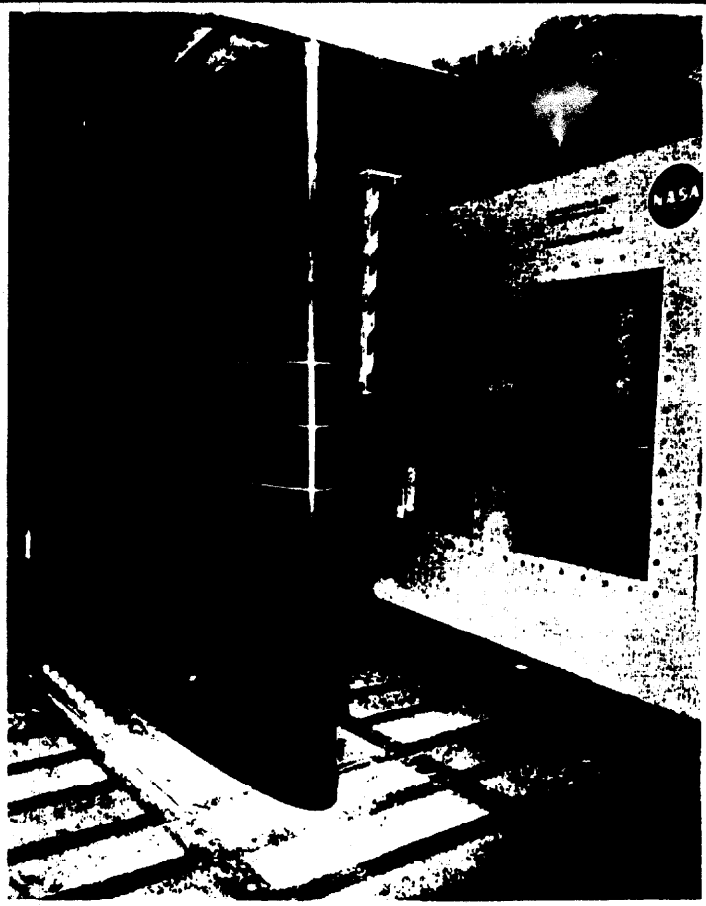
APPENDIX F—ICE SHAPE INFORMATION

IRT Installation



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NASA

NTSB/Embraer Wing Test

Model: Embraer Wing
Data: Ice shape tracings, photos, wake probe

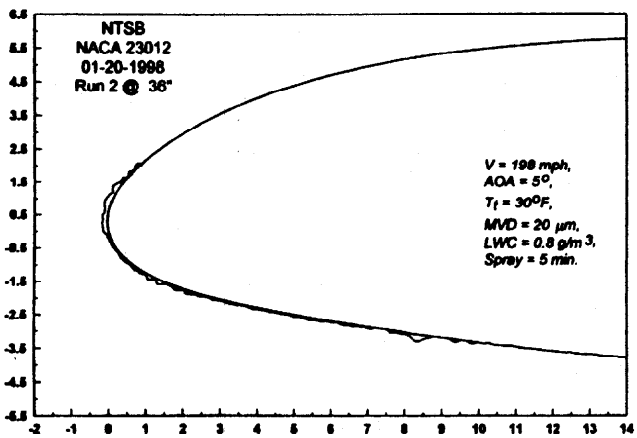
Assume running 5PM to 11PM, with 3/4 hour per run
So, we can get in 8 runs per night

All Runs to be repeated at least once

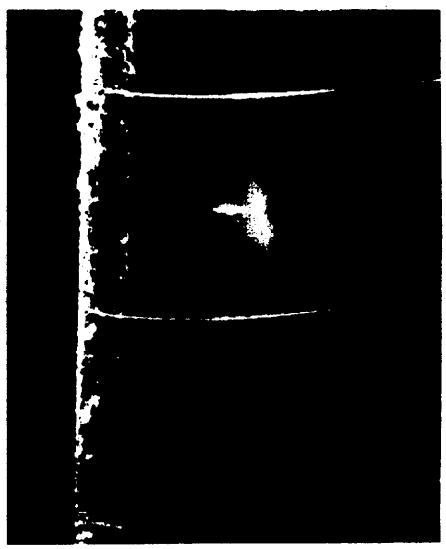
3.5 days	Estimated 3.5 days to complete matrix
3.5 days	Add another 3.5 days to repeat
1 day	Add one day for temperature measurements
1 day	With one day left over for makeups or early quit
9 days	otal test entry

Run #	A/S (knots)	otal Temp (F	AOA (deg)	LWC	MVD	Pair	DP	Time	Comment
1	172								Clean Wake Run
2	172	30	5	0.8	20	37	98	5	Base line series
3	172	30	5	0.8	40	19	83	5	Base line series
4	172	30	5	0.52	40	10	33	5	Base line series
5	172	30	5	0.58	70	8.2	32	5	Base line series
6	172	30	7	0.8	20	37	98	5	Higher AOA series
7	172	30	7	0.8	40	19	83	5	Higher AOA series
8	172	30	7	0.52	40	10	33	5	Higher AOA series
9	172	30	7	0.58	70	8.2	32	5	Higher AOA series
10	172								Clean Wake Run
11	172								Clean Wake Run
12	172	30	3	0.8	20	37	98	5	Lower AOA series
13	172	30	3	0.8	40	19	83	5	Lower AOA series
14	172	30	3	0.52	40	10	33	5	Lower AOA series
15	172	30	3	0.58	70	8.2	32	5	Lower AOA series
16	172	31	5	0.8	20	37	98	5	Higher Temp series
17	172	31	5	0.8	40	19	83	5	Higher Temp series
18	172	31	5	0.52	40	10	33	5	Higher Temp series
19	172	31	5	0.58	70	8.2	32	5	Higher Temp series
20	172								Clean Wake Run
21	172								Clean Wake Run
22	172	28	5	0.8	20	37	98	5	Lower Temp series
23	172	28	5	0.8	40	19	83	5	Lower Temp series
24	172	28	5	0.52	40	10	33	5	Lower Temp series
25	172	28	5	0.58	70	8.2	32	5	Lower Temp series
26	172	26	5	0.8	20	37	98	5	Lower Temp series II
27	172	26	5	0.8	40	19	83	5	Lower Temp series II
28	172	26	5	0.52	40	10	33	5	Lower Temp series II
29	172	26	5	0.58	70	8.2	32	5	Lower Temp series II
30	172								Clean Wake Run
31	172								Clean Wake Run
32	172	30	5	0.8	20	37	98	10	Longer Time series
33	172	30	5	0.8	40	19	83	10	Longer Time series
34	172	30	5	0.52	40	10	33	10	Longer Time series
35	172	30	5	0.58	70	8.2	32	10	Longer Time series
36	172								Clean Wake Run
37	172	30	5	0.6	100	6	30	5	Additional SLD series
38	172	30	5	0.6	120	5	28	5	Additional SLD series
39	172	30	5	0.85	175	5	50	5	Additional SLD series
40	172	30	5	0.85	270	2	22	5	Additional SLD series
41	172	28	5	0.6	100	6	30	5	Additional SLD series
42	172	30	3	0.6	100	6	30	5	Additional SLD series
43	172	30	7	0.6	100	6	30	5	Additional SLD series

Resultant Ice Shapes



Matrix # 2



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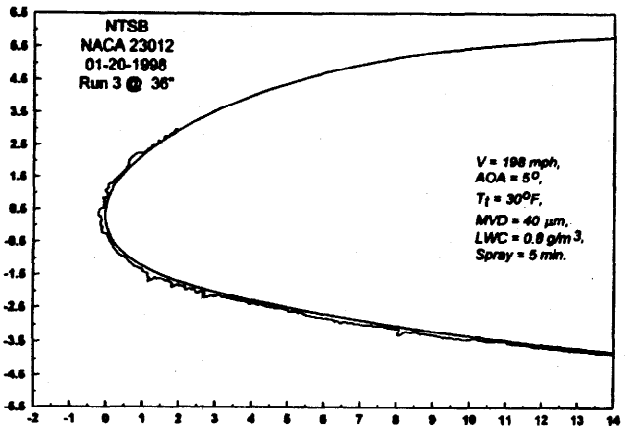
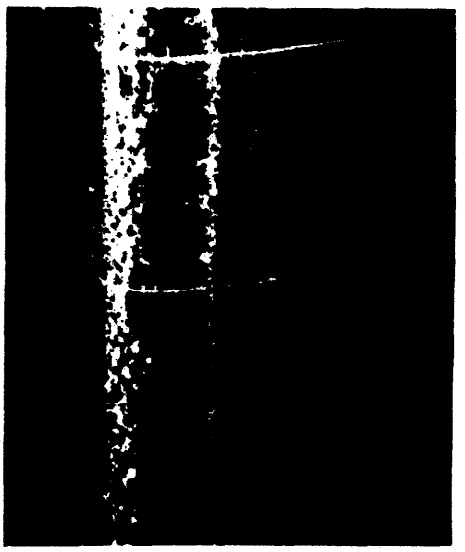
Resultant Ice Shapes



Matrix # 3



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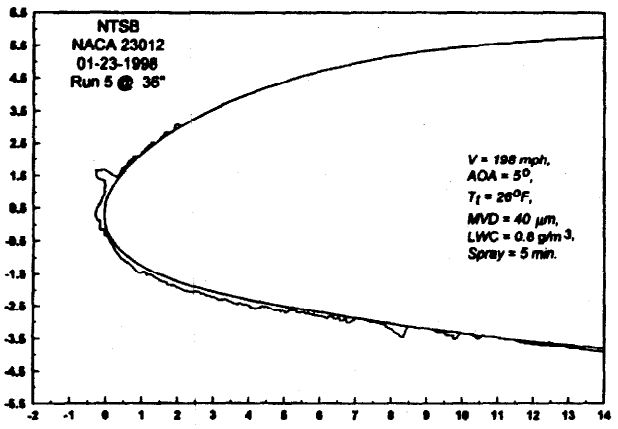
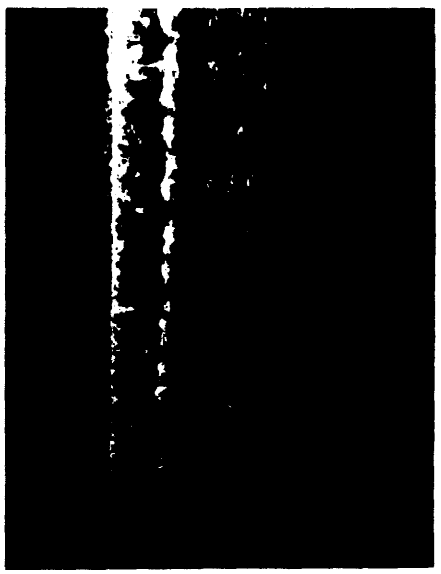
Resultant Ice Shapes



Matrix # 27, Mold Case



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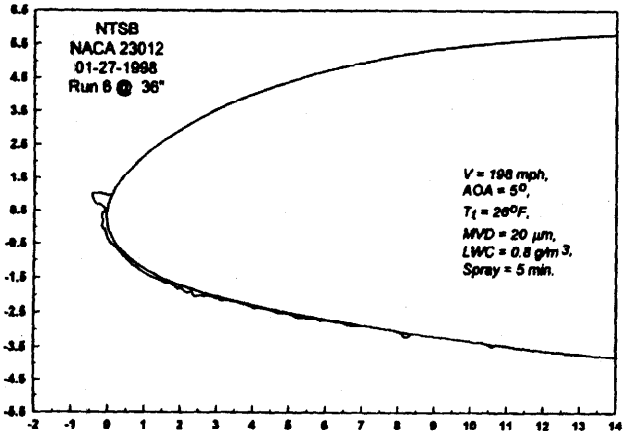
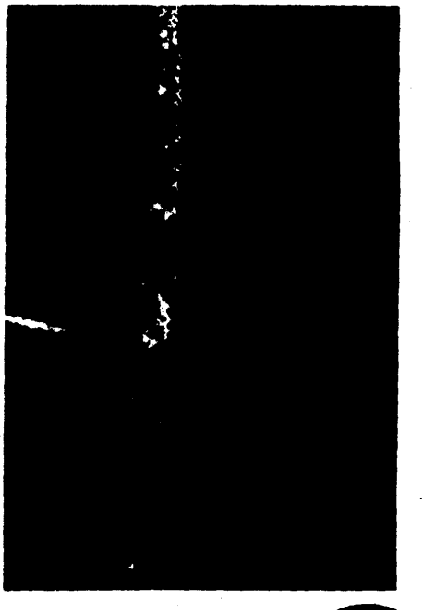
Resultant Ice Shapes



Matrix # 26



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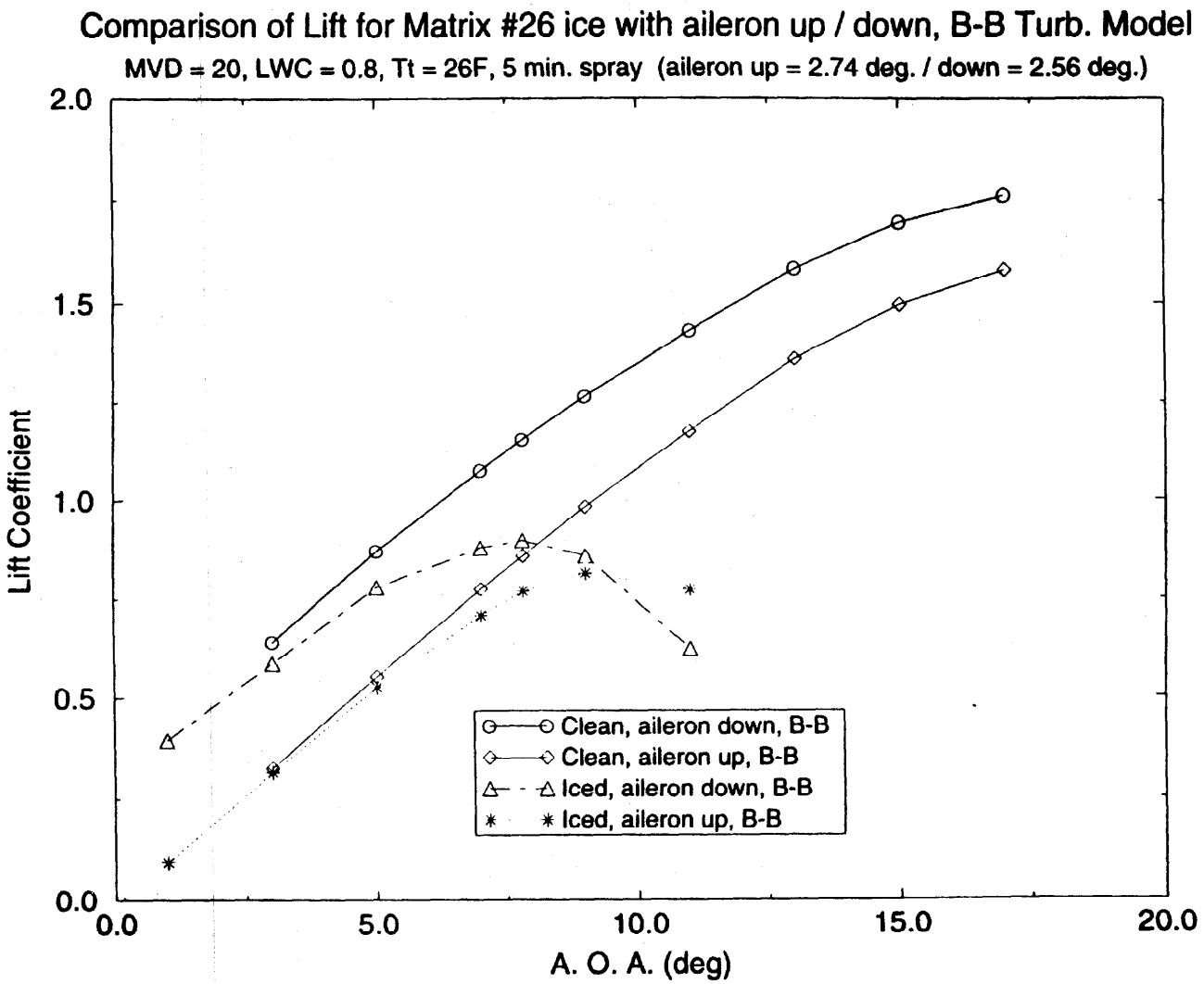
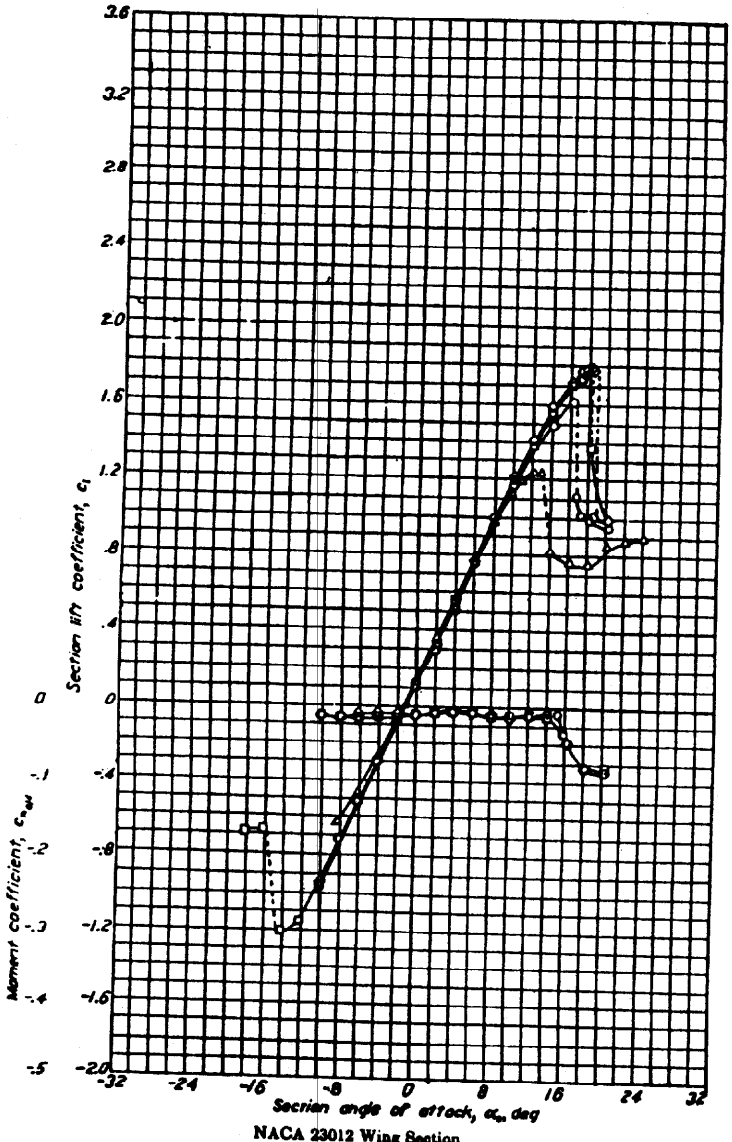
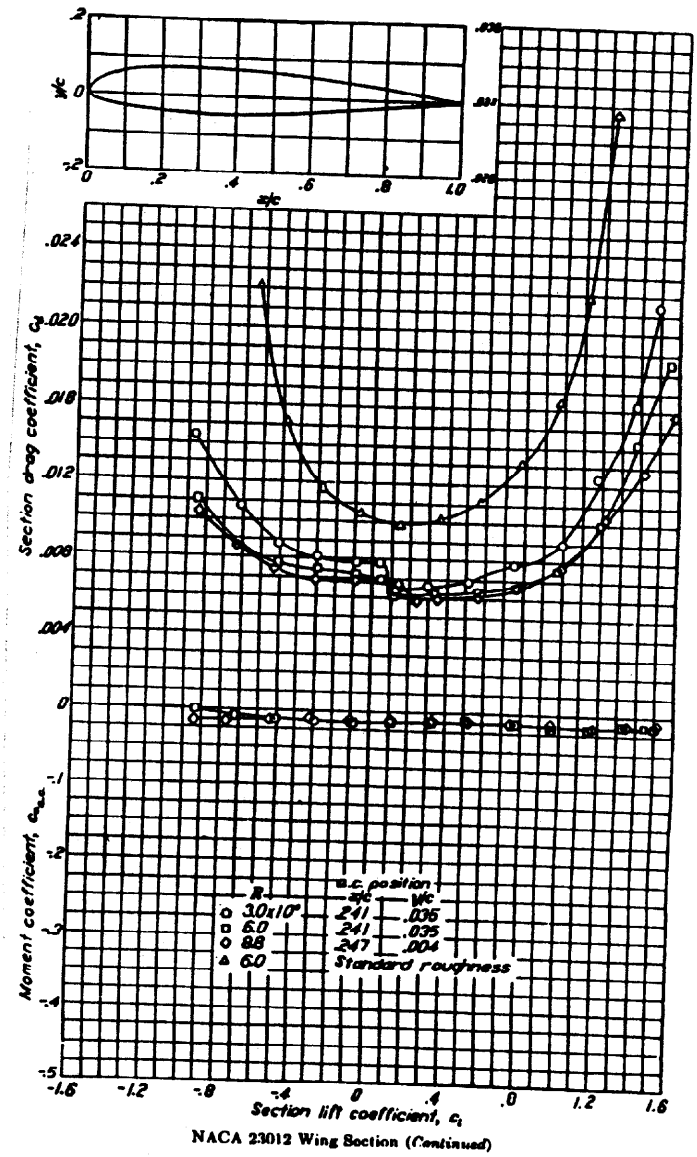
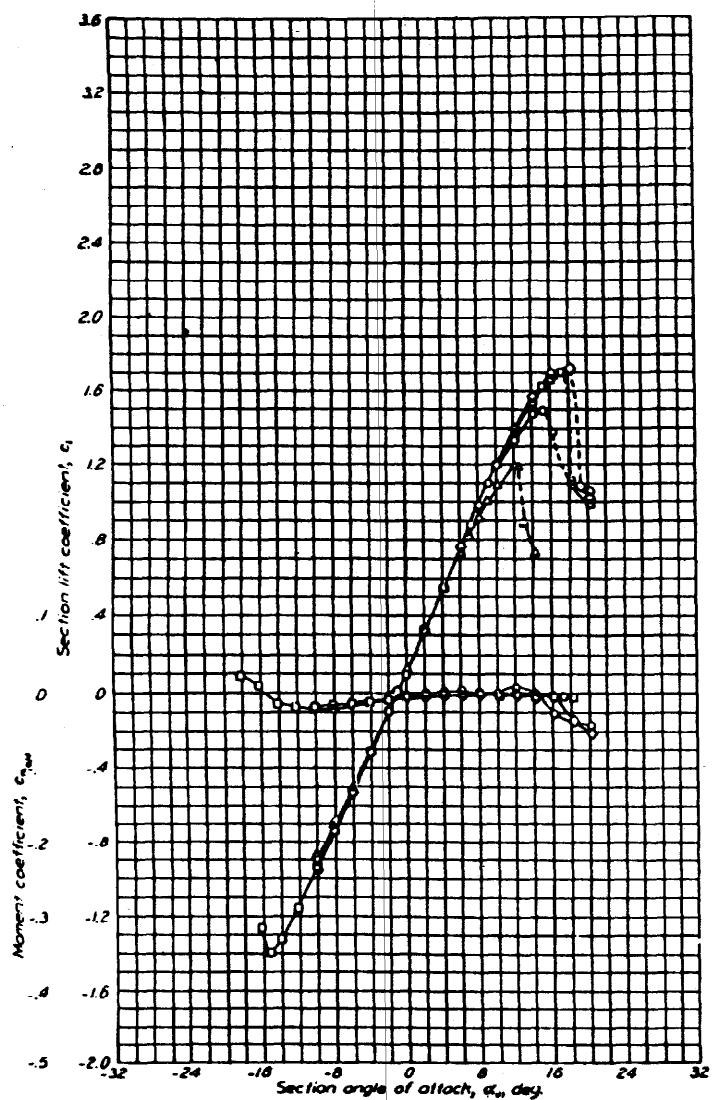

Comparison of Lift for Matrix #26 ice with aileron up / down, B-B Turb. Model
MVD = 20, LWC = 0.8, Tt = 26F, 5 min. spray (aileron up = 2.74 deg. / down = 2.56 deg.)
Lift Coefficient
2.0
1.5
1.0
0.5
0.0
0.0
5.0
10.0
15.0
20.0
A. O. A. (deg)
Clean, aileron down, B-B
Clean, aileron up, B-B
Iced, aileron down, B-B
Iced, aileron up, B-B



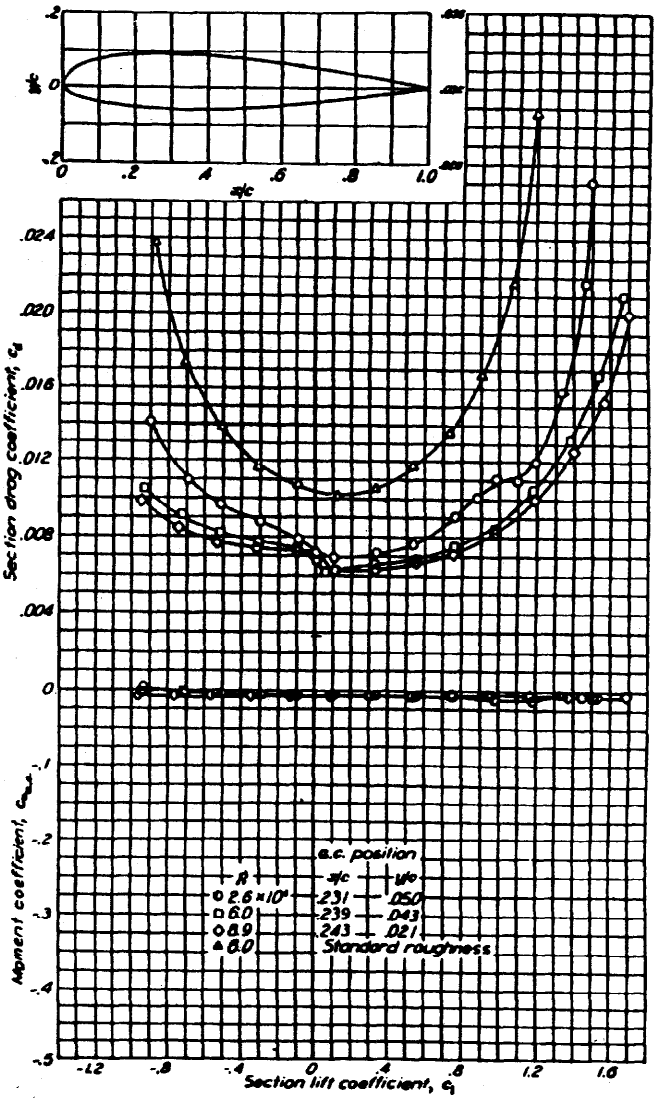
NACA 23012 Wing Section



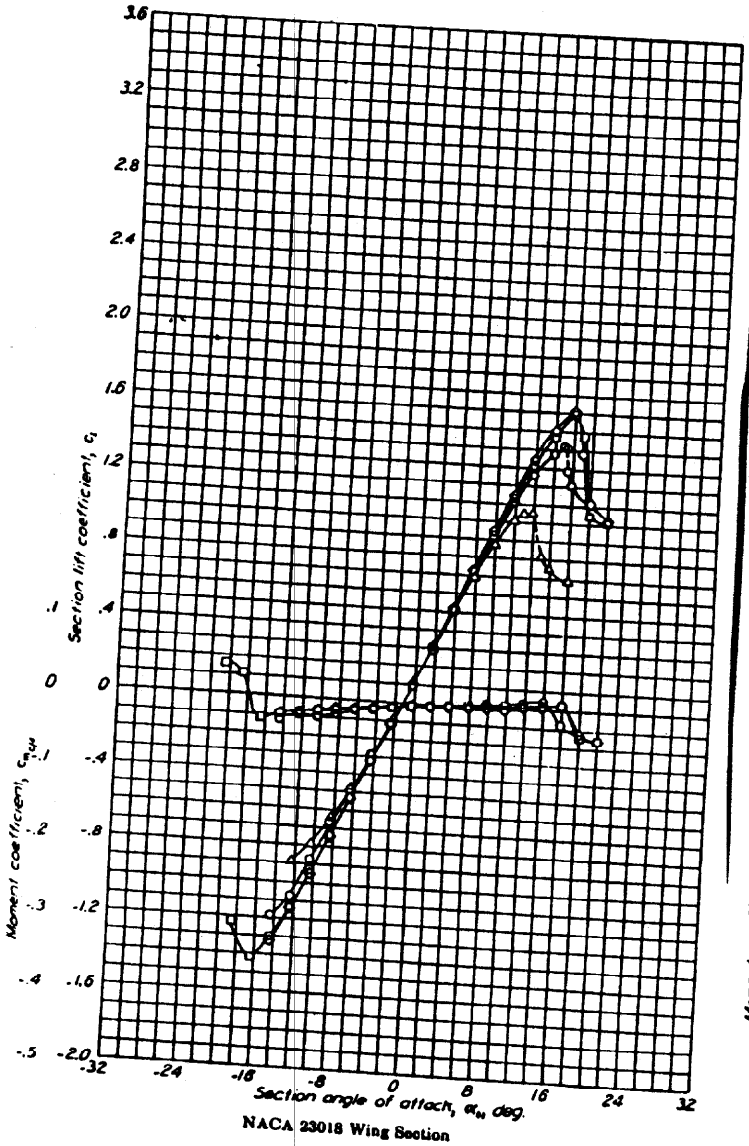
NACA 23012 Wing Section (Continued)



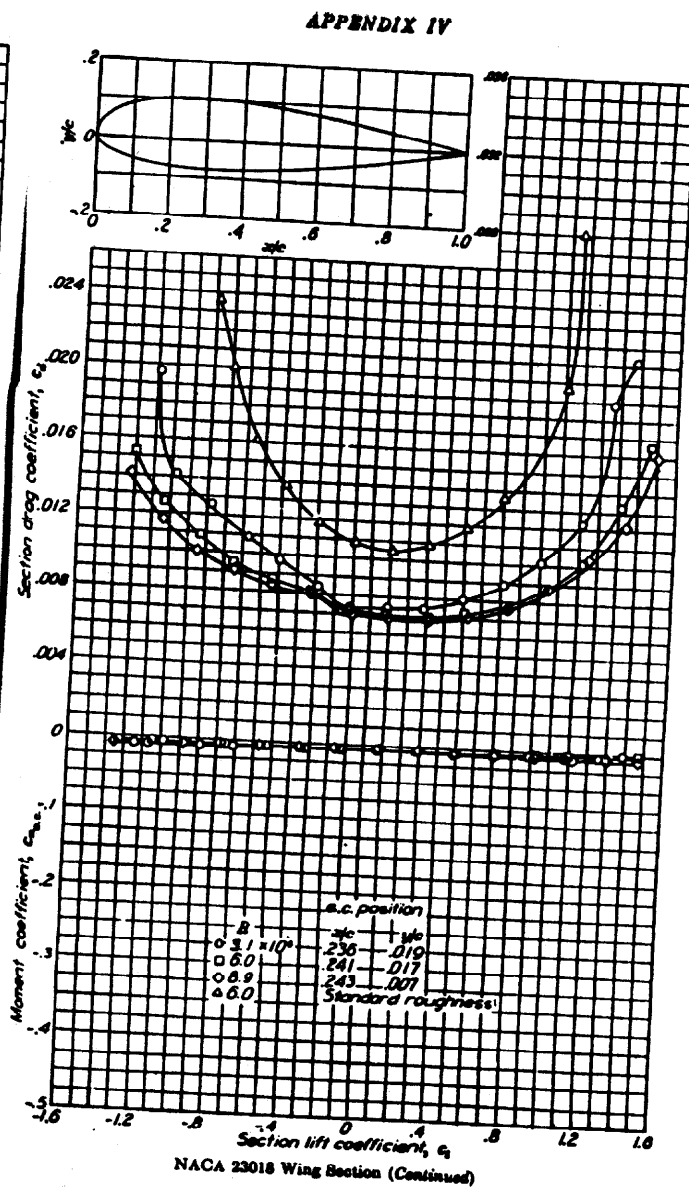
NACA 23015 Wing Section



NACA 23015 Wing Section (Continued)



NACA 23018 Wing Section



NACA 23018 Wing Section (Continued)

transition when located at 5 per cent of the chord with its axis normal to the surface[48] is shown in Fig. 74. These data were obtained at rather low

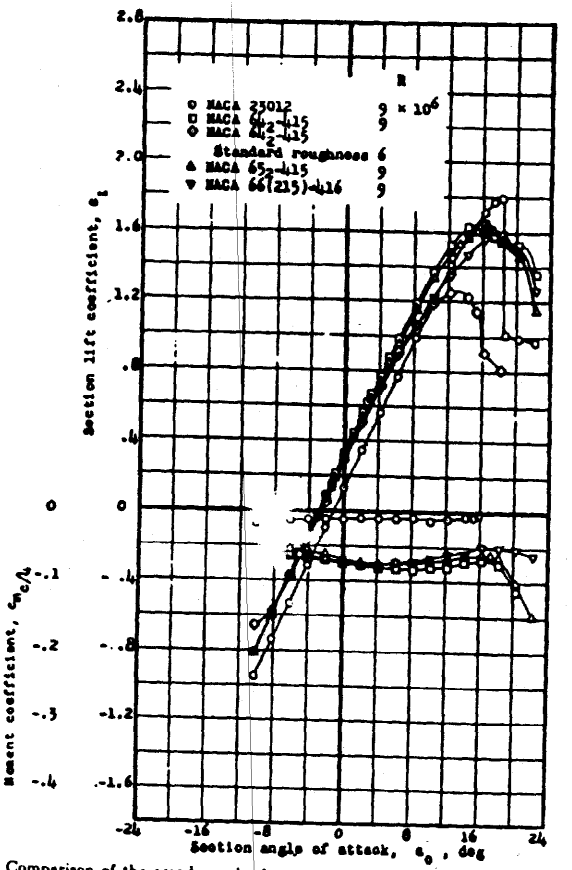


FIG. 73. Comparison of the aerodynamic characteristics of some NACA airfoils from tests in the Langley two-dimensional low-turbulence pressure tunnel.

values of the Reynolds number and show a large decrease of the allowable height with increase of Reynolds number.

Analysis[48] of these data showed that the height of the protuberance that caused transition depended on the shape of the protuberance and on the Reynolds number based on the height of the protuberance and the local velocity at the top of the protuberance. This Reynolds number is plotted against the fineness ratio of the protuberance in Fig. 75 for protuberances located at various chordwise positions on two wing sections.

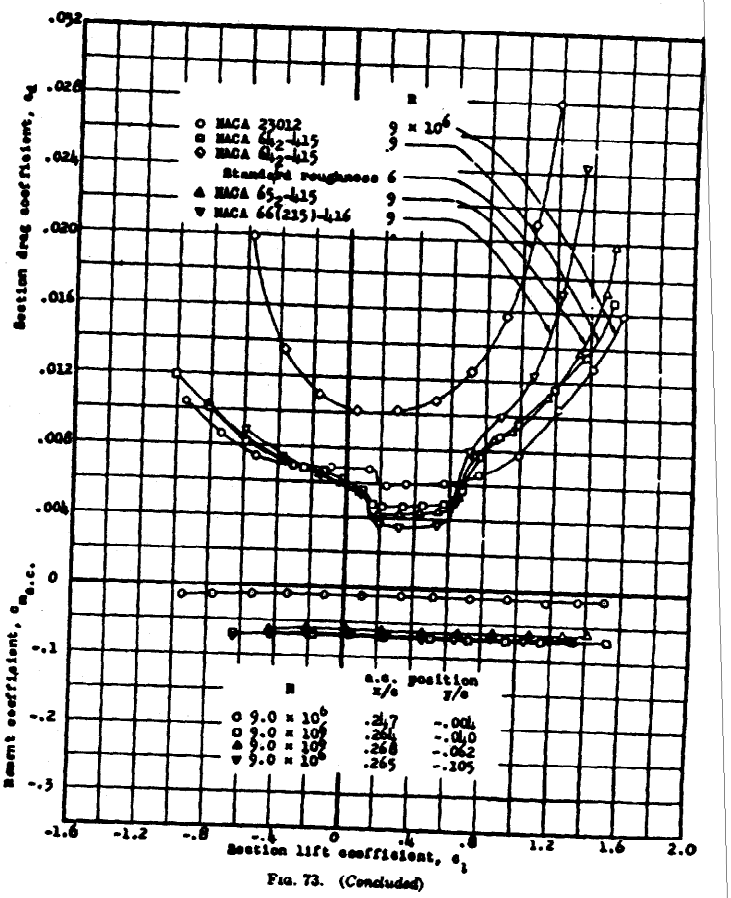
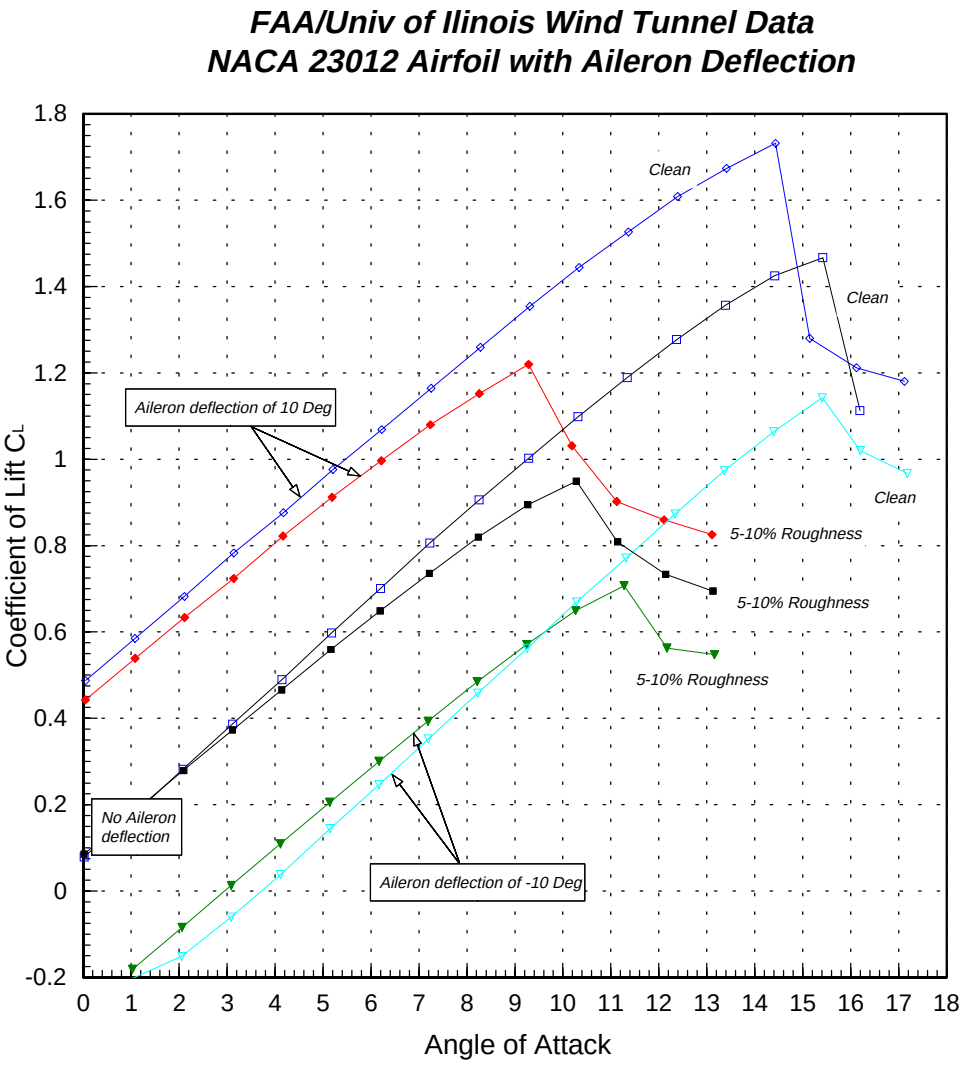


FIG. 73. (Concluded)

The effect of Reynolds number on permissible surface roughness[3] is also indicated in Fig. 76, in which a sharp increase of drag at a Reynolds number of approximately 20 million occurs for the model painted with camouflage lacquer. Experiments with models finished with camouflage paint[17] in-


FAA/Univ of Ilinois Wind Tunnel Data
NACA 23012 Airfoil with Aileron Deflection
Coefficient of Lift C_L
Angle of Attack
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Clean
Clean
Clean
Aileron deflection of 10 Deg
5-10% Roughness
5-10% Roughness
5-10% Roughness
No Aileron deflection
Aileron deflection of -10 Deg

FAA/Univ of Illinois Wind Tunnel Data
NACA 23012 Airfoil with Aileron Deflection
Aileron Hinge Moment Coefficient