 | 1.017 | .1264 | −.310 | .299 | 8.04 | 1.00 | .0713 |

## TABLE XX

U. S. A.-27 AIRFOIL — M. I. T. TEST

Airfoil size 6 × 36 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 5 changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.01 | −0.059 | 0.0594 | −0.066 | | −0.99 | | 0.0592 |
| −3.97 | .112 | .0333 | −.117 | 0.880 | 3.38 | 3.47 | .0326 |
| −1.94 | .244 | .0226 | −.154 | .608 | 10.8 | 2.35 | .0194 |
| .09 | .386 | .0231 | −.182 | .465 | 16.7 | 1.87 | .0151 |
| 2.13 | .534 | .0301 | −.215 | .402 | 17.7 | 1.59 | .0149 |
| 4.17 | .685 | .0400 | −.253 | .369 | 17.1 | 1.40 | .0150 |
| 6.20 | .825 | .0534 | −.286 | .345 | 15.4 | 1.28 | .0172 |
| 8.23 | .958 | .0693 | −.320 | .329 | 13.8 | 1.19 | .0204 |
| 10.26 | 1.081 | .0871 | −.350 | .314 | 12.4 | 1.08 | .0250 |
| 12.29 | 1.198 | .1059 | −.376 | .300 | 11.3 | 1.06 | .0296 |
| 14.31 | 1.294 | .1254 | −.399 | .295 | 10.3 | 1.02 | .0368 |
| 16.33 | 1.347 | .1491 | −.415 | .295 | 9.02 | 1.00 | .0526 |
| 18.33 | 1.347 | .2069 | −.425 | .307 | 6.50 | 1.00 | .1104 |
| 20.31 | 1.290 | .3725 | −.426 | .311 | 3.46 | 1.02 | .2841 |

## TABLE XXI

U. S. A.-35A AIRFOIL — M. I. T. TEST

Airfoil size, 6×36 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 5, changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −7.99 | 0.041 | 0.0931 | −0.059 | | 0.44 | | 0.0930 |
| −5.96 | .176 | .0545 | −.131 | 0.900 | 3.23 | 2.89 | .0529 |
| −3.92 | .315 | .0302 | −.186 | .619 | 10.4 | 2.16 | .0249 |
| −1.89 | .457 | .0326 | −.227 | .495 | 14.0 | 1.79 | .0215 |
| .15 | .608 | .0404 | −.261 | .429 | 15.1 | 1.56 | .0207 |
| 2.18 | .759 | .0509 | −.294 | .391 | 14.9 | 1.39 | .0203 |
| 4.22 | .905 | .0649 | −.331 | .367 | 13.9 | 1.28 | .0213 |
| 6.26 | 1.050 | .0810 | −.367 | .350 | 13.0 | 1.18 | .0225 |
| 8.29 | 1.183 | .1001 | −.399 | .340 | 11.8 | 1.11 | .0259 |
| 10.31 | 1.286 | .1231 | −.426 | .333 | 10.4 | 1.07 | .0352 |
| 12.33 | 1.363 | .1534 | −.450 | .330 | 8.90 | 1.04 | .0548 |
| 14.35 | 1.421 | .1806 | −.470 | .330 | 7.50 | 1.02 | .0824 |
| 16.35 | 1.453 | .2230 | −.484 | .331 | 6.52 | 1.01 | .1109 |
| 18.36 | 1.470 | .2527 | −.477 | .351 | 5.82 | 1.00 | .1378 |
| 20.25 | 1.017 | .2709 | | .390 | 3.75 | 1.20 | .2158 |

## TABLE XXII

U. S. A.-35B Airfoil — M. I. T. Test

Airfoil size, 6×36 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 6 changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.00 | −0.006 | 0.0278 | −0.073 | | −0.21 | | 0.0278 |
| −3.97 | .123 | .0189 | −.109 | 0.960 | 6.50 | 3.26 | .0181 |
| −1.94 | .258 | .0157 | −.147 | .560 | 13.8 | 2.25 | .0151 |
| .10 | .397 | .0226 | −.183 | .433 | 17.6 | 1.81 | .0142 |
| 2.13 | .542 | .0301 | −.220 | .387 | 18.0 | 1.55 | .0144 |
| 4.17 | .698 | .0408 | −.257 | .353 | 17.1 | 1.37 | .0149 |
| 6.21 | .860 | .0543 | −.294 | .332 | 15.8 | 1.23 | .0146 |
| 8.24 | 1.003 | .0704 | −.331 | .321 | 14.3 | 1.14 | .0169 |
| 10.27 | 1.129 | .0895 | −.368 | .312 | 12.6 | 1.07 | .0218 |
| 12.30 | 1.238 | .1125 | −.394 | .309 | 11.0 | 1.03 | .0311 |
| 14.32 | 1.300 | .1357 | −.402 | .305 | 9.60 | 1.00 | .0460 |
| 16.31 | 1.275 | .1684 | −.407 | .307 | 7.58 | 1.01 | .0821 |

## TABLE XXIII

Clark Y Airfoil — McC. F. Test

Airfoil size, 6 × 36 inches.
Aspect ratio, 6.

Test speed, 80 M. P. H.
Test $Vl$, 58.67 sq. ft./sec.

Data with tunnel-wall interference corrections applied are taken from Reference 7 and changed to absolute coefficients

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.22 | 0 | 0.0152 | −0.074 | | 0 | | 0.0152 |
| −4.17 | .144 | .0149 | −.109 | 0.760 | 9.71 | 2.94 | .0138 |
| −0.04 | .468 | .0227 | −.183 | .392 | 20.6 | 1.63 | .0110 |
| 4.07 | .760 | .0450 | −.253 | .332 | 16.9 | 1.28 | .0144 |
| 8.16 | 1.040 | .0759 | −.319 | .307 | 13.7 | 1.10 | .0184 |
| 12.20 | 1.232 | .1150 | −.367 | .300 | 10.7 | 1.01 | .0344 |
| 14.18 | 1.248 | .1443 | −.374 | .302 | 8.93 | 1.00 | .0615 |
| 16.17 | 1.239 | .1892 | −.379 | .312 | 6.54 | 1.01 | .1077 |

## TABLE XXIV

Clark Y-15 Airfoil — McC. F. Test

Airfoil size, 6 × 36 inches.
Aspect ratio, 6.

Test speed, 80 M. P. H.
Test $Vl$, 58.67 sq. ft./sec.

Data with tunnel-wall interference corrections applied are taken from Reference 7 and changed to absolute coefficients

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.23 | −0.013 | 0.0137 | −0.070 | | −0.97 | | 0.0137 |
| −4.17 | .136 | .0137 | −.103 | 0.765 | 9.98 | 3.12 | .0127 |
| −2.12 | .281 | .0168 | −.133 | .475 | 16.71 | 2.18 | .0126 |
| −0.06 | .422 | .0219 | −.163 | .390 | 19.29 | 1.78 | .0124 |
| 2.00 | .593 | .0328 | −.215 | .362 | 18.06 | 1.50 | .0141 |
| 4.06 | .741 | .0446 | −.248 | .333 | 16.63 | 1.34 | .0155 |
| 6.10 | .873 | .0579 | −.293 | .335 | 15.09 | 1.23 | .0174 |
| 8.14 | 1.009 | .0751 | −.310 | .307 | 13.43 | 1.14 | .0209 |
| 10.18 | 1.132 | .0931 | −.333 | .295 | 12.16 | 1.09 | .0251 |
| 12.21 | 1.235 | .1118 | −.357 | .292 | 11.04 | 1.04 | .0308 |
| 14.21 | 1.294 | .1333 | −.373 | .288 | 9.71 | 1.02 | .0444 |
| 16.20 | 1.322 | .1677 | −.392 | .298 | 7.89 | 1.00 | .0750 |
| 16.96 | .966 | .2561 | −.356 | .347 | 3.77 | 1.17 | .2065 |
| 17.99 | 1.009 | .2757 | −.357 | .343 | 3.66 | 1.14 | .2215 |

## TABLE XXII

U. S. A.-35B AIRFOIL — M. I. T. TEST

Airfoil size, 6×36 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 29.33 sq. ft./sec.

Faired data from Reference 6 changed to absolute coefficients and corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.00 | −0.006 | 0.0278 | −0.073 | -------- | −0.21 | -------- | 0.0278 |
| −3.97 | .123 | .0189 | −.109 | 0.960 | 6.50 | 3.26 | .0181 |
| −1.94 | .258 | .0187 | −.147 | .560 | 13.8 | 2.25 | .0151 |
| .10 | .397 | .0226 | −.183 | .438 | 17.6 | 1.81 | .0142 |
| 2.13 | .542 | .0301 | −.220 | .387 | 18.0 | 1.55 | .0144 |
| 4.17 | .698 | .0408 | −.257 | .353 | 17.1 | 1.37 | .0149 |
| 6.21 | .860 | .0543 | −.294 | .332 | 15.8 | 1.23 | .0146 |
| 8.24 | 1.003 | .0704 | −.331 | .321 | 14.3 | 1.14 | .0169 |
| 10.27 | 1.129 | .0895 | −.368 | .312 | 12.6 | 1.07 | .0218 |
| 12.30 | 1.238 | .1125 | −.394 | .309 | 11.0 | 1.03 | .0311 |
| 14.32 | 1.300 | .1357 | −.402 | .305 | 9.60 | 1.00 | .0460 |
| 16.31 | 1.275 | .1684 | −.407 | .307 | 7.58 | 1.01 | .0821 |

## TABLE XXIII

CLARK Y AIRFOIL — McC. F. TEST

Airfoil size, 6 × 36 inches.
Aspect ratio, 6.

Test speed, 80 M. P. H.
Test $Vl$, 58.67 sq. ft./sec.

Data with tunnel-wall interference corrections applied are taken from Reference 7 and changed to absolute coefficients

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.22 | 0 | 0.0152 | −0.074 | -------- | 0 | -------- | 0.0152 |
| −4.17 | .144 | .0149 | −.109 | 0.760 | 9.71 | 2.94 | .0138 |
| −0.04 | .468 | .0227 | −.183 | .392 | 20.6 | 1.63 | .0110 |
| 4.07 | .760 | .0450 | −.253 | .332 | 16.9 | 1.28 | .0144 |
| 8.16 | 1.040 | .0759 | −.319 | .307 | 13.7 | 1.10 | .0184 |
| 12.20 | 1.232 | .1150 | −.367 | .300 | 10.7 | 1.01 | .0344 |
| 14.18 | 1.248 | .1443 | −.374 | .302 | 8.93 | 1.00 | .0615 |
| 16.17 | 1.239 | .1892 | −.379 | .312 | 6.54 | 1.01 | .1077 |

## TABLE XXIV

CLARK Y-15 AIRFOIL — McC. F. TEST

Airfoil size, 6 × 36 inches.
Aspect ratio, 6.

Test speed, 80 M. P. H.
Test $Vl$, 58.67 sq. ft./sec.

Data with tunnel-wall interference corrections applied are taken from Reference 7 and changed to absolute coefficients

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −6.23 | −0.013 | 0.0137 | −0.070 | -------- | −0.97 | -------- | 0.0137 |
| −4.17 | .136 | .0137 | −.103 | 0.765 | 9.98 | 3.12 | .0127 |
| −2.12 | .281 | .0168 | −.133 | .475 | 16.71 | 2.18 | .0126 |
| −0.06 | .422 | .0219 | −.163 | .390 | 19.29 | 1.78 | .0124 |
| 2.00 | .593 | .0328 | −.215 | .362 | 18.06 | 1.50 | .0141 |
| 4.06 | .741 | .0446 | −.248 | .333 | 16.63 | 1.34 | .0155 |
| 6.10 | .873 | .0579 | −.293 | .335 | 15.09 | 1.23 | .0174 |
| 8.14 | 1.009 | .0751 | −.310 | .307 | 13.43 | 1.14 | .0209 |
| 10.18 | 1.132 | .0931 | −.333 | .295 | 12.16 | 1.09 | .0251 |
| 12.21 | 1.235 | .1118 | −.357 | .292 | 11.04 | 1.04 | .0308 |
| 14.21 | 1.294 | .1333 | −.373 | .288 | 9.71 | 1.02 | .0444 |
| 16.20 | 1.322 | .1677 | −.392 | .293 | 7.89 | 1.00 | .0750 |
| 16.96 | .966 | .2561 | −.336 | .347 | 3.77 | 1.17 | .2065 |
| 17.99 | 1.009 | .2757 | −.357 | .348 | 3.66 | 1.14 | .2215 |

## TABLE XXV

G-398 AIRFOIL — McC. F. TEST

Airfoil size, 6×36 inches.
Aspect ratio, 6.

Test speed, 80 M. P. H.
Test $Vl$, 58.67 sq. ft./sec.

Data with tunnel-wall interference corrections applied are taken from Reference 7 and changed to absolute coefficients

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.23 | −0.097 | 0.0168 | −0.062 | -------- | −5.79 | -------- | 0.0163 |
| −6.20 | .044 | .0152 | −.093 | -------- | 2.87 | -------- | .0152 |
| −4.14 | .198 | .0164 | −.129 | 0.657 | 12.1 | 2.67 | .0143 |
| −2.08 | .353 | .0199 | −.168 | .478 | 17.7 | 2.00 | .0133 |
| −.01 | .508 | .0274 | −.211 | .415 | 18.6 | 1.67 | .0136 |
| 2.04 | .661 | .0360 | −.246 | .373 | 18.4 | 1.46 | .0128 |
| 4.10 | .811 | .0516 | −.282 | .348 | 15.7 | 1.32 | .0167 |
| 6.15 | .961 | .0676 | −.322 | .335 | 14.2 | 1.21 | .0185 |
| 8.19 | 1.098 | .0856 | −.355 | .322 | 12.8 | 1.13 | .0215 |
| 10.23 | 1.224 | .1048 | −.379 | .310 | 11.7 | 1.07 | .0253 |
| 12.26 | 1.337 | .1271 | −.417 | .312 | 10.5 | 1.03 | .0323 |
| 14.28 | 1.408 | .1544 | −.429 | .307 | 9.12 | 1.00 | .0492 |
| 16.22 | 1.358 | .2002 | −.442 | .327 | 6.78 | 1.02 | .1023 |

## TABLE XXVI

CLARK Y AIRFOIL — W. N. Y. TEST

Airfoil size 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 11 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.02 | −0.167 | 0.0356 | −0.040 | -------- | −4.69 | -------- | -------- |
| −7.01 | −.096 | .0249 | -------- | -------- | −3.86 | -------- | -------- |
| −6.00 | −.029 | .0214 | -------- | -------- | −1.36 | -------- | -------- |
| −4.99 | .041 | .0198 | -------- | -------- | 2.07 | -------- | 0.0197 |
| −3.99 | .111 | .0183 | −.105 | 0.950 | 6.06 | 3.37 | .0176 |
| −2.98 | .181 | .0184 | −.121 | .680 | 9.84 | 2.64 | .0166 |
| −1.97 | .254 | .0199 | −.138 | .540 | 12.8 | 2.28 | .0165 |
| −.96 | .325 | .0216 | −.156 | .474 | 15.0 | 1.97 | .0160 |
| .05 | .400 | .0241 | −.174 | .428 | 16.6 | 1.77 | .0156 |
| 2.07 | .551 | .0320 | −.212 | .380 | 17.2 | 1.55 | .0159 |
| 4.09 | .704 | .0437 | −.247 | .344 | 16.1 | 1.34 | .0173 |
| 6.11 | .840 | .0573 | −.277 | .328 | 14.7 | 1.22 | .0198 |
| 8.13 | .980 | .0748 | −.308 | .314 | 13.2 | 1.14 | .0233 |
| 10.14 | 1.093 | .0925 | −.340 | .303 | 11.8 | 1.07 | .0291 |
| 12.15 | 1.190 | .1115 | −.355 | .300 | 10.7 | 1.03 | .0364 |
| 14.16 | 1.242 | .1322 | −.361 | .296 | 9.39 | 1.00 | .0503 |
| 16.16 | 1.257 | .1622 | −.360 | .294 | 7.74 | 1.00 | .0782 |
| 18.13 | 1.058 | .2938 | −.388 | .354 | 3.58 | 1.09 | .2349 |

## TABLE XXVII

G-387 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec

Data from Reference 8 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.01 | −0.065 | 0.0513 | -------- | -------- | −1.27 | -------- | -------- |
| −7.00 | .014 | .0357 | -------- | -------- | .39 | -------- | 0.0357 |
| −5.99 | .075 | .0287 | −0.118 | -------- | 2.61 | 4.46 | .0283 |
| −4.98 | .141 | .0254 | -------- | 0.954 | 5.55 | 3.25 | .0243 |
| −3.97 | .213 | .0236 | −.147 | .702 | 9.03 | 2.64 | .0212 |
| −2.96 | .279 | .0247 | −.161 | .584 | 11.3 | 2.31 | .0206 |
| −1.95 | .352 | .0278 | −.179 | .514 | 12.7 | 2.06 | .0212 |
| .06 | .493 | .0353 | −.214 | .438 | 14.0 | 1.74 | .0224 |
| 2.08 | .639 | .0439 | −.248 | .492 | 14.6 | 1.53 | .0222 |
| 4.10 | .785 | .0555 | −.283 | .364 | 14.1 | 1.38 | .0228 |
| 6.12 | .922 | .0708 | −.314 | .346 | 13.0 | 1.27 | .0256 |
| 8.14 | 1.057 | .0883 | −.348 | .332 | 12.0 | 1.19 | .0289 |
| 10.15 | 1.192 | .1083 | −.378 | .322 | 11.0 | 1.12 | .0329 |
| 12.17 | 1.309 | .1306 | −.405 | .312 | 10.0 | 1.07 | .0396 |
| 14.18 | 1.404 | .1530 | −.428 | .306 | 9.18 | 1.03 | .0484 |
| 16.19 | 1.467 | .1753 | −.441 | .306 | 8.37 | 1.01 | .0610 |
| 18.19 | 1.488 | .2074 | −.490 | .334 | 7.17 | 1.00 | .0898 |
| 20.14 | 1.105 | .3263 | −.406 | .356 | 3.38 | 1.16 | .2614 |

## TABLE XXVIII

G-398 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 8 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.02 | −0.130 | 0.0301 | -------- | -------- | −4.32 | -------- | |
| −7.01 | −.059 | .0235 | -------- | -------- | −2.51 | -------- | 0.0232 |
| −6.00 | .013 | .0200 | -------- | -------- | .65 | -------- | .0200 |
| −4.99 | .083 | .0183 | −0.108 | -------- | 4.54 | 4.20 | .0179 |
| −3.98 | .157 | .0175 | −.125 | 0.796 | 8.97 | 2.96 | .0162 |
| −2.97 | .227 | .0182 | −.141 | .620 | 12.5 | 2.47 | .0155 |
| −1.96 | .300 | .0197 | −.158 | .525 | 15.2 | 2.15 | .0149 |
| .06 | .439 | .0256 | −.189 | .432 | 17.1 | 1.78 | .0153 |
| 2.08 | .593 | .0354 | −.230 | .388 | 16.8 | 1.53 | .0167 |
| 4.09 | .736 | .0475 | −.262 | .356 | 15.5 | 1.37 | .0188 |
| 6.11 | .878 | .0619 | −.297 | .340 | 14.2 | 1.26 | .0210 |
| 8.13 | 1.011 | .0780 | −.324 | .324 | 13.0 | 1.18 | .0237 |
| 10.15 | 1.137 | .0970 | −.353 | .314 | 11.7 | 1.11 | .0283 |
| 12.16 | 1.252 | .1178 | −.379 | .308 | 10.6 | 1.05 | .0345 |
| 14.17 | 1.350 | .1396 | −.400 | .302 | 9.67 | 1.01 | .0429 |
| 16.18 | 1.387 | .1638 | −.406 | .300 | 8.47 | 1.00 | .0617 |
| 18.17 | 1.370 | .1973 | −.403 | .306 | 6.94 | 1.01 | .0977 |

## TABLE XXIX

G-436 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 8 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.03 | −0.270 | 0.0674 | −0.021 | -------- | −4.01 | -------- | |
| −6.01 | −.094 | .0341 | −.044 | -------- | −2.76 | -------- | 0.0336 |
| −5.00 | −.017 | .0254 | -------- | -------- | −.67 | -------- | .0254 |
| −3.99 | .066 | .0223 | −.089 | -------- | 2.96 | 4.49 | .0221 |
| −2.98 | .142 | .0202 | −.079 | 0.760 | 7.03 | 3.06 | .0191 |
| −1.97 | .211 | .0196 | −.123 | .580 | 10.8 | 2.51 | .0172 |
| −.96 | .280 | .0207 | −.134 | .492 | 13.5 | 2.18 | .0165 |
| .05 | .348 | .0229 | −.154 | .436 | 15.2 | 1.95 | .0165 |
| 2.06 | .488 | .0287 | −.187 | .380 | 17.0 | 1.65 | .0160 |
| 4.08 | .638 | .0388 | −.222 | .350 | 16.4 | 1.44 | .0171 |
| 6.10 | .788 | .0527 | −.257 | .328 | 15.0 | 1.30 | .0198 |
| 8.12 | .924 | .0687 | −.292 | .322 | 13.5 | 1.20 | .0233 |
| 10.14 | 1.059 | .0879 | −.322 | .316 | 12.1 | 1.12 | .0284 |
| 12.15 | 1.177 | .1087 | −.354 | .310 | 10.8 | 1.06 | .0352 |
| 14.17 | 1.296 | .1300 | −.382 | .302 | 9.97 | 1.01 | .0409 |
| 16.17 | 1.325 | .1580 | −.380 | .296 | 8.38 | 1.00 | .0648 |
| 18.16 | 1.285 | .2013 | −.391 | .314 | 6.38 | 1.02 | .1136 |

## TABLE XXX

N-9 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from reference 10 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.04 | −0.318 | 0.0500 | 0.031 | -------- | −6.36 | -------- | -------- |
| −6.02 | −.165 | .0236 | −.013 | -------- | −6.99 | -------- | -------- |
| −5.01 | −.081 | .0183 | −.036 | -------- | −4.43 | -------- | 0.0179 |
| −4.00 | .008 | .0150 | -------- | -------- | .53 | -------- | .0150 |
| −2.99 | .094 | .0136 | −.083 | 0.888 | 6.91 | 3.47 | .0131 |
| −1.98 | .167 | .0137 | −.101 | .604 | 12.2 | 2.60 | .0122 |
| −.97 | .246 | .0142 | −.120 | .486 | 17.3 | 2.14 | .0110 |
| .04 | .320 | .0160 | −.130 | .422 | 20.0 | 1.88 | .0106 |
| 2.06 | .460 | .0231 | −.166 | .358 | 19.9 | 1.57 | .0118 |
| 4.08 | .608 | .0342 | −.199 | .326 | 17.8 | 1.36 | .0145 |
| 6.10 | .752 | .0474 | −.234 | .312 | 15.9 | 1.23 | .0174 |
| 8.11 | .895 | .0632 | −.266 | .298 | 14.2 | 1.12 | .0207 |
| 10.13 | 1.011 | .0827 | −.292 | .292 | 12.2 | 1.06 | .0264 |
| 12.14 | 1.107 | .1047 | −.310 | .288 | 10.6 | 1.01 | .0396 |
| 14.14 | 1.124 | .1328 | −.315 | .286 | 8.46 | 1.00 | .0657 |
| 16.14 | 1.094 | .2265 | −.359 | .328 | 4.83 | 1.02 | .1629 |

## TABLE XXXI

N-10 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio 6.

Test speed 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 10 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.03 | −0.209 | 0.0372 | −0.010 | ------ | −5.62 | ------ | ------ |
| −6.01 | −.047 | .0223 | −.034 | ------ | −2.11 | ------ | 0.0222 |
| −5.00 | .031 | .0193 | −.060 | ------ | 1.61 | ------ | .0192 |
| −3.99 | .103 | .0179 | −.106 | ------ | 5.75 | 3.50 | .0173 |
| −2.98 | .173 | .0177 | −.122 | 0.700 | 9.77 | 2.69 | .0161 |
| −1.97 | .251 | .0191 | −.139 | .554 | 13.1 | 2.24 | .0157 |
| −0.96 | .321 | .0204 | −.155 | .480 | 15.7 | 1.98 | .0149 |
| .05 | .397 | .0232 | −.172 | .432 | 17.1 | 1.78 | .0148 |
| 2.07 | .545 | .0310 | −.206 | .378 | 17.6 | 1.52 | .0152 |
| 4.09 | .693 | .0422 | −.239 | .346 | 16.4 | 1.35 | .0167 |
| 6.11 | .836 | .0573 | −.275 | .332 | 14.6 | 1.23 | .0202 |
| 8.12 | .976 | .0729 | −.303 | .316 | 13.4 | 1.13 | .0222 |
| 10.14 | 1.110 | .0901 | −.332 | .304 | 12.3 | 1.07 | .0246 |
| 12.16 | 1.218 | .1117 | −.354 | .298 | 10.9 | 1.02 | .0329 |
| 14.16 | 1.257 | .1347 | −.352 | .292 | 9.32 | 1.00 | .0508 |
| 16.16 | 1.215 | .1679 | −.350 | .288 | 7.24 | 1.02 | .0896 |

## TABLE XXXII

N-22-AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 12 corrected for tunnel-wall interference.

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −10.04 | −0.309 | 0.0745 | −0.003 | ------ | −4.15 | ------ | ------ |
| −8.02 | −.165 | .0365 | −.050 | ------ | −4.52 | ------ | ------ |
| −7.01 | −.090 | .0235 | −.064 | ------ | −3.83 | ------ | ------ |
| −6.00 | −.020 | .0210 | ------ | ------ | −0.95 | ------ | 0.0210 |
| −4.99 | .053 | .0186 | ------ | ------ | 2.85 | ------ | .0184 |
| −3.98 | .125 | .0183 | −.109 | 0.912 | 6.83 | 3.32 | .0175 |
| −2.97 | .200 | .0194 | −.126 | .654 | 10.3 | 2.63 | .0173 |
| −1.96 | .275 | .0207 | −.143 | .538 | 13.3 | 2.24 | .0167 |
| −0.96 | .330 | .0219 | −.150 | .472 | 15.1 | 2.05 | .0161 |
| .05 | .426 | .0251 | −.176 | .426 | 17.0 | 1.80 | .0155 |
| 2.08 | .591 | .0345 | −.217 | .376 | 17.1 | 1.53 | .0159 |
| 4.09 | .740 | .0462 | −.247 | .348 | 16.0 | 1.37 | .0171 |
| 6.11 | .880 | .0627 | −.275 | .326 | 14.0 | 1.26 | .0216 |
| 8.13 | 1.024 | .0779 | −.304 | .310 | 13.1 | 1.16 | .0221 |
| 10.15 | 1.152 | .0978 | −.334 | .304 | 11.8 | 1.10 | .0273 |
| 12.16 | 1.267 | .1184 | −.357 | .298 | 10.7 | 1.05 | .0331 |
| 14.17 | 1.347 | .1396 | −.368 | .292 | 9.65 | 1.02 | .0433 |
| 16.18 | 1.384 | .1648 | −.369 | .286 | 8.40 | 1.00 | .0531 |
| 18.16 | 1.241 | .2490 | ------ | ------ | 4.98 | ------ | .1672 |

## TABLE XXXIII

N. A. C. A.-M6 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 14, corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.06 | −0.438 | 0.0527 | 0.084 | ------ | −8.31 | ------ | ------ |
| −6.04 | −.316 | .0284 | .058 | ------ | −11.1 | ------ | ------ |
| −4.02 | −.186 | .0193 | .034 | ------ | −9.63 | ------ | 0.0175 |
| −3.02 | −.122 | .0169 | .018 | ------ | −7.22 | ------ | .0162 |
| −2.01 | −.056 | .0155 | .006 | ------ | −3.61 | ------ | .0153 |
| −1.00 | .018 | .0138 | −.013 | 0.726 | 1.30 | ------ | .0138 |
| .01 | .108 | .0145 | −.038 | .350 | 7.45 | 2.93 | .0139 |
| 1.03 | .207 | .0170 | −.068 | .326 | 12.2 | 2.11 | .0147 |
| 2.04 | .296 | .0199 | −.091 | .308 | 14.9 | 1.76 | .0152 |
| 4.06 | .442 | .0269 | −.130 | .294 | 16.4 | 1.44 | .0165 |
| 6.07 | .577 | .0368 | −.164 | .284 | 15.7 | 1.26 | .0191 |
| 8.09 | .709 | .0468 | −.193 | .274 | 15.1 | 1.14 | .0200 |
| 10.10 | .821 | .0599 | −.213 | .260 | 13.7 | 1.06 | .0241 |
| 12.12 | .900 | .0738 | −.221 | .248 | 12.2 | 1.01 | .0308 |
| 14.12 | .922 | .0889 | −.216 | .238 | 10.4 | 1.00 | .0438 |
| 16.12 | .904 | .1163 | −.212 | .238 | 7.77 | 1.01 | .0729 |

## TABLE XXXIV

N. A. C. A.-M12 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 13, corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.06 | −0.446 | 0.0419 | 0.056 | | −10.6 | | |
| −6.04 | −.317 | .0253 | .055 | | −12.5 | | |
| −4.02 | −.142 | .0178 | .057 | | −7.97 | | 0.0167 |
| −3.01 | −.080 | .0150 | −.007 | | −5.33 | | .0147 |
| −2.00 | −.013 | .0136 | | | −.96 | | .0136 |
| −.99 | .063 | .0134 | −.043 | 0.682 | 4.70 | 3.91 | .0132 |
| .02 | .147 | .0141 | −.063 | .428 | 10.4 | 2.56 | .0130 |
| 1.03 | .241 | .0163 | −.090 | .372 | 14.8 | 2.00 | .0131 |
| 2.04 | .325 | .0201 | −.116 | .358 | 16.2 | 1.72 | .0145 |
| 4.06 | .466 | .0277 | −.152 | .326 | 16.8 | 1.44 | .0161 |
| 6.08 | .591 | .0360 | −.180 | .304 | 16.4 | 1.27 | .0174 |
| 8.09 | .710 | .0475 | −.203 | .256 | 15.0 | 1.16 | .0206 |
| 10.10 | .817 | .0601 | −.222 | .274 | 13.6 | 1.08 | .0246 |
| 12.12 | .909 | .0752 | −.236 | .262 | 12.1 | 1.03 | .0313 |
| 14.12 | .960 | .0931 | −.244 | .254 | 10.3 | 1.00 | .0441 |
| 16.12 | .944 | .1442 | −.253 | .268 | 6.54 | 1.01 | .0969 |

## TABLE XXXV

R. A. F.-15 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 9 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.05 | −0.406 | 0.0829 | | | −4.90 | | |
| −6.03 | −.263 | .0423 | 0.035 | | −6.21 | | |
| −4.02 | −.135 | .0221 | .006 | | −6.11 | | 0.0211 |
| −3.01 | −.064 | .0181 | −.013 | | −3.54 | | .0179 |
| −2.00 | .009 | .0165 | −.030 | | .55 | | .0165 |
| −0.99 | .094 | .0160 | −.055 | 0.592 | 5.88 | 3.43 | .0155 |
| .02 | .081 | .0156 | −.077 | .434 | 11.6 | 2.41 | .0138 |
| 1.03 | .260 | .0185 | | .402 | 14.1 | 2.02 | .0149 |
| 2.04 | .335 | .0217 | −.124 | .374 | 15.4 | 1.78 | .0157 |
| 4.06 | .477 | .0285 | −.156 | .334 | 16.7 | 1.49 | .0164 |
| 6.08 | .614 | .0372 | −.184 | .304 | 16.5 | 1.31 | .0171 |
| 8.10 | .752 | .0504 | −.214 | .292 | 14.9 | 1.18 | .0204 |
| 10.11 | .865 | .0663 | −.238 | .284 | 13.0 | 1.10 | .0265 |
| 12.12 | .971 | .0865 | −.262 | .278 | 11.2 | 1.04 | .0364 |
| 14.13 | 1.014 | .1238 | −.274 | .278 | 8.19 | 1.02 | .0691 |
| 16.13 | 1.054 | .2120 | −.334 | .318 | 4.97 | 1.00 | .1530 |
| 18.13 | 1.043 | .2680 | −.372 | .354 | 3.62 | 1.01 | .2301 |

## TABLE XXXVI

SLOANE AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test $Vl$, 24.44 sq. ft./sec.

Data from Reference 9 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_s}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.05 | −0.416 | 0.0801 | | | −5.19 | | |
| −7.04 | −.340 | .0631 | | | −5.39 | | |
| −6.03 | −.265 | .0451 | 0.031 | | −5.87 | | |
| −5.02 | −.192 | .0314 | | | −6.11 | | |
| −4.02 | −.119 | .0209 | −.010 | | −5.69 | | 0.0201 |
| −3.01 | −.050 | .0169 | −.029 | | −2.96 | | .0168 |
| −2.00 | .018 | .0118 | −.043 | | 1.53 | | .0118 |
| −.99 | .088 | .0118 | −.061 | 0.702 | 7.46 | 3.41 | .0114 |
| .02 | .164 | .0126 | −.082 | .508 | 13.0 | 2.50 | .0112 |
| 2.05 | .344 | .0149 | −.133 | .394 | 23.1 | 1.72 | .0086 |
| 4.07 | .505 | .0201 | −.171 | .348 | 25.1 | 1.42 | .0065 |
| 6.08 | .639 | .0345 | −.207 | .330 | 18.5 | 1.26 | .0128 |
| 8.10 | .752 | .0530 | −.231 | .312 | 14.2 | 1.16 | .0230 |
| 10.11 | .853 | .0811 | −.260 | .300 | 10.5 | 1.09 | .0424 |
| 12.12 | .957 | .1344 | −.285 | .304 | 7.12 | 1.03 | .0857 |
| 14.13 | 1.002 | .2008 | −.334 | .335 | 4.99 | 1.01 | .1474 |
| 16.13 | 1.019 | .2621 | −.372 | .360 | 3.88 | 1.00 | .2068 |
| 18.13 | 1.011 | .3103 | −.396 | .380 | 3.26 | 1.00 | .2560 |

## TABLE XXXVII

U. S. A.-27 AIRFOIL — W. N. Y. TEST

Airfoil size, 5×30 inches.
Aspect ratio, 6.

Test speed, 40 M. P. H.
Test *Vl*, 24.44 sq. ft./sec.

Data from Reference 11 corrected for tunnel-wall interference

| Angle of attack $\alpha$ degrees | Lift coefficient $C_L$ | Drag coefficient $C_D$ | Moment coefficient $C_M$ | Center of pressure coefficient $C_p$ | $\frac{C_L}{C_D}$ | Speed ratio $\frac{V}{V_S}$ | Profile drag coefficient $C_{D_0}$ |
|---|---|---|---|---|---|---|---|
| −8.03 | −0.217 | 0.0777 | 0.003 | ---------- | −2.79 | | |
| −7.02 | −.131 | .0588 | −.036 | ---------- | −2.23 | ---------- | ---------- |
| −6.01 | −.046 | .0440 | ---------- | ---------- | −1.04 | ---------- | ---------- |
| −5.00 | .030 | .0296 | ---------- | ---------- | 1.01 | ---------- | 0.0295 |
| −3.99 | .102 | .0242 | −.113 | ---------- | 4.22 | 3.67 | .0236 |
| −2.98 | .174 | .0217 | −.127 | 0.728 | 8.02 | 2.82 | .0201 |
| −1.97 | .245 | .0220 | −.143 | .580 | 11.1 | 2.37 | .0188 |
| −.96 | .316 | .0232 | −.160 | .500 | 13.6 | 2.09 | .0179 |
| .05 | .387 | .0257 | −.178 | .452 | 15.1 | 1.89 | .0177 |
| 2.07 | .531 | .0321 | −.211 | .388 | 16.5 | 1.61 | .0171 |
| 4.09 | .688 | .0422 | −.249 | .360 | 16.3 | 1.42 | .0170 |
| 6.11 | .825 | .0560 | −.281 | .336 | 14.7 | 1.29 | .0198 |
| 8.12 | .966 | .0719 | −.311 | .320 | 13.4 | 1.19 | .0222 |
| 10.14 | 1.086 | .0896 | −.340 | .310 | 12.1 | 1.13 | .0269 |
| 12.14 | 1.211 | .1086 | −.366 | .304 | 11.1 | 1.07 | .0308 |
| 14.16 | 1.289 | .1311 | −.382 | .298 | 9.83 | 1.03 | .0429 |
| 16.17 | 1.356 | .1498 | −.391 | .288 | 9.05 | 1.01 | .0523 |
| 18.17 | 1.378 | .1789 | −.392 | .286 | 7.70 | 1.00 | .0782 |
| 20.17 | 1.347 | .2229 | −.512 | ---------- | 6.04 | 1.01 | .1266 |

## TABLE XXXVIII

MAIN SLOPE OF LIFT CURVE, $dC_L/d\alpha$

| Laboratory and test conditions | Airfoil section | $dC_L/d\alpha$ |
|---|---|---|
| Göttingen tests<br>Aspect ratio, 5.<br>Approximate Reynolds Number, 412,000. | G-387 | 0.070 |
| | G-398 | .069 |
| | G-436 | .069 |
| | U. S. A.-27 | .069 |
| L. M. A. L. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 3,600,000. | Clark Y | .071 |
| | G-387 | .072 |
| | M-6 | .070 |
| | M-12 | .071 |
| | R. A. F.-15 | .072 |
| | U. S. A.-27 | .070 |
| | U. S. A.-35A | .071 |
| | U. S. A.-35B | .072 |
| M. I. T. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 187,000. | Clark Y | .071 |
| | Clark Y-15 | .070 |
| | G-387 | .071 |
| | G-436 | .073 |
| | R. A. F.-15 | .075 |
| | U. S. A.-27 | .070 |
| | U. S. A.-35A | .071 |
| | U. S. A.-35B | .070 |
| McC. F. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 374,000. | Clark Y | .072 |
| | Clark Y-15 | .070 |
| | G-398 | .073 |
| W. N. Y. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 156,000. | Clark Y | .071 |
| | G-387 | .070 |
| | G-398 | .072 |
| | G-436 | .072 |
| | M-6 | .069 |
| | M-12 | .068 |
| | N-9 | .072 |
| | N-10 | .073 |
| | N-22 | .075 |
| | R. A. F.-15 | .073 |
| | Sloane | .075 |
| | U. S. A.-27 | .071 |

## TABLE XXXIX

### ANGLE AND MOMENT COEFFICIENT FOR ZERO LIFT

| Laboratory and test conditions | Airfoil section | Angle of attack for zero lift (degrees) | $C_M$ at zero $C_L$ |
|---|---|---|---|
| Göttingen tests. Aspect ratio, 5. Approximate Reynolds Number, 412,000. | G-387 | −7.3 | −0.096 |
| | G-398 | −6.4 | −.091 |
| | G-436 | −5.2 | −.075 |
| | U. S. A.-27 | −5.4 | −.083 |
| L. M. A. L. tests. Aspect ratio, 6. Approximate Reynolds Number, 3,600,000. | Clark Y | −5.1 | −.081 |
| | G-387 | −6.8 | −.096 |
| | M-6 | −0.2 | .010 |
| | M-12 | −1.2 | −.005 |
| | R. A. F.-15 | −2.2 | −.052 |
| | U. S. A.-27 | −4.6 | −.090 |
| | U. S. A.-35A | −7.9 | −.119 |
| | U. S. A.-35B | −5.1 | −.072 |
| M. I. T. tests. Aspect ratio, 6. Approximate Reynolds Number, 187,000. | Clark Y | −5.6 | −.084 |
| | Clark Y-15 | −5.9 | −.079 |
| | G-387 | −7.1 | −.082 |
| | G-436 | −5.1 | −.071 |
| | R. A. F.-15 | −2.1 | −.023 |
| | U. S. A.-27 | −5.3 | −.087 |
| | U. S. A.-35A | −8.5 | −.020 |
| | U. S. A.-35B | −5.9 | −.075 |
| McC. F. tests. Aspect ratio, 6. Approximate Reynolds Number, 374,000. | Clark Y | −6.2 | −.074 |
| | Clark Y-15 | −6.0 | −.073 |
| | G-398 | −6.8 | −.084 |
| W. N. Y. tests. Aspect ratio, 6. Approximate Reynolds Number, 156,000. | Clark Y | −5.6 | −.077 |
| | G-387 | −7.1 | −.101 |
| | G-398 | −6.2 | −.089 |
| | G-436 | −4.8 | −.070 |
| | M-6 | −1.2 | −.009 |
| | M-12 | −1.8 | −.028 |
| | N-9 | −4.0 | −.059 |
| | N-10 | −5.4 | −.049 |
| | N-22 | −5.8 | −.082 |
| | R. A. F.-15 | −2.1 | −.030 |
| | Sloane | −2.2 | −.042 |
| | U. S. A.-27 | −5.4 | −.084 |

## TABLE XL

### CENTER OF PRESSURE CHARACTERISTICS

| Laboratory and test conditions | Airfoil section | $C_p$ most forward | $C_p$ at $\frac{V}{V_s}=2.0$ | $C_p$ at $\frac{V}{V_s}=3.0$ |
|---|---|---|---|---|
| Göttingen tests. Aspect ratio, 5. Approximate Reynolds Number, 412,000. | G-387 | 0.32 | 0.51 | 0.91 |
| | G-398 | .31 | .51 | .86 |
| | G-436 | .30 | .47 | .76 |
| | U. S. A.-27 | .31 | .51 | .86 |
| L. M. A. L. tests. Aspect ratio, 6. Approximate Reynolds Number, 3,600,000. | Clark Y | .294 | .463 | .766 |
| | G-387 | .301 | .494 | .889 |
| | M-6 | | .195 | .148 |
| | M-12 | .246 | .269 | .280 |
| | R. A. F.-15 | .289 | .400 | .610 |
| | U. S. A.-27 | .293 | .473 | .792 |
| | U. S. A.-35A | .342 | .628 | 1.132 |
| | U. S. A.-35B | .302 | .425 | .718 |
| M. I. T. tests. Aspect ratio, 6. Approximate Reynolds Number, 187,000. | Clark Y | .308 | .501 | .805 |
| | Clark Y-15 | .290 | .478 | .773 |
| | G-387 | .310 | .511 | .859 |
| | G-436 | .310 | .502 | .784 |
| | R. A. F.-15 | .285 | .381 | .558 |
| | U. S. A.-27 | .292 | .495 | .761 |
| | U. S. A.-35A | .330 | .560 | .943 |
| | U. S. A.-35B | .305 | .485 | .850 |
| McC. F. tests. Aspect ratio, 6. Approximate Reynolds Number, 374,000. | Clark Y | .300 | .475 | .783 |
| | Clark Y-15 | .288 | .428 | .722 |
| | G-398 | .307 | .478 | .769 |
| W. N. Y. tests. Aspect ratio, 6. Approximate Reynolds Number, 156,000. | Clark Y | .294 | .480 | .794 |
| | G-387 | .306 | .500 | .845 |
| | G-398 | .300 | .484 | .810 |
| | G-436 | .296 | .448 | .739 |
| | M-6 | .238 | .318 | .352 |
| | M-12 | .254 | .371 | .497 |
| | N-9 | .286 | .449 | .728 |
| | N-10 | .288 | .483 | .801 |
| | N-22 | .266 | .461 | .789 |
| | R. A. F.-15 | .278 | .400 | .508 |
| | Sloane | .300 | .431 | .608 |
| | U. S. A.-27 | .286 | .450 | .792 |

## TABLE XLI

### MAXIMUM LIFT COEFFICIENT, $C_{L_{max}}$

Airfoils listed according to merit

| Laboratory and test conditions | Airfoil section | $C_{L_{max}}$ | $\alpha$ for $C_{L_{max}}$ degrees |
|---|---|---|---|
| Göttingen tests | G-387 | 1.362 | 16.5 |
| Aspect ratio, 5. | G-398 | 1.200 | 14.5 |
| Approximate Reynolds Number, 412,000. | U. S. A.-27 | 1.253 | 15.5 |
| | G-436 | 1.204 | 14.6 |
| L. M. A. L. tests | U. S. A.-27 | 1.386 | 16.7 |
| Aspect ratio, 6. | U. S. A.-35B | 1.377 | 16.0 |
| Approximate Reynolds Number, 3,600,000. | Clark Y | 1.370 | 16.0 |
| | G-387 | 1.329 | 14.6 |
| | M-12 | 1.293 | 18.6 |
| | M-6 | 1.222 | 18.6 |
| | R. A. F.-15 | 1.211 | 15.7 |
| | U. S. A.-35A | 1.208 | 13.5 |
| M. I. T. tests | U. S. A. 35A | 1.470 | 18.3 |
| Aspect ratio, 6. | G-387 | 1.431 | 16.3 |
| Approximate Reynolds Number, 187,000. | U. S. A.-27 | 1.351 | 17.3 |
| | U. S. A.-35B | 1.301 | 14.6 |
| | Clark Y-15 | 1.260 | 15.6 |
| | Clark Y | 1.239 | 14.4 |
| | G-436 | 1.204 | 13.0 |
| | R. A. F.-15 | 1.017 | 13.9 |
| McC. F. tests | G-398 | 1.408 | 14.5 |
| Aspect ratio, 6. | Clark Y-15 | 1.322 | 16.2 |
| Approximate Reynolds Number, 374,000. | Clark Y | 1.250 | 13.8 |
| W. N. Y. tests | G-387 | 1.488 | 18.2 |
| Aspect ratio, 6. | G-398 | 1.387 | 16.2 |
| Approximate Reynolds Number, 156,000. | N-22 | 1.384 | 16.2 |
| | U. S. A.-27 | 1.378 | 18.2 |
| | G-436 | 1.325 | 15.9 |
| | Clark Y | 1.258 | 15.6 |
| | N-10 | 1.257 | 14.2 |
| | N-9 | 1.125 | 13.6 |
| | R. A. F.-15 | 1.053 | 16.4 |
| | Sloane | 1.019 | 16.1 |
| | M-12 | .962 | 14.6 |
| | M-6 | .922 | 14.1 |

## TABLE XLII

### MINIMUM DRAG COEFFICIENT, $C_{D_{min}}$

Airfoils listed according to merit

| Laboratory and test conditions | Airfoil section | $C_{D_{min}}$ | $\alpha$ for $C_{D_{min}}$ degrees |
|---|---|---|---|
| Göttingen tests | G-436 | 0.0130 | −4.0 |
| Aspect ratio, 5. | G-398 | .0150 | −5.4 |
| Approximate Reynolds Number, 412,000. | U. S. A.-27 | .0150 | −3.0 |
| | G-387 | .0178 | −5.0 |
| L. M. A. L. tests | M-6 | .0080 | 0.0 |
| Aspect ratio, 6. | R. A. F.-15 | .0083 | −1.5 |
| Approximate Reynolds Number, 3,600,000. | M-12 | .0089 | −1.5 |
| | U. S. A.-35B | .0093 | −4.8 |
| | Clark Y | .0106 | −5.5 |
| | U. S. A.-27 | .0116 | −4.0 |
| | G-387 | .0126 | −6.0 |
| | U. S. A.-35A | .0142 | −6.7 |
| M. I. T. tests | R. A. F.-15 | .0123 | −0.7 |
| Aspect ratio, 6. | Clark Y | .0153 | −3.5 |
| Approximate Reynolds Number, 187,000. | G-436 | .0165 | −3.0 |
| | Clark Y-15 | .0168 | −4.5 |
| | U. S. A.-35B | .0185 | −2.7 |
| | U. S. A.-27 | .0220 | −1.0 |
| | G-387 | .0237 | −3.9 |
| | U. S. A.-35A | .0302 | −8.6 |
| McC. F. tests | Clark Y-15 | .0133 | −5.0 |
| Aspect ratio, 6. | Clark Y | .0149 | −4.5 |
| Approximate Reynolds Number, 374,000. | G-398 | .0152 | −6.2 |
| W. N. Y. tests | Sloane | .0118 | −1.0 |
| Aspect ratio, 6. | M-12 | .0134 | −1.5 |
| Approximate Reynolds Number, 156,000. | N-9 | .0135 | −2.5 |
| | M-6 | .0138 | −1.0 |
| | R. A. F.-15 | .0156 | −0.6 |
| | G-398 | .0175 | −4.0 |
| | N-10 | .0177 | −3.5 |
| | N-22 | .0183 | −4.0 |
| | Clark Y | .0183 | −4.0 |
| | G-436 | .0196 | −2.0 |
| | U. S. A.-27 | .0217 | −2.9 |
| | G-387 | .0236 | −4.0 |

## TABLE XLIII

### MAXIMUM RATIO $C_L/C_D$ AND LIFT COEFFICIENT AT MAXIMUM $C_L/C_D$

Airfoils listed according to maximum $C_L/C_D$ merit

| Laboratory and test conditions | Airfoil section | Maximum $C_L/C_D$ | $\alpha$ for maximum $C_L/C_D$ degrees |
|---|---|---|---|
| Göttingen tests<br>Aspect ratio, 5.<br>Approximate Reynolds Number, 412,000. | G-436 | 18.9 | 1.0 |
| | U. S. A.-27 | 18.5 | .8 |
| | G-398 | 17.5 | 0 |
| | G-387 | 16.6 | 0 |
| L. M. A. L. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 3,600,000. | R. A. F.-15 | 24.3 | 3.2 |
| | M-6 | 21.9 | 4.4 |
| | Clark Y | 21.1 | .3 |
| | M-12 | 20.6 | 4.8 |
| | U. S. A.-27 | 20.6 | 1.7 |
| | U. S. A.-35B | 20.5 | .3 |
| | G-387 | 18.6 | −1.3 |
| | U. S. A.-35A | 18.4 | −1.3 |
| M. I. T. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 187,000. | Clark Y | 18.8 | 1.0 |
| | G-436 | 18.5 | 1.6 |
| | Clark Y-15 | 18.4 | .5 |
| | R. A. F.-15 | 18.4 | 2.5 |
| | U. S. A.-35B | 18.1 | 1.5 |
| | U. S. A.-27 | 17.7 | 2.0 |
| | G-387 | 16.2 | 1.5 |
| | U. S. A.-35A | 15.1 | .4 |
| McC. F. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 374,000. | Clark Y | 20.6 | 0 |
| | Clark Y-15 | 19.2 | .5 |
| | G-398 | 18.6 | 0 |
| W. N. Y. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 156,000. | Sloane | 25.1 | 3.8 |
| | N-9 | 20.6 | 1.0 |
| | N-10 | 17.6 | 1.7 |
| | N-22 | 17.6 | 1.0 |
| | Clark Y | 17.2 | 1.8 |
| | G-398 | 17.1 | .5 |
| | M-12 | 16.8 | 4.0 |
| | R. A. F.-15 | 16.8 | 4.8 |
| | G-436 | 16.8 | 2.3 |
| | U. S. A.-27 | 16.5 | 2.8 |
| | M-6 | 16.4 | 4.1 |
| | G-387 | 14.6 | 2.1 |

| Laboratory and test conditions | Airfoil section | $C_L$ at maximum $C_L/C_D$ | $\frac{C_L \text{ at max. } C_L/C_D}{C_{L_{max}}}$ |
|---|---|---|---|
| Göttingen tests<br>Aspect ratio, 5.<br>Approximate Reynolds Number, 412,000. | G-436 | 0.430 | 0.355 |
| | U. S. A.-27 | .410 | .327 |
| | G-398 | .443 | .355 |
| | G-387 | .487 | .358 |
| L. M. A. L. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 3,600,000. | R. A. F.-15 | .401 | .331 |
| | M-6 | .330 | .270 |
| | Clark Y | .391 | .286 |
| | M-12 | .439 | .348 |
| | U. S. A.-27 | .440 | .318 |
| | U. S. A.-35B | .390 | .284 |
| | G-387 | .390 | .294 |
| | U. S. A.-35A | .470 | .389 |
| M. I. T. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 187,000. | Clark Y | .462 | .378 |
| | G-436 | .478 | .396 |
| | Clark Y-15 | .445 | .353 |
| | R. A. F.-15 | .370 | .364 |
| | U. S. A.-35B | .495 | .370 |
| | U. S. A.-27 | .520 | .385 |
| | G-387 | .610 | .426 |
| | U. S. A.-35A | .628 | .427 |
| McC. F. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 374,000. | Clark Y | .510 | .408 |
| | Clark Y-15 | .470 | .355 |
| | G-398 | .470 | .334 |
| W. N. Y. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 156,000. | Sloane | .432 | .473 |
| | N-9 | .389 | .346 |
| | N-10 | .515 | .410 |
| | N-22 | .499 | .360 |
| | Clark Y | .531 | .422 |
| | G-398 | .471 | .340 |
| | M-12 | .457 | .475 |
| | R. A. F.-15 | .528 | .501 |
| | G-436 | .500 | .378 |
| | U. S. A.-27 | .533 | .423 |
| | M-6 | .445 | .493 |
| | G-387 | .639 | .429 |

## TABLE XLIV

RATIO $C_L/C_D$ FOR VARIOUS FRACTIONS OF MAXIMUM $C_L$.

| Laboratory and test conditions | Airfoil section | $C_L/C_D$ at— ¾ maximum $C_L$ | $C_L/C_D$ at— ½ maximum $C_L$ |
|---|---|---|---|
| Göttingen tests. Aspect ratio, 5. Approximate Reynolds Number 412,000. | G-387 | 13.6 | 15.6 |
| | G-398 | 14.1 | 16.6 |
| | G-436 | 14.6 | 17.8 |
| | U. S. A.-27 | 14.2 | 16.7 |
| L. M. A. L. tests. Aspect ratio, 6. Approximate Reynolds Number 3,600,000. | Clark Y | 14.8 | 18.7 |
| | G-387 | 14.0 | 16.0 |
| | M-6 | 15.0 | 17.8 |
| | M-12 | 14.6 | 17.4 |
| | R. A. F.-15 | 16.7 | 20.9 |
| | U. S. A.-27 | 14.8 | 17.8 |
| | U. S. A.-35A | 15.4 | 17.8 |
| | U. S. A.-35B | 14.2 | 17.0 |
| M. I. T. tests. Aspect ratio, 6. Approximate Reynolds Number 187,000. | Clark Y | 15.2 | 18.0 |
| | Clark Y-15 | 14.8 | 17.5 |
| | G-387 | 14.0 | 15.8 |
| | G-436 | 15.6 | 17.8 |
| | R. A. F.-15 | 16.6 | 18.0 |
| | U. S. A.-27 | 14.5 | 17.1 |
| | U. S. A.-35A | 13.8 | 15.0 |
| | U. S. A.-35B | 15.8 | 17.4 |
| McC. F. tests. Aspect ratio, 6. Approximate Reynolds Number 374,000. | Clark Y | 15.9 | 19.0 |
| | Clark Y-15 | 15.0 | 17.5 |
| | G-398 | 14.4 | 17.7 |
| W. N. Y. tests. Aspect ratio, 6. Approximate Reynolds Number 156,000. | Clark Y | 14.7 | 16.9 |
| | G-387 | 12.4 | 14.3 |
| | G-398 | 13.7 | 15.9 |
| | G-436 | 14.0 | 16.0 |
| | N-9 | 15.9 | 18.4 |
| | N-10 | 14.6 | 17.0 |
| | N-22 | 14.1 | 16.4 |
| | M-6 | 15.4 | 16.3 |
| | M-12 | 16.1 | 16.8 |
| | R. A. F.-15 | 15.6 | 16.8 |
| | Sloane | 16.9 | 25.0 |
| | U. S. A.-27 | 13.8 | 16.2 |

| Laboratory and test conditions | Airfoil section | $C_L/C_D$ at— ¼ maximum $C_L$ | $C_L/C_D$ at— ⅙ maximum $C_L$ | $C_L/C_D$ at— ⅛ maximum $C_L$ |
|---|---|---|---|---|
| Göttingen tests. Aspect ratio 5. Approximate Reynolds Number, 412,000. | G-387 | 15.5 | 12.2 | 9.9 |
| | G-398 | 16.1 | 12.8 | 10.3 |
| | G-436 | 17.4 | 13.9 | 11.3 |
| | U. S. A.-27 | 17.2 | 13.7 | 10.8 |
| L. M. A. L. tests. Aspect ratio, 6. Approximate Reynolds Number, 3,600,000. | Clark Y | 20.6 | 17.3 | 14.8 |
| | G-387 | 17.9 | 14.5 | 12.1 |
| | M-6 | 21.8 | 19.0 | 15.4 |
| | M-12 | 19.6 | 17.2 | 15.6 |
| | R. A. F.-15 | 23.4 | 20.6 | 17.4 |
| | U. S. A.-27 | 20.0 | 16.8 | 13.8 |
| | U. S. A.-35A | 16.7 | 13.3 | 10.6 |
| | U. S. A.-35B | 20.2 | 17.6 | 15.7 |
| M. I. T. tests. Aspect ratio, 6. Approximate Reynolds Number, 187,000. | Clark Y | 17.2 | 13.4 | 10.2 |
| | Clark Y-15 | 16.6 | 12.2 | 9.3 |
| | G-387 | 13.8 | 10.2 | 7.0 |
| | G-436 | 15.9 | 11.9 | 9.4 |
| | R. A. F.-15 | 17.4 | 13.3 | 10.8 |
| | U. S. A.-27 | 15.2 | 9.5 | 5.9 |
| | U. S. A.-35A | 12.5 | 5.8 | 3.7 |
| | U. S. A.-35B | 16.0 | 12.0 | 9.3 |
| Mc. C. F. tests. Aspect ratio, 6. Approximate Reynolds Number, 374,000. | Clark Y | 17.3 | 13.1 | 10.1 |
| | Clark Y-15 | 18.1 | 14.6 | 12.0 |
| | G-398 | 17.5 | 14.0 | 11.2 |
| W. N. Y. tests. Aspect ratio, 6. Approximate Reynolds Number, 156,000. | Clark Y | 14.8 | 11.2 | 8.5 |
| | G-387 | 13.0 | 10.2 | 7.7 |
| | G-398 | 16.3 | 12.6 | 9.8 |
| | G-436 | 14.9 | 11.2 | 8.3 |
| | N-9 | 19.0 | 13.0 | 10.2 |
| | N-10 | 15.4 | 11.3 | 8.8 |
| | N-22 | 15.2 | 11.7 | 9.1 |
| | M-6 | 13.1 | 10.1 | 8.2 |
| | M-12 | 14.9 | 11.1 | 8.9 |
| | R. A. F.-15 | 14.2 | 11.6 | 8.9 |
| | Sloane | 20.1 | 14.2 | 10.3 |
| | U. S. A.-27 | 14.4 | 10.6 | 8.0 |

## TABLE XLV

### RATIO OF MAXIMUM $C_L$ TO MINIMUM $C_D$

Airfoils listed according to merit

| Laboratory and test conditions | Airfoil section | $\frac{C_{L_{max}}}{C_{D_{max}}}$ |
|---|---|---|
| Göttingen tests<br>Aspect ratio, 5.<br>Approximate Reynolds Number, 412,000. | G-436 | 92.5 |
| | G-398 | 84.0 |
| | U. S. A.-27 | 83.5 |
| | G-387 | 76.5 |
| L. M. A. L. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 3,600,000. | M-6 | 153 |
| | U. S. A.-35B | 148 |
| | R. A. F.-15 | 146 |
| | M-12 | 145 |
| | Clark Y | 129 |
| | U. S. A.-27 | 120 |
| | G-387 | 106 |
| | U. S. A.-35A | 85.1 |
| M. I. T. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 187,000. | R. A. F.-15 | 82.7 |
| | Clark Y | 80.9 |
| | Clark Y-15 | 75.0 |
| | G-436 | 73.0 |
| | U. S. A.-35B | 70.3 |
| | U. S. A.-27 | 61.4 |
| | G-387 | 60.4 |
| | U. S. A.-35A | 48.7 |
| McC. F. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 374,000. | Clark Y-15 | 99.4 |
| | G-398 | 92.5 |
| | Clark Y | 83.9 |
| W. N. Y. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 156,000. | Sloane | 86.3 |
| | N-9 | 83.3 |
| | G-398 | 79.1 |
| | N-22 | 75.6 |
| | M-12 | 71.8 |
| | N-10 | 71.0 |
| | Clark Y | 68.7 |
| | G-436 | 67.6 |
| | R. A. F. 15 | 67.5 |
| | M-6 | 66.8 |
| | U. S. A.-27 | 63.5 |
| | G-387 | 63.0 |

## TABLE XLVI

### MAXIMUM RATIO OF $C_L^3$ TO $C_D^2$

Airfoils listed according to merit

| Laboratory and test conditions | Airfoil section | $(C_L^3/C_D^2)_{max}$ |
|---|---|---|
| Göttingen tests<br>Aspect ratio, 5.<br>Approximate Reynolds Number, 412,000. | G-436 | 189 |
| | U. S. A.-27 | 188 |
| | G-387 | 180 |
| | G-398 | 174 |
| L. M. A. L. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 3,600,000. | R. A. F.-15 | 265 |
| | Clark Y | 237 |
| | U. S. A.-27 | 229 |
| | M-6 | 204 |
| | M-12 | 202 |
| | U. S. A.-35A | 202 |
| | U. S. A.-35B | 197 |
| | G-387 | 179 |
| M. I. T. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 187,000. | U. S. A.-35B | 215 |
| | Clark Y | 203 |
| | U. S. A.-27 | 203 |
| | G-436 | 202 |
| | Clark Y-15 | 201 |
| | R. A. F.-15 | 193 |
| | G-387 | 188 |
| | U. S. A.-35A | 181 |
| McC. F. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 374,000. | G-398 | 227 |
| | Clark Y | 226 |
| | Clark Y-15 | 204 |
| W. N. Y. tests<br>Aspect ratio, 6.<br>Approximate Reynolds Number, 156,000. | Sloane | 320 |
| | N-9 | 194 |
| | N-10 | 190 |
| | Clark Y | 188 |
| | N-22 | 185 |
| | U. S. A.-27 | 183 |
| | G-436 | 181 |
| | G-398 | 176 |
| | R. A. F.-15 | 171 |
| | M-12 | 166 |
| | M-6 | 162 |
| | G-387 | 162 |

## TABLE XLVII

RATIO OF MAXIMUM $C_L^3$ TO MINIMUM $C_D^2$

Airfoils listed according to merit

| Laboratory and test conditions | Airfoil section | $\frac{C_{L\,max}^3}{C_{D\,max}^2}$ |
|---|---|---|
| Göttingen tests | G-436 | 10,300 |
| Aspect ratio, 5. | G-398 | 8,890 |
| Approximate Reynolds Number, 412,000. | U. S. A.-27 | 8,736 |
| | G-387 | 7,970 |
| L. M. A. L. tests | U. S. A.-35B | 30,200 |
| Aspect ratio, 6. | M-6 | 28,500 |
| Approximate Reynolds Number, 3,600,000. | M-12 | 27,300 |
| | R. A. F.-15 | 25,800 |
| | Clark Y | 22,900 |
| | U. S. A.-27 | 19,800 |
| | G-387 | 14,800 |
| | U. S. A.-35A | 8,750 |
| M. I. T. tests | Clark Y | 8,100 |
| Aspect ratio, 6. | Clark Y-15 | 7,090 |
| Approximate Reynolds Number, 187,000. | R. A. F.-15 | 6,960 |
| | U. S. A.-35B | 6,430 |
| | G-436 | 6,410 |
| | G-387 | 5,220 |
| | U. S. A.-27 | 5,090 |
| | U. S. A.-35A | 3,490 |
| McC. F. tests | Clark Y-15 | 13,100 |
| Aspect ratio, 6. | G-398 | 12,000 |
| Approximate Reynolds Number, 374,000. | Clark Y | 8,800 |
| W. N. Y. tests | G-398 | 8,680 |
| Aspect ratio, 6. | N-22 | 7,910 |
| Approximate Reynolds Number, 156,000. | N-9 | 7,800 |
| | Sloane | 7,580 |
| | N-10 | 6,320 |
| | G-436 | 6,050 |
| | Clark Y | 5,930 |
| | G-387 | 5,900 |
| | U. S. A.-27 | 5,550 |
| | M-12 | 4,900 |
| | R. A. F.-15 | 4,800 |
| | M-6 | 4,110 |

## TABLE XLVIII

MINIMUM PROFILE DRAG COEFFICIENT $C_{D0}$ (FAIRED)

Airfoils listed according to merit

| Laboratory and test conditions | Airfoil section | $C_{D0\,max}$ |
|---|---|---|
| Göttingen tests | G-436 | 0.0106 |
| Aspect ratio, 5. | U. S. A.-27 | .0116 |
| Approximate Reynolds Number, 412,000. | G-398 | .0124 |
| | G-387 | .0147 |
| L. M. A. L. tests | R. A. F.-15 | .0076 |
| Aspect ratio, 6. | M-6 | .0083 |
| Approximate Reynolds Number, 3,600,000. | M-12 | .0089 |
| | U. S. A.-35B | .0091 |
| | Clark Y | .0105 |
| | U. S. A.-27 | .0106 |
| | G-387 | .0123 |
| | U. S. A.-35A | .0132 |
| M. I. T. tests | R. A. F.-15 | .0116 |
| Aspect ratio, 6. | Clark Y | .0127 |
| Approximate Reynolds Number, 187,000. | Clark Y-15 | .0132 |
| | G-436 | .0137 |
| | U. S. A.-35B | .0142 |
| | U. S. A.-27 | .0147 |
| | G-387 | .0176 |
| | U. S. A.-35A | .0204 |
| McC. F. tests | Clark Y | .0118 |
| Aspect ratio, 6. | Clark Y-15 | .0124 |
| Approximate Reynolds Number, 374,000. | G-398 | .0131 |
| W. N. Y. tests | Sloane | .0076 |
| Aspect ratio, 6. | N-9 | .0106 |
| Approximate Reynolds Number, 156,000. | M-12 | .0130 |
| | M-6 | .0138 |
| | R. A. F.-15 | .0145 |
| | G-398 | .0148 |
| | N-10 | .0148 |
| | N-22 | .0156 |
| | Clark Y | .0156 |
| | G-436 | .0160 |
| | U. S. A.-27 | .0170 |
| | G-387 | .0207 |

## TABLE XLIX

FAIRED RATIO $C_{D_0}/C_{L_{max}}$ FOR VARIOUS SPEED RATIOS

| Laboratory and test conditions | Airfoil section | $C_{D_0}/C_{L_{max}}$ (faired) at— | | |
|---|---|---|---|---|
| | | $V/V_s$=1.10 | $V/V_s$=1.50 | $V/V_s$=2.50 |
| Göttingen tests | G-387 | 0.0140 | 0.0101 | 0.0112 |
| Aspect ratio, 5. | G-398 | .0140 | .0099 | .0108 |
| Approximate Reynolds Number, 412,000. | G-436 | .0130 | .0088 | .0098 |
| | U. S. A.-27 | .0147 | .0093 | .0102 |
| L. M. A. L. tests | Clark Y | .0171 | .0068 | .0077 |
| Aspect ratio, 6. | G-387 | .0217 | .0121 | .0094 |
| Approximate Reynolds Number, 3,600,000. | M-6 | .0212 | .0101 | .0070 |
| | M-12 | .0208 | .0104 | .0071 |
| | R. A. F.-15 | .0149 | .0073 | .0063 |
| | U. S. A.-27 | .0164 | .0087 | .0078 |
| | U. S. A.-35A | .0139 | .0117 | .0109 |
| | U. S. A.-35B | .0211 | .0101 | .0072 |
| M. I. T. tests | Clark Y | .0208 | .0107 | .0108 |
| Aspect ratio, 6. | Clark Y-15 | .0210 | .0110 | .0117 |
| Approximate Reynolds Number, 187,000. | G-387 | .0180 | .0123 | .0157 |
| | G-436 | .0177 | .0116 | .0122 |
| | R. A. F.-15 | .0195 | .0130 | .0114 |
| | U. S. A.-27 | .0193 | .0108 | .0158 |
| | U. S. A.-35A | .0158 | .0139 | .0207 |
| | U. S. A.-35B | .0145 | .0109 | .0122 |
| McC. F. tests | Clark Y | .0155 | .0092 | .0102 |
| Aspect ratio, 6. | Clark Y-15 | .0181 | .0103 | .0094 |
| Approximate Reynolds Number, 374,000. | G-398 | .0168 | .0094 | .0101 |
| W. N. Y. tests | Clark Y | .0209 | .0127 | .0131 |
| Aspect ratio, 6. | G-387 | .0235 | .0150 | .0142 |
| Approximate Reynolds Number, 156,000. | G-398 | .0210 | .0123 | .0110 |
| | G-436 | .0232 | .0125 | .0132 |
| | N-9 | .0201 | .0110 | .0108 |
| | N-10 | .0126 | .0123 | .0125 |
| | N-22 | .0196 | .0117 | .0120 |
| | M-6 | .0242 | .0177 | .0152 |
| | M-12 | .0234 | .0157 | .0135 |
| | R. A. F.-15 | .0256 | .0154 | .0137 |
| | Sloane | .0335 | .0075 | .0096 |
| | U. S. A.-27 | .0214 | .0123 | .0138 |

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