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Report No. Aero 1830

Report No. Aero 1830
June, 1943

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH

Wind tunnel tests with slipstream on Tempest models

M.A.P. Reference: Nil
R.A.E. Reference: Aero/974/2.D/28
Item No. : 9C/9/41

D

S U M M A R Y

Reason for Enquiry

Wind tunnel tests with slipstream were required to determine the effects of the propeller on the longitudinal and directional stabilities of the Tempest with (a) wing leading edge radiators and (b) underbody nose radiator.

Range of Investigation

Tests were made to measure the following:-

- (a) Lift, drag, pitching and yawing moment coefficients without propeller for various conditions of both models.
- (b) Lift, pitching and yawing moment coefficients with propeller on and $T_c = 0$ for the same conditions as in (a).
- (c) Lift and pitching moment coefficients of the wing leading edge radiator model with maximum climb power.

Conclusions

Neutral point positions for stick fixed static longitudinal stability are as follows:-

	Neutral point position (Mean over range $C_L = 0.2$ to 0.7)	
	Wing radiator model	Nose radiator model
Model without propeller	0.345c	0.36c
With propeller $T_c = 0$	0.27c	0.29c

Values of n_z (rudder fixed) are

	Wing radiator model	Nose radiator model
Model without propeller	+0.081	+0.083
With propeller $T_c = 0$	+0.044	+0.039

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D 1. Introduction

Wind tunnel tests with slipstream on a Typhoon model¹ had shown that the propeller had large adverse effects on both longitudinal and directional stability. Measurements have been made to determine these effects on Tempest models fitted with wing leading edge radiators and with an underbody nose radiator. The wing radiator is at the moment fitted to the prototype Tempest I, and the nose radiator to the prototype Tempest V. Previous tests on these two models^{2,3} had been made without slipstream, but, as modifications to wing plan form and control surface areas had since been made, these tests were repeated with the alterations incorporated.

The tests were made in the Royal Aircraft Establishment 11½ ft. x 8½ ft. tunnel during March 1943 at a tunnel speed of 120 ft./sec. ($R \approx 10^6$), except at high propeller thrusts when the speed was reduced to 80 ft./sec. ($R \approx 0.65 \times 10^6$).

2. Description of models

Details of the two models, which were identical except for the radiator installations, are given in Table 1 and Figs. 1 and 2. The tail plane of span 15 ft. 8 in. and area 49.5 sq.ft. (F.S.) was used, and thin fin and rudder of area 26.2 sq.ft. (F.S.). For the tests with slipstream the propeller (blade angle kept constant at 50° at 0.7R) was attached to the model and driven by an internal motor. The radiator exit flaps were at 0° on both models throughout the tests.

3. Scope of tests

For both models lift and pitching moment coefficients were measured over a range of incidence and yawing moment coefficients over a range of sideslip, with and without the appropriate tail surface. The tests were done both with no propeller and with the propeller on and $T_c = 0$. The effect of power was investigated on the wing radiator model, measurements of lift and pitching moment being made for a range of thrust coefficients at each incidence. From these a constant power pitching moment - lift curve has been derived, the power considered being maximum climb power for the Sabre IV engine i.e. 2,050 B.H.P. at 9,000 ft.

-3-

The propeller was calibrated with the model removed from the tunnel; the $T_c - J$ relationship obtained is given in Table 2.

4. Results

4.1. Longitudinal stability (Tables 3,4,5,6,7. Figs.4,5,6)

The test results were converted to a C.G. position situated at 0.28c and 13.1 in. (F.S.) below the thrust line for both models. Neutral point positions for stick fixed static longitudinal stability have been derived from the $C_M - C_L$ curves and are tabulated below.

		Wing radiator model			Nose radiator model		
		$C_L=0.2$	$C_L=0.5$	$C_L=0.7$	$C_L=0.2$	$C_L=0.5$	$C_L=0.7$
Model less tail	No propeller	0.125c	0.12c	0.11c	0.17c	0.155c	0.135c
	$T_c = 0$	0.08c	0.075c	0.07c	0.125c	0.115c	0.105c
Complete model	No propeller	0.345c	0.35c	0.34c	0.365c	0.35c	0.34c
	$T_c = 0$	0.265c	0.275c	0.28c	0.29c	0.29c	0.28c
	Maximum climb power	0.32c	0.295c	0.215c	-	-	-

The value of C_{M_0} for both models is -0.035. This value is 0.009 less negative than the value measured on the previous models with the slightly different wing-body arrangement.

4.2. Directional stability (Table 8, Figs.7,8)

The following table gives values of n_y defined as $\frac{\partial C_n}{\partial \beta}$ over $\pm 5^\circ$ of sideslip. (β is the angle of sideslip in radians). The wing incidence was kept constant for all the tests at $\alpha = +1.2^\circ$.

		Wing radiator model	Nose radiator model
Model less fin and rudder	No propeller	-0.009	-0.012
	$T_c = 0$	-0.037	-0.042
Complete model	No propeller	+0.081	+0.083
	$T_c = 0$	+0.044	+0.039

REFERENCES

<u>No.</u>	<u>Author</u>	<u>Title, etc.</u>
1	Warren and Walker	Wind tunnel tests with slipstream on Typhoon. R.A.E. Report No. Aero Not yet published.
2	Anscombe and Kirk	Wind tunnel tests on the Tempest I with leading edge in-wing radiators. R.A.E. Report No. Aero 1788. November, 1942.
3	Warren, Robertson and Kirk	Wind tunnel tests on the Typhoon II (F.10/41) with nose radiator. R.A.E. Report No. Aero 1773. September, 1942.
4	Seddon, Haile and Spence	Wind tunnel tests on the Tempest II. R.A.E. Report No. Aero Not yet published.

Table 1.

Full scale dimensions and data of Tempest I and V models.

Scale: 1/5.5

<u>Wing:</u>	gross area	S	302.5 sq. ft.
	span	b	42.9 ft.
	mean chord	$S/b = \bar{c}$	7.05 ft.
	aspect ratio	$b/\bar{c} = A$	6.08
	angle to thrust line	i_w	0.8°
	dihedral (outboard section)		5.5°
	root chord	c	9.02 ft.
	mean thickness ratio		13%

<u>Tail:</u>	gross area	S'	49.5 sq. ft.
	span		15.7 ft.
	thickness ratio		14.5%
	arm (C.G. to mean 1/4c point)	l	20.1 ft.
	volume coefficient	$\bar{V} = \frac{S'l}{S\bar{c}}$	0.466

(tail setting γ_p° is relative to wing root chord)

Fin and rudder:

	area (rudder + fin down to fuselage line)	S''	26.2 sq. ft.
	rudder area (behind hinge)		12.9 sq. ft.
	arm (C.G. to mean 1/4 chord point of fin and rudder)	l''	22.3 ft.
	volume coefficient	$\bar{V}'' = \frac{S''l''}{Sb}$	0.045
	thickness ratio at root		11.8%

C.G. position on models (same taken for both Tempest I & V)

	behind L.E. of root chord	27.4 ins.
	" " standard mean chord	0.280 \bar{c}
	below thrust line	13.1 inches
	above L.E. of root chord	14.5 inches.

The standard mean chord, as defined in A.P.970, is a line of length $\bar{c} = S/b$ whose 1/4 point (\bar{x} , \bar{z}) is defined by the equations

$$\bar{x} = \frac{1}{S} \int_{-b/2}^{+b/2} c x dy, \quad \bar{z} = \frac{1}{S} \int_{-b/2}^{+b/2} c z dy,$$

where (x,z) is the 1/4 point of the wing chord of length c.

Note: The wing leading edge at the centre line is 8.1 in. (F.S.) further aft than on the models of References 2 and 3, the wing tips being in the same fore and aft position. The present model is now correct.

* The root chord is defined as the wing chord 1.72 ft. (F.S.) from the \bar{c} of the aircraft, omitting fillet.

Table 2.

Propeller details and thrust calibration.

Diameter 13.925 ft.
 No. of blades 4
 Section Clark Y
 Solidity at 0.7R 0.122
 Blade angle at 0.7R 50°

Calibration of propeller with thrust line horizontal.

	J	T _c
0.000	2.84	0
0.005	2.22	0.024
0.010	1.51	0.068
0.015	1.14	0.157
0.020	1.00	0.217
0.025	0.90	0.251

Table 3.

Lift, drag and pitching moment coefficients of model without tail.

No propeller.
 V = 120 ft./sec.

1. Tempest I model.
 - wing radiator

2. Tempest V model.
 - nose radiator

α°	C _L	C _D	C _M
- 0.9	+0.001	+0.0149	- 0.0350
+ 1.2	0.144	- 0.151	- 0.0138
4.35	0.361	0.0222	+ 0.0215
7.5	0.570	0.0359	0.0527
10.65	0.768	0.0554	0.0865
13.75	0.909	0.1015	0.1105
14.75	0.916	-	-
15.75	0.906	-	-

α°	C _L	C _D	C _M
- 0.9	- 0.006	+0.0145	- 0.0343
+ 1.2	+ 0.144	0.0150	- 0.0162
4.35	0.3655	0.0224	+ 0.0074
7.5	0.585	0.0368	0.0328
10.65	0.788	0.0560	0.0633
13.75	0.924	0.1012	0.0842
14.75	0.931	-	-
15.75	0.913	-	-

Table 4.

Lift and pitching moment coefficients of complete models.

No propeller.

$V = 120$ ft./sec.

Tailsetting to wing chord $\gamma_T = -1.45^\circ$

1. Tempest I model. - wing radiator

α°	$\gamma = -4.8^\circ$		$\gamma = 0$		$\gamma = +4.85^\circ$	
	C_L	C_M	C_L	C_M	C_L	C_M
- 0.9	- 0.064	*0.1371	- 0.032	* 0.0646	- 0.002	- 0.0138
+ 1.2	+ 0.094	0.1228	+ 0.126	0.0510	+ 0.155	- 0.0252
4.35	0.333	0.1059	0.357	0.0366	0.388	- 0.0391
7.5	0.574	0.0916	0.602	0.0192	0.655	- 0.0562
10.65	0.786	0.0751	0.810	0.0065	0.847	- 0.0682
13.75	0.944	0.0491	0.963	- 0.154	0.989	- 0.0829

2. Tempest V model. - nose radiator

α°	$\gamma = -4.8^\circ$		$\gamma = 0$		$\gamma = +4.85^\circ$	
	C_L	C_M	C_L	C_M	C_L	C_M
- 0.9	- 0.080	+0.1251	- 0.041	+0.0530	- 0.015	- 0.0225
+ 1.2	+ 0.081	0.1116	+ 0.120	0.0369	+ 0.148	- 0.0388
4.35	0.534	0.0888	0.374	0.0142	0.397	- 0.0576
7.5	0.578	0.0682	0.606	-0.0040	0.632	- 0.0745
10.65	0.789	0.0552	0.822	-0.0161	0.849	- 0.0885
13.75	0.948	0.0235	0.970	-0.0451	0.994	- 0.1122

Table 5.

Lift and pitching moment coefficients of models with propellers.

$V = 120$ ft./sec.

1. Tempest I model - wing radiator ($\gamma_c = 0$)

Tailsetting to wing chord $\gamma_T = -1.45^\circ$

α°	Model less tail		$\gamma = -4.8^\circ$		$\gamma = 0$		$\gamma = +4.85^\circ$	
	C_L	C_M	C_L	C_M	C_L	C_M	C_L	C_M
- 0.9	+0.025	- 0.0380	- 0.032	*0.1250	- 0.011	+0.0548	+0.010	- 0.0212
+ 1.2	0.169	- 0.0062	+ 0.116	0.1272	+ 0.149	- 0.0578	0.176	- 0.0156
4.35	0.397	+ 0.0388	0.358	0.1312	0.384	0.0619	0.409	- 0.0119
7.5	0.622	0.0843	0.608	0.1359	0.631	0.0654	0.645	- 0.0112
10.65	0.825	0.1261	0.823	0.1387	0.846	0.0652	0.876	- 0.0110
13.75	0.945	0.1523	0.950	0.1211	1.000	0.0474	1.022	- 0.0215

Table 5 (contd.)

2. Tempest V model - nose radiator ($T_c = 0$)
Tail setting to wing chord $\gamma_T = -1.4^\circ$

α°	Model less tail		$\eta = -4.8^\circ$		$\eta = 0^\circ$		$\eta = +4.85^\circ$	
	C_L	C_M	C_L	C_M	C_L	C_M	C_L	C_M
- 0.9	- 0.011	- 0.0334	- 0.068	+ 0.1221	- 0.042	+ 0.0537	- 0.016	- 0.0213
+ 1.2	+ 0.144	- 0.0077	+ 0.092	0.1210	+ 0.123	0.0494	+ 0.151	- 0.0226
4.35	0.381	+ 0.0279	0.343	0.1174	0.371	0.0484	0.402	- 0.0252
7.5	0.604	0.0630	0.588	0.1168	0.613	0.0453	0.642	- 0.0275
10.65	0.812	0.1009	0.818	0.1154	0.838	0.0438	0.867	- 0.0277
13.75	0.955	0.1276	0.969	0.1004	0.991	0.0285	1.016	- 0.0429

Table 6.

Lift and pitching moment coefficients of Tempest I model (wing radiator) with propeller

$v = 80$ ft./sec.

$\gamma_T = -1.45^\circ$

Model less tail				Complete model $\eta = -4.8^\circ$			
α°	T_c	C_L	C_M	α°	T_c	C_L	C_M
- 0.9	+ 0.004	+ 0.016	- 0.0354	- 0.9	+ 0.001	- 0.056	+ 0.1257
+ 1.15	+ 0.0035	0.157	- 0.0094	+ 1.15	+ 0.001	+ 0.109	+ 0.1255
4.3	+ 0.003	0.389	+ 0.0354	4.3	+ 0.004	+ 0.365	+ 0.1319
	0.059	0.47	0.0202		0.0615	0.380	0.1295
	0.0805	0.407	0.0142		0.0805	0.385	0.1307
	0.099	0.419	0.0105		0.096	0.387	0.1306
7.45	+ 0.0045	0.593	0.0775	7.45	+ 0.0025	+ 0.594	0.1540
	0.1165	0.649	0.0452		0.113	0.644	0.1394
	0.133	0.657	0.0393		0.131	0.649	0.1407
	0.152	0.670	0.0361		0.152	0.655	0.1419
10.6	+ 0.003	0.775	0.1217	10.6	+ 0.004	+ 0.768	0.1314
	0.133	0.862	0.0942		0.135	0.840	0.1508
	0.152	0.873	0.0798		0.152	0.846	0.1541
	0.164	0.887	0.0781		0.161	0.853	0.1548
13.65	+ 0.004	0.885	0.1427	13.65	+ 0.005	+ 0.904	0.1132
	0.133	0.988	0.1107		0.146	0.985	0.1509
	0.152	1.003	0.1048		0.152	0.981	0.1493
	0.161	1.009	0.1021		0.164	0.994	0.1439
Complete model $\eta = 0^\circ$				Complete model $\eta = +4.85^\circ$			
- 0.9	+ 0.003	- 0.17	+ 0.0527	- 0.9	+ 0.007	0	- 0.0238
+ 1.15	+ 0.004	+ 0.135	+ 0.0529	+ 1.15	+ 0.003	+ 0.166	- 0.0131
4.3	+ 0.005	+ 0.387	+ 0.605	4.3	+ 0.0015	+ 0.407	- 0.0146
	0.0595	0.400	0.0482		0.056	0.423	- 0.0360
	0.0805	0.409	0.0458		0.076	0.433	- 0.0408
	0.098	0.414	0.0440		0.091	0.436	- 0.0444

Table 6 (contd.)

Complete model $\eta = 0^\circ$				Complete model $\eta = 4.85^\circ$			
α°	T_c	C_L	C_{M1}	α°	T_c	C_L	C_{M1}
7.45	+0.005	+0.810	+0.0613	7.45	+0.002	+0.617	-0.0117
	0.1135	0.667	0.0513		0.111	0.672	-0.0347
	0.138	0.673	0.0509		0.126	0.679	-0.0381
	0.152	0.682	0.0508		0.146	0.686	-0.0429
10.6	+0.0035	+0.799	+0.0589	10.6	+0.004	+0.826	-0.0112
	0.135	0.868	0.0654		0.115	0.889	-0.0182
	0.158	0.874	0.0652		0.133	0.900	-0.0198
	0.167	0.882	0.0691		0.149	0.911	-0.0197
13.65	+0.004	0.922	+0.0406	13.65	+0.002	+0.951	-0.0137
	0.135	1.000	0.0562		0.113	1.012	-0.0165
	0.158	1.007	0.0615		0.131	1.031	-0.0153
	0.167	1.000	0.0612		0.152	1.039	-0.0138

Table 7.

Representation of full throttle flight conditions for Tempest I. - wing radiator to be used.

All-up weight	11,000 lb.
Engine power	2,050 B.H.P.
Altitude	9,000 ft.
Engine speed	3,700 r.p.m.
Gear ratio	0.252

Coefficients of lift and pitching moments deduced from table 6.

$\eta_T = -1.45^\circ$ to wing chord.

α° wing inci- dence	T_c	C_L (Trimmed)	Model less tail		$\eta_T = -4.8^\circ$		$\eta_T = 0^\circ$		$\eta_T = 4.85^\circ$	
			C_L	C_{M1}	C_L	C_{M1}	C_L	C_{M1}	C_L	C_{M1}
-0.9	0	0.005	0.02	-0.036	-0.05	+0.125	-0.01	+0.055	0	-0.021
+1.2	0.024	0.175	0.175	-0.012	0.12	0.124	+0.15	0.055	0.18	-0.026
4.3	0.083	0.425	0.41	+0.013	0.38	0.131	0.41	0.045	0.43	-0.044
7.45	0.157	0.680	0.67	0.034	0.65	0.142	0.68	0.049	0.695	-0.042
10.6	0.217	0.930	0.91	0.067	0.85	0.162	0.91	0.071	0.94	-0.023
13.65	0.251	1.080	1.09	0.075	1.02	0.141	1.00	0.078	1.085	-0.016

Table 8.

Yawing moment coefficients due to yaw.

Wing incidence $\alpha = +1.2^\circ$.

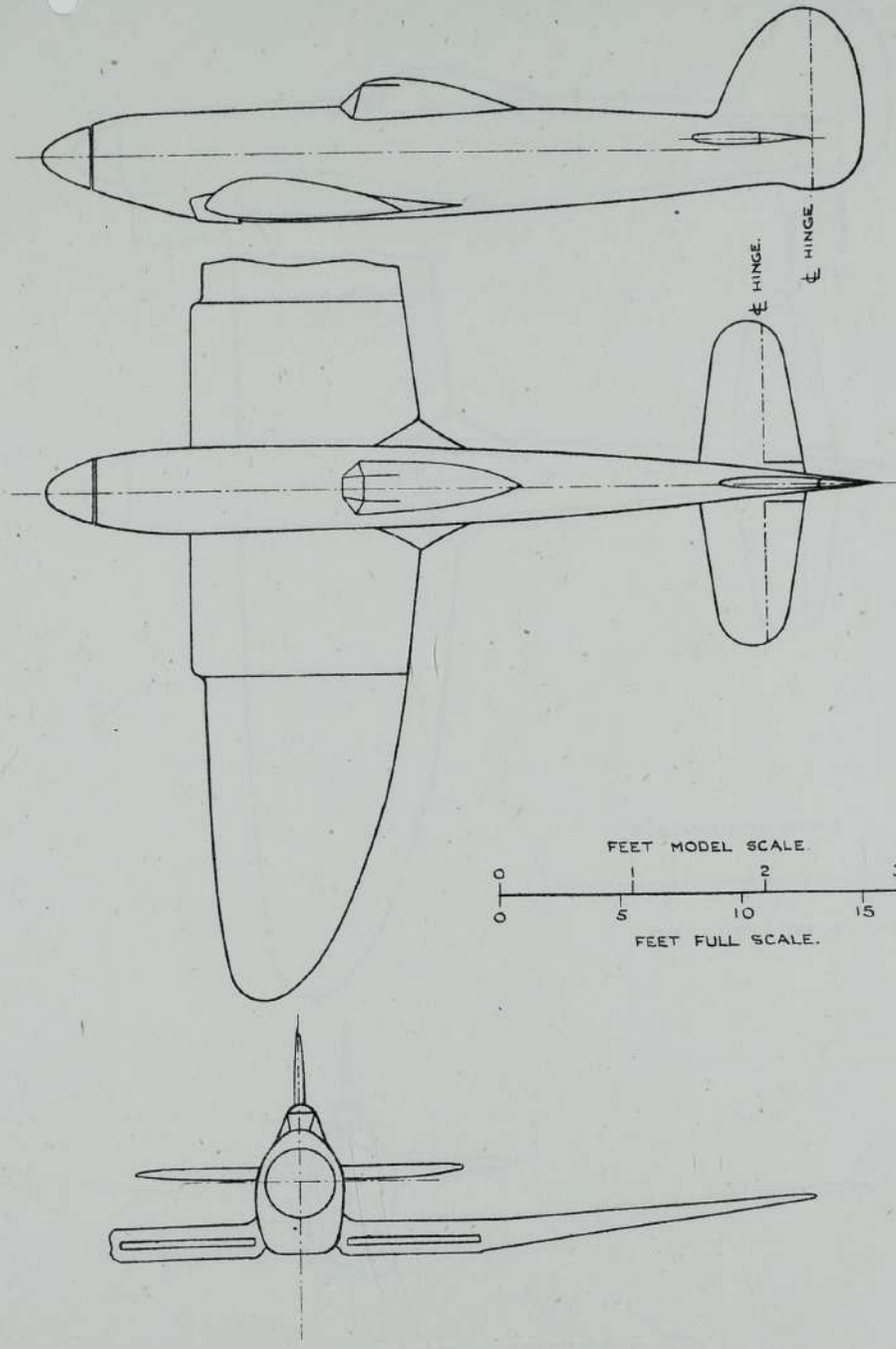
Angle of sideslip β°	$C_n \times 10^3$			
	No propeller		Propeller on; $T_c = 0$	
	Complete model	Model less fin	Complete model	Model less fin.
1. Tempest model. - wing radiator				
- 10	- 15.55	+ 1.09	- 9.63	+ 5.00
- 5	- 7.05	0.80	- 3.77	3.17
0	0	0	- 0.15	0.46
+ 5	+ 7.05	- 0.80	+ 3.94	- 3.23
+ 10	15.55	- 1.09	8.90	- 6.86
2. Tempest model. - nose radiator				
- 10	- 15.05	+ 1.65	- 8.12	+ 6.45
- 5	- 7.22	1.07	- 3.97	3.01
- 2.5	- 3.30	-	-	-
0	0	0	- 0.49	- 0.59
+ 2.5	+ 3.30	-	-	-
5	7.22	- 1.07	+ 2.90	- 4.24
10	15.05	- 1.65	9.09	- 7.34

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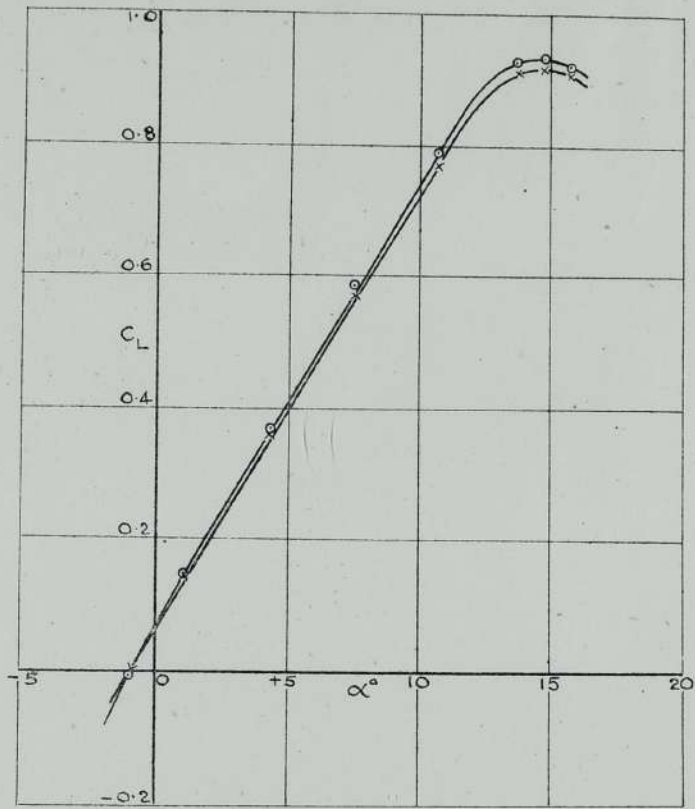
FIG. 1.



G.A. OF TEMPEST MODEL. (WING RADIATORS).

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 APP. F.03

FIG. 5

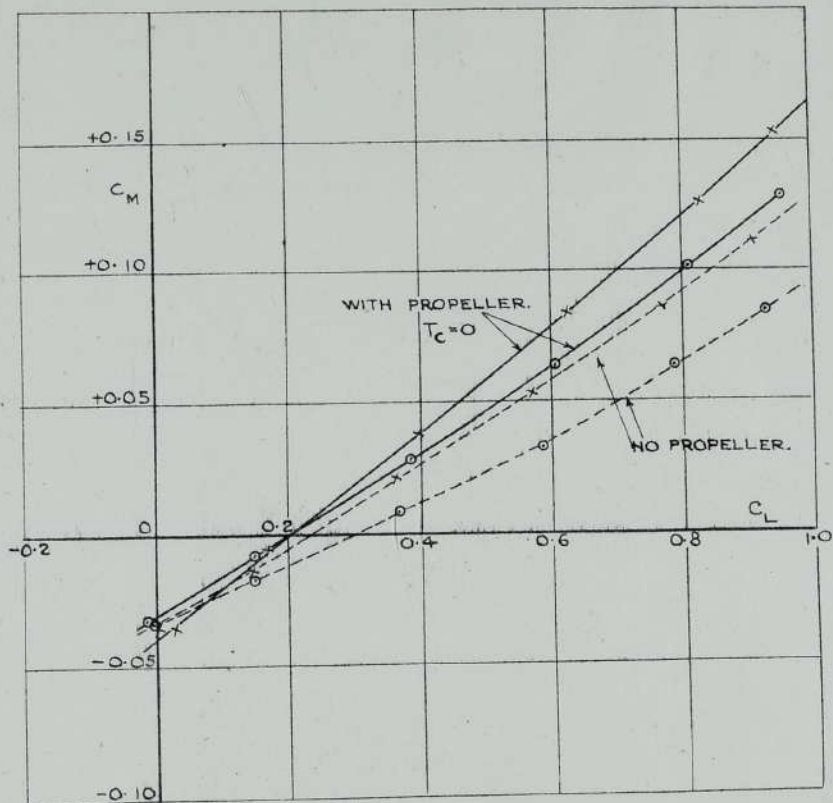


—x— WING RADIATOR MODEL.
 —o— NOSE RADIATOR MODEL.

LIFT COEFFICIENTS OF MODELS WITHOUT TAILPLANE OR PROPELLER.
 TEMPEST.

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FIG. 4.

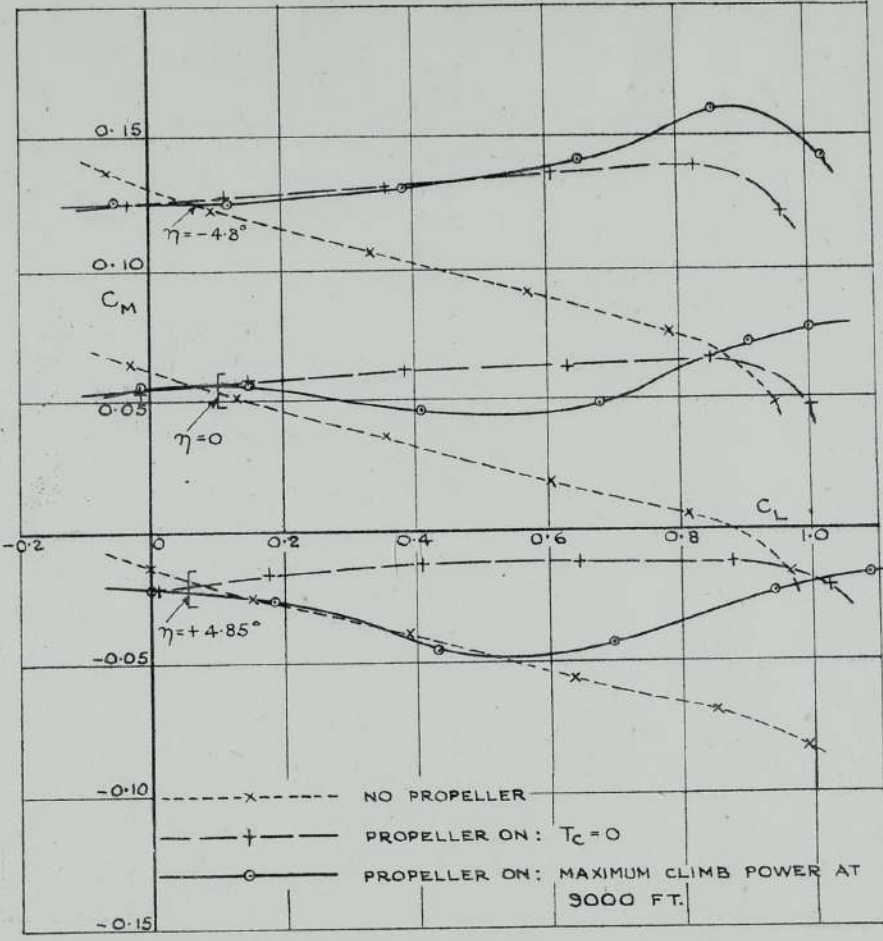


—x— WING RADIATOR MODEL.
 —o— NOSE RADIATOR MODEL.

PITCHING MOMENTS OF MODELS WITHOUT TAILPLANE.
 TEMPEST.

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FIG. 5.



$\eta_T = -1.45^\circ$

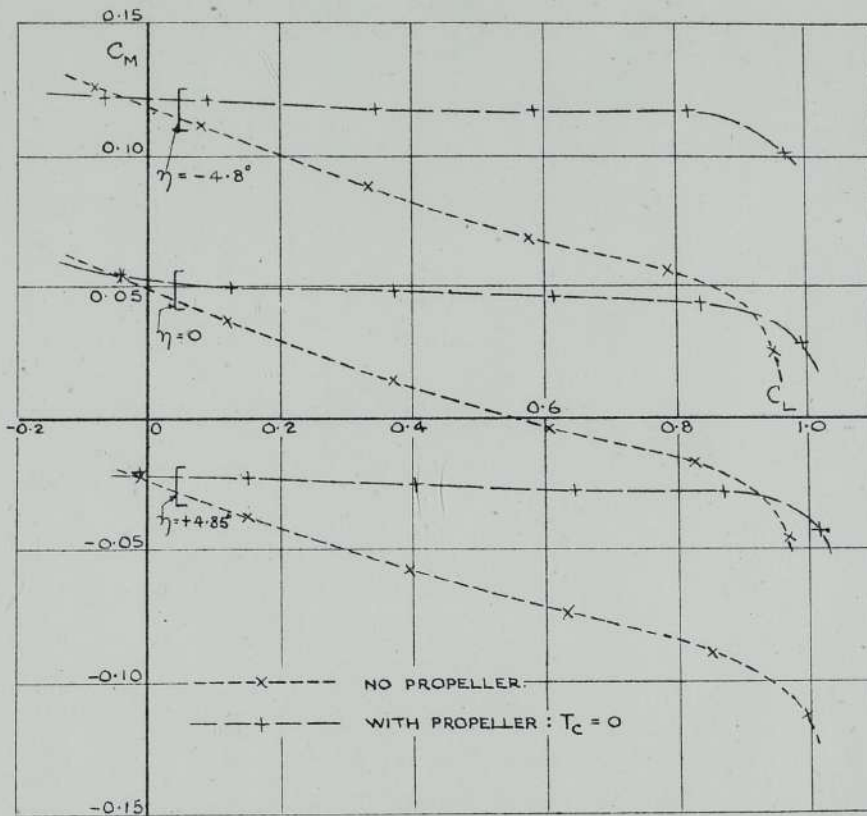
C.G. AT 0.280 \bar{c}

LONGITUDINAL STABILITY OF WING RADIATOR MODEL.

TEMPEST.

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FIG. 6



$\eta_T = -1.4^\circ$

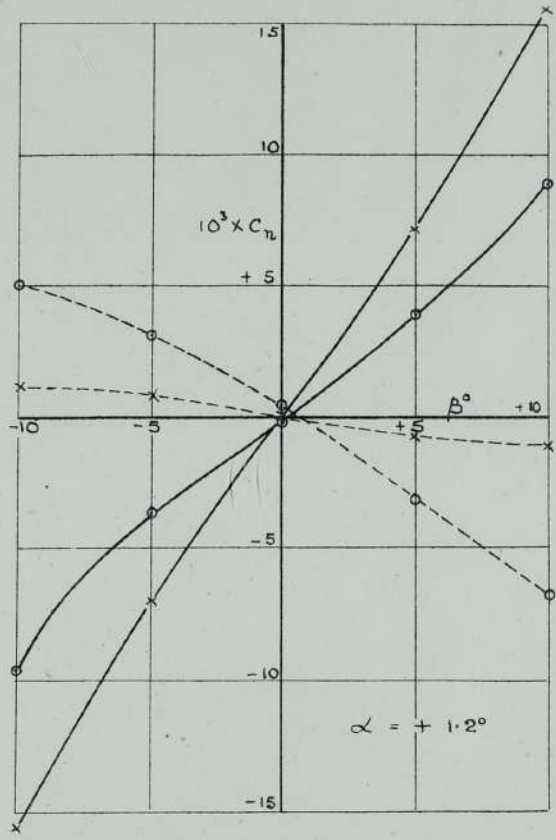
C.G. AT $.280 \bar{c}$

LONGITUDINAL STABILITY OF NOSE RADIATOR MODEL.

TEMPEST.

DR AS
 TR. LEB 19-6-43
 CH. W.H.
 APP. FEB

FIG. 7.

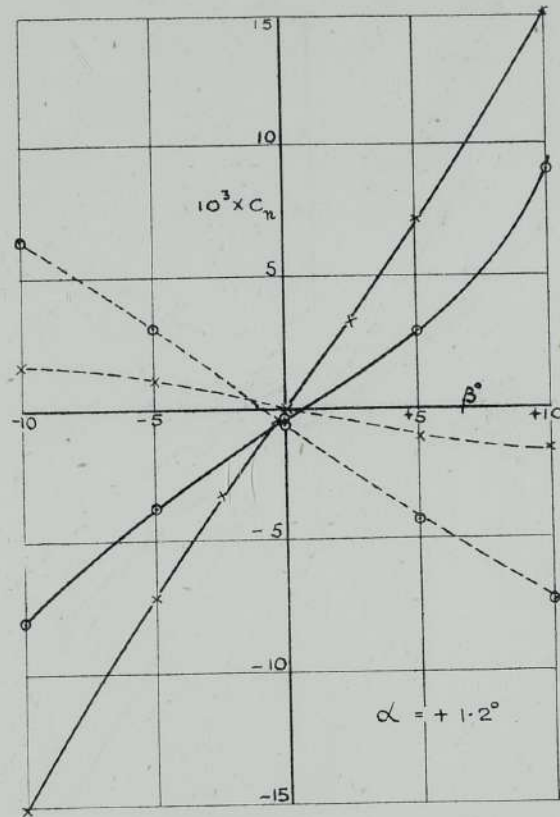


— x — NO PROPELLER } COMPLETE MODEL.
 — o — $T_c = 0$ }

BROKEN LINES WITHOUT FIN AND RUDDER.
 YAWING MOMENT COEFFICIENTS OF WING RADIATOR MODEL.
 TEMPEST.

N^o 127735
 DR: AS
 TR. L. E. B. 21. 6. 43
 CH. O. J. H.
 APP. F. B. B.

FIG. 8



— x — NO PROPELLER. } COMPLETE MODEL.
 — o — T_c = 0

BROKEN LINES WITHOUT FIN & RUDDER.
 YAWING MOMENT COEFFICIENT OF NOSE RADIATOR MODEL.

TEMPEST.

10 FEB 1944

UNCLASSIFIED

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH

Corrigenda (a)
to,
Report No. Aero.1850

Wind tunnel tests with slipstream on
Tempest models

R.A.E. Ref : Aero.974/2D/126

Page 3

Para. 4 Results.

Replace table in para. 4.1. Longitudinal stability (Tables 5, 6, 5, 6, 7; Figs. 4, 5, 6) by :-

		Wing radiator model			Hose radiator model		
		$\beta_1=0.2$	$\beta_1=0.5$	$\beta_1=0.7$	$\beta_1=0.2$	$\beta_1=0.5$	$\beta_1=0.7$
Model less tail	No propeller	0.135	0.135	0.1255	0.175	0.1655	0.155
	$T_0 = 0$	0.0955	0.095	0.085	0.1355	0.135	0.1155
Complete model	No propeller	0.345	0.3455	0.3355	0.3655	0.355	0.345
	$T_0 = 0$	0.2655	0.2755	0.265	0.295	0.295	0.265
	Maximum climb power	0.335	0.265	0.225	-	-	-

Replace last sentence of 4.1. by :-

The value of C_{ND} for both models is ≈ 0.053 . This value is 0.011 less negative than the value measured on the previous models with the slightly different wing-body arrangement.

Page 5 Table I.

Under Tail:

Arm (C.G. to mean $\frac{1}{2}$ chord point) ℓ Replace 20.1 ft. by 18.9 ft.

Volume coefficient $\bar{V} = \frac{S \cdot \ell}{S_b}$ Replace 0.466 by 0.440

Fin and rudder:

Arm (C.G. to mean $\frac{1}{4}$ chord point of fin and rudder) ℓ'' Replace 22.3 ft. by 21.1 ft.

Volume coefficient $\bar{V} = \frac{S'' \cdot \ell''}{S_b}$ Replace 0.045 by 0.043.

Secret
 Corrigenda to
 Report No. Aero.1830

TABLE 3 Replace last column C_M by :-

1. Tempest I model

- wing radiator

C_M
-0.0329
-0.0133
+0.0198
0.0492
0.0811
0.1037

2. Tempest V model

- nose radiator

C_M
-0.0323
-0.0174
+0.0065
0.0305
0.0594
0.0792

TABLE 4. Replace C_M columns by :-

1. Tempest I model - wing radiator

C_M		
$\eta = -4.8^\circ$	$\eta = 0$	$\eta = +4.85^\circ$
+0.1277	+0.0600	-0.0132
0.1142	0.0472	-0.0239
0.0984	0.0338	-0.0369
0.0853	0.0178	-0.0525
0.0704	0.0064	-0.0632
0.0464	-0.0137	-0.0762

2. Tempest V model - nose radiator

C_M		
$\eta = -4.8^\circ$	$\eta = 0$	$\eta = +4.85^\circ$
+0.1165	+0.0492	-0.0213
0.1038	0.0341	-0.0361
0.0825	0.0132	-0.0541
0.0635	-0.0038	-0.0696
0.0518	-0.0147	-0.0820
0.0244	-0.0414	-0.1040

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 Report No. Aero.1830

TABLE 5

Replace C_M columns by:-

1. Tempest I model - wing radiator.

C_M			
Model less tail	$\gamma = -4.8^\circ$	$\gamma = 0$	$\gamma = +4.85^\circ$
-0.0339	+0.1164	+0.0508	-0.0201
-0.0061	0.1185	0.0536	-0.0149
+0.0359	0.1221	0.0574	-0.0115
0.0785	0.1267	0.0591	-0.0105
0.1181	0.1298	0.0611	-0.0098
0.1428	0.1136	0.0450	-0.0193

2. Tempest V model - nose radiator

C_M			
Model less tail	$\gamma = -4.8^\circ$	$\gamma = 0$	$\gamma = +4.85^\circ$
-0.0314	+0.1138	+0.0499	-0.0201
-0.0075	0.1126	0.0458	-0.0214
+0.0257	0.1092	0.0448	-0.0239
0.0587	0.1089	0.0422	-0.0261
0.0946	0.1081	0.0413	-0.0254
0.1198	0.0944	0.0274	-0.0392

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Corrigenda to
Report No. Aero.1830

TABLE 6

Tempest I model (wing radiator) with propeller

Replace C_M columns in table by :-

α°	C_M			
	Model less tail	$\eta = -4.8^\circ$	$\eta = 0^\circ$	$\eta = +4.85^\circ$
-0.9	-0.0333	+0.1171	+0.0490	-0.0224
+1.15	-0.0091	+0.1168	+0.0490	-0.0126
4.3	+0.0327	+0.1227	+0.0561	-0.0140
	0.0195	0.1214	0.0455	-0.0330
	0.0143	0.1229	0.0437	-0.0372
	0.0111	0.1231	0.0423	-0.0403
7.45	+0.0723	+0.1249	+0.0571	-0.0111
	0.0441	0.1318	0.0497	-0.0306
	0.0389	0.1334	0.0497	-0.0335
	0.0362	0.1349	0.0499	-0.0358
10.6	+0.1139	+0.1228	+0.0552	-0.0101
	0.0813	0.1433	0.0636	-0.0147
	0.0775	0.1467	0.0639	-0.0158
	0.0761	0.1475	0.0677	-0.0154
13.65	+0.1337	+0.1060	+0.0383	-0.0124
	0.1063	0.1438	0.0552	-0.0130
	0.1011	0.1423	0.0606	-0.0115
	0.0988	0.1422	0.0605	-0.0125

TABLE 7

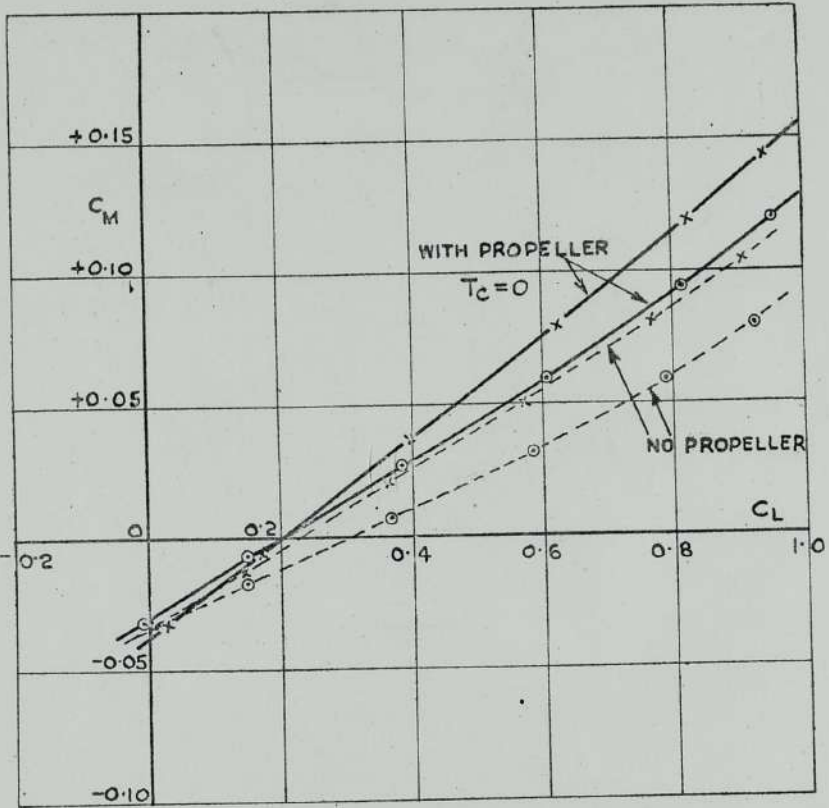
Representation of full throttle flight conditions
for Tempest I - wing radiator

Replace C_M columns in table by :-

α°	C_M			
	Model less tail	$\eta = -4.8^\circ$	$\eta = 0^\circ$	$\eta = +4.85^\circ$
-0.9	-0.033	+0.117	+0.051	-0.020
+1.2	-0.011	0.118	0.052	-0.021
4.3	+0.014	0.122	0.044	-0.020
7.45	0.036	0.134	0.050	-0.037
10.6	0.064	0.152	0.069	-0.016
13.65	0.080	0.140	0.070	-0.013

138445
 OR A.V.H.
 R 1.0.1.44
 H 1.0.1.
 PP 1.0.1.

FIG. 4
(REVISED)

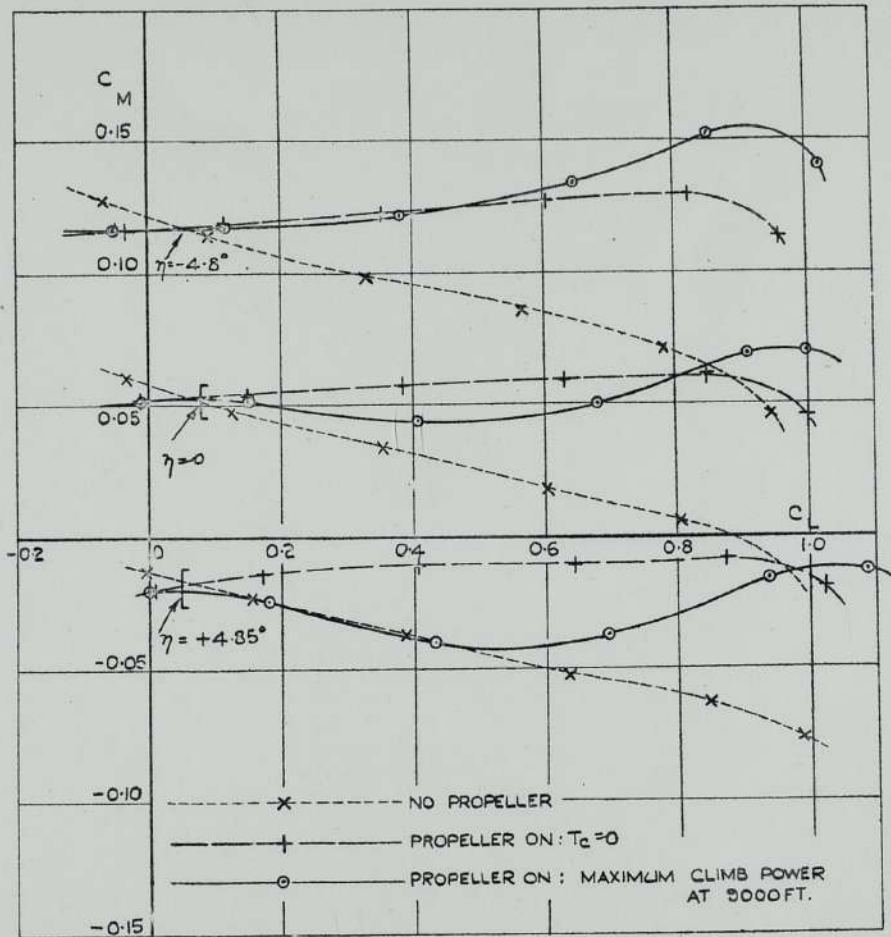


— x — WING RADIATOR MODEL
 — o — NOSE RADIATOR MODEL

PITCHING MOMENTS OF MODELS WITHOUT TAIL PLANE TEMPEST

N° 13345.6
 DR. A. H.
 TR. 5517.144
 CH. 0.511
 APP. 1938

FIG. 5.
(REVISED)

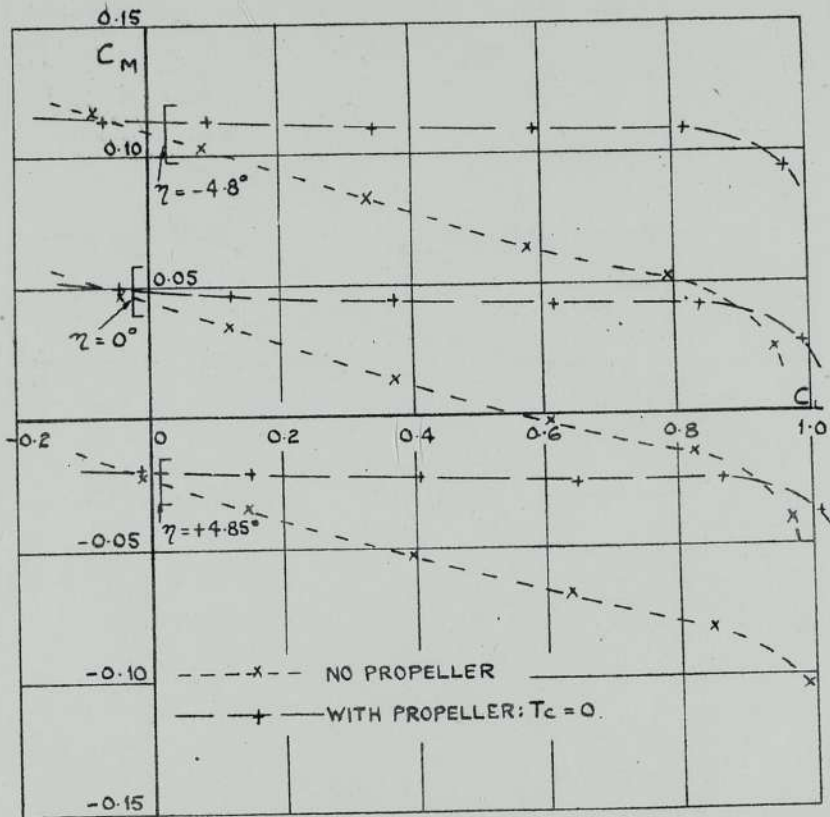


$\eta_T = -1.45^\circ$
 C.G. AT 0.280E

LONGITUDINAL STABILITY OF WING RADIATOR MODEL.
 TEMPEST.

Nº 1384 S.
 DR. ~~...~~
 TR. 17. 1. 44
 CH. A. V. H.
 APC. F. B. P.

FIG. 6
(REVISED)



$\eta_T = -1.4^\circ$
 C.G. AT $\cdot 280 \bar{c}$

LONGITUDINAL STABILITY OF NOSE RADIATOR MODEL
 TEMPEST.

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