TECHNICAL NOTES

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 240

THE N.A.C.A. CYH AIRFOIL SECTION

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Summary

The N.A.C.A. CYH airfoil section is described and its aerodynamic characteristics are given as tested in the N.A.C.A. variable density wind tunnel at twenty atmospheres pressure. This section has a low drag, a high maximum lift, and a small travel of center of pressure.

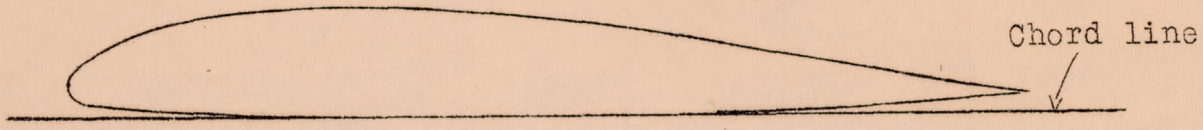
The N.A.C.A. CYH airfoil section was developed from the Clark Y section by modifying the after portion in such a manner that the center of pressure travel is reduced, maintaining as far as possible the good characteristics of the Clark Y section. The development is shown in Fig. 1. The ordinates are given in Table I.

A plaster of Paris model airfoil was made and tested in the usual manner in the variable density wind tunnel at a density corresponding to twenty atmospheres pressure. The results are given in Table II and are plotted in Figs. 2 and 3. The drag coefficient, moment coefficient about the quarter chord point,

D/L values, and the angles of attack are plotted against lift coefficient in Fig. 2; and the center of pressure against lift coefficient in Fig. 3. The drag is low; the maximum lift high; and the center of pressure travel is small.

Curves of the minimum induced drag, the moment coefficient and the lift coefficient as calculated from the present aerodynamic theory are also shown in Fig. 2 for comparison. The agreement of the moment coefficient curves is very good.

TABLE I.



N.A.C.A. CYH AIRFOIL SECTION

Ordinates in Fractions of Chord

Sta.	.000	.0125	.025	.050	.075	.10	.15	.20	.30
Upper	.0350	.0545	.0650	.0790	.0885	.0960	.10685	.1136	.1170
Lower	.0350	.0193	.0147	.0093	.0063	.0042	.0015	.0003	.0000
Sta.	.40	.50	.60	.65	.70	.80	.90	.95	1.00
Upper	.1140	.10515	.0915	.0830	.0741	.0562	.0384	.0293	.0205
Lower	.0000	.0000	.0000	.0000	.0006	.0038	.0102	.0140	.0185

Radius of leading edge - 0.015.

TABLE II.

Airfoil - N.A.C.A.-CYH
Average tank pressure - 20.3 atm.
Average dynamic pressure - q=633 kg/m²
Average Reynolds number - 3,570,000
Average temperature - 33°C.

Span - 30 in. (76.2 cm)
Chord - 5 in. (12.7 cm)
Aspect ratio - 6
Material - Plaster of Paris
Date - June 1, 1926.

Angle of attack degrees	Lift Coefficient C_L	Drag Coefficient C_D	Ratio D/L	Moment Coefficient C_M(.25 chord)	Center of pressure % chord from L.E.
-6	-.219	.0158	-.072	-.026	13.0
-4.5	-.114	.0131	-.175	-.034	-5.1
-3	.002	.0117	5.85	-.031	1173
-1.5	.111	.0114	.103	-.031	52.8
0	.230	.0133	.058	-.016	32.0
1.5	.342	.0164	.048	-.026	32.6
3	.454	.0217	.048	-.021	29.6
4.5	.562	.0279	.050	-.023	29.1
6	.667	.0351	.053	-.026	28.9
7.5	.787	.0458	.058	-.019	27.4
9	.891	.0554	.062	-.011	26.2
10.5	.989	.0674	.068	-.011	26.1
12	1.096	.0819	.075	-.019	26.7
13.5	1.189	.0971	.082	-.023	27.0
15	1.267	.1133	.090	-.034	27.7
16.5	1.302	.1310	.101	-.039	28.1
18	1.231	.1989	.161	-.049	29.0
19.5	1.196	.2231	.187	-.058	29.8
21	1.066	.2844	.267	-.080	32.3

Line AB was drawn tangent to upper camber of the Clark Y section at A, 65% of the chord. Line BD was drawn bisecting angle ABC. The after part of the Clark Y section AEC was then rotated about line BD as an axis to the position CFA. With the trailing edge cut to G, making the chord 100%, the revolved section became the after part of the modified section, N.A.C.A. CYH.

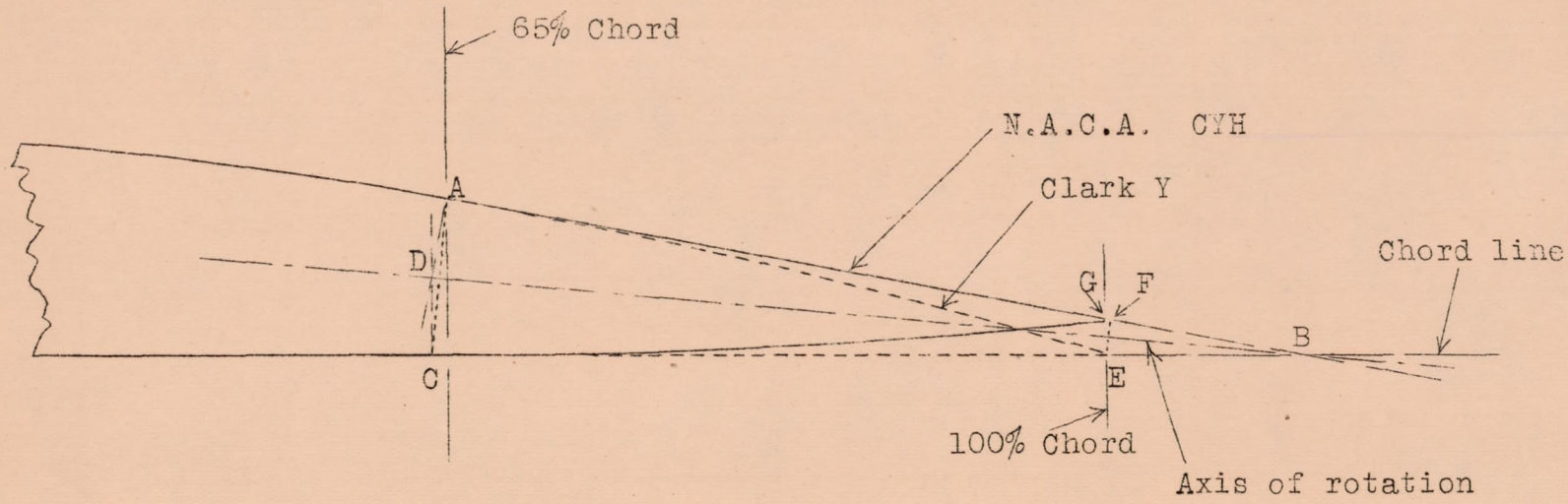


Fig.1 Development of the N.A.C.A. CYH airfoil section.

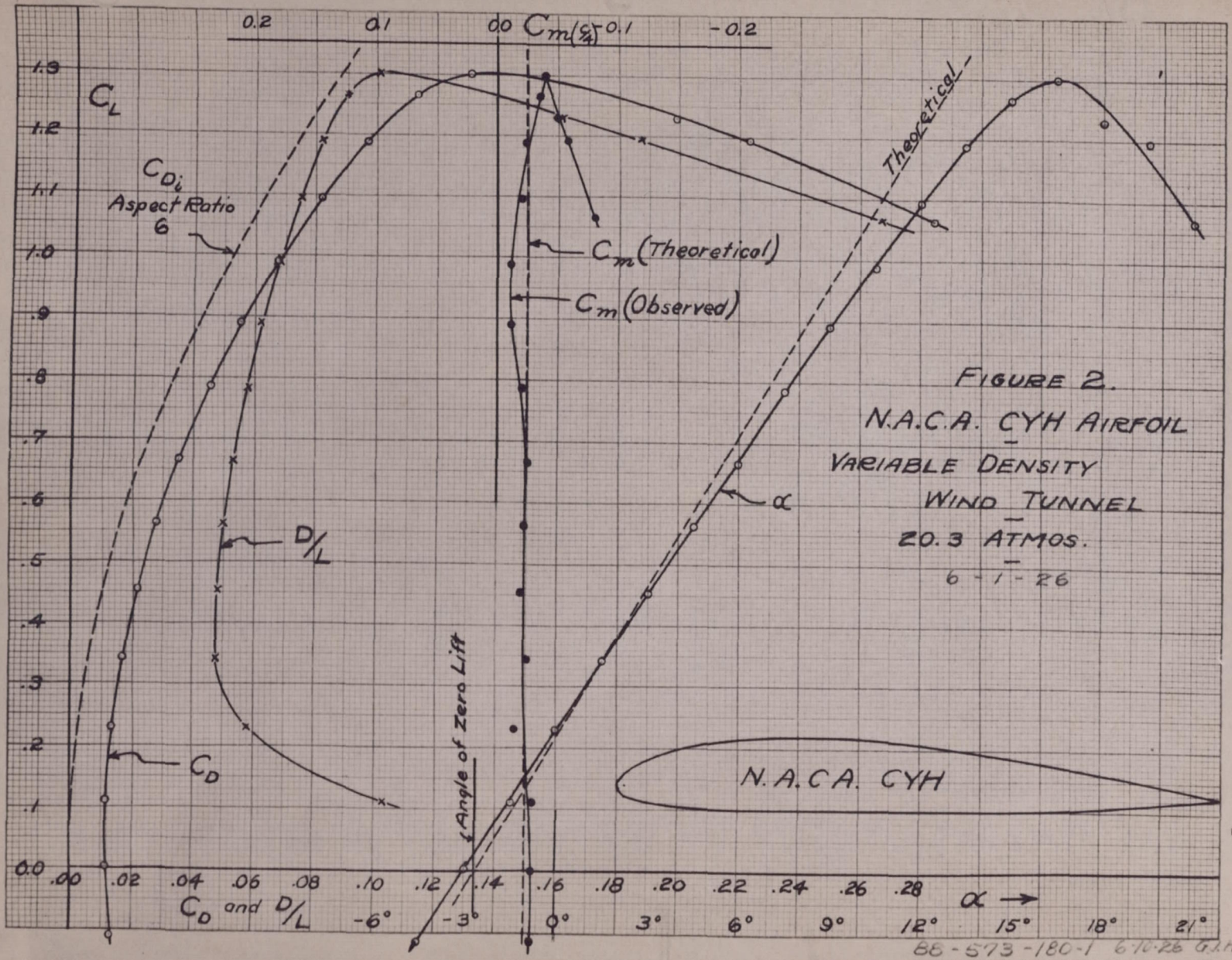


FIGURE 2.
N.A.C.A. CYH AIRFOIL
VARIABLE DENSITY
WIND TUNNEL
20.3 ATMOS.
6-1-26

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Fig. 2

88-573-180-1 6.10.26 G.H.

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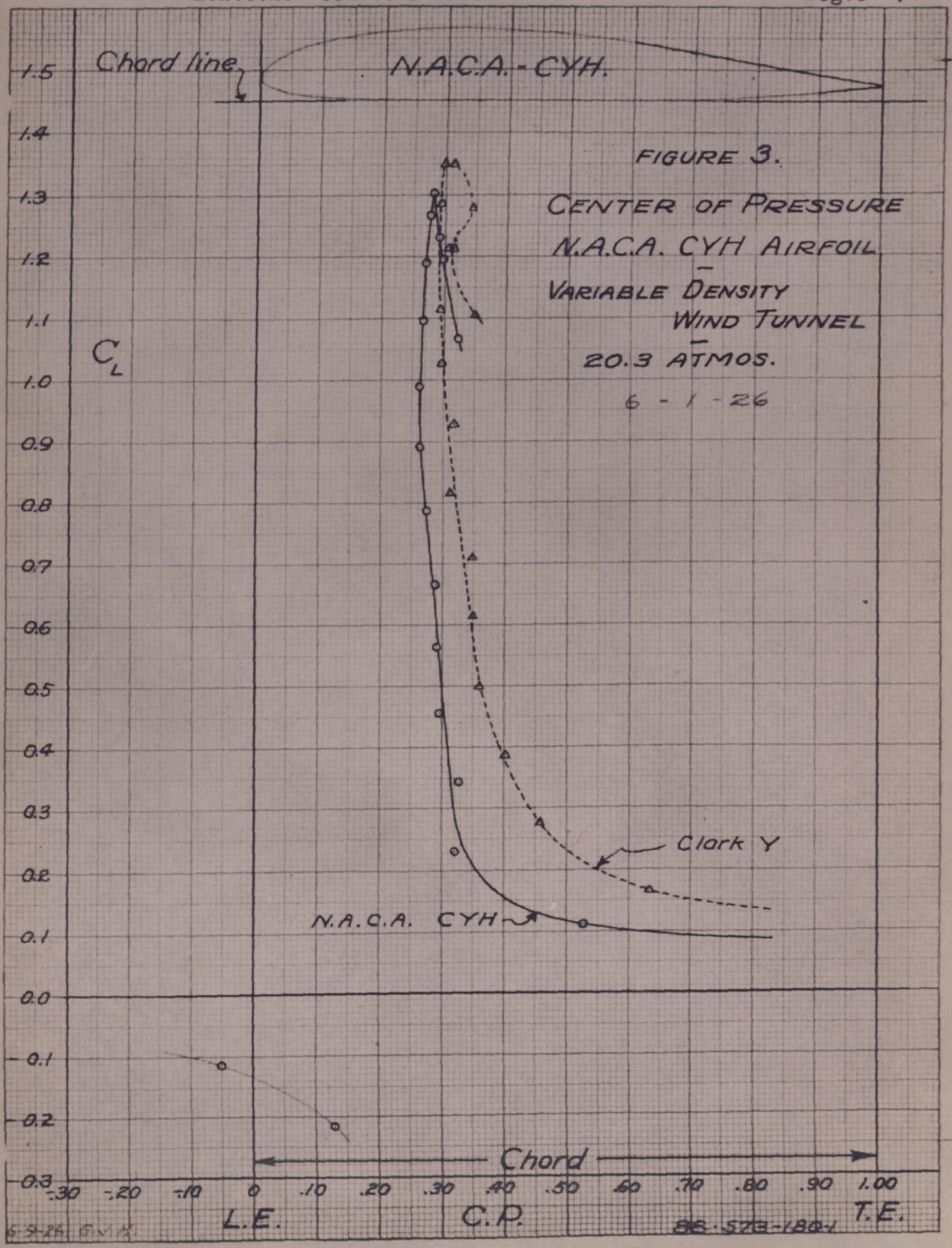
Chord line
N.A.C.A.-CYH.
FIGURE 3.
CENTER OF PRESSURE
N.A.C.A. CYH AIRFOIL
VARIABLE DENSITY
WIND TUNNEL
20.3 ATMOS.
6-1-26
C_L
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
Clark Y
N.A.C.A. CYH
Chord
-.30 -.20 -.10 0 .10 .20 .30 .40 .50 .60 .70 .80 .90 1.00
L.E.
C.P.
T.E.