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Low Speed Tunnel Measurements of the Ground Effect on a 1/5th Scale Model of the Swift

by

M. N. Wood, B.A. & W. J. G. Trebble, B.Sc.

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SUMMARY

Low speed tunnel tests have been made on a $^1/5$th scale model of the four-gun Swift to collect information on the effect of ground on swept-winged aircraft. Lift, drag and pitching moment have been measured with the model in free stream and also at two distances from a ground board, the nearer position of the mean quarter chord point being 0.42 mean chords from the board. Two tailplane positions and various flap configurations have been tested.

Existing theories on ground effect for unswept wings give good estimates of the decrease in induced drag but underestimate the gain in lift curve slope and overestimate the effect of the ground on the downwash at the tailplane. Slight modifications to the theories are suggested.

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1 Introduction

Although theoretical methods of estimating ground effect have never been very reliable, a good deal of information is available for aircraft with unswept wings, and it has been found that this can be applied reasonably well to delta-winged aircraft where again the trailing edge is unswept. With swept wings the position seemed less satisfactory, and tests have been made on a model of the four-gun version of the Supermarine Swift, both in free stream and near a ground board, to collect data on ground effect for comparison with flight tests and theoretical estimates. Some effort has been made to extend the scope of the results by using two tailplane heights and several flap configurations, and the results are compared with theoretical estimates of ground effect.

2 Details of Model and Tests

The model used for these tests was a 1/5th scale model of the Swift with four-gun wing[1]; the undercarriage was not represented. The main dimensions are given in Table I and the general arrangement is illustrated in Fig. 1. Tests were made with the actual aircraft flaps, which are of irregular shape, and also with alternative 50° split flaps, which were suitable for joining with a fuselage flap and extending as full span flaps. (Figs. 2 and 4). These consisted of an unswept body flap B_1, constant chord trailing edge flaps B_2 over the inner wing, and 30% chord trailing edge flaps B_3 over the outer wing. The gaps between adjacent flaps were sealed.

Tests were made without tailplane and with the two tailplane positions illustrated in Fig. 3. The upper tailplane was the same as that used in the tests of Ref. 1, and represented the position on the aircraft. The lower tailplane position was obtained by inverting the rear fuselage of the model, giving an anhedral of 10°.

Transition was free on the aerofoil surfaces, but was fixed on the fuselage at 10% of its length and on the cabin and intake lips. The ground (Fig. 5) was represented by a wooden board two inches thick spanning the tunnel. It had a length of thirteen feet, two feet of which formed a chamferred nose, the chamfer being on the side of the ground nearer the model. A note on the problems involved in the use of a ground board and in calibrating the tunnel is given in the Appendix.

The tests were made between August and November 1954, in the No. 1 $11\frac{1}{2}$ ft tunnel at the R.A.E. The tunnel speed was 120 ft/sec, giving a Reynolds Number based on wing mean chord of 1.5×10^6. Measurements were made both with and without the ground board in the tunnel. For the former, the model pivot point on the 1/5th scale model (see Table I) was 8.7 ins. or 10.6 inches from the ground. At zero incidence this gave heights H for the mean quarter chord point of 0.42 and 0.50 mean chords. The model pivot point is not the same as on the aircraft (wheel axles) and the smaller height was chosen so that at about $\alpha = 3^\circ$ the model represents the position of the aircraft with the nosewheel just touching the ground; the greater height is approximately that for the aircraft with main wheels and rear fuselage touching the ground.

Measurements were made of the lift, drag and pitching moments for the following model configurations.

/Table

Flaps	Tailplane	Ground Height	Fences
0 Swift flaps 35° Swift flaps 50°	No Tailplane Upper Tailplane Lower Tailplane	No Ground $H/\bar{c}$ = 0.50 $H/\bar{c}$ = 0.42	With and without fences.
B_2, $B_1 + B_2$ $B_2 + B_3$, $B_1 + B_2 + B_3$	No Tailplane	No Ground $H/\bar{c}$ = 0.42	No fences.
$B_1 + B_2 + B_3$	Upper Tailplane		

where η_T for both upper and lower tailplane was -2.25° and usually two elevator settings were tested. Tests were made both with and without 5.3% chord fences fitted at 66% semispan (Fig. 2).

An extensive tunnel calibration was required to estimate the velocity on the lower side of the ground board (see Appendix). The new wake blockage correction of Maskell[2] was applied to the results. For the ground tests, the tunnel cross sectional area was taken as the area of the lower part of the tunnel.

3 Results and Discussion

3.1 Model Without Tailplane

3.1.1 Lift (Figs. 6-8)

Before looking at the ground effect, the efficiencies of the various 50° flaps are compared in the following table (see also Figs. 2, 4). The lift increments are given both as ΔC_L based on wing area and $\Delta C_L'$ based on flap area, at incidences which give values of 0.6 and 0.8 for C_L with flaps down.

	Swift 50°	B_2	$B_2 + B_3$	$B_1 + B_2$	$B_1 + B_2 + B_3$
ΔC_L (C_L = 0.6	0.275	0.32	0.49	0.35	0.54
ΔC_L (C_L = 0.8	0.275	0.32	0.48	0.36	0.54
$\Delta C_L'$ (C_L = 0.6	2.9	3.5	2.6	2.85	2.45
$\Delta C_L'$ (C_L = 0.8	2.9	3.5	2.55	2.95	2.45

The efficiency of the body flap is low, especially when used with the inner flaps only, and the outer flaps B_3 are less efficient than the inner ones B_2. This latter effect is more marked than is forecast by the method of Ref. 3, but agrees with results on 42° and 45° swept wings given in Refs. 4 and 5.

The ground causes increases in lift and lift curve slope. With flaps up or with Swift flaps deflected, the ground ($H/\bar{c}$ = 0.42) causes an increase of 30% to 35% in the slope of the linear part of the lift curve. The increments in C_L caused by the ground ($H/\bar{c}$ = 0.42) are given in the following table for incidences corresponding to C_L = 0.6 and 0.8 in free stream.

	Flaps 0	Swift 35°	Swift 50°	B_2	$B_2 + B_3$	$B_1 + B_2$	$B_1 + B_2 + B_3$
C_L = 0.6	0.13	0.16	0.17	0.18	0.12	0.21	0.14
C_L = 0.8	-	0.13	0.14	0.14	0.13	0.17	0.15

The value for flaps $B_1 + B_2$ seems high; on the other hand, the lift for these flaps in free stream seems low.

3.1.2 Drag

The ground produces a marked decrease in the total drag (Figs. 9 and 10). This agrees with theory in which the images of the trailing vortices in the ground cause a reduction in induced drag.

3.1.3 Pitching Moment

The ground has little effect on the pitching moment of the model without tailplane (Figs. 11-17) over the first 10° of incidence, and the fences increase the incidence at which the effect of the ground becomes appreciable. The main effect of the ground is to cause a decrease of the stalling angle.

3.2 Model With Tailplane (Tables III, IV, VII-XIV, Figs. 11-19)

The trimmed lifts are given in Tables XIII and XIV together with the mean angle of downwash at the tailplane, the elevator power and the elevator angle to trim. The table below gives the longitudinal static stability margin and elevator angle to trim at a few values of trimmed lift, for the model with fences and with the tailplane in the normal Swift position.

$C_{L_{Trim}}$	Longitudinal Static Stability Margin			η^o to trim, $\eta_T = -2.25^o$		
	$H/\bar{c} = \infty$	$H/\bar{c} = 0.50$	$H/\bar{c} = 0.42$	$H/\bar{c} = \infty$	$H/\bar{c} = 0.50$	$H/\bar{c} = 0.42$
			Flaps 0°			
0.4	0.06c̄	0.10c̄	0.10c̄	-0.4	-0.1	0
0.6	0.065c̄	0.125c̄	0.13c̄	-2.3	-3.6	-3.3
0.8	0.045c̄	0.145c̄	0.115c̄	-3.0	-7.4	-6.4
			Flaps 35°			
0.6	0.07c̄	0.13c̄	0.13c̄	-1.9	-4.0	-3.6
0.8	0.04c̄	0.12c̄	0.15c̄	-4.0	-7.7	-8.0
0.9	-0.02c̄	0.10c̄	0.155c̄	-3.7	-9.2	-11.0
			Flaps 50°			
0.6	0.08c̄	0.13c̄	0.14c̄	-1.5	-2.5	-2.4
0.8	0.05c̄	0.135c̄	0.13c̄	-3.7	-6.2	-6.0
0.9	0	0.13c̄	0.11c̄	-4.0	-8.5	-7.6
0.95	-0.11c̄	0.13c̄	0.10c̄	-3.7	-9.8	-8.6

Downwash (Figs. 18, 19) has been calculated from the measured pitching moments. It has been assumed that the radio of elevator to tailplane power is independent of the height of the tailplane above the ground, and the ratio 0.605 from Ref. 1 has been used. It has also been assumed that the variation of tailplane lift with elevator angle is linear over the elevator angles considered.

The lower tailplane results are of doubtful accuracy since the tailplane tips enter the boundary layer of the board at the highest incidences tested.

4 Estimates of Ground Effect

4.1 Lift

An estimate of the effect of ground on lift slope was made by the image method of Tani[6], assuming the vortex system to lie in a plane of height H, the height of the mean quarter chord point. Sweep and taper were ignored and the height $H = 0.42\bar{c}$ was used in the present calculations. The height of the trailing edge of a swept wing varies considerably with incidence and spanwise position and it seemed that a better choice for the height of the trailing vortices might be the height H' of the trailing edge at the effective span of the wing. A free stream loading curve gave the effective span to be about 85% of the true span and a second estimate was made assuming the trailing vortices to lie at a height H'. The height $\frac{H + H'}{2}$ was thus used for the trailing vortex term in the calculations since the bound vorticity was still assumed to be at a height H above the ground. A third estimate used H' as the height for the trailing vortex term.

The results of the calculations are compared in the following table:-

Comparison of calculated and measured incidences. $0.42\bar{c}$ above the ground.

Flaps 0°

C_L	0	0.2	0.4	0.6	0.8
Measured in free stream	0.2	3.9	7.7	11.5	16.3
Measured near ground board	0.5	3.4	6.2	9.2	12.8
Estimate using H for trailing vortex term	0.62	3.58	6.74	10.02	14.41
Estimate using $\frac{H + H'}{2}$ for trailing vortex term	0.62	3.56	6.66	9.81	14.0
Estimate using H' for trailing vortex term	0.62	3.54	6.57	9.57	13.54

The best estimate is that using H' which yields over 90% of the measured increase in lift slope.

4.2 Drag

The reduction in C_D caused by the ground was estimated using Ref. 6, but taking the trailing vortex effects for a height H'. Agreement is quite good at incidences below the stall, especially for flaps 0°, the case for which the theory was designed.

Comparison between calculated and estimated values of ΔC_D caused by the ground ($H/\bar{c}$ = 0.42)

$\alpha°$	Flaps 0°			Flaps 35°			Flaps 50°		
	C_L No Ground	ΔC_D Estimate	ΔC_D Meas.	C_L No Ground	ΔC_D Estimate	ΔC_D Meas.	C_L No Ground	ΔC_D Estimate	ΔC_D Meas.
0	-0.01	0	-0.001	0.21	0.002	0.002	0.28	0.003	0.002
4	0.20	0.002	0.003	0.42	0.008	0.013	0.48	0.011	0.012
8	0.41	0.009	0.009	0.64	0.020	0.028	0.70	0.025	0.029
12	0.63	0.023	0.022	0.84	0.041	0.038	0.89	0.045	0.042

4.3 Pitching Moment

The major effect of ground on pitching moment is the reduction in downwash at the tailplane, (Figs. 18, 19) and this was estimated, for $H/\bar{c} = 0.42$, by the method of Ref. 7. In this method the bound and trailing vorticity is replaced by a simple horseshoe vortex at the height at which the trailing vortices are assumed to be shed. (The height H' was used.) The span of the horseshoe is b_1, the effective span of the wing and flaps as defined in Ref. 8, and, in order to simplify the formula, the tailplane is assumed to be a distance $\frac{b_1}{2}$ downstream of the bound vortex. The ground is represented by an image system, and the ratio of the downwash from the image horseshoe to that from the real horseshoe is

$$K \times \frac{b_1^2 + 4(H' - h)^2}{b_1^2 + 4(H' + h)^2}$$

where h is the height of the tailplane above the ground and

$$K = \frac{1 + \dfrac{b_1}{\sqrt{\frac{1}{2}b_1^2 + (H' + h)^2}}}{1 + \dfrac{b_1}{\sqrt{\frac{1}{2}b_1^2 + (H' - h)^2}}}$$

K is assumed to be unity and the downwash near the ground is a fraction

$$\left(1 - \frac{b_1^2 + 4(H' - h)^2}{b_1^2 + 4(H' + h)^2}\right)$$

of the value in free stream.

This method overestimates the effect of the ground in the present case (Table XV) and there are two possible contributing factors. Firstly, the assumption K = 1 seems no longer to be justified; with the values of H', h and b_1 as used in the Swift estimates K can be as low as 0.82. Secondly, it is no longer justified to ignore the increase of lift near the ground. At a particular incidence, the ground increases the circulation round the wing and the strength of the equivalent horseshoe vortex. Consequently the free-stream downwash angle should be increased in proportion to the increase in lift slope before the factor

$$\left(1 - K\frac{b_1^2 + 4(H' - h)^2}{b_1^2 + 4(H' + h)^2}\right)$$

is used to estimate the downwash near the ground.

A second estimate was made, including the variation of K and taking account of the 30% increase in lift slope for $H/\bar{c} = 0.42$. This method gave better agreement with tunnel results (Table XV).

5 Conclusions

There is an increase in lift and lift curve slope when the model is brought near to the ground. With flaps up, or with Swift flaps deflected, there is a gain in lift slope of between 30% and 35% when the mean quarter chord point is 0.42 mean chords above the ground. The model drag is considerably reduced at high incidence near the ground due to the fall in induced drag.

Estimates have been made of the ground effect on lift and drag for $H/\bar{c} = 0.42$. The estimates of ΔC_D are good up to the stall, and the estimate of the increase in lift slope is correct to within 10%.

There is an appreciable change of trim near the ground caused by the reduction in downwash. A theoretical method gives fairly good estimates of downwash at the tailplane for $H/\bar{c} = 0.42$.

Fences at 66% semispan delay the start of the stall and of the instability in the pitching moment curves.

LIST OF SYMBOLS

H Height above the ground of the mean quarter chord point of the wing.

H' Height above the ground of the wing trailing edge at the effective semispan.

h Height above the ground of the mean quarter chord point of the tailplane.

b_1 The effective span of the wing and flaps[8].

K $$\frac{1 + \dfrac{b_1}{\sqrt{\frac{1}{2}b_1^2 + (H' + h)^2}}}{1 + \dfrac{b_1}{\sqrt{\frac{1}{2}b_1^2 + (H' - h)^2}}}$$

REFERENCES

No.	Author	Title, etc.
1	D.A. Kirby, W.J.G. Trebble, A.P. Cox	Low Speed Tunnel Tests on a 1/5th scale model of a single-jet sweptback fighter with side intakes. (Supermarine F105P). A.R.C. 15183. June, 1952.
2	E.C. Maskell	A theory of Wind Tunnel Blockage Effects on Stalled Flows. (Not yet issued)
3	A.D. Young and P.A. Hufton	Note on the lift and profile drag effects of split and slotted flaps R. & M. 2545. September, 1941.
4	G.L. Pratt and T.V. Bollech	The effect of span and deflection of split flaps and leading edge roughness on the longitudinal stability and gliding characteristics of a 42° sweptback wing equipped with leading edge flaps. NACA/TIB/2130. June 1949. NACA RM L9E02
5	H.S. Johnson and J.R. Hagerman	Wind-Tunnel Investigation at low speeds of a 45° sweptback untapered semispan wing of aspect ratio 1.59 equipped with various 25% chord plain flaps. NACA T.N. 2169. August 1950.
6	I. Tani, Kogakusi, M. Taima and S. Simidu	The effect of ground on the aerodynamic characteristics of a monoplane wing. A.R.C. 3376. February 1938.
7	R.W. Piper and H. Davies	Note on the factors affecting trim at take-off and landing. Unpublished M.O.S. Report. October, 1941
8	H.M. Lyon and J.E. Adamson	Effect of ground interference on trim of a low wing monoplane. R. & M. 1861. October 1938.

APPENDIX

Difficulties in the Use of a Ground Board

The main difficulty experienced in making these tests lay in the fact that the No. 1 $11\frac{1}{2}$ ft tunnel has a very restricted settling length. The flow, though reasonably unifrom by the normal mounting position for a model, is still non-uniform, with lower velocity in the centre of the tunnel, at the beginning of the parallel section 6 ft ahead of the balance centre line (Fig. 5). Since the ground board was 15% of the tunnel height above the centre line, this introduced difficulties in estimating the speed in the lower half of the tunnel.

The drag on the model caused a redistribution of mass flow between the two sections of the tunnel. The "ground" leading edge was only 5 ft downstream of the measuring holes for velocity determination and these were affected by the flow redistribution. As a result, extensive measurements had to be made to obtain the mean velocity in the nozzle. The mean velocity in the upper part of the tunnel was estimated from a velocity traverse on the tunnel and balance centre line. It was found that the difference in the mean velocities across the two sections of the tunnel was linearly related to the drag on the model.

The flow redistribution effectively causes a circulation around the ground board, and it would possibly be better to use a rounded leading edge instead of the straight chamfer as used in the present tests. The rounded leading edge would be less likely to cause a thickening or separation of the boundary layer on the ground board.

The principal effects of the flow redistribution caused by the presence of the ground board should be reduced in future by having a longer tunnel settling length and a smaller model than used in the present tests.

TABLE I

Relevant Dimensions of Swift (4-gun wing)

		1/5 Scale		Full Scale
Wing				
Gross Area (Projected)	S	12.82 sq ft		320.5 sq ft
Span	b	6.47 ft		32.35 ft
Standard mean chord	$\bar{c} = S/b$	1.98 ft		9.90 ft
Aspect Ratio	$A = b/\bar{c}$		3.27	
Dihedral			2°	
Wing-body angle			2.5°	
Sweepback of quarter chord line:-				
Inboard of crank			45°	
Outboard of crank			40°	
Distance of crank from centre-line		1.67 ft		8.33 ft
Tailplane				
Gross area (Projected)	S_T	2.49 sq ft		62.15 sq ft
Span	b_T	2.58 ft		12.90 ft
Mean chord	$\bar{c}_T = S_T/b_T$	0.96 ft		4.82 ft
Aspect Ratio			2.69	
Tailplane Setting (to wing chord)			-2.25°	
Tailplane arm (C.G. to mean quarter chord point)	ℓ_T	3.16 ft		15.80 ft
Tailplane volume coefficient	$\bar{V} = \dfrac{S_T\, l_T}{S\, \bar{c}}$	0.339		0.414
High Tailplane				
Height of pivot point, on fuselage ℄, above fuselage datum		0.117 ft		0.583 ft
Dihedral			10°	
Low Tailplane				
Height of pivot point, on fuselage ℄, above fuselage datum		-0.117 ft		-0.583 ft
Dihedral			-10°	
C.G. Position				
Aft of leading edge of standard mean chord			$0.37\bar{c}$	
Aft of nose		4.06 ft		20.29 ft
Below fuselage datum		0.08 ft		0.38 ft
Pivot point of model (fore and aft position relative to fuselage datum same as that of C.G.).				
Distance below C.G.		0.26 ft		1.325 ft
Distance below fuselage datum		0.341 ft		1.705 ft
Height above ground board		(0.72 ft (0.88 ft		3.61 ft 4.42 ft
Mean quarter chord point				
Aft of wing apex		2.098 ft		10.49 ft
Height of mean quarter chord point above ground board at $\alpha = 0^\circ$			$H =$ (0.42$\bar{c}$ (0.50$\bar{c}$	

TABLE II

4-Gun Swift
Lift, drag and pitching moment of the model without tailplane, Swift flaps, no ground

No fences				With 5.3% chord fences at 66% semispan			
$\alpha°$	C_L	C_D	C_m	$\alpha°$	C_L	C_D	C_m
			Flaps 0°				
0	-0.008	0.0151	-0.0142	0	-0.011	0.0151	-0.0136
4.05	0.206	0.0206	-0.0023	4.05	0.206	0.0203	-0.0018
8.0	0.415	0.0376	0.0088	8.0	0.418	0.0382	0.0089
12.0	0.625	0.0765	0.0144	12.0	0.628	0.0773	0.0138
13.55	0.709	0.0990	0.0182	13.5	0.709	0.1010	0.0140
15.55	0.782	0.1436	0.0276	15.55	0.777	0.1481	0.0098
17.6	0.811	0.2043	0.0370	17.6	0.835	0.2073	0.0057
19.95	0.829	0.2590	0.0448	20.0	0.878	0.2701	0.0051
21.65	0.848	0.2967	0.0498	21.65	0.877	0.3062	0.0287
23.95	0.860	0.3512	0.0464	23.95	0.844	0.3488	0.0504
			Flaps 35°				
				- 3.75	0.007	0.0516	-0.0647
				0.2	0.216	0.0542	-0.0554
				4.25	0.431	0.0698	-0.0471
8.25	0.662	0.1004	-0.0444	8.25	0.653	0.1005	-0.0431
12.2	0.857	0.1537	-0.0375	12.2	0.855	0.1533	-0.0373
13.7	0.890	0.1930	-0.0279	13.7	0.909	0.1903	-0.0355
15.7	0.900	0.2466	-0.0145	15.7	0.974	0.2423	-0.0378
17.7	0.903	0.2929	-0.0007	17.75	0.989	0.2992	-0.0302
20.05	0.906	0.3452	0.0083	20.0	0.960	0.3495	-0.0302
21.75	0.905	0.3797	0.0091	21.75	0.942	0.3846	-0.0104
24.0	0.889	0.4235	0.0092	24.0	0.890	0.4206	-0.0062
			Flaps 50°				
				- 3.65	0.086	0.0794	-0.0737
				0.25	0.290	0.0826	-0.0654
				4.3	0.492	0.0989	-0.0568
8.3	0.712	0.1296	-0.0550	8.3	0.714	0.1315	-0.0527
12.25	0.889	0.1873	-0.0418	12.25	0.900	0.1873	-0.0466
13.7	0.904	0.2293	-0.0295	13.75	0.949	0.2225	-0.0437
15.7	0.916	0.2728	-0.0168	15.75	0.997	0.2718	-0.0400
17.7	0.903	0.3198	-0.0025	17.8	0.987	0.3262	-0.0364
20.05	0.894	0.3684	+0.0071	20.0	0.934	0.3708	-0.0158
21.7	0.893	0.4050	0.0112	21.7	0.905	0.4031	-0.0073
24.0	0.858	0.4393	0.0125	24.0	0.863	0.4359	-0.0264

TABLE III

Lift, drag and pitching moment of the model with upper tailplane, Swift flaps, no ground

(a) No fences

α°	$\eta_T = -2.25^\circ,\ \eta = 0.6^\circ$			$\eta_T = -2.25^\circ,\ \eta = -4.0^\circ$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
12.0	0.665	0.0833	-0.0250	0.632	0.0786	0.0102
13.55	0.748	0.1070	-0.0280			
15.55	0.820	0.1460	-0.0187	0.792	0.1503	0.0135
17.6	0.844	0.2137	-0.0038			
19.95	0.854	0.2679	0.0189	0.832	0.2627	0.0496
21.65	0.874	0.3045	0.0255			
23.95	0.890	0.3612	0.0164	0.871	0.3566	0.0404
			Flaps 35°			
0.2	0.171	0.0543	0.0109	0.143	0.0559	0.0455
8.25	0.666	0.0998	-0.0234	0.619	0.0983	0.0117
12.2	0.862	0.1553	-0.0336	0.840	0.1542	0.0011
13.7	0.896	0.1958	-0.0257			
15.7	0.899	0.2484	-0.0035	0.875	0.2431	0.0300
17.7	0.898	0.3020	0.0186	0.879		0.0507
20.05	0.897	0.3395	0.0386	0.883	0.3356	0.0638
21.7	0.897	0.3712	0.0444			
24.0	0.882	0.4226	0.0263	0.877	0.4147	0.0401
			Flaps 50°			
0.25	0.245	0.0834	0.0119	0.204	0.0845	0.0469
12.25	0.895	0.1895	-0.0332	0.863	0.1845	0.0014
13.7	0.902	0.2316	-0.0185			
15.7	0.887	0.2775	0.0008	0.883	0.2729	0.0339
17.7	0.897	0.3247	0.0223	0.872	0.3146	0.0573
20.05	0.883	0.3656	0.0407	0.862	0.3583	0.0608
21.7	0.869	0.3967	0.0415			
24.0	0.846	0.4373	0.0271	0.848	0.4359	0.0410

TABLE III (Contd)

Lift, drag and pitching moment of the model with upper tailplane, Swift flaps, no ground

(b) With 5.3% chord fences at 66% semispan

α^o	$\eta_T = -2.25^o$, $\eta = 0.6^o$			$\eta_T = -2.25^o$, $\eta = -4.0^o$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0	-0.026	0.0170	0.0174	-0.057	0.0186	0.0532
4.05	0.205	0.0223	0.0041	0.178	0.0225	0.0387
8.0	0.430	0.0408	-0.0085	0.403	0.0397	0.0266
12.0	0.662	0.0834	-0.0248	0.640	0.0811	0.0106
13.5	0.744	0.1084	-0.0281	0.717	0.1060	0.0096
-15.55	0.826	0.1564	-0.0291	0.804	0.1566	0.0074
17.6	0.887	0.2157	-0.0297	0.869	0.2089	0.0018
20.0	0.917	0.2773	-0.0277	0.899	0.2720	-0.0001
21.65	0.900	0.3113	0.0043	0.879	0.3038	0.0300
23.95	0.872	0.3559	0.0233	0.860	0.3525	0.0473
			Flaps 35°			
- 3.75	-0.054	0.0547	0.0285	-0.091	0.0577	0.0642
0.2	0.169	0.0547	0.0109	0.132	0.0559	0.0483
4.25	0.416	0.0693	-0.0045	0.375	0.0699	0.0302
8.25	0.646	0.1009	-0.0210	0.618	0.0984	0.0128
12.2	0.863	0.1556	-0.0346	0.836	0.1522	0.0008
13.7	0.926	0.1938	-0.0329	0.894	0.1879	0.0020
15.7	0.977	0.2428	-0.0303	0.954	0.2381	0.0025
17.75	0.985	0.2927	-0.0184	0.959	0.2893	0.0067
20.0	0.955	0.3461	-0.0050	0.927	0.3420	0.0133
21.75	0.915	0.3771	+0.0161	0.896	0.3718	0.0334
24.0	0.893	0.4213	-0.0002	0.870	0.4232	0.0207
			Flaps 50°			
- 3.65	0.006	0.0840	0.0354	-0.021	0.0869	0.0705
0.25	0.239	0.0839	0.0138	0.205	0.0856	0.0487
4.3	0.463	0.0993	-0.0037	0.439	0.0987	0.0303
8.3	0.688	0.1311	-0.0216	0.668	0.1294	0.0116
12.25	0.895	0.1887	-0.0344	0.878	0.1868	-0.0003
13.75	0.948	0.2253	-0.0322	0.923	0.2236	0.0003
15.75	0.994	0.2737	-0.0268	0.977	0.2701	0.0067
17.8	0.977	0.3052	-0.0132	0.960	0.3111	0.0118
20.0	0.937	0.3701	-0.0069	0.923	0.3680	0.0094
21.7	0.889	0.3986	0.0166	0.881	0.3959	0.0328
24.0	0.854	0.4344	0.0016	0.847	0.4359	0.0195

TABLE IV

Lift, drag and pitching moment of the model with lower tailplane, Swift flaps, no ground

(a) No fences

α°	$\eta_T = -2.25^\circ,\ \eta = -1.2^\circ$			$\eta_T = -2.25^\circ,\ \eta = -6.3^\circ$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0	-0.032	0.0162	0.0140	-0.060	0.0177	0.0529
8.0	0.423	0.0399	-0.0039	0.398	0.0377	0.0341
12.0	0.655	0.0827	-0.0155	0.631	0.0782	0.0218
13.55	0.741	0.1086	-0.0207			
15.55	0.820	0.1514	-0.0223	0.798	0.1511	0.0140
17.6	0.857	0.2152	-0.0316			
19.95	0.897	0.2788	-0.0428	0.878	0.2708	-0.0072
21.65	0.926	0.3215	-0.0600			
23.95	0.963	0.3875	-0.0951	0.943	0.3752	-0.0521
			Flaps 35°			
0.2	0.159	0.0528	0.0207	0.139	0.0548	0.0591
8.25	0.633	0.0962	-0.0033	0.604	0.0956	0.0359
12.2	0.850	0.1527	-0.0173	0.818	0.1495	0.0209
13.7	0.892	0.1864	-0.0185			
15.7	0.911	0.2484	-0.0255	0.892	0.2441	0.0086
17.75	0.934	0.2983	-0.0317			
20.0	0.959	0.3575	-0.0573	0.917	0.3494	-0.0242
21.7	0.982	0.4004	-0.0816			
24.0	0.996	0.4593	-0.1196	0.973	0.4513	-0.0853
			Flaps 50°			
0.25	0.224	0.0824	0.0236	0.196	0.0837	0.0616
8.3	0.674	0.1264	-0.0068	0.663	0.1270	0.0308
12.25	0.882	0.1866	-0.0221	0.858	0.1826	0.0172
13.7	0.909	0.2310	-0.0230			
15.7	0.926	0.2842	-0.0255	0.900	0.2742	0.0076
17.7	0.925	0.3289	-0.0324			
20.05	0.940	0.3812	-0.0528	0.924	0.3757	-0.0223
21.7	0.957	0.4223	-0.0799			
24.0	0.966	0.4754	-0.1187	0.931	0.4674	-0.0854

TABLE IV (Contd)

Lift, drag and pitching moment of the model with lower tailplane, Swift flaps, no ground

(b) With 5.3% chord fences at 66% semispan

α°	$\eta_T = -2.25^{\circ}$, $\eta = -1.2^{\circ}$			$\eta_T = -2.25^{\circ}$, $\eta = -6.3^{\circ}$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0	-0.029	0.0174	0.0125	-0.055	0.0185	0.0506
4.05	0.201	0.0226	0.0045	0.178	0.0222	0.0429
8	0.427	0.0414	-0.0021	0.404	0.0397	0.0343
12.0	0.658	0.0837	-0.0173	0.630	0.0800	0.0206
13.5	0.743	0.1098	-0.0259	0.713	0.1056	0.0128
15.55	0.837	0.1626	-0.0460	0.808	0.1568	-0.0062
17.6	0.918	0.2190	-0.0652	0.889	0.2135	-0.0290
20.0	0.965	0.2885	-0.0861	0.934	0.2815	-0.0498
21.65	0.955	0.3284	-0.0571	0.930	0.3185	-0.0265
23.95	0.954	0.3821	-0.0948	0.933	0.3763	-0.0515
			Flaps 35°			
- 3.75	-0.066	0.0550	0.0336	-0.095	0.0575	0.0716
0.2	0.160	0.0547	0.0218	0.133	0.0556	0.0603
4.25	0.399	0.0689	0.0103	0.372	0.0684	0.0486
8.25	0.624	0.0993	-0.0029	0.598	0.0961	0.0378
12.2	0.852	0.1559	-0.0201	0.829	0.1524	0.0177
13.7	0.915	0.1937	-0.0304	0.898	0.1905	0.0053
15.7	0.989	0.2504	-0.0474	0.963	0.2408	-0.0140
17.75	1.022	0.3052	-0.0657	0.989	0.2955	-0.0332
20.0	1.015	0.3642	-0.0936	0.986	0.3563	-0.0665
21.75	0.996	0.4039	-0.1017	0.969	0.3966	-0.0695
24.0	0.991	0.4559	-0.1378	0.977	0.4456	-0.0999
			Flaps 50°			
- 3.65	-0.009	0.0839	0.0391	-0.020	0.0869	0.0735
0.25	0.218	0.0834	0.0243	0.199	0.0858	0.0606
4.3	0.443	0.0987	0.0101	0.428	0.0979	0.0476
8.3	0.680	0.1297	-0.0069	0.654	0.1275	0.0319
12.25	0.884	0.1873	-0.0256	0.871	0.1858	0.0114
13.75	0.948	0.2272	-0.0351	0.927	0.2235	0.0019
15.75	1.013	0.2758	-0.0442	0.993	0.2719	-0.0128
17.8	1.014	0.3296	-0.0642	0.987	0.3272	-0.0354
20.0	0.980	0.3833	-0.0895	0.967	0.3808	-0.0613
21.7	0.971	0.4237	-0.0957	0.942	0.4185	-0.0675
24.0	0.950	0.4706	-0.1291	0.938	0.4664	-0.1031

TABLE V

Lift, drag and pitching moment of the model without tailplane, Swift flaps

Pivot point 43.5 ins (full scale) from the ground $^{H}/_{\bar{c}} = 0.42$

α^{o}	No fences			With 5.3% chord fences at 66% semispan		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0	-0.036	0.0161	-0.0073			
2.0	0.104	0.0159	0.0011			
4.0	0.250	0.0191	0.0066			
6.0	0.386	0.0248	0.0120			
8.0	0.530	0.0394	0.0124	0.520	0.0388	0.0135
10.0	0.656	0.0556	0.0168	0.653	0.0580	0.0154
12.0	0.773	0.0883	0.0218	0.765	0.0966	0.0148
13.5	0.832	0.1405	0.0267	0.832	0.1340	0.0131
			Flaps 35°			
- 4.0	-0.012	0.0522	-0.0623			
0	0.265	0.0514	-0.0539			
2.0	0.419	0.0559	-0.0503			
4.0	0.556	0.0620	-0.0463			
6.0	0.688	0.0758	-0.0418			
8.0	0.802	0.0924	-0.0422	0.797	0.0958	-0.0414
10.0	0.898	0.1213	-0.0334	0.889	0.1288	-0.0369
12.0	0.939	0.1920	-0.0213	0.958	0.1748	-0.0370
13.5	0.966	0.2264	-0.0130	0.977	0.2205	-0.0307
			Flaps 50°			
- 4.0	0.110	0.0818	-0.0688			
0	0.381	0.0814	-0.0629			
2.0	0.515	0.0857	-0.0597			
4.0	0.640	0.0941	-0.0567			
6.0	0.750	0.1059	-0.0527			
8.0	0.848	0.1233	-0.0465	0.849	0.1268	-0.0477
10.0	0.905	0.1778	-0.0331	0.930	0.1644	-0.0437
12.0	0.941	0.2272	-0.0228	0.982	0.2085	-0.0402
13.5	0.962	0.2651	-0.0146	0.988	0.2524	-0.0341

TABLE VI

Lift, drag and pitching moment of the model without tailplane, Swift flaps

Pivot point 53 ins (full scale) from the ground $H/\bar{c} = 0.50$

α°	No fences			With 5.3% chord fences at 66% semispan		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0				-0.033	0.0163	-0.0093
4.0				0.241	0.0198	0.0050
8.0				0.506	0.0387	0.0120
10.0	0.626	0.0542	0.0153	0.631	0.0568	0.0143
12.0	0.747	0.0839	0.0182	0.747	0.0931	0.0137
14.0	0.821	0.1433	0.0282	0.833	0.1378	0.0098
15.5	0.852	0.1805	0.0342	0.866	0.1817	0.0088
			Flaps 35°			
0				0.260	0.0526	-0.0538
4.0				0.524	0.0594	-0.0455
8.0	0.765	0.0916	-0.0409	0.768	0.0941	-0.0406
10.0	0.874	0.1188	-0.0348	0.873	0.1243	-0.0365
12.0	0.898	0.1818	-0.0196	0.948	0.1712	-0.0382
14.0	0.930	0.2245	-0.0071	0.963	0.2259	-0.0348
15.5	0.948	0.2656	0.0001	0.966	0.2630	-0.0264
			Flaps 50°			
0				0.349	0.0809	-0.0611
4.0				0.594	0.0923	-0.0559
8.0				0.817	0.1227	-0.0476
10.0	0.890	0.1475	-0.0378	0.893	0.1558	-0.0412
12.0	0.904	0.2132	-0.0211	0.955	0.1983	-0.0408
14.0	0.922	0.2526	-0.0053	0.959	0.2526	-0.0312
15.5	0.935	0.2966	0.0004	0.962	0.2940	-0.0220

TABLE VII

Lift, drag and pitching moment of the model with upper tailplane, Swift flaps. Pivot point 43.5 ins (full scale) from the ground $H/\bar{c}$ = 0.42

(a) No fences

α^o	$\eta_T = -2.25^o$, $\eta = 0.6^o$			$\eta_T = -2.25^o$, $\eta = -4.0^o$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0	-0.065	0.0172	0.0334	-0.089	0.0180	0.0699
2.0	0.087	0.0167	0.0225	0.072	0.0178	0.0573
4.0	0.248	0.0194	0.0094	0.232	0.0190	0.0461
6.0	0.396	0.0257	-0.0047			
8.0	0.543	0.0383	-0.0215	0.527	0.0372	0.0140
10.0	0.683	0.0571	-0.0383	0.669	0.0565	-0.0039
12.0	0.813	0.0889	-0.0527	0.800	0.0901	-0.0180
13.5	0.874	0.1441	-0.0590	0.867	0.1446	-0.0255
			Flaps 35°			
- 4.0	-0.106	0.0577	0.0449	-0.117	0.0606	0.0821
0	0.221	0.0533	0.0146	0.201	0.0538	0.0498
2.0	0.382	0.0560	-0.0021			
4.0	0.531	0.0631	-0.0204	0.508	0.0620	0.0147
6.0	0.675	0.0752	-0.0401			
8.0	0.813	0.0935	-0.0593	0.788	0.0910	-0.0239
10.0	0.920	0.1232	-0.0750	0.900	0.1220	-0.0417
12.0	0.961	0.1937	-0.0700	0.946	0.1913	-0.0380
13.5	1.002	0.2283	-0.0699	0.973	0.2243	-0.0391
			Flaps 50°			
- 4.0	0.017	0.0889	0.0493	-0.012	0.0924	0.0877
0	0.318	0.0828	0.0164	0.302	0.0834	0.0523
2.0	0.468	0.0857	-0.0021			
4.0	0.604	0.0930	-0.0215	0.585	0.0925	0.0137
6.0	0.743	0.1060	-0.0423			
8.0	0.849	0.1228	-0.0559	0.832	0.1227	-0.0197
10.0	0.923	0.1796	-0.0614	0.903	0.1815	-0.0271
12.0	0.964	0.2274	-0.0581	0.943	0.2264	-0.0277
13.5	0.978	0.2621	-0.0497	0.960	0.2601	-0.0216

TABLE VII (Contd)

Lift, drag and pitching moment of the model with upper tailplane.

Swift flaps. Pivot point 43.5 ins (full scale) from ground $H/\bar{c} = 0.42$

(b) With 5.3% chord fences at 66% semispan

α°	$\eta_T = -2.25^\circ$, $\eta = 0.6^\circ$		
	C_L	C_D	C_m
	Flaps 0°		
4.0	0.253	0.0211	0.0096
8.0	0.554	0.0420	-0.0220
10.0	0.693	0.0620	-0.0422
12.0	0.805	0.1022	-0.0548
13.5	0.878	0.1392	-0.0615
	Flaps 35°		
8.0	0.810	0.0981	-0.0584
10.0	0.915	0.1334	-0.0703
12.0	0.990	0.1815	-0.0802
13.5	0.998	0.2241	-0.0690
	Flaps 50°		
8.0	0.852	0.1280	-0.0579
10.0	0.944	0.1643	-0.0681
12.0	1.011	0.2107	-0.0734
13.5	1.013	0.2559	-0.0559

TABLE VII

Lift, drag and pitching moment of the model, with lower tailplane, Swift flaps. Pivot point 43.5 ins (full scale) from the ground $H/\bar{c} = 0.42$

(a) No fences

α^o	$\eta_T = -2.25^o$, $\eta = -1.2^o$			$\eta_T = -2.25^o$, $\eta = -6.3^o$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0	-0.062	0.0181	0.0292	-0.092	0.0192	0.0745
4.0	0.249	0.0205	0.0084	0.221	0.0205	0.0534
8.0	0.548	0.0393	-0.0257	0.522	0.0388	0.0171
10.0	0.701	0.0589	-0.0555	0.676	0.0580	-0.0130
12.0	0.849	0.0910	-0.1067	0.826	0.0900	-0.0553
			Flaps 35°			
0	0.220	0.0543	0.0230	0.202	0.0548	0.0639
4.0	0.532	0.0632	-0.0158	0.506	0.0634	0.0269
8.0	0.816	0.0948	-0.0750	0.800	0.0951	-0.0336
10.0	0.950	0.1240	-0.1083	0.924	0.1234	-0.0663
12.0	1.009	0.1967	-0.1404	0.992	0.1973	-0.1012
			Flaps 50°			
0	0.318	0.0824	0.0230	0.300	0.0845	0.0645
4.0	0.610	0.0934	-0.0235	0.586	0.0936	0.0189
8.0	0.869	0.1255	-0.0808	0.849	0.1250	-0.0417
10.0	0.949	0.1737	-0.1006	0.928	0.1789	-0.0619
12.0	0.994	0.2282	-0.1122	0.982	0.2298	-0.0819
	$\eta_T = -2.25^o$, $\eta = -15.7^o$					
	C_L	C_D	C_m			
		Flaps 0°				
8.0	0.469	0.0392	0.1021			
10.0	0.617	0.0571	0.0768			
12.0	0.768	0.0890	0.0399			

TABLE VIII (Contd)

Lift, drag and pitching moment of the model with lower tailplane, Swift flaps. Pivot point 43.5 ins (full scale) from the ground $H/\bar{c} = 0.42$

(b) With 5.3% chord fences at 66% semispan

α°	$\eta_T = -2.25^\circ, \eta = -1.2^\circ$		
	C_L	C_D	C_m
	Flaps 0°		
8.0	0.544	0.0413	-0.0235
10.0	0.698	0.0619	-0.0554
12.0	0.837	0.1027	-0.1085
	Flaps 35°		
8.0	0.812	0.0966	-0.0717
10.0	0.929	0.1324	-0.1038
12.0	1.026	0.1796	-0.1458
	Flaps 50°		
8.0	0.864	0.1274	-0.0778
10.0	0.965	0.1670	-0.1021
12.0	1.039	0.2144	-0.1255

TABLE IX

Lift, drag and pitching moment of the model with upper tailplane. Swift flaps. Pivot point 53 ins (full scale) from the ground $H/\bar{c} = 0.50$

(a) No fences

α°	$\eta_T = -2.25^{\circ}$, $\eta = +0.6^{\circ}$		
	C_L	C_D	C_m
	Flaps 0°		
0	-0.062	0.0175	0.0323
4.0	0.241	0.0198	0.0088
8.0	0.523	0.0390	-0.0208
10.0	0.667	0.0587	-0.0367
12.0	0.790	0.0867	-0.0498
14.0	0.870	0.1523	-0.0522
15.5	0.906	0.1890	-0.0496
	Flaps 35°		
0	0.205	0.0528	0.0148
4.0	0.503	0.0621	-0.0170
8.0	0.773	0.0922	-0.0516
10.0	0.888	0.1197	-0.0660
12.0	0.931	0.1854	-0.0573
14.0	0.954	0.2308	-0.0485
15.5	0.968	0.2683	-0.0403
	Flaps 50°		
0	0.294	0.0820	0.0155
4.0	0.568	0.0908	-0.0178
8.0	0.817	0.1205	-0.0516
10.0	0.908	0.1513	-0.0626
12.0	0.923	0.2184	-0.0476
14.0	0.942	0.2655	-0.0330
15.5	0.950	0.2991	-0.0229

TABLE IX (Contd)

Lift, drag and pitching moment of the model with upper tailplane.
Swift flaps. Pivot point 53 ins (full scale) from the ground $H/\bar{c}$ = 0.50

(b) With 5.3% chord fences at 66% semispan

α^o	$\eta_T = -2.25^o$, $\eta = 0.6^o$			$\eta_T = -2.25^o$, $\eta = -4.0^o$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0				-0.092	0.0198	0.0689
4.0				0.209	0.0209	0.0462
8.0				0.505	0.0398	0.0153
10.0	0.670	0.0616	-0.0381	0.642	0.0600	-0.0021
12.0	0.786	0.0977	-0.0507	0.763	0.0957	-0.0163
14.0	0.867	0.1431	-0.0601	0.854	0.1457	-0.0305
15.5	0.902	0.1847	-0.0573	0.893	0.1864	-0.0307
			Flaps 35°			
0				0.186	0.0570	0.0502
4.0				0.479	0.0664	0.0178
8.0				0.757	0.0963	-0.0188
10.0	0.884	0.1218	-0.0650	0.867	0.1257	-0.0325
12.0	0.963	0.1707	-0.0721	0.947	0.1718	-0.0405
14.0	0.977	0.2242	-0.0596	0.961	0.2288	-0.0342
15.5	0.975	0.2610	-0.0466	0.960	0.2647	-0.0213
			Flaps 50°			
0				0.270	0.0844	0.0519
4.0				0.547	0.0907	0.0179
8.0	0.817	0.1233	-0.0512	0.802	0.1237	-0.0149
10.0	0.909	0.1577	-0.0612	0.889	0.1561	-0.0273
12.0	0.974	0.2010	-0.0683	0.957	0.1992	-0.0367
14.0	0.962	0.2560	-0.0487	0.962	0.2554	-0.0199
15.5	0.974	0.2966	-0.0321	0.950	0.2906	-0.0096

TABLE X

Lift, drag and pitching moment of the model with lower tailplane.

Swift flaps. Pivot point 53 ins (full scale) from the ground $H/\bar{c}$ = 0.50

(a) No fences

α^o	$\eta_T = -2.25^o$, $\eta = -1.2^o$			$\eta_T = -2.25^o$, $\eta = -6.3^o$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
0	-0.056	0.0174	0.0282	-0.083	0.0189	0.0719
4.0	0.246	0.0202	0.0072	0.220	0.0208	0.0499
8.0	0.529	0.0392	-0.0219	0.506	0.0383	0.0190
10.0	0.674	0.0585	-0.0471	0.657	0.0577	-0.0055
12.0	0.814	0.0882	-0.0769	0.789	0.0872	-0.0318
14.0	0.935	0.1604	-0.1387	0.899	0.1542	-0.0848
			Flaps 35°			
0	0.216	0.0527	0.0218	0.191	0.0536	0.0630
4.0	0.510	0.0621	-0.0100	0.483	0.0623	0.0318
8.0	0.791	0.0935	-0.0597	0.769	0.0924	-0.0176
10.0	0.910	0.1229	-0.0874	0.890	0.1206	-0.0461
12.0	0.966	0.1907	-0.1144	0.943	0.1866	-0.0728
14.0	1.031	0.2407	-0.1513	1.011	0.2395	-0.1085
			Flaps 50°			
0	0.305	0.0815	0.0219	0.272	0.0828	0.0617
4.0	0.576	0.0910	-0.0170	0.547	0.0905	0.0246
8.0	0.840	0.1213	-0.0684	0.809	0.1202	-0.0290
10.0	0.935	0.1546	-0.0895	0.907	0.1518	-0.0522
12.0	0.961	0.2222	-0.0996	0.943	0.2193	-0.0670
14.0	0.996	0.2700	-0.1126	0.978	0.2652	-0.0796

TABLE X (Contd)

Lift, drag and pitching moment of the model with lower tailplane.

Swift flaps. Pivot point 53 ins (full scale) from the ground $H/\bar{c} = 0.50$

(b) With 5.3% chord fences at 66% semispan

α^o	$\eta_T = -2.25^o, \eta = -1.2^o$			$\eta_T = -2.25^o, \eta = -6.3^o$		
	C_L	C_D	C_m	C_L	C_D	C_m
			Flaps 0°			
8.0	0.524	0.0409	-0.0218			
10.0	0.686	0.0611	-0.0471	0.645	0.0592	-0.0043
12.0	0.800	0.0980	-0.0783	0.783	0.0986	-0.0388
14.0	0.934	0.1520	-0.1524	0.903	0.1468	-0.1004
			Flaps 35°			
8.0	0.778	0.0950	-0.0588			
10.0	0.897	0.1243	-0.0861	0.872	0.1232	-0.0447
12.0	0.996	0.1738	-0.1221	0.974	0.1698	-0.0820
14.0	1.037	0.2311	-0.1632	1.020	0.2301	-0.1242
			Flaps 50°			
8.0	0.832	0.1237	-0.0689	0.811	0.1235	-0.0278
10.0	0.923	0.1583	-0.0873	0.905	0.1565	-0.0520
12.0	1.001	0.2020	-0.1151	0.986	0.2017	-0.0809
14.0	1.022	0.2614	-0.1315	1.003	0.2579	-0.0981

TABLE XI

Lift, drag and pitching moment of the model with flaps B deflected 50°

No fences. No ground

$\alpha°$	No tailplane C_L	C_D	C_m	$\alpha°$	No tailplane C_L	C_D	C_m
	Flaps $B_1 + B_2$				Flaps B_2		
0.35	0.359	0.1049	-0.0707	0.3	0.320	0.0803	-0.0840
4.4	0.575	0.1240	-0.0665	4.35	0.540	0.0987	-0.0796
8.35	0.787	0.1597	-0.0646	8.35	0.754	0.1336	-0.0755
12.3	0.962	0.2218	-0.0583	12.3	0.927	0.1927	-0.0638
13.8	0.976	0.2673	-0.0482	13.75	0.944	0.2420	-0.0523
15.75	0.975	0.3166	-0.0348	15.7	0.941	0.2877	-0.0368
17.75	0.961	0.3592	-0.0213	17.75	0.934	0.3315	-0.0219
20.1	0.938	0.4064	-0.0103	20.05	0.920	0.3785	-0.0127
21.75	0.907	0.4349	-0.0076	21.3	0.916	0.4027	-0.0099
				24.0	0.872	0.4484	-0.0072
	Flaps $B_1 + B_2 + B_3$				Flaps $B_2 + B_3$		
0.55	0.560	0.1714	-0.1727	0.55	0.511	0.1430	-0.1784
4.55	0.773	0.2037	-0.1641	4.5	0.712	0.1758	-0.1685
8.5	0.956	0.2481	-0.1508	8.45	0.902	0.2161	-0.1561
12.45	1.063	0.3245	-0.1288	12.4	1.021	0.2927	-0.1311
13.9	1.051	0.3607	-0.1169	13.85	1.010	0.3327	-0.1166
15.85	1.049	0.4008	-0.1007	15.8	1.012	0.3774	-0.1025
17.85	1.033	0.4464	-0.0846	17.85	1.007	0.4214	-0.0854
20.2	1.015	0.4928	-0.0713	20.2	0.994	0.4708	-0.0715
				21.9	0.981	0.5044	-0.0679

Flaps $B_1 + B_2 + B_3$, with upper tailplane

$\alpha°$	$\eta_T = -2.25°$, $\eta = 0.6°$ C_L	C_D	C_m	$\eta_T = -2.25°$, $\eta = -4.0°$ C_L	C_D	C_m
0.55	0.510	0.1738	-0.0837	0.493	0.1752	-0.0499
4.55	0.730	0.2021	-0.1018	0.710	0.2027	-0.0701
8.5	0.925	0.2430	-0.1088	0.910	0.2459	-0.0779
12.45	1.040	0.3219	-0.0943	1.027	0.3205	-0.0637
13.9	1.032	0.3585	-0.0804	1.013	0.3544	-0.0486
15.85	1.024	0.3980	-0.0637	1.015	0.3949	-0.0334
17.85	1.017	0.4410	-0.0401	1.000	0.4362	-0.0185
20.2	0.979	0.5062	-0.0291	0.978	0.4837	-0.0084

TABLE XII

Lift, drag and pitching moment of the model with flaps B deflected 50°

Pivot point 43.5 ins (full scale) from the ground $^H/\bar{c}$ = 0.42

No fences

α°	No tailplane			No tailplane		
	C_L	C_D	C_m	C_L	C_D	C_m
	Flaps $B_1 + B_2$			Flaps B_2		
4.0	0.243	0.0944	-0.0771			
0	0.514	0.0972	-0.0742	0.414	0.0770	-0.0860
4.0	0.758	0.1122	-0.0685	0.674	0.0912	-0.0792
8.0	0.959	0.1471	-0.0636	0.903	0.1250	-0.0698
10.0	0.994	0.2184	-0.0550			
12.0	1.029	0.2713	-0.0493	0.991	0.2347	-0.0423
13.5	1.032	0.3069	-0.0434	1.004	0.2743	-0.0304
	Flaps $B_1 + B_2 + B_3$			Flaps $B_2 + B_3$		
0	0.657	0.1534	-0.1584	0.587	0.1323	-0.1729
4.0	0.885	0.1733	-0.1478	0.812	0.1510	-0.1564
8.0	1.058	0.2196	-0.1378	1.005	0.1850	-0.1341
12.0	1.103	0.3388	-0.1017	1.056	0.3067	-0.0992
13.5	1.083	0.3866	-0.0988	1.062	0.3485	-0.0865

α°	Flaps $B_1 + B_2 + B_3$ with upper tailplane, $\eta_T = -2.25^\circ$, $\eta = 0.6^\circ$		
	C_L	C_D	C_m
0	0.620	0.1573	-0.0874
4.0	0.861	0.1742	-0.1161
8.0	1.070	0.2248	-0.1434
12.0	1.120	0.3418	-0.1242
13.5	1.109	0.3882	-0.1161

TABLE XIII

Trimmed lift, mean downwash angle at the tailplane, and elevator angle to trim, for the model with Swift flaps

(a) No ground, no fences

α°	$C_{L_{Trim}}$	Upper tailplane			Lower tailplane		
		ε°	$\frac{\partial C_m}{\partial \eta}$	η° To trim	ε°	$\frac{\partial C_m}{\partial \eta}$	η° To trim
			Flaps 0°				
0	-0.017				- 0.7	-0.0076	0.65
4.05	0.205						- 0.6
8.0	0.421				+ 3.75	-0.0074	- 1.7
12.0	0.634	7.05	-0.0078	- 2.7	6.45	-0.0073	- 3.3
13.55	0.720	7.8		- 3.1	7.25		- 3.9
15.55	0.800	9.6	-0.0072	- 2.1	8.3	-0.0073	- 4.4
17.6	0.834	12.1		+ 0.05	8.65		- 5.5
19.95	0.857	15.7	-0.0067	3.4	9.2	-0.0070	- 7.35
21.65	0.879	17.3		4.9	9.45		- 9.7
23.95	0.889	18.5	-0.0052	3.7	10.5	-0.0084	-12.5
			Flaps 35°				
0.2	0.178	3.8	-0.0075	2.05	3.35	-0.0076	1.5
8.25	0.634	8.3	-0.0073	- 2.95	8.5	-0.0076	- 1.6
12.2	0.833	10.65	-0.0075	- 3.85	10.6	-0.0076	- 3.5
13.7	0.872	12.1		- 2.9	11.5		- 3.7
15.7	0.892	14.9	-0.0070	+ 0.1	11.7	-0.0068	- 5.05
17.7	0.903	17.75	-0.0070	3.25	11.8		- 5.95
20.05	0.912	21.7	-0.0054	7.7	10.8	-0.0066	- 9.95
21.7	0.910	23.8		11.2	10.3		-13.6
24.0	0.895	24.45	-0.0028	9.9	9.5	-0.0067	-19.0
			Flaps 50°				
0.25	0.252	4.85	-0.0076	2.2	4.7	-0.0075	1.95
8.3	0.677	8.95	-0.0073	- 3.0	9.35	-0.0074	- 2.1
12.25	0.862	11.1	-0.0076	- 3.8	10.8	-0.0076	- 4.0
13.7	0.886	12.8		- 1.85	11.25		- 4.3
15.7	0.905	15.35	-0.0073	+ 0.7	11.85	-0.0065	- 5.15
17.7	0.902	17.85	-0.0076	3.6	11.7		- 6.1
20.05	0.898	22.85	-0.0045	9.1	10.95	-0.0061	-10.0
21.7	0.901	23.65		11.8	8.7		-14.0
24.0	0.866	25.1	-0.0027	10.7	8.6	-0.0066	-19.4

TABLE XIII (Contd)

Trimmed lift, mean angle of downwash at the tailplane, and elevator angle to trim for the model with Swift flaps

(b) No ground, 5.3% chord fences at 66% semispan

α°	$C_{L_{Trim}}$	Upper tailplane ε°	Upper tailplane $\frac{\partial C_m}{\partial \eta}$	Upper tailplane η° To trim	Lower tailplane ε°	Lower tailplane $\frac{\partial C_m}{\partial \eta}$	Lower tailplane η° To trim
			Flaps 0°				
0	-0.019	0.6	-0.0078	2.85	- 0.85	-0.0075	0.45
4.05	0.205	2.8	-0.0076	1.15	1.6	-0.0076	- 0.6
8.0	0.424	4.75	-0.0078	-0.5	4.05	-0.0071	- 1.5
12.0	0.637	7.05	-0.0078	-2.65	6.45	-0.0076	- 3.55
13.5	0.718	8.45	-0.0082	-2.8	7.3	-0.0078	- 4.55
+15.55	0.783	10.65	-0.0080	-3.1	8.2	-0.0079	- 7.1
17.65	0.839	12.5	-0.0068	-3.7	8.7	-0.0073	-10.2
20.0	0.880	14.8	-0.0061	-4.0	9.35	-0.0074	-13.1
21.65	0.895	17.15	-0.0058	+1.35	9.6	-0.0060	-10.8
23.95	0.876	18.85	-0.0052	5.0	10.1	-0.0083	-12.4
			Flaps 35°				
- 3.75	-0.034	1.65	-0.0077	4.35	1.4	-0.0075	3.2
0.2	0.181	3.6	-0.0078	2.0	3.4	-0.0077	1.65
4.25	0.401	5.8	-0.0077	0	6.0	-0.0075	0.15
8.25	0.626	8.25	-0.0074	-2.35	8.4	-0.0080	- 1.6
12.2	0.831	10.55	-0.0077	-3.9	10.65	-0.0075	- 3.85
13.7	0.887	11.95	-0.0077	-3.75	11.2	-0.0070	- 5.55
15.7	0.951	14.5	-0.0072	-3.65	11.5	-0.0065	- 8.45
17.75	0.969	17.25	-0.0055	-2.75	11.35	-0.0064	-11.35
20.0	0.941	21.8	-0.0041	-0.8	10.6	-0.0061	-17.2
21.75	0.936	24.2	-0.0038	+4.8	10.2	-0.0067	-16.7
24.0	0.887	22.95	-0.0046	0.6	9.75	-0.0073	-20.1
			Flaps 50°				
- 3.65	0.039	3.3	-0.0077	5.25	3.7	-0.0068	4.25
0.25	0.249	4.75	-0.0077	2.4	5.05	-0.0072	2.15
4.3	0.456	6.85	-0.0075	0.1	7.0	-0.0073	0.2
8.3	0.680	9.05	-0.0074	-2.45	9.0	-0.0077	- 2.1
12.25	0.870	11.4	-0.0076	-4.0	11.0	-0.0074	- 4.7
13.75	0.921	12.85	-0.0071	-4.0	11.7	-0.0072	- 6.05
15.75	0.972	15.0	-0.0074	-3.1	12.35	-0.0062	- 8.4
17.8	0.964	18.45	-0.0054	-1.85	11.75	-0.0056	-12.55
20.0	0.924	19.75	-0.0035	-1.65	8.7	-0.0055	-17.3
21.7	0.900	23.9	-0.0035	+5.3	8.75	-0.0055	-18.5
24.0	0.846	26.4	-0.0041	1.1	8.45	-0.0051	-23.5

TABLE XIII (Contd)

Trimmed lift, mean downwash angle at the tailplane, and elevator angle to trim for the model with Swift flaps

(c) With ground $H/\bar{c}$ = 0.42. No fences

α°	$C_{L_{Trim}}$	Upper tailplane			Lower tailplane		
		ε°	$\frac{\partial C_m}{\partial \eta}$	η° To trim	ε°	$\frac{\partial C_m}{\partial \eta}$	η° To trim
			Flaps 0°				
0	-0.041	1.3	-0.0079	4.85	-0.45	-0.0089	2.1
2.0	0.105	1.85	-0.0076	3.45			
4.0	0.254	2.3	-0.0080	1.8	1.15	-0.0088	-0.25
6.0	0.394	2.7		0			
8.0	0.538	3.35	-0.0077	-2.15	2.25	-0.0087	-4.25
10.0	0.667	3.5	-0.0075	-4.5	2.0	-0.0090	-7.8
12.0	0.787	3.9	-0.0075	-6.4	1.05	-0.0100	-11.7
13.5	0.848	4.25	-0.0072	-7.45			
			Flaps 35°				
-4.0	-0.051	2.35	-0.0081	6.25			
0	0.232	3.6	-0.0077	2.5	3.0	-0.0080	1.6
2.0	0.387	4.1		0.3			
4.0	0.527	4.2	-0.0076	-2.1	3.25	-0.0084	-3.15
6.0	0.661	4.25		-4.6			
8.0	0.775	4.7	-0.0077	-7.1	2.5	-0.0081	-10.4
10.0	0.876	4.5	-0.0072	-9.75	1.4	-0.0083	-14.5
12.0	0.925	5.75	-0.0069	-9.5	-0.7	-0.0077	-18.4
13.5	0.957	6.35		-9.7			
			Flaps 50°				
-4.0	0.066	2.85	-0.0084	6.5			
0	0.341	4.35	-0.0078	2.7	3.55	-0.0081	1.65
2.0	0.478	4.8		0.3			
4.0	0.604	4.95	-0.0076	-2.25	3.5	-0.0083	-3.95
6.0	0.716	5.0		-4.8			
8.0	0.819	5.25	-0.0080	-6.6	2.25	-0.0077	-11.7
10.0	0.884	5.75	-0.0074	-7.7	1.45	-0.0075	-14.5
12.0	0.927	6.8	-0.0066	-8.15	-0.3	-0.0060	-20.0
13.5	0.953	8.0	-0.0061	-7.55			

TABLE XIII (Contd)

Trimmed lift, mean downwash angle at the tailplane,

and elevator angle to trim, for the model with Swift flaps

(d) Pivot point 43.5 ins (full scale) from the ground $H/\bar{c}$ = 0.42
with 5.3% chord fences fitted at 66% semispan

α^o	$C_{L_{Trim}}$	Upper tailplane			Lower tailplane		
		ε^o	$\frac{\partial C_m}{\partial \eta}$	η^o To trim	ε^o	$\frac{\partial C_m}{\partial \eta}$	η^o To trim
				Flaps 0°			
4.0	0.254	2.35		1.8			
8.0	0.528	3.25		- 2.25	2.25		- 4.0
10.0	0.663	3.3		- 5.1	1.7		- 7.8
12.0	0.774	4.3		- 6.75	1.35		-12.0
13.5	0.839	5.2		- 7.9			
				Flaps 35°			
8.0	0.772	4.75		- 7.0	2.65		-10.2
10.0	0.866	5.2		- 9.2	1.95		-14.4
12.0	0.935	6.3		-10.9	-0.25		-18.8
13.5	0.958	8.1		- 9.6			
				Flaps 50°			
8.0	0.818	5.15		- 6.8	2.55		-11.3
10.0	0.902	6.1		- 8.5	2.2		-14.7
12.0	0.956	7.0		-10.4	0.25		-22.0
13.5	0.967	7.75		- 8.5			

TABLE XIII (Contd)

Trimmed lift, mean downwash angle at the tailplane, and elevator angle to trim for the model with Swift flaps

(e) Pivot point 53 ins (full scale) from the ground $H/\bar{c} = 0.50$. No fences

α°	$C_{L_{Trim}}$	Upper tailplane			Lower tailplane		
		ε°	$\frac{\partial C_m}{\partial \eta}$	η° To trim	ε°	$\frac{\partial C_m}{\partial \eta}$	η° To trim
				Flaps 0°			
0	-0.038	1.35		4.75	-0.3	-0.0086	2.6
4.0	0.250	2.35		1.7	1.6	-0.0084	- 0.35
8.0	0.515	3.6		-2.0	2.2	-0.0080	- 3.9
10.0	0.636	4.0		-4.0	2.25	-0.0082	- 7.0
12.0	0.758	4.4		-6.05	2.15	-0.0087	-11.3
14.0	0.839	4.3		-7.6	1.1	-0.0106	-14.3
15.5	0.874	4.6		-7.95			
				Flaps 35°			
0	0.230	3.6		2.5	2.85	-0.0081	1.5
4.0	0.492	4.45		-1.6	3.7	-0.0082	- 2.4
8.0	0.739	5.15		-6.6	3.6	-0.0082	- 8.45
10.0	0.853	5.4		-8.7	3.0	-0.0082	-12.0
12.0	0.885	6.65		-7.7	1.75	-0.0082	-15.5
14.0	0.926	7.45		-8.0	0.5	-0.0085	-19.1
15.5	0.948	9.0		-6.7			
				Flaps 50°			
0	0.304	4.1		2.6	3.6	-0.0078	1.55
4.0	0.557	5.2		-1.65	3.95	-0.0082	- 3.35
8.0	0.785	5.8		-6.0	3.35	-0.0078	- 9.95
10.0	0.866	6.0		-7.9	2.6	-0.0072	-13.5
12.0	0.891	7.7		-6.45	1.4	-0.0064	-16.8
14.0	0.918	9.35		-4.65	0.7	-0.0065	-18.6
15.5	0.935	10.65		-4.1			

TABLE XIII (Contd)

Trimmed lift, mean downwash angle at the tailplane, and elevator angle to trim for the model with Swift flaps

(f) Pivot point 53.0 ins (full scale) above the ground $H/\bar{c}$ = 0.50 with 5.3% chord fences fitted at 66% semispan

α°	$C_{L_{Trim}}$	Upper tailplane ε°	Upper tailplane $\frac{\partial C_m}{\partial \eta}$	Upper tailplane η° To trim	Lower tailplane ε°	Lower tailplane $\frac{\partial C_m}{\partial \eta}$	Lower tailplane η° To trim
			Flaps 0°				
0	-0.039	1.35	-0.0080	4.75			
4.0	0.244	2.35	-0.0081	1.7			
8.0	0.514	3.6	-0.0079	- 2.0	2.35		- 3.85
10.0	0.640	3.95	-0.0078	- 4.25	2.45	-0.0083	- 6.8
12.0	0.756	4.7	-0.0075	- 6.2	1.7	-0.0078	-11.3
14.0	0.840	5.3	-0.0064	- 8.8	0.9	-0.0101	-16.3
15.5	0.872	6.5	-0.0058	- 9.3			
			Flaps 35°				
0	0.227	3.6	-0.0077	2.5			
4.0	0.495	4.45	-0.0075	- 1.6			
8.0	0.742	5.15	-0.0072	- 6.6			- 8.3
10.0	0.850	5.6	-0.0070	- 8.6	3.1	-0.0082	-11.8
12.0	0.924	7.0	-0.0069	- 9.9	1.85	-0.0079	-16.5
14.0	0.942	9.3	-0.0055	-10.1	0.55	-0.0076	-22.15
15.5	0.949	11.3	-0.0055	- 7.9			
			Flaps 50°				
0	0.311	4.1	-0.0079	2.6			
4.0	0.559	5.2	-0.0076	- 1.65			
8.0	0.787	5.8	-0.0079	- 6.0	3.4	-0.0081	- 9.85
10.0	0.867	6.4	-0.0073	- 7.75	2.9	-0.0069	-13.55
12.0	0.929	7.6	-0.0068	- 9.4	2.15	-0.0066	-18.5
14.0	0.949	10.35	-0.0063	- 7.15	1.5	-0.0065	-21.45
15.5	0.949	12.3	-0.0049	- 5.95			

TABLE XIV

Trimmed lift and mean angle of downwash at the tailplane with full span flaps deflected 50°

Upper tailplane. No fences

α°	C_L (Trim)	ε°
	No ground	
0.55	0.453	6.2
4.55	0.670	8.25
8.5	0.862	10.4
12.45	0.987	13.7
13.9	0.978	15.35
15.85	0.986	17.5
17.85	0.980	23.7
20.2	0.971	24.2
	$H/\bar{c}$ = 0.42	
0	0.558	4.3
4.0	0.794	4.9
8.0	0.981	5.6
12.0	1.040	8.0
13.5	1.022	9.95

TABLE XV

A comparison between estimated and measured values of ε, the downwash angle at the tailplane, near the ground ($H/\bar{c}$ = 0.42) with Swift flaps deflected

Flaps 0°

	Upper tailplane				Lower tailplane			
α°	0	4	8	12	0	4	8	12
ε, measured in free stream	0.6	2.7	4.75	7.05	-0.85	1.7	4.05	6.45
εg, measured near the ground	1.2	2.1	3.0	4.25	-0.3	1.25	2.0	1.3
εg, first estimate*	0.3	1.0	1.3	1.3	-0.3	0.5	0.7	0.6
εg, second estimate*	0.4	1.4	1.9	1.8	-0.4	0.8	1.1	0.8

Flaps 35°

	Upper tailplane				Lower tailplane			
α°	0	4	8	12	0	4	8	12
ε, measured in free stream	3.45	5.65	8.2	10.5	3.4	5.9	8.35	10.5
εg, measured near the ground	3.7	4.2	4.75	6.4	2.9	3.25	2.6	- 0.2
εg, first estimate*	2.3	2.8	3.0	2.5	2.1	2.4	2.1	1.3
εg, second estimate*	3.2	4.0	4.3	3.6	3.0	3.5	3.0	1.9

Flaps 50°

	Upper tailplane				Lower tailplane			
α°	0	4	8	12	0	4	8	12
ε, measured in free stream	4.6	6.75	8.95	11.2	4.8	7.0	8.95	10.8
εg, measured near the ground	4.4	4.95	5.25	7.0	3.6	3.5	2.7	0.2
εg, first estimate*	3.1	3.5	3.3	2.7	3.0	2.9	2.2	1.3
εg, second estimate*	4.4	4.9	4.9	3.9	4.2	4.2	3.2	1.9

*See section 4.3 of text.

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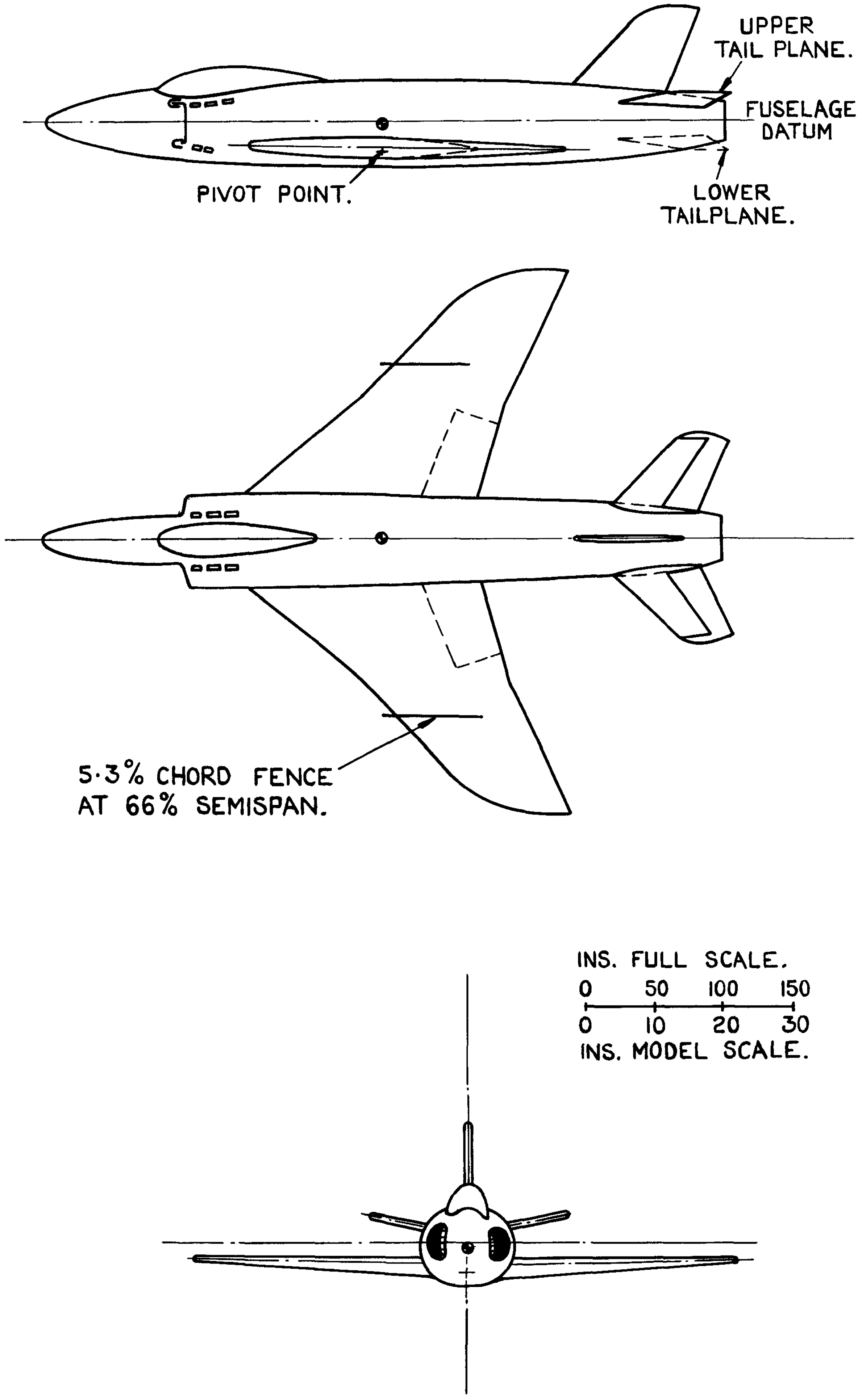


FIG.1. G.A.OF MODEL.

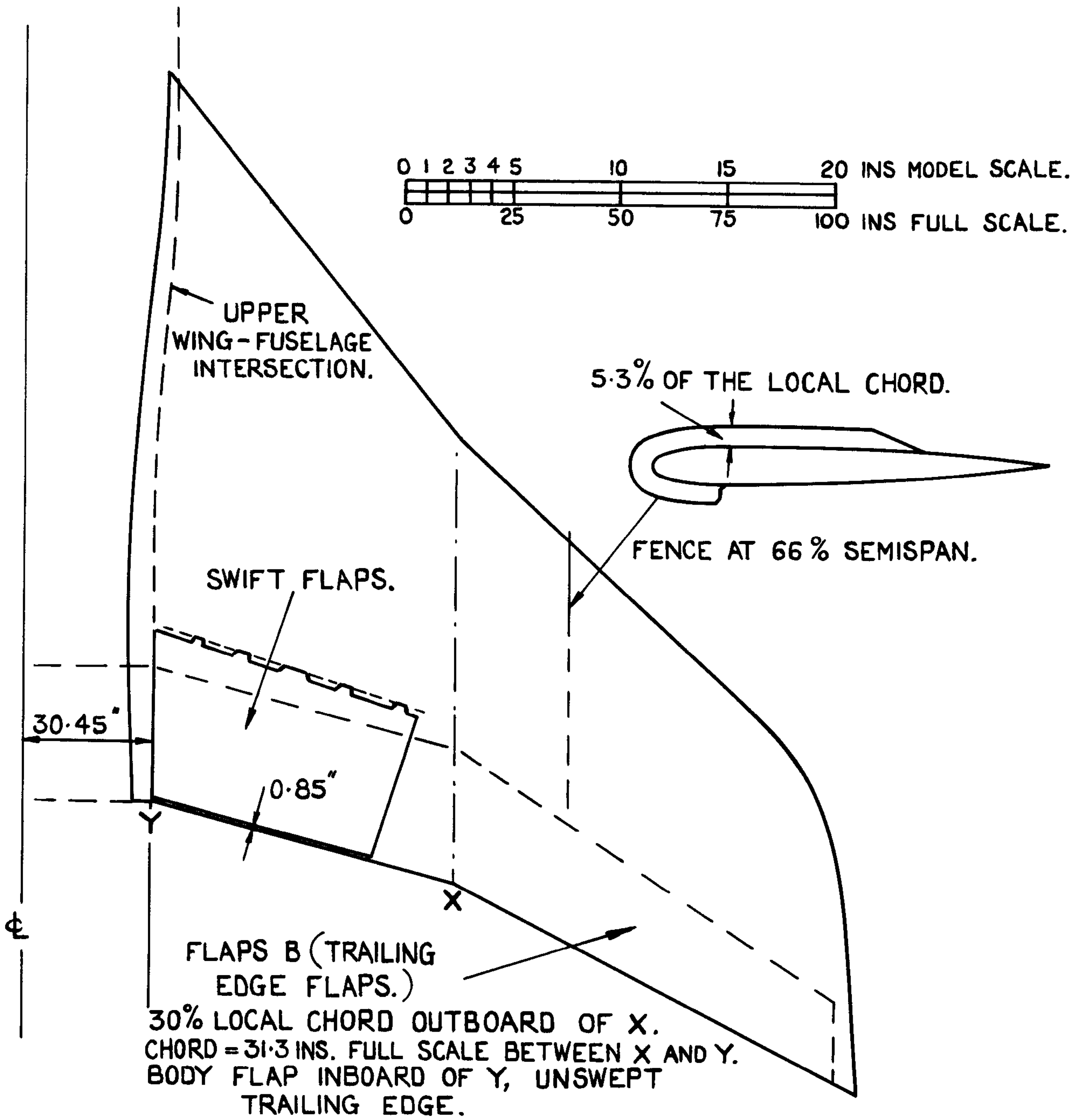


FIG. 2. POSITIONS OF THE FLAPS.

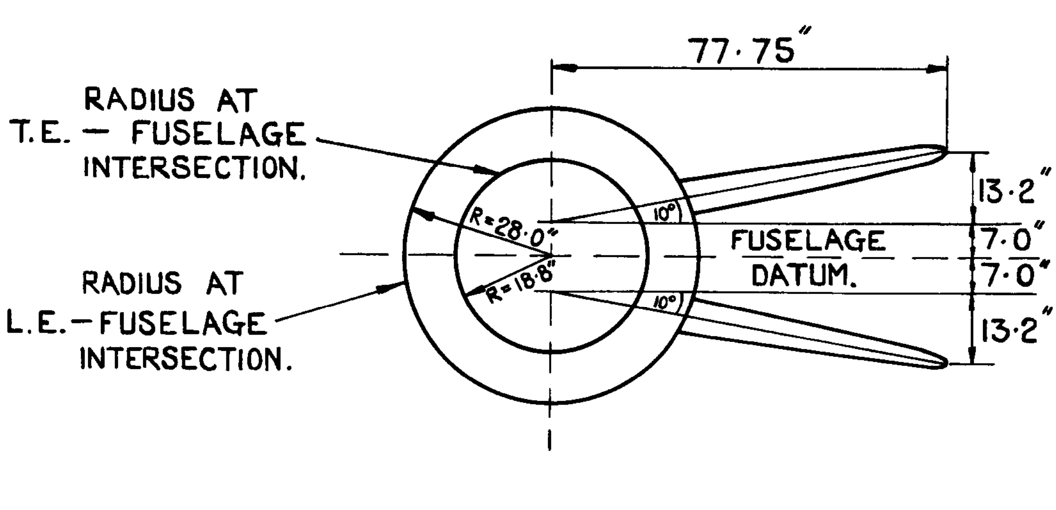


FIG. 3. UPPER & LOWER TAILPLANE POSITIONS.

DIMENSIONS ARE GIVEN IN INCHES FULL SCALE.

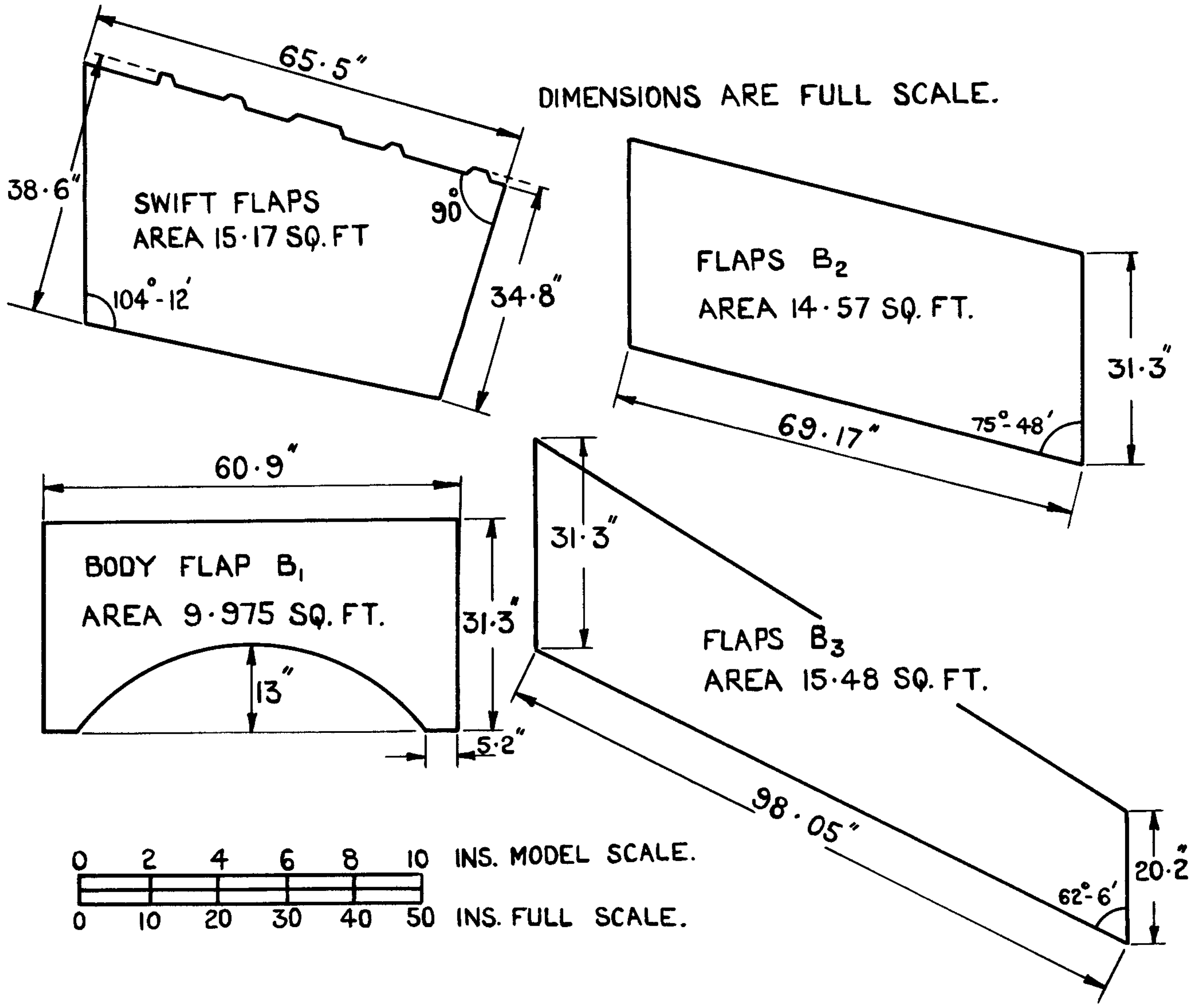


FIG. 4. DETAILS OF THE FLAPS.

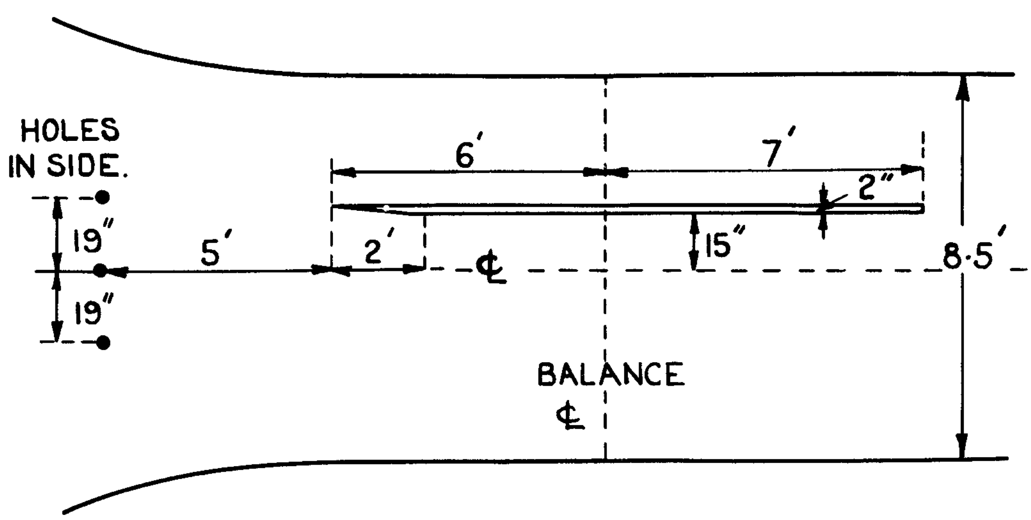


FIG. 5. No. 1. $11\frac{1}{2}$ FT x $8\frac{1}{2}$ FT TUNNEL WITH GROUND.

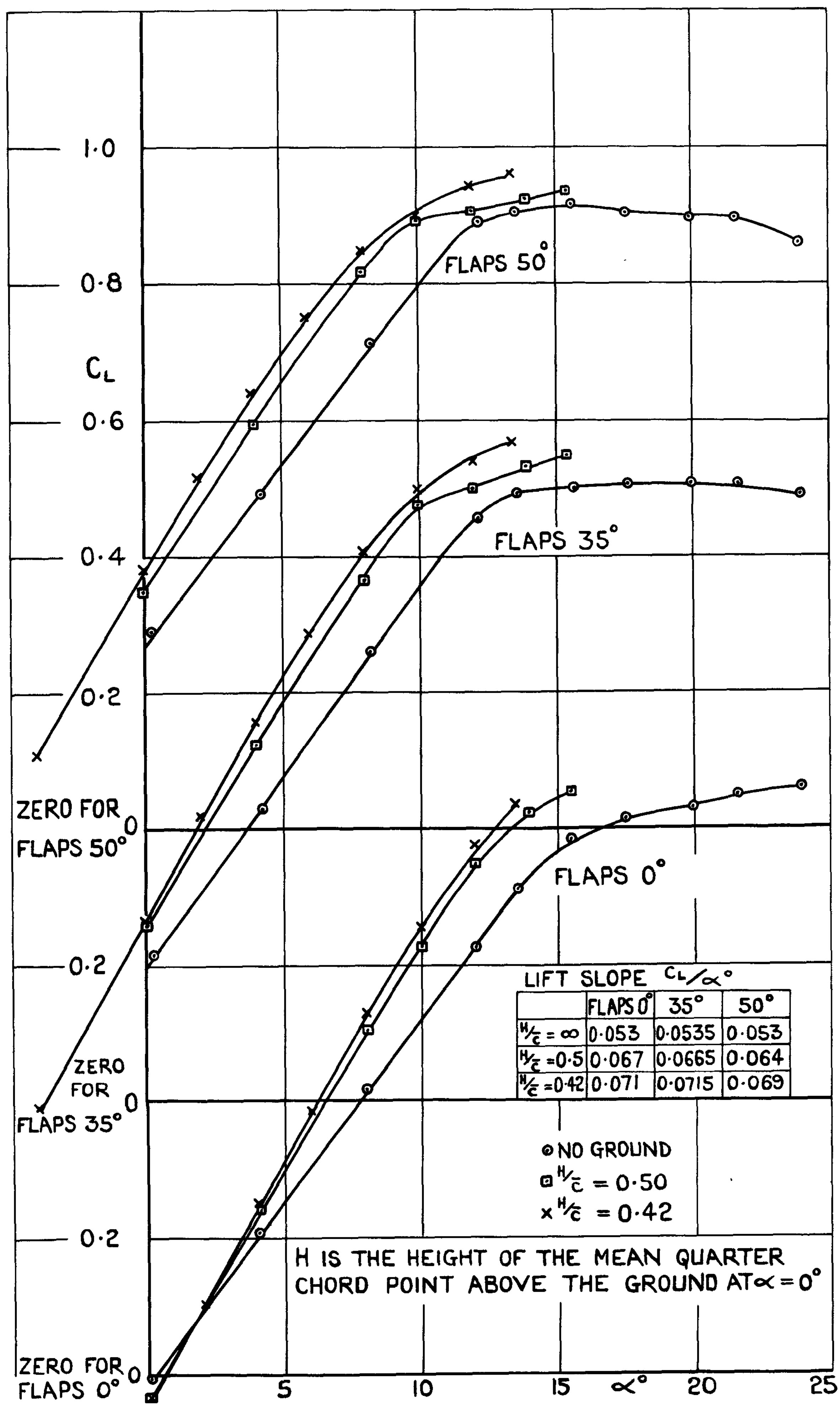


FIG. 6. LIFT OF MODEL WITHOUT TAILPLANE. SWIFT FLAPS. NO FENCES.

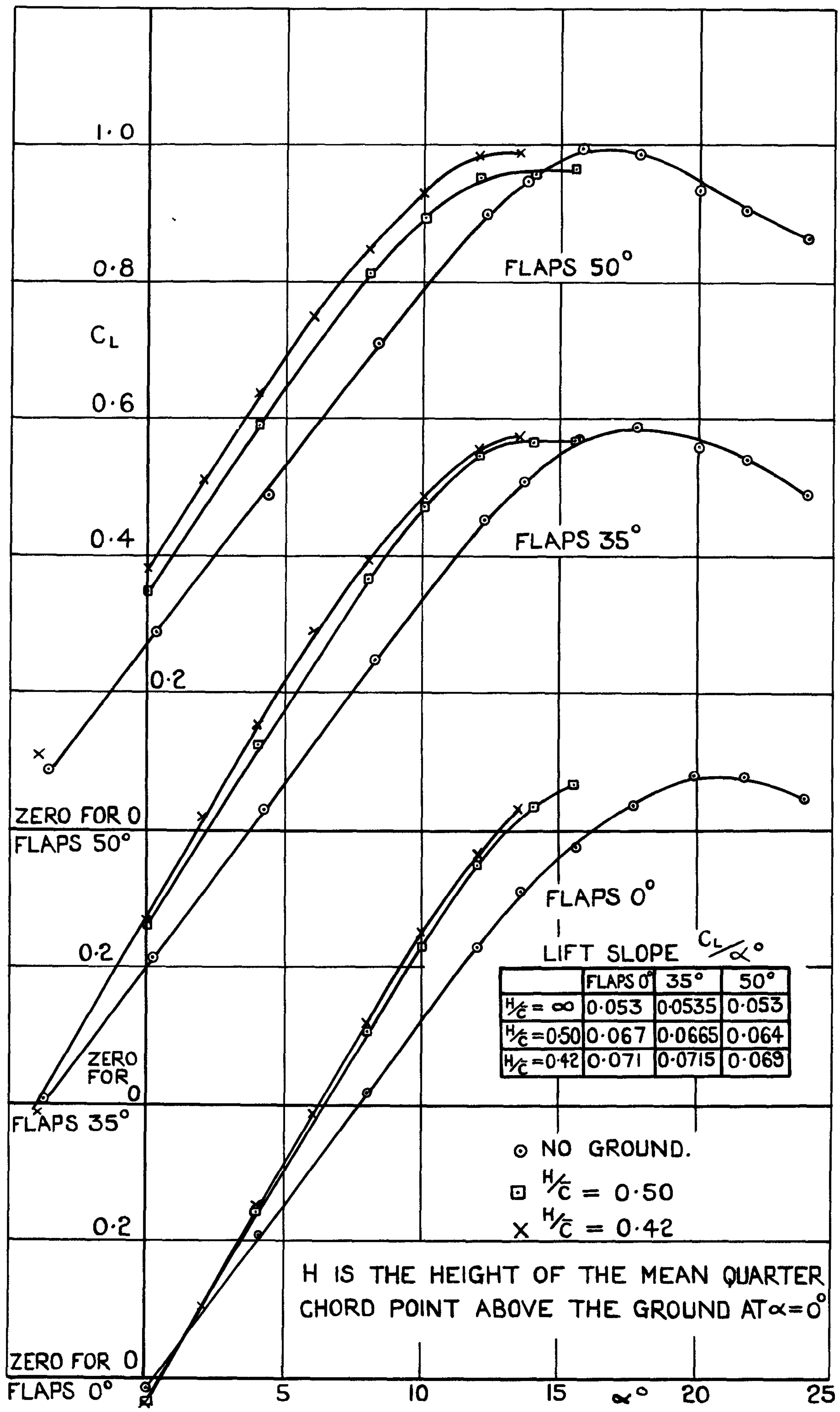
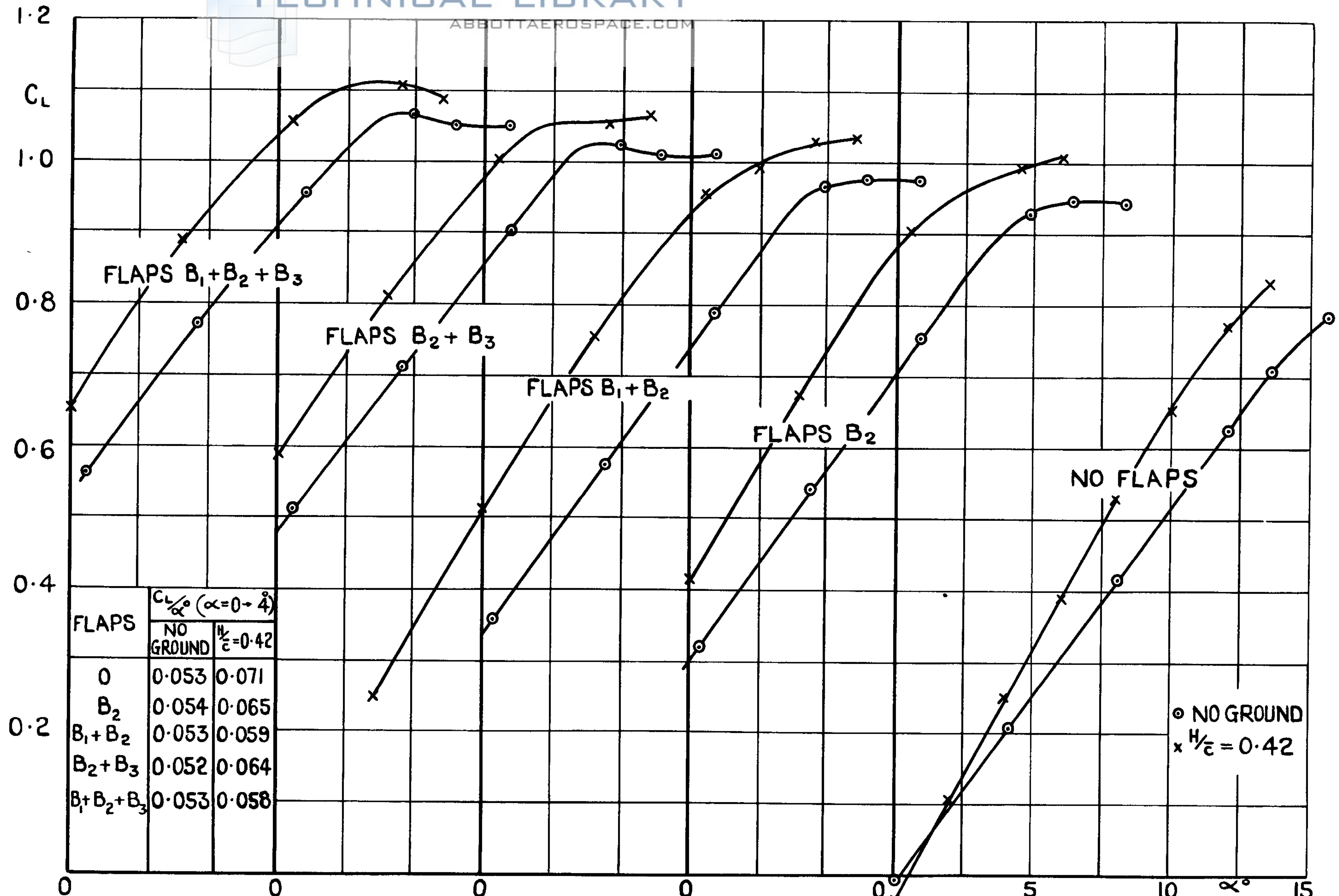


FIG.7. LIFT OF MODEL WITHOUT TAILPLANE.
SWIFT FLAPS.
5·3 % CHORD FENCES AT 66 % SEMISPAN.



FLAPS	$C_L/\alpha°$ ($\alpha=0\to4°$) NO GROUND	$H/c=0·42$
0	0·053	0·071
B_2	0·054	0·065
B_1+B_2	0·053	0·059
B_2+B_3	0·052	0·064
$B_1+B_2+B_3$	0·053	0·058

FIG. 8. LIFT OF MODEL WITH FLAPS B DEFLECTED 50°. NO TAILPLANE. NO FENCES.

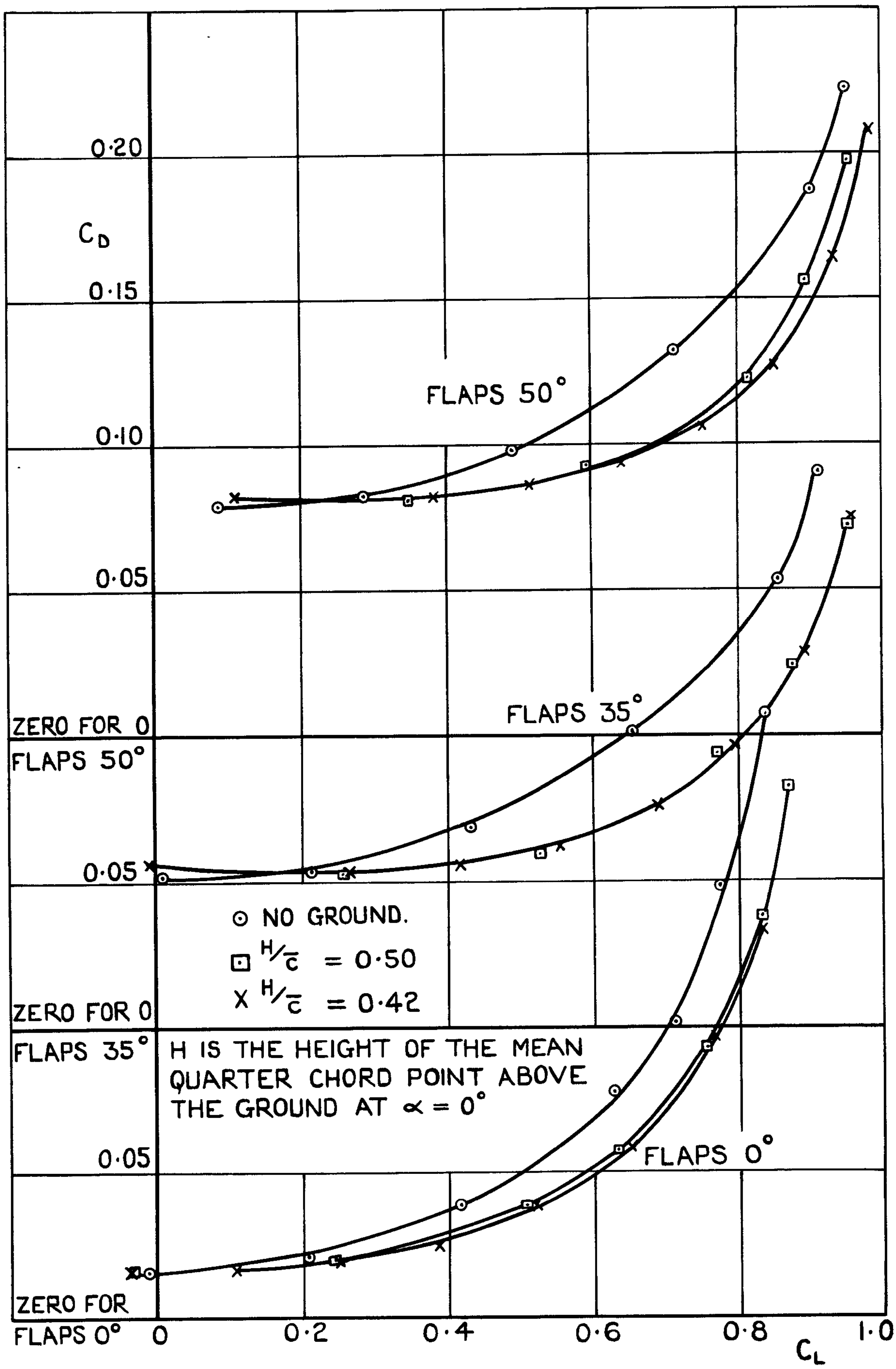


FIG.9. DRAG OF MODEL WITHOUT TAILPLANE.
SWIFT FLAPS.
5·3 % CHORD FENCES AT 66% SEMISPAN.

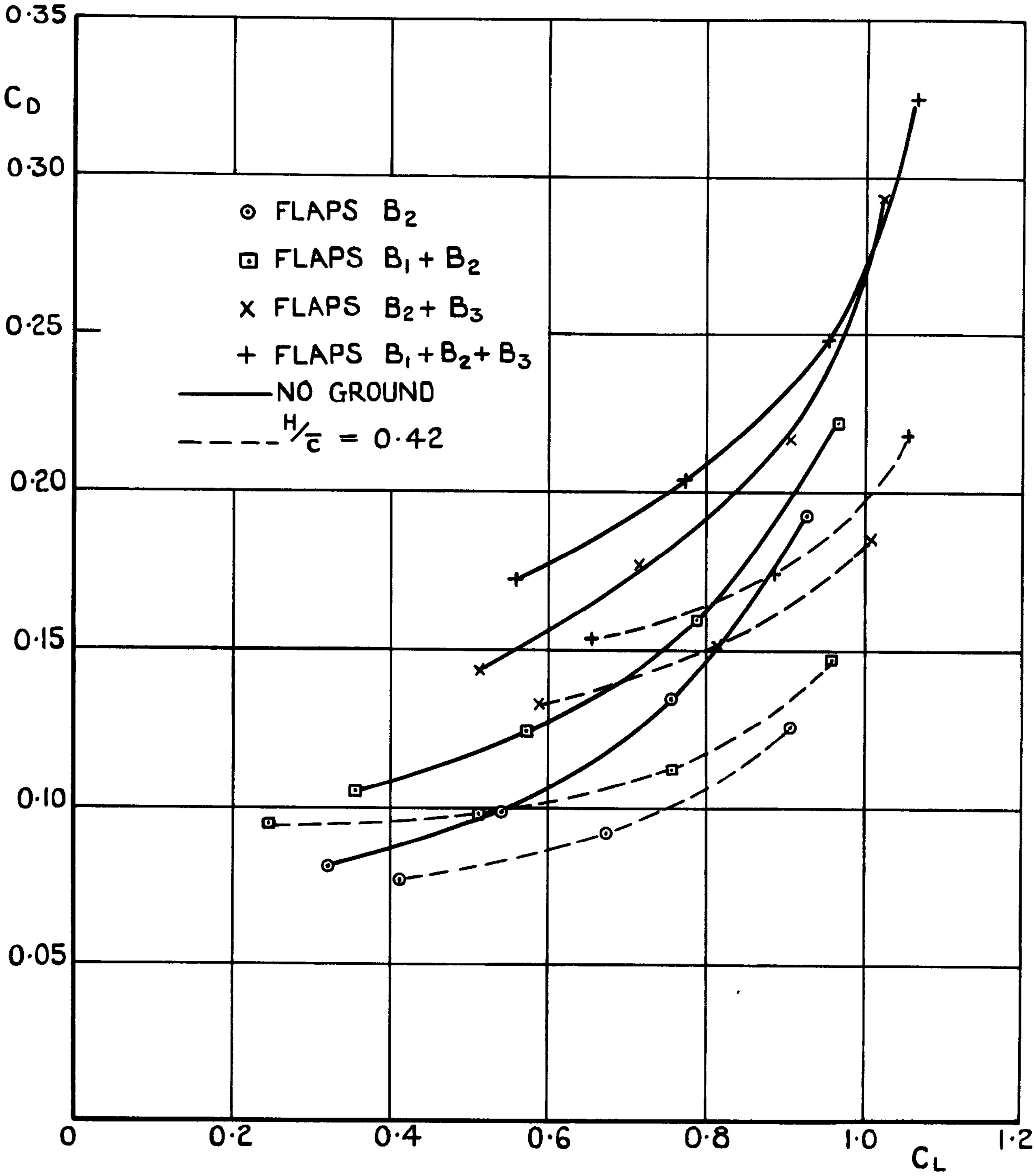
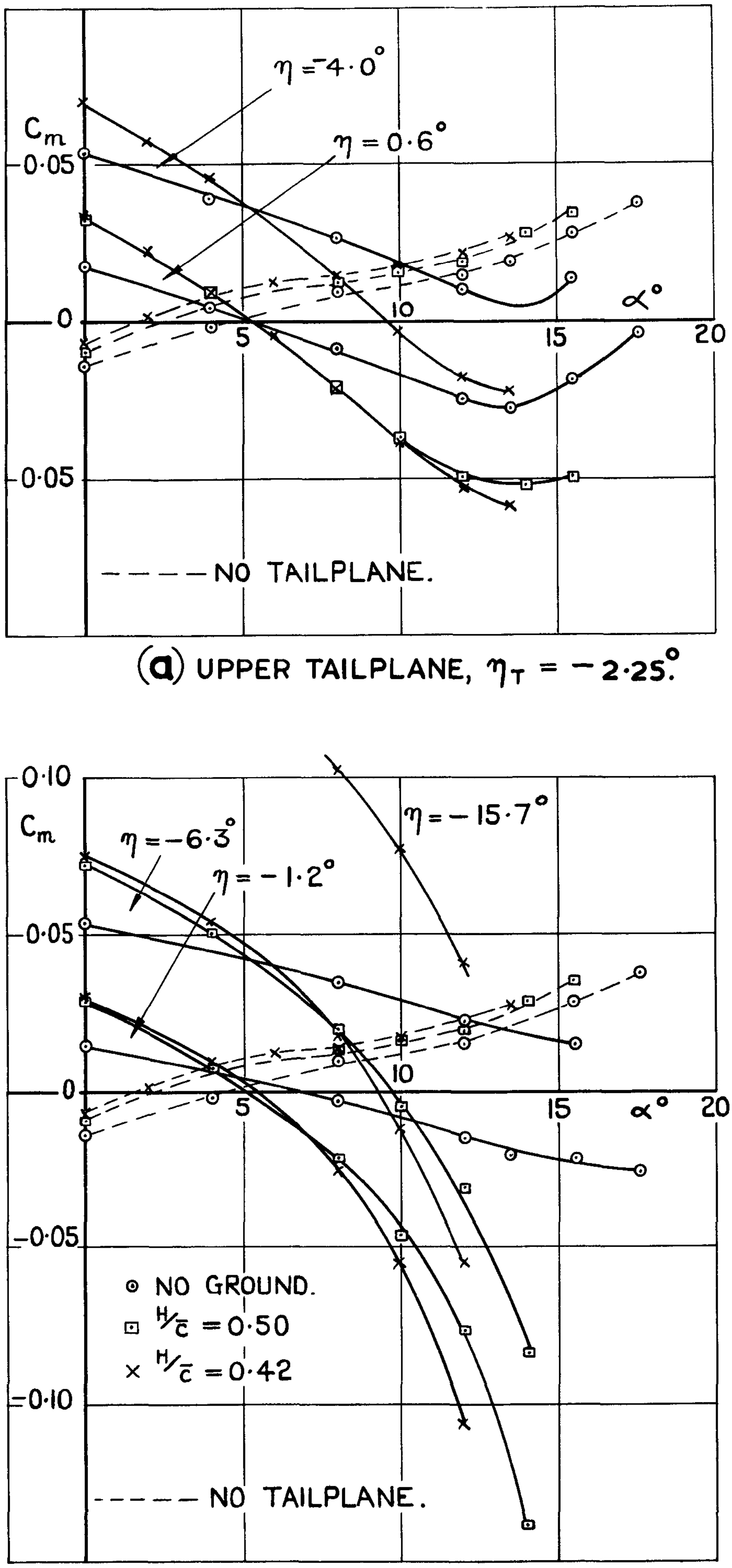
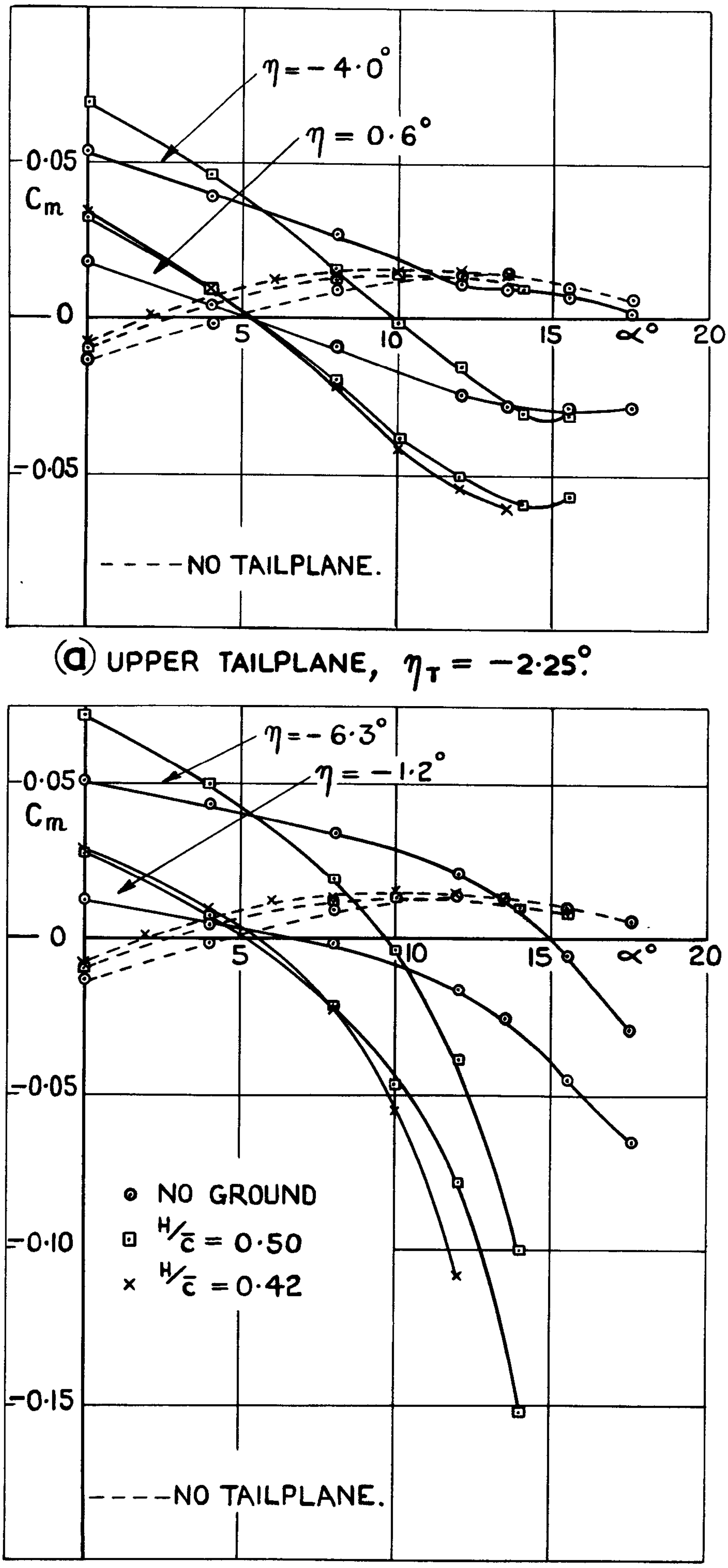


FIG. 10. DRAG OF MODEL WITHOUT TAILPLANE. FLAPS B DEFLECTED 50°. NO FENCES.



(b) LOWER TAILPLANE, η_T = −2·25°

FIG.11. (a & b) PITCHING MOMENT WITH FLAPS 0°
NO FENCES.



(a) UPPER TAILPLANE, $\eta_T = -2{\cdot}25°$

(b) LOWER TAILPLANE, $\eta_T = -2{\cdot}25°$

FIG 12. (a&b) PITCHING MOMENT WITH FLAPS 0°.
5·3% CHORD FENCES AT 66% SEMISPAN.

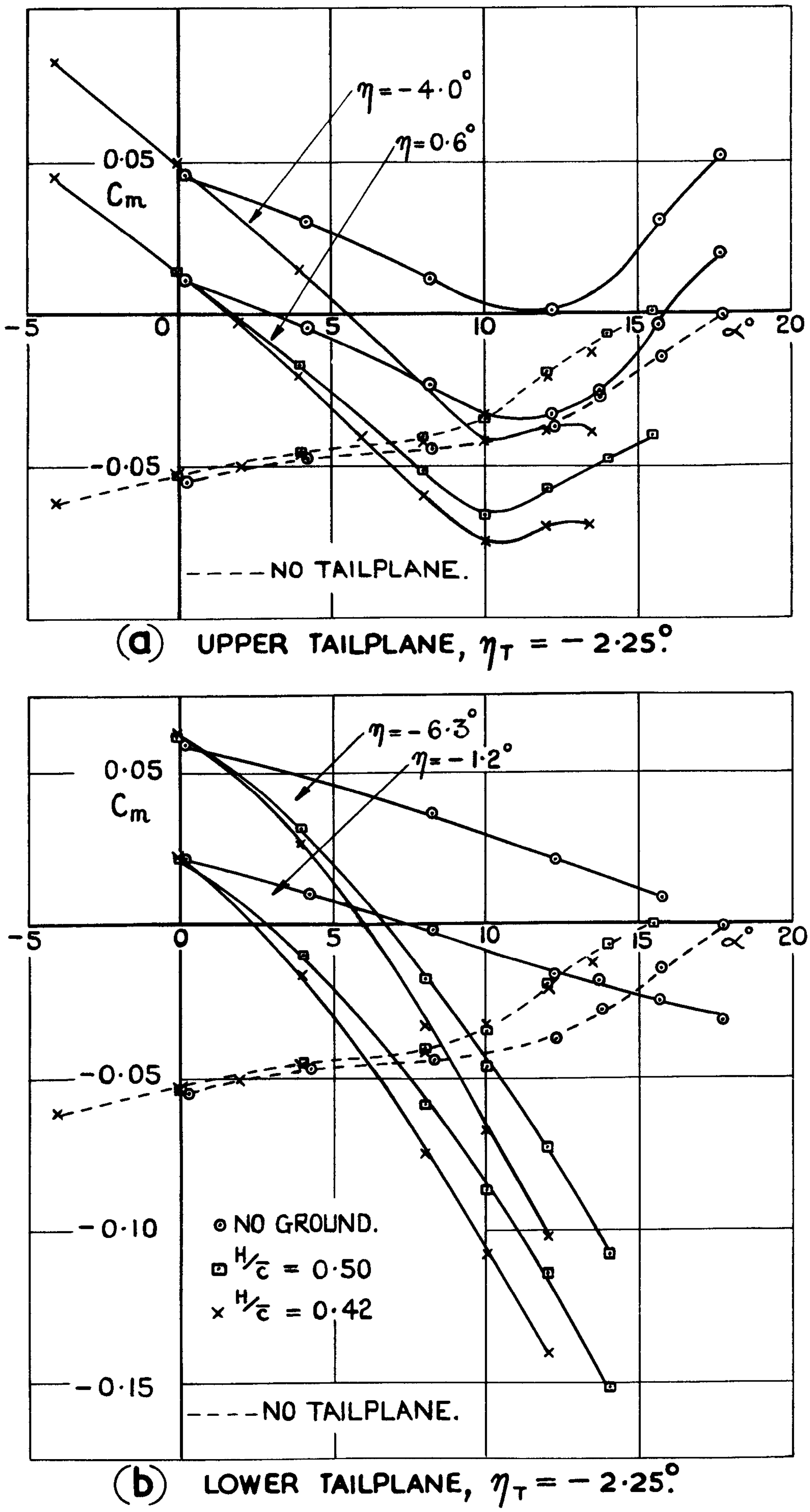
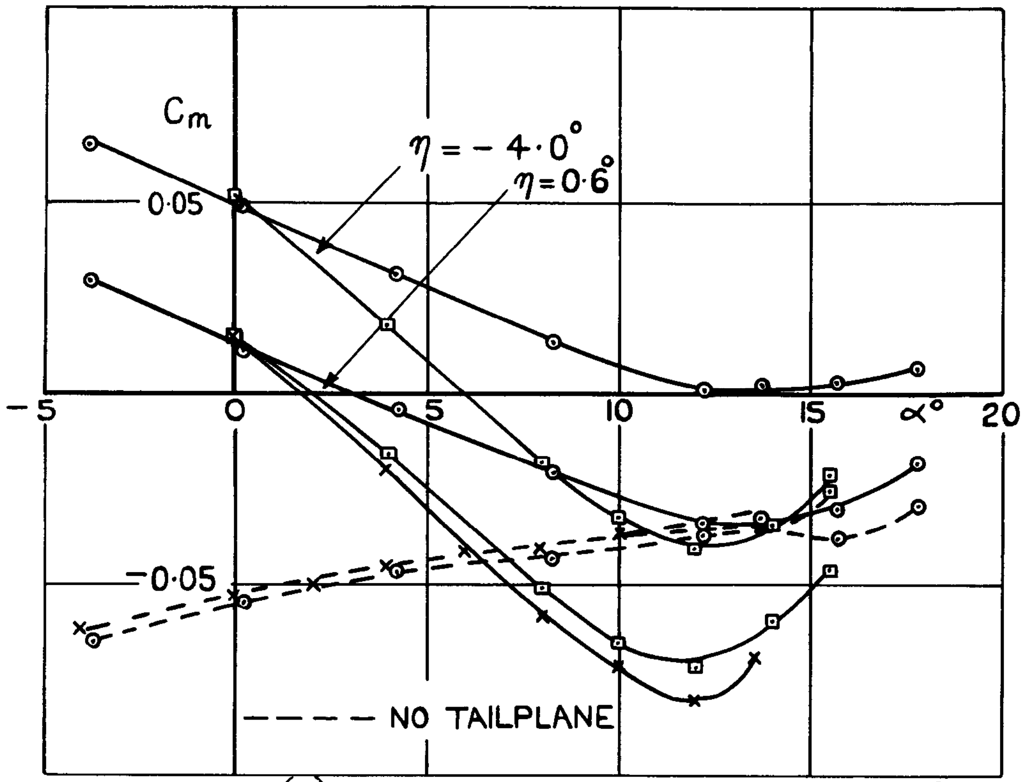
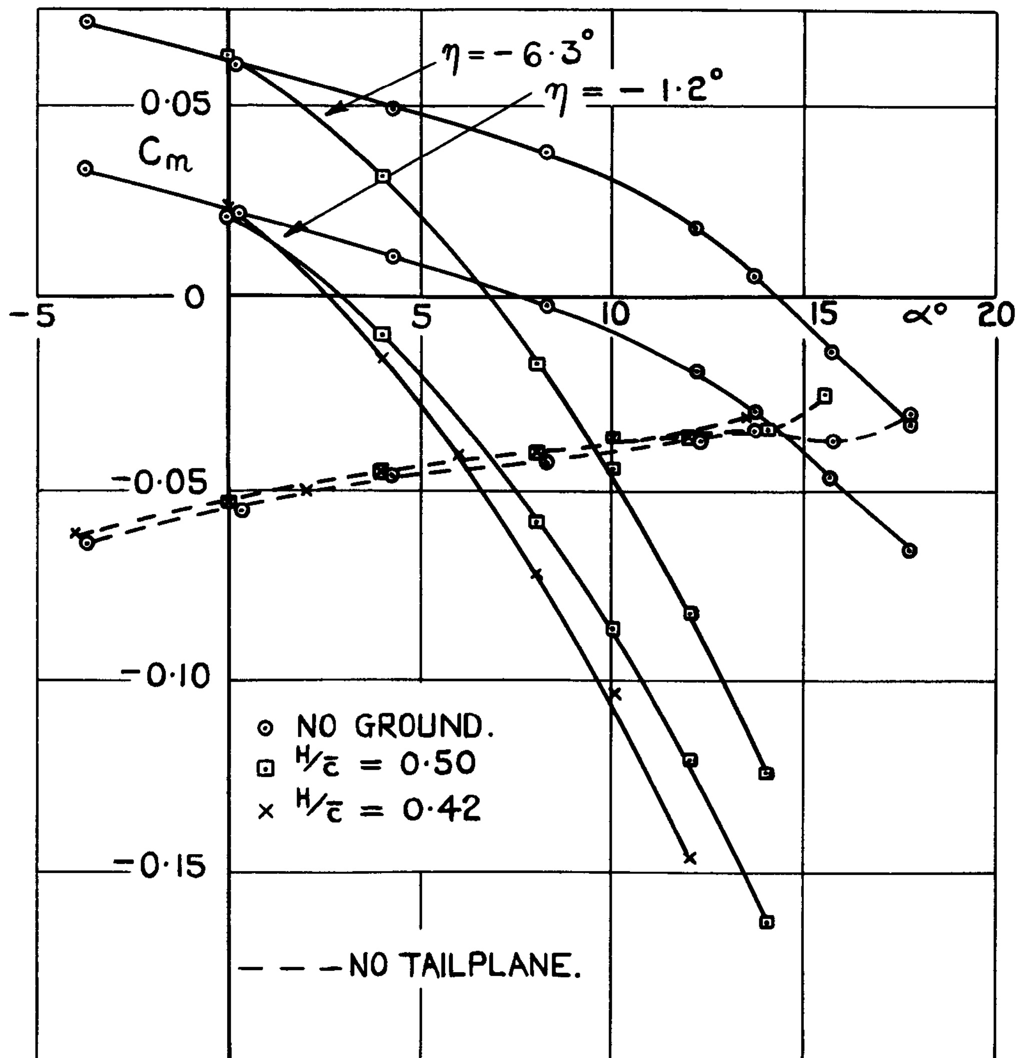


FIG. 13. (a&b) PITCHING MOMENT WITH SWIFT FLAPS DEFLECTED 35°. NO FENCES.

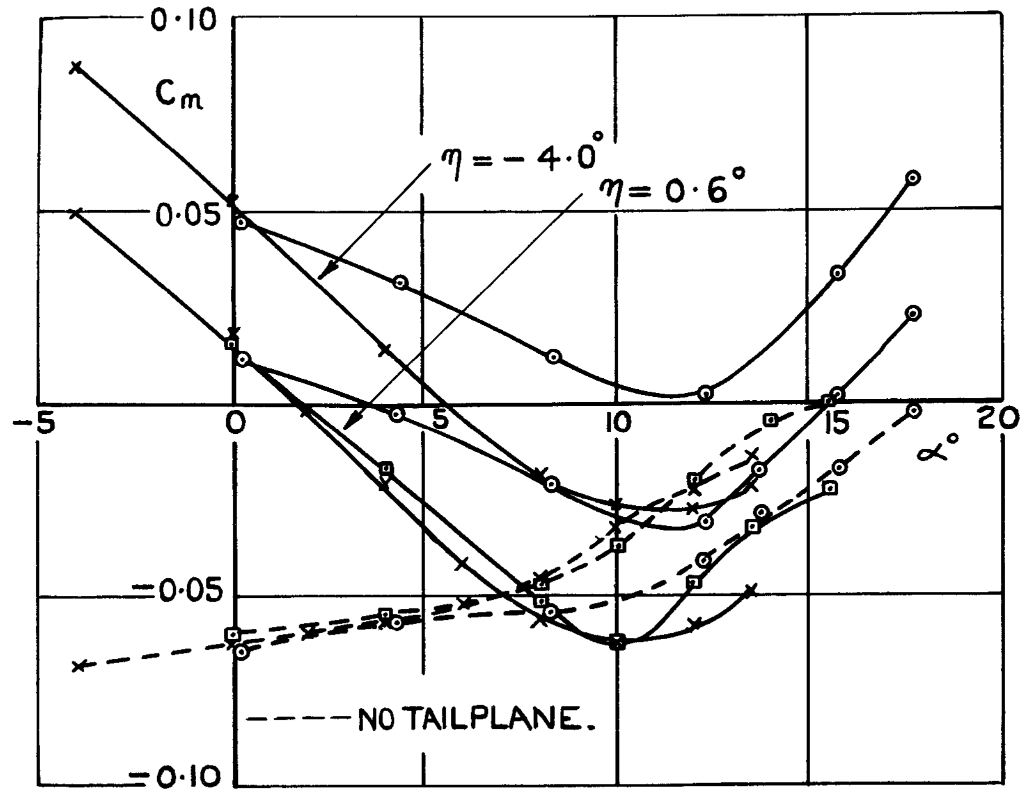


(a) UPPER TAILPLANE, $\eta_T = -2{\cdot}25°$

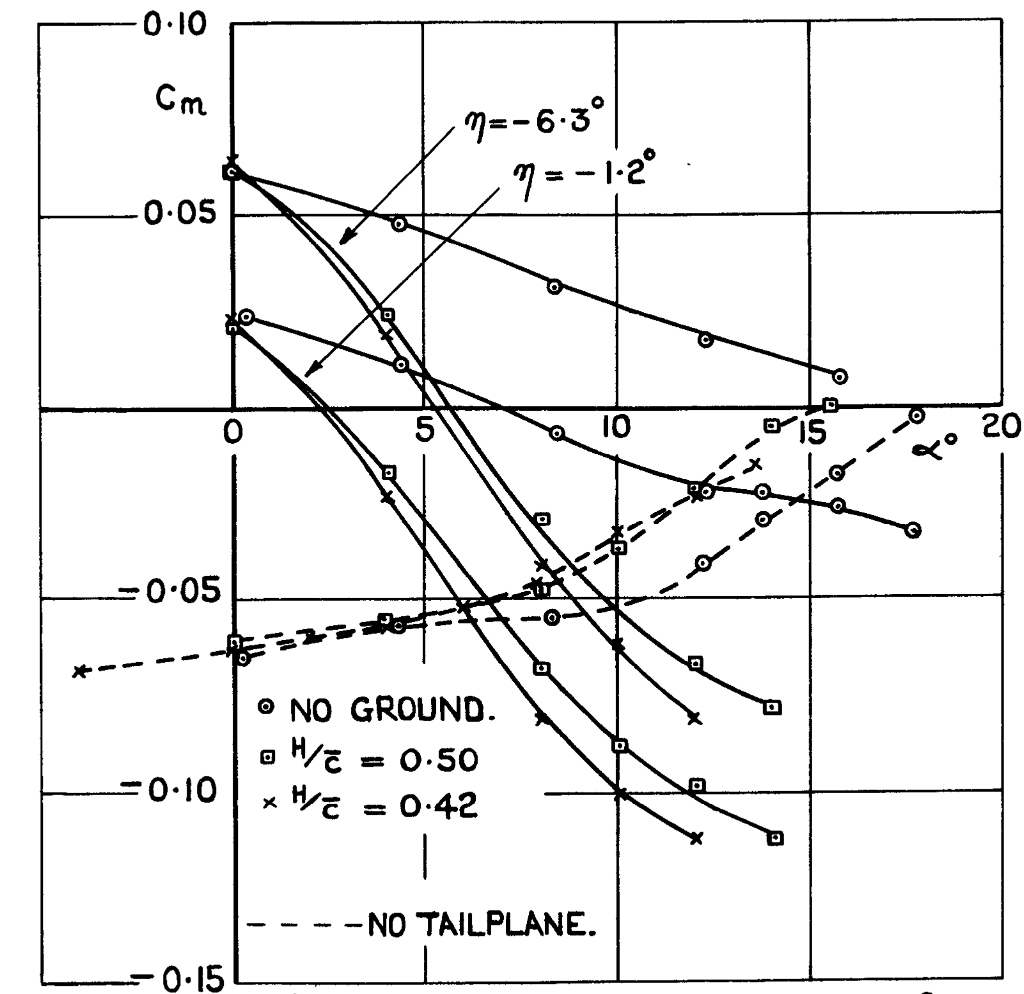


(b) LOWER TAILPLANE, $\eta_T = -2{\cdot}25°$

FIG. 14.(a & b) PITCHING MOMENT WITH SWIFT FLAPS DEFLECTED 35°.
5·3 % CHORD FENCES AT 66 % SEMISPAN.

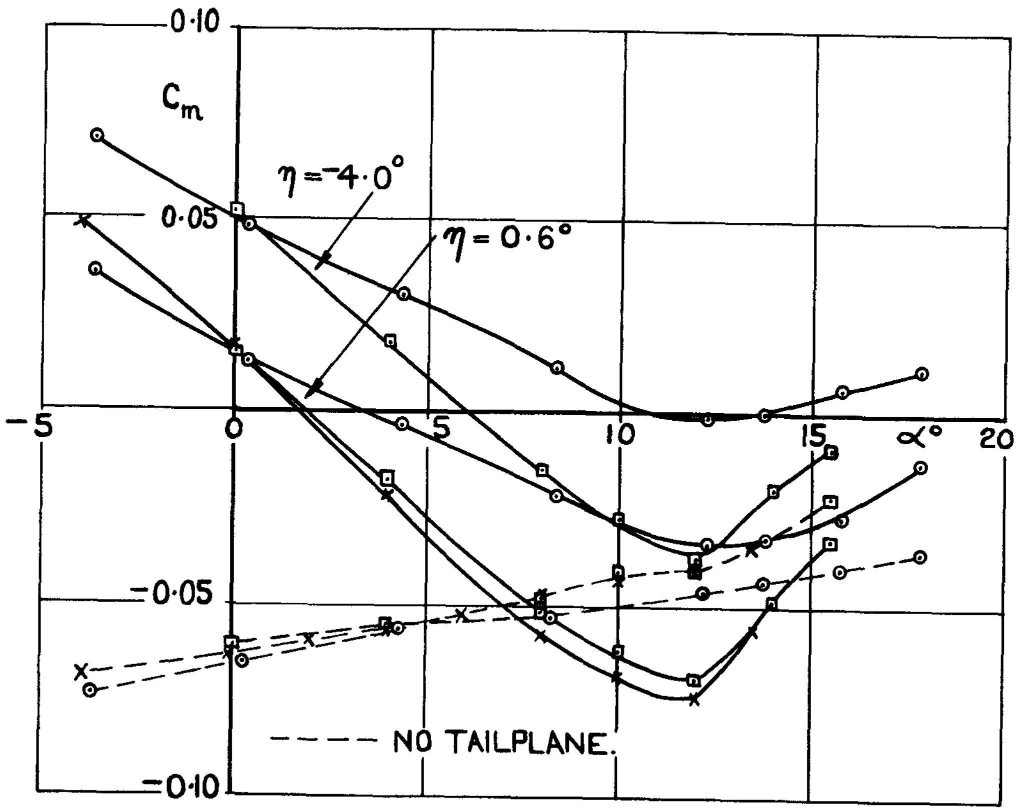


(a) UPPER TAILPLANE, $\eta_T = -2{\cdot}25°$.

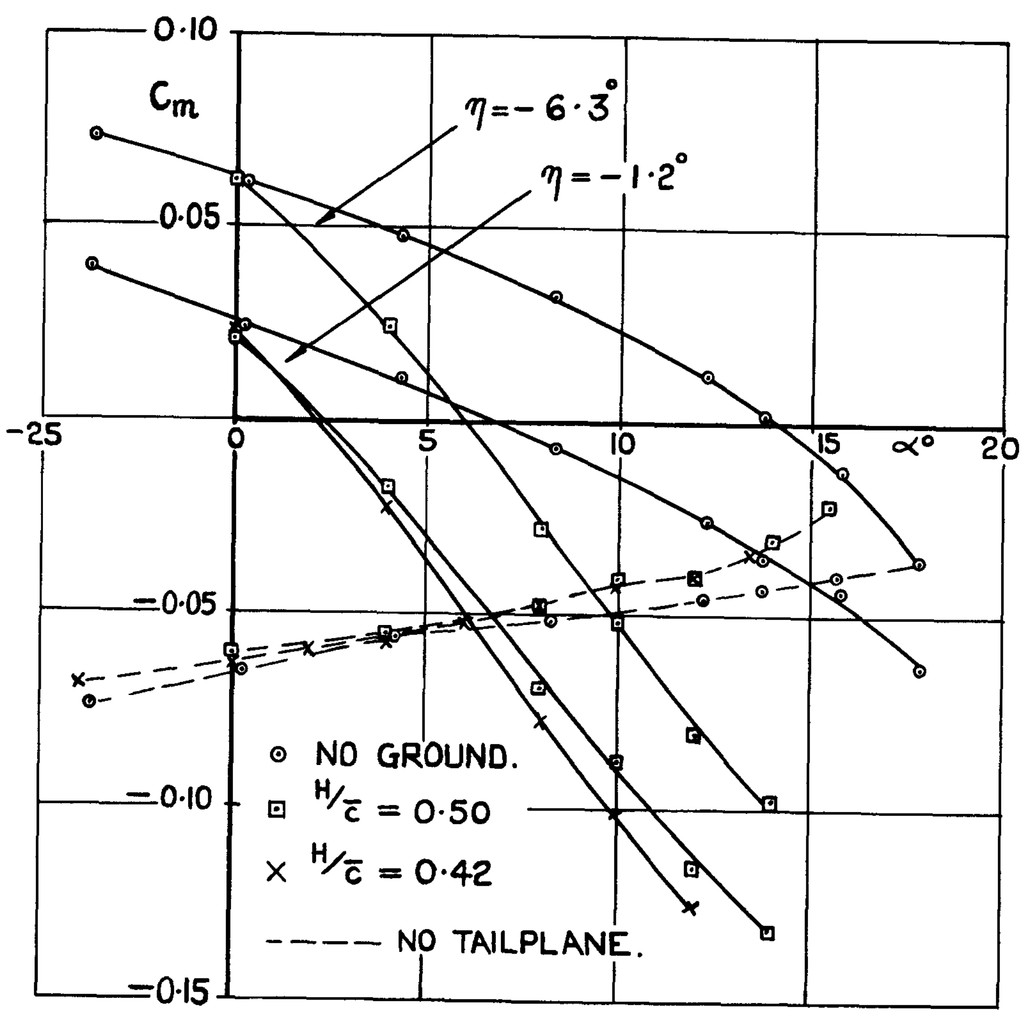


(b) LOWER TAILPLANE, $\eta_T = -2{\cdot}25°$.

FIG. 15. (a & b) PITCHING MOMENT WITH SWIFT FLAPS DEFLECTED 50°. NO FENCES.



(a) UPPER TAILPLANE, $\eta_T = -2\cdot25°$.



(b) LOWER TAILPLANE, $\eta_T = -2\cdot25°$.

FIG. 16. (a & b) PITCHING MOMENT WITH SWIFT FLAPS DEFLECTED 50°. 5·3 % CHORD FENCES AT 66% SEMISPAN.

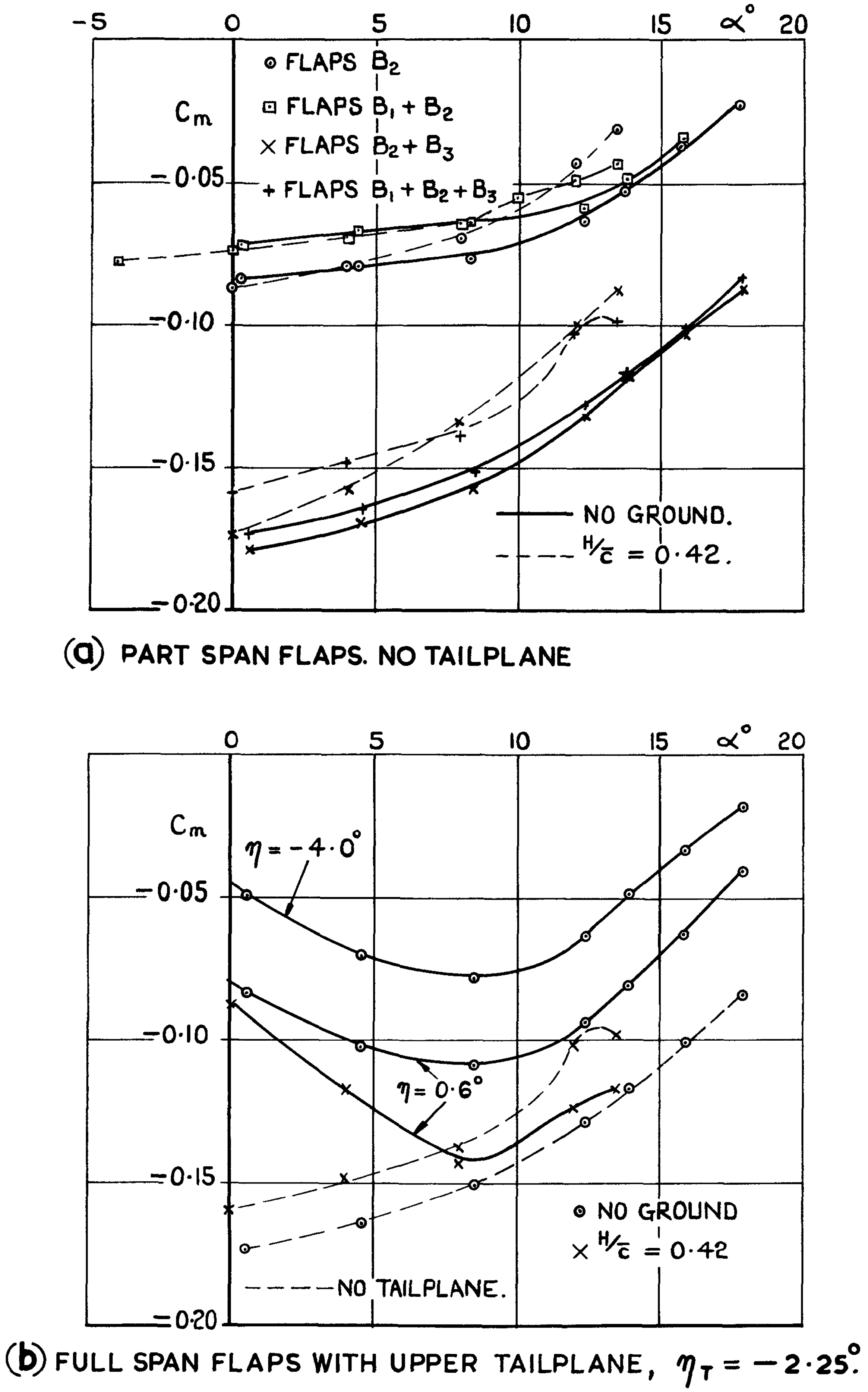


FIG 17 (a & b) PITCHING MOMENT WITH FLAPS B DEFLECTED 50°. NO FENCES.

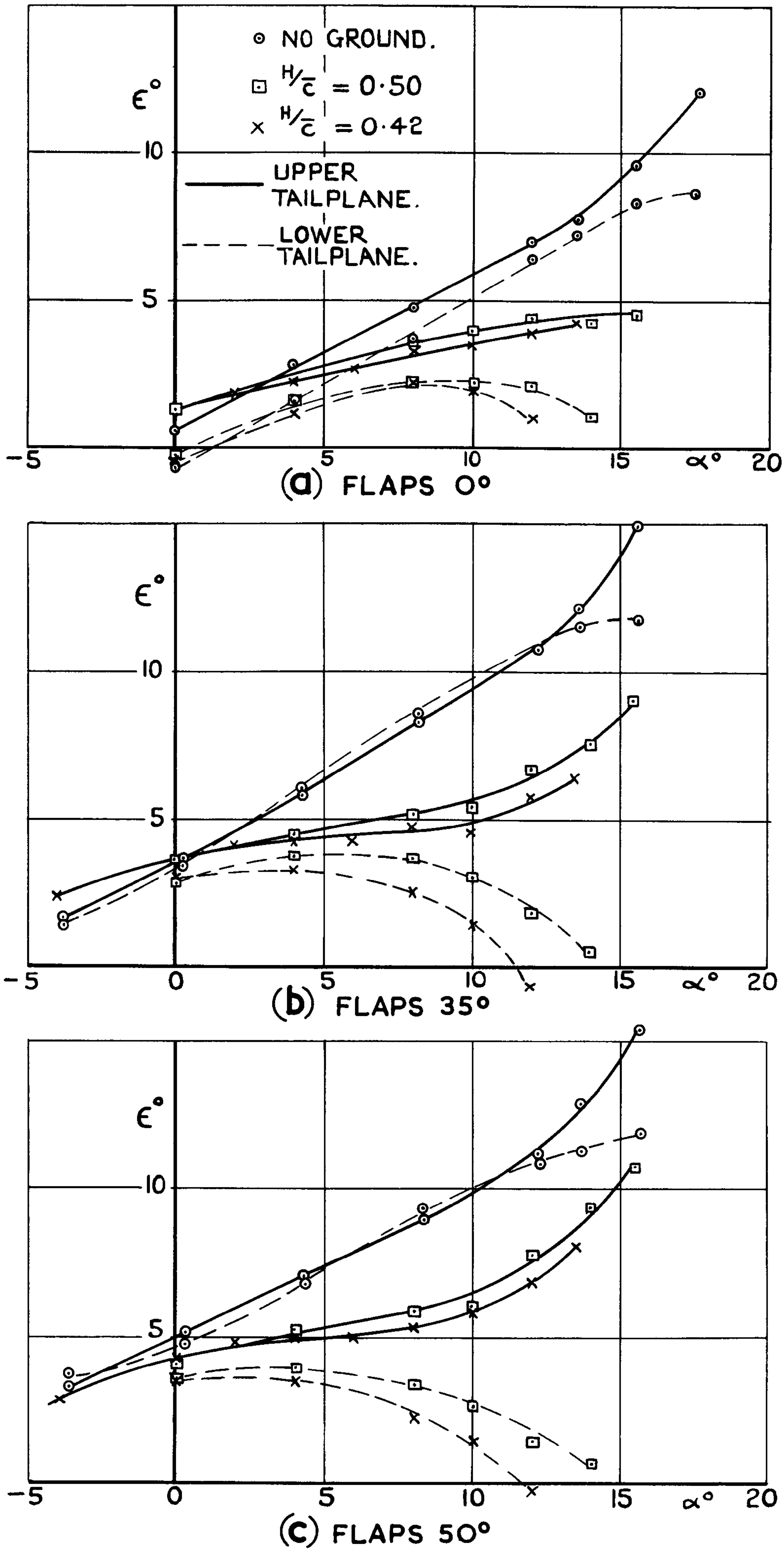


FIG. 18. (a. b & c) MEAN DOWNWASH AT TAILPLANE. SWIFT FLAPS. NO FENCES.

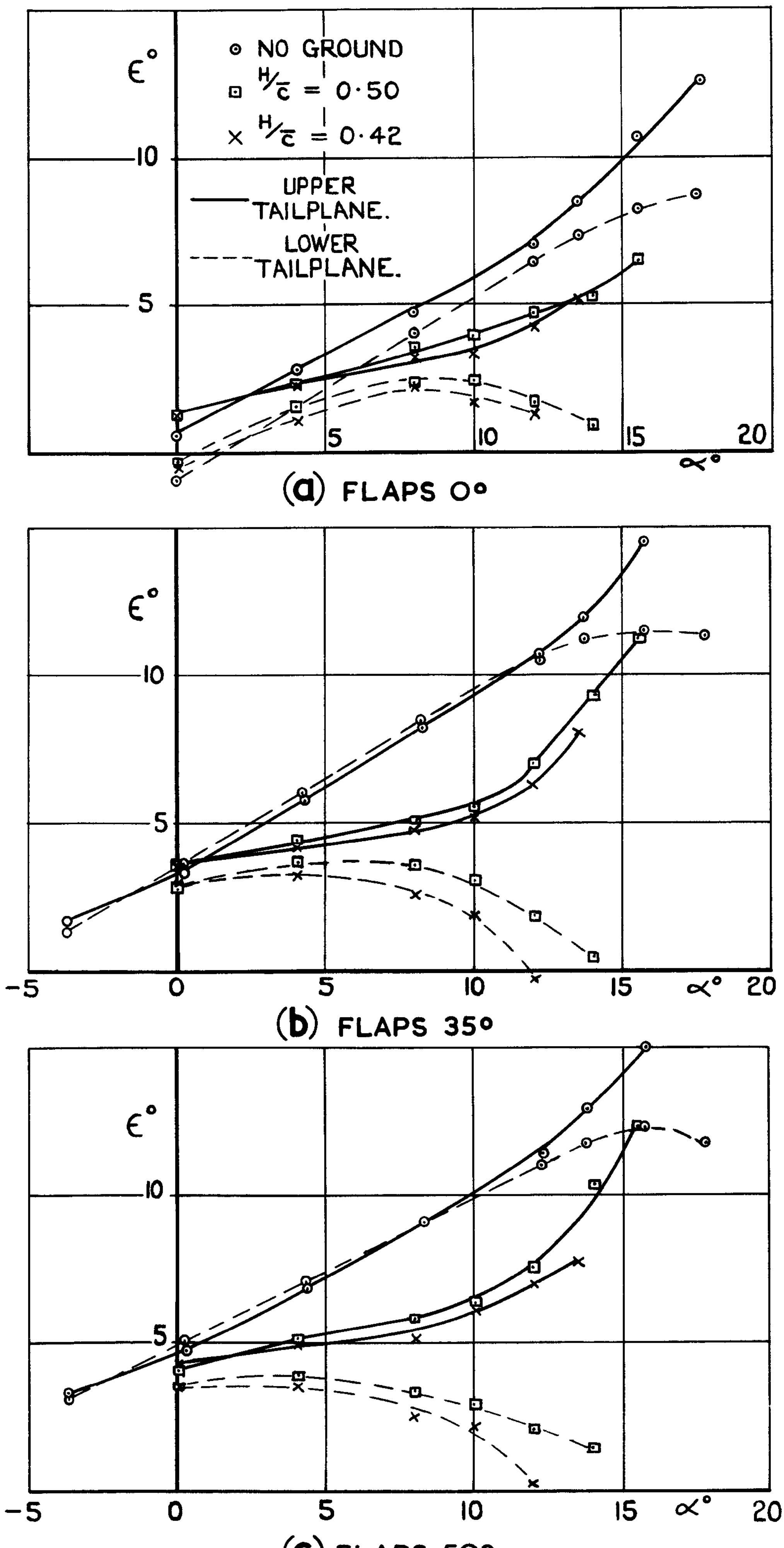


FIG 19 (a, b & c) MEAN DOWNWASH AT TAILPLANE.
SWIFT FLAPS.
5·3 % CHORD FENCES AT 66% SEMISPAN.

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