C-105 P/Wind Tunnel/3

SECRET

UNCLASSIFIED

STABILITY DERIVATIVES

C.A.L. WIND TUNNEL

JUNE 1954

UNCLASSIFIED / NON-CLASSIFIED ANALYZED

COMPARISON WITH ESTIMATES

National Research Council Canada
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Aeronautical and Mechanical Engineering Library

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TO

DATE

Report no.: QCX - AVRO - CF105 - P-WT-31

has been ☐ downgraded to: _____

☒ de-classified

by (Name): Michel W. Drapeau

(Dept.): A/DND Coordinator, Access to Information

Date: Dec. 7, 1992

R. Auger
Signature

A. V ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: C 105 REPORT NO P/WT/31

FILE NO: NO OF SHEETS:

TITLE:

LONGITUDINAL AND LATERAL STABILITY DERIVATIVES

EXTRAPOLATED TO M = 2.0

Comparison of theoretical estimates with C.A.L.

Wind Tunnel Tests.

JUNE 1954

PREPARED BY S. Kwiatkowski DATE Sept. 1954
CHECKED BY DATE
SUPERVISED BY DATE
APPROVED BY DATE

ISSUE NO	REVISION NO	REVISED BY	APPROVED BY	DATE	REMARKS

FORM 316A

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AIRCRAFT C105 COMPONENT SHEET No. 1.1. REPORT No P/W.T./31

A.U.W. DATE July 54 PREP. BY Kuwahara

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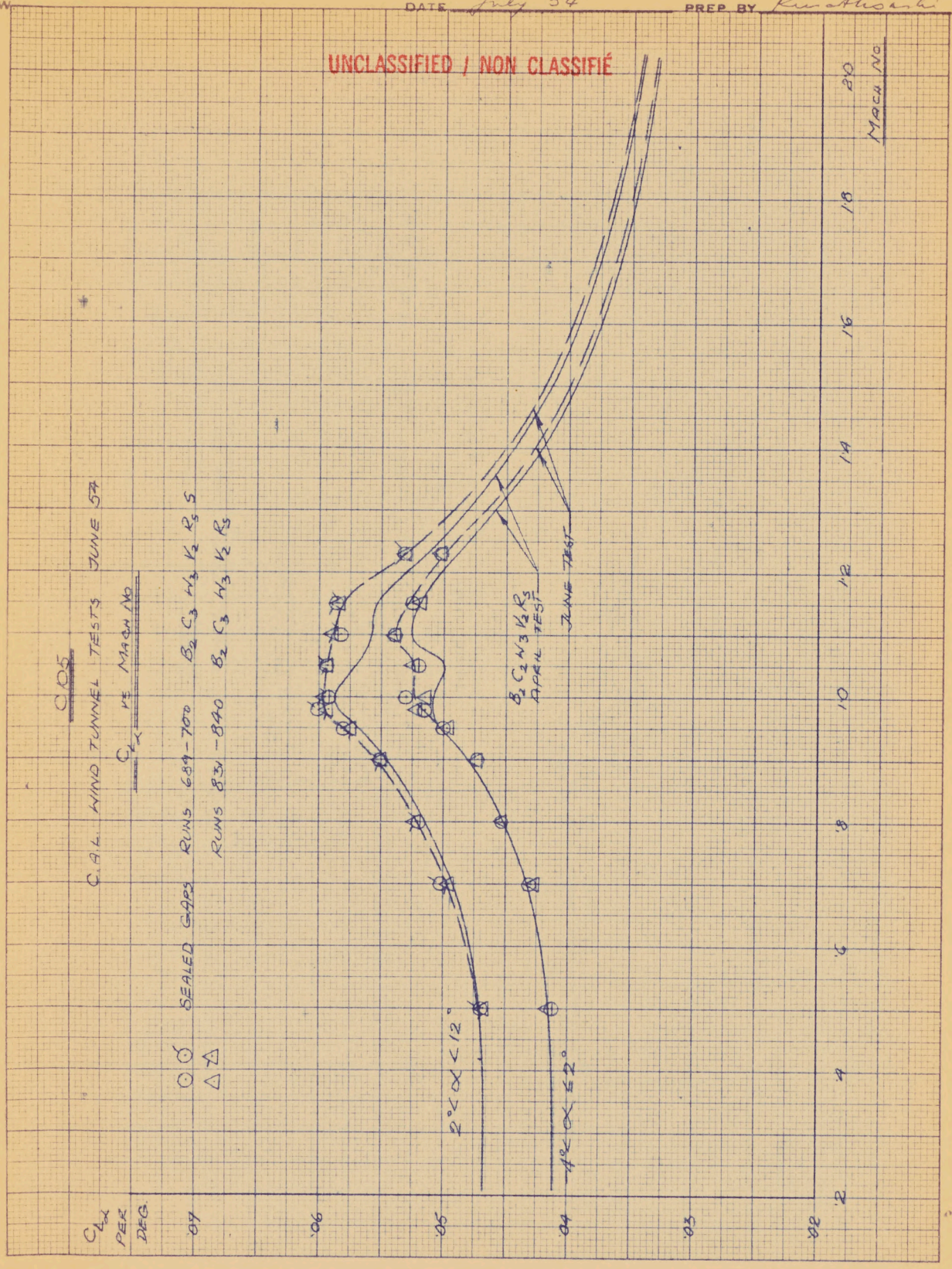

FORM 1746

AIRCRAFT C105 COMPONENT SHEET No. 1.2. REPORT No. P/W.T /31
A. U. W. DATE July 6/54 PREP. BY Kuiatkowski

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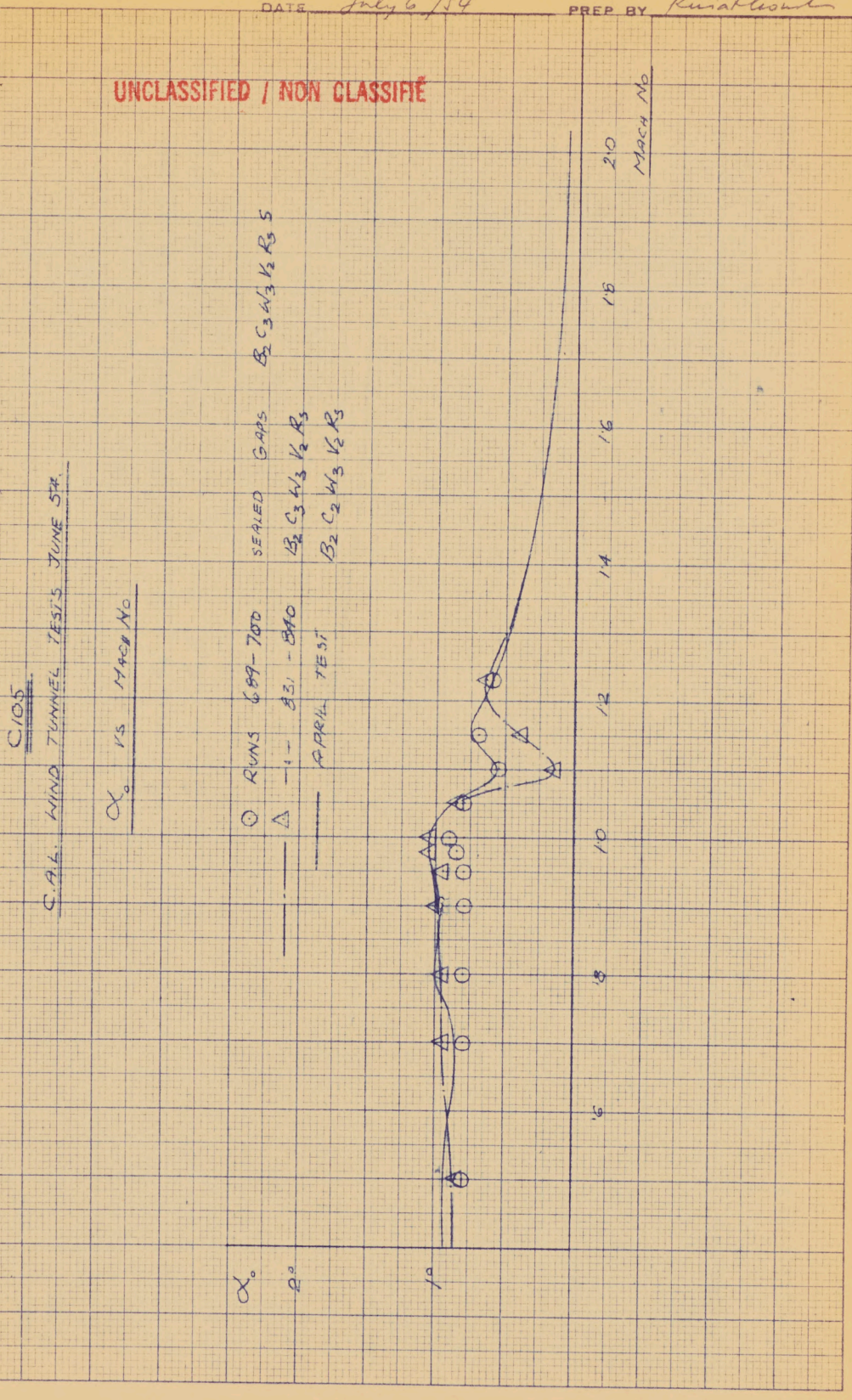
C105

C.19.6. WIND TUNNEL TESTS JUNE 54.

α_o VS MACH NO



FORM 1746

AIRCRAFT C105 COMPONENT

A. U. W.

SHEET No. 2.1 REPORT No P/4.T./31

DATE July 2/54 PREP. BY K. [illegible]

C105

C.P.L. WIND TUNNEL TESTS JUNE '54

AERODYNAMIC CENTRE

$B_2 C_2 W_3 V_2 R_3$ —— APRIL TEST

$B_2 C_3 W_3 V_2 R_3$ ○ JUNE TEST RUNS 780, 781, 851-840

$B_2 C_3 W_3 V_2 R_3 S$ △ —"— —"— RUNS 687-700 SEALED GAPS

A.C. % MAC.

60

50

40

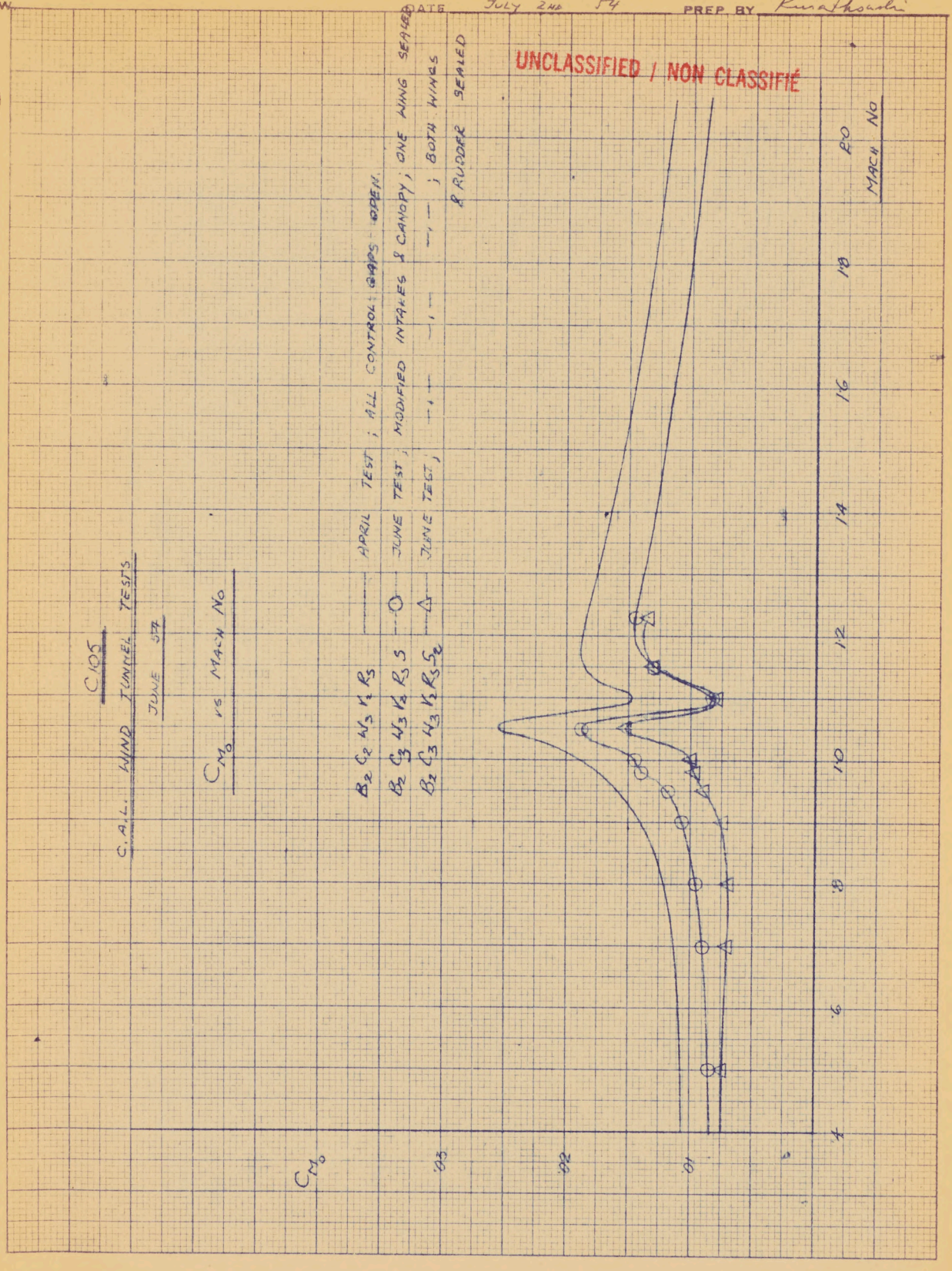
30

20

4 6 8 10 12 14 16 18 20 MACH No.

AIRCRAFT C105 COMPONENT SHEET No. 2.2. REPORT No. P/H.T. 131

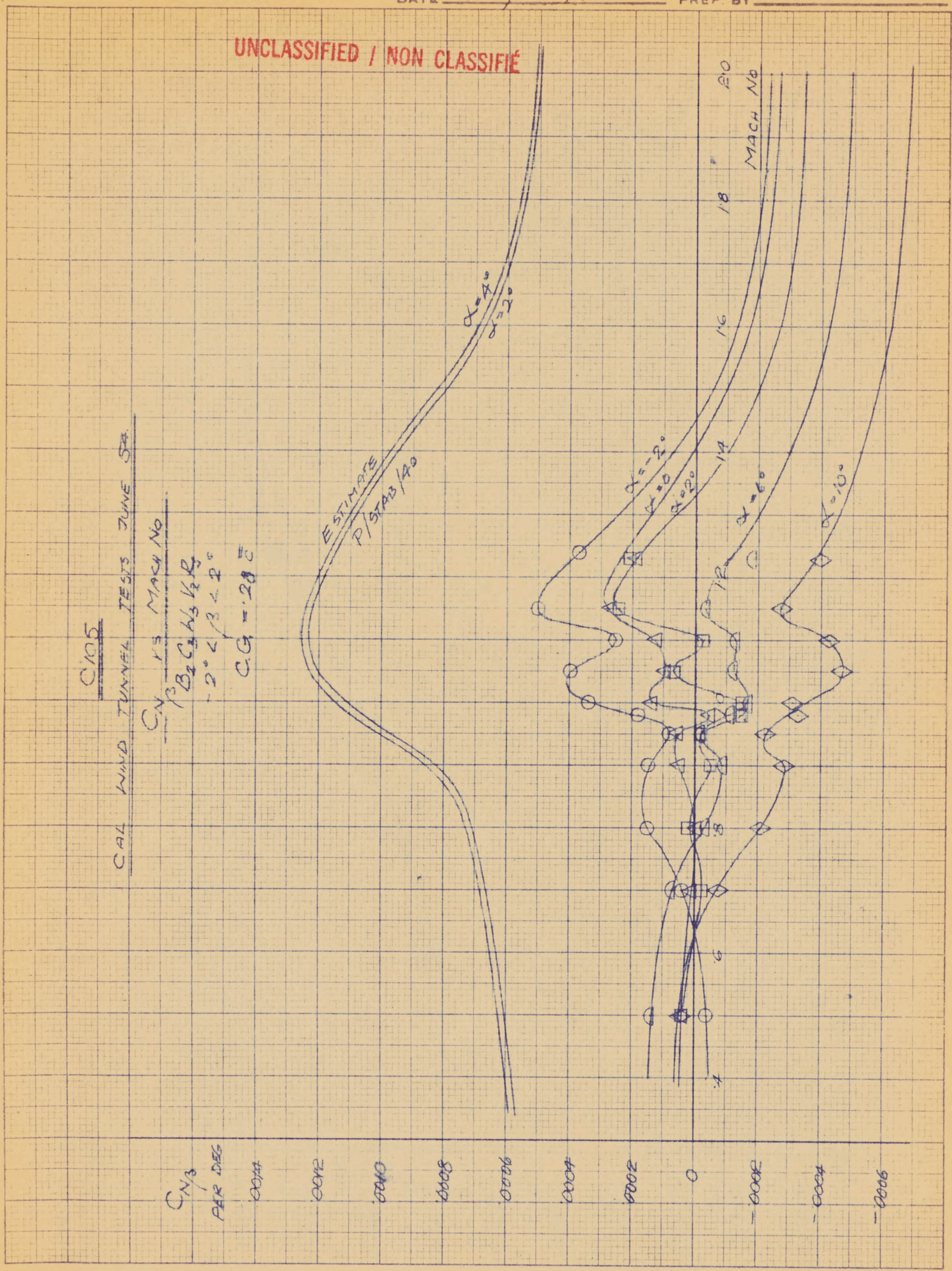
A.U.W. DATE JULY 2nd 54 PREP. BY Kuratkowski



FORM 1746

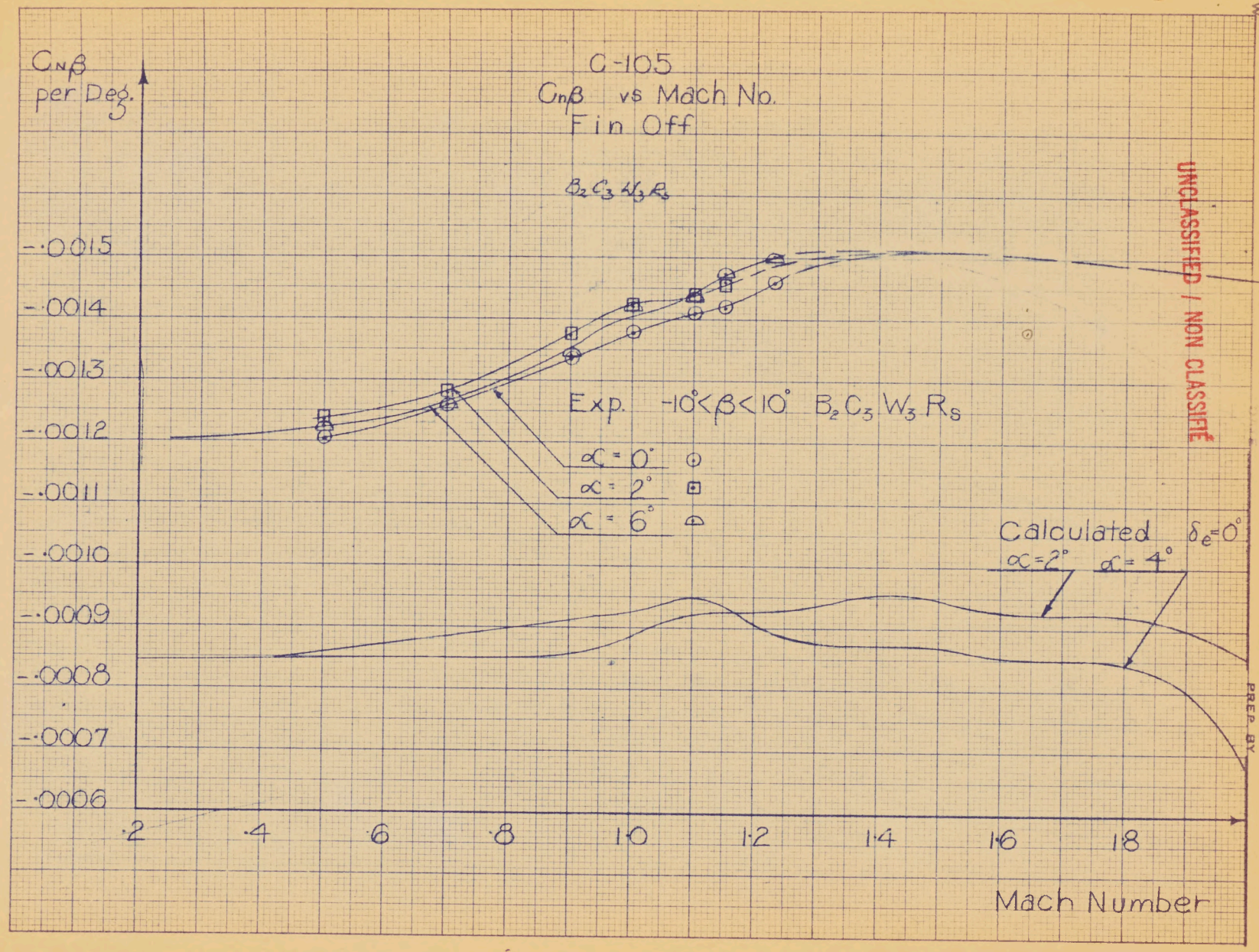
AIRCRAFT C105 COMPONENT SHEET No. 3.11 REPORT No. P/WT/31

A.U.W. DATE August /54. PREP. BY Kuchhosuli



FORM 1746

AIRCRAFT C-105 COMPONENT SHEET NO. 3.1.1.5 REPORT NO P/W.T./31
A U W PREP. BY



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AIRCRAFT C105
A. U. W.

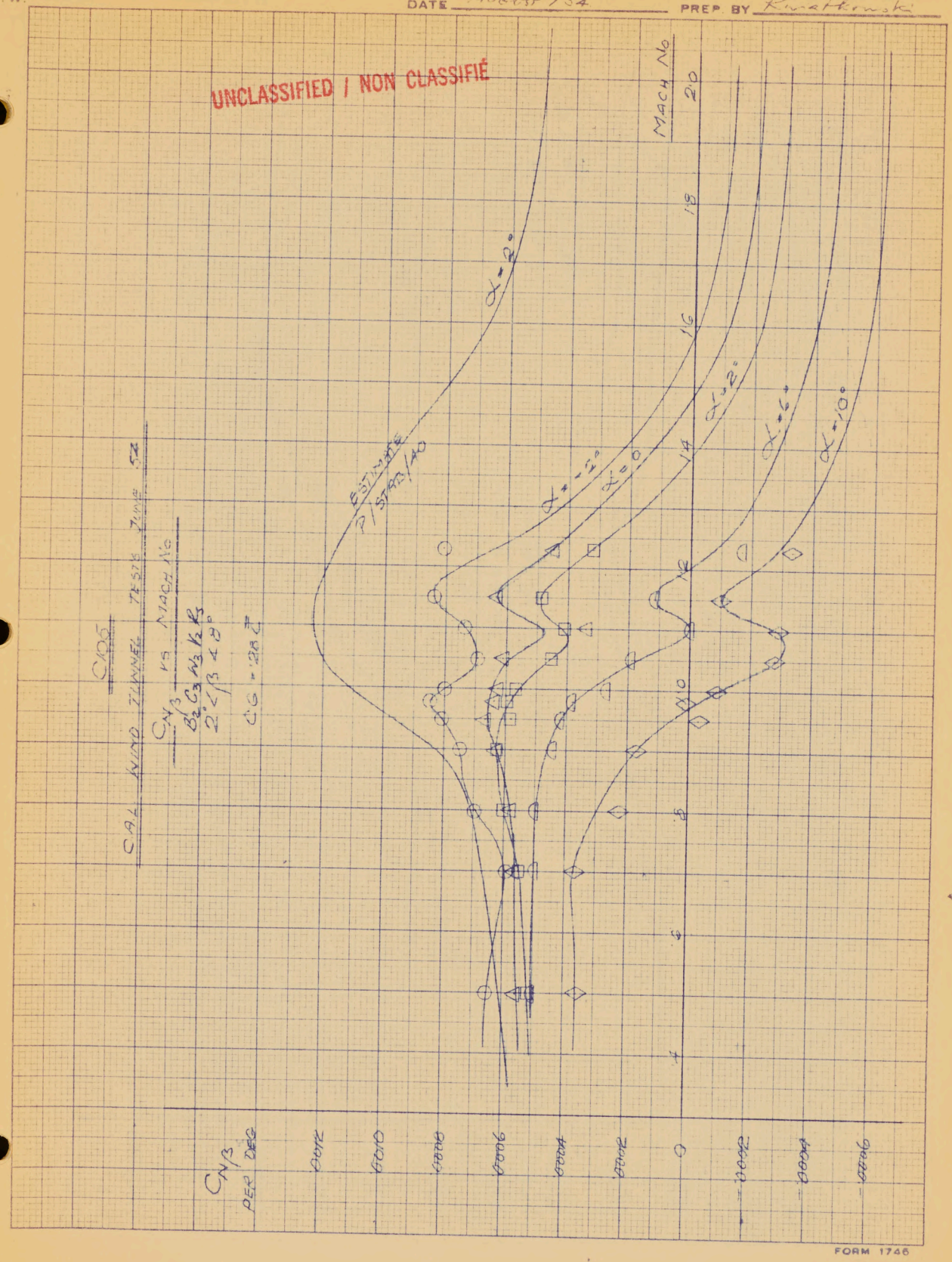
COMPONENT

SHEET No. 312.

DATE AUGUST 1954

REPORT No. P/W T/31

PREP. BY Kwiatkowski



FORM 1746

C 105
$C_{n\beta}$ vs Mach No.
Fin Off

$B_2 C_3 W_3 R_3$

$C_{n\beta}$ per Degree

-.0015
-.0014
-.0013
-.0012
-.0011
-.0010
-.0009
-.0008
-.0007
-.0006

Exp. $-2° < \beta < 2°$ $B_2 C_3 W_3 R_3$

$\alpha = 0°$ ⊕
$\alpha = 2°$ ⊞
$\alpha = 6°$ ⊕

Calculated $\delta_e = 0°$
$\alpha = 2°$ $\alpha = 4°$

.2 .4 .6 .8 1.0 1.2 1.4 1.6 1.8
Mach Number

C105.

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3.2.1. P/W.T./31

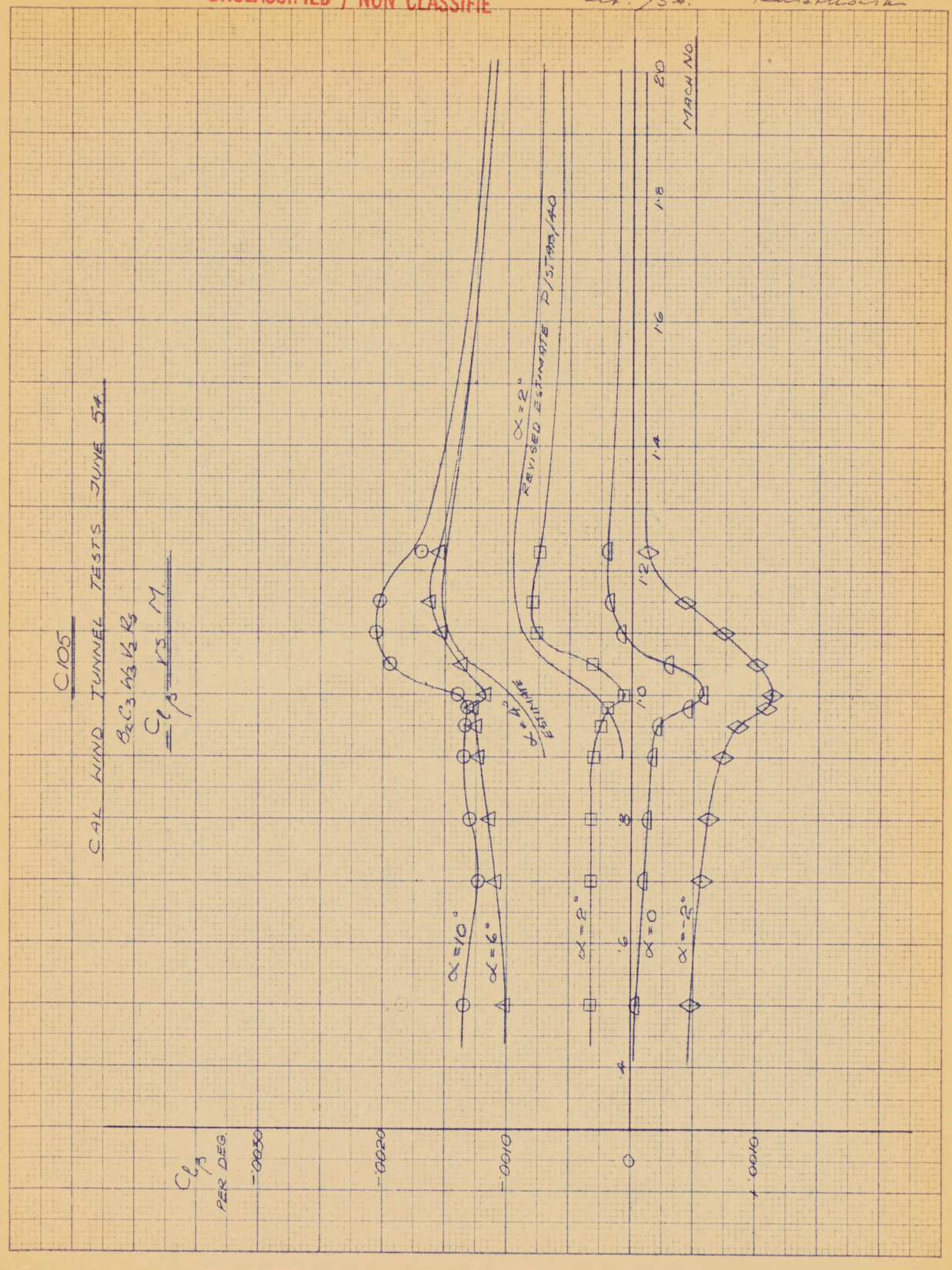
Ref. /57. Kawakami

C105

CAL WIND TUNNEL TESTS JUNE 57.

B_2C_3 W3 W2 W3

C_{l_β} M



C105

3.2.2. P/WT/31

Oct/54.

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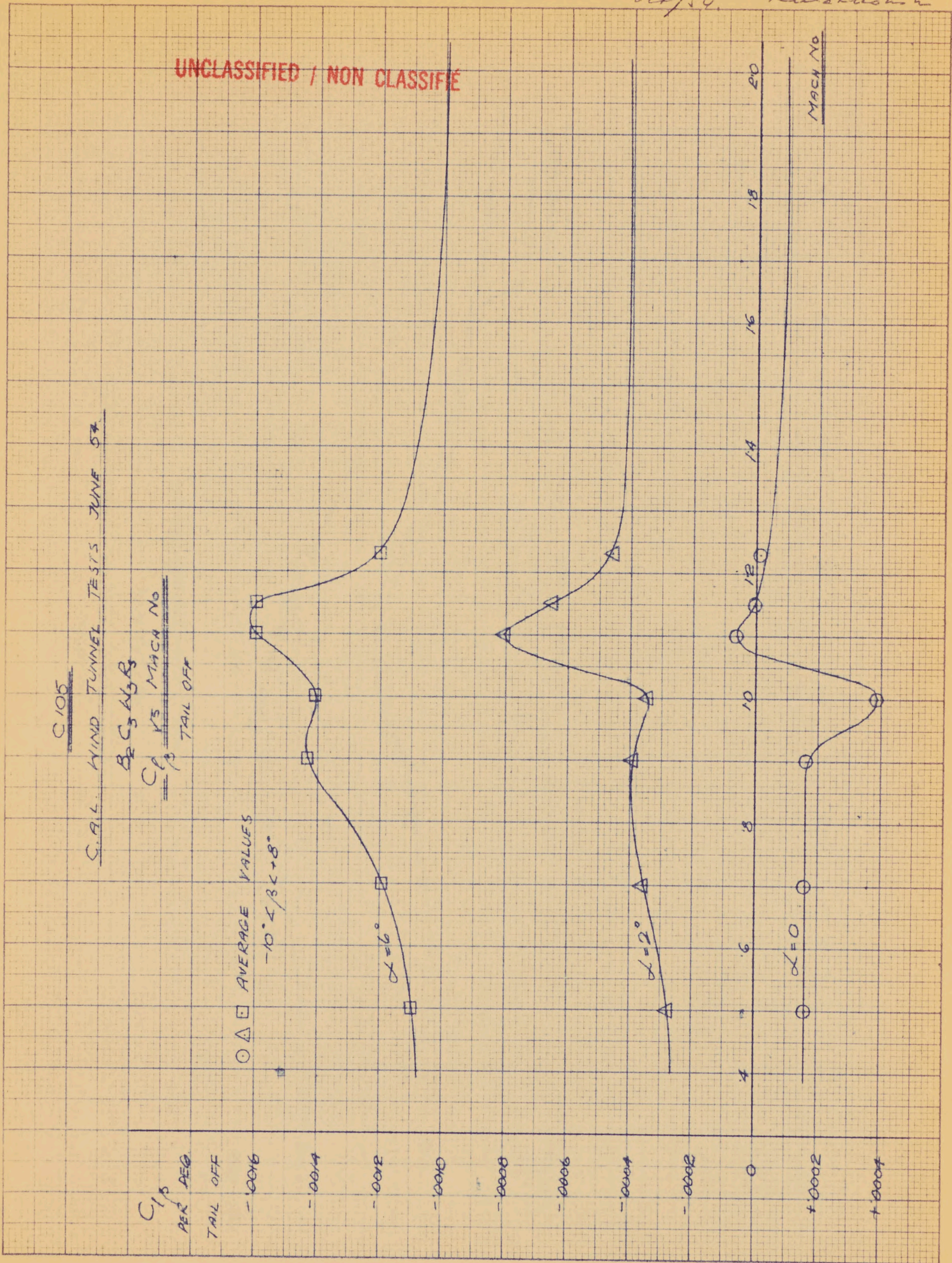
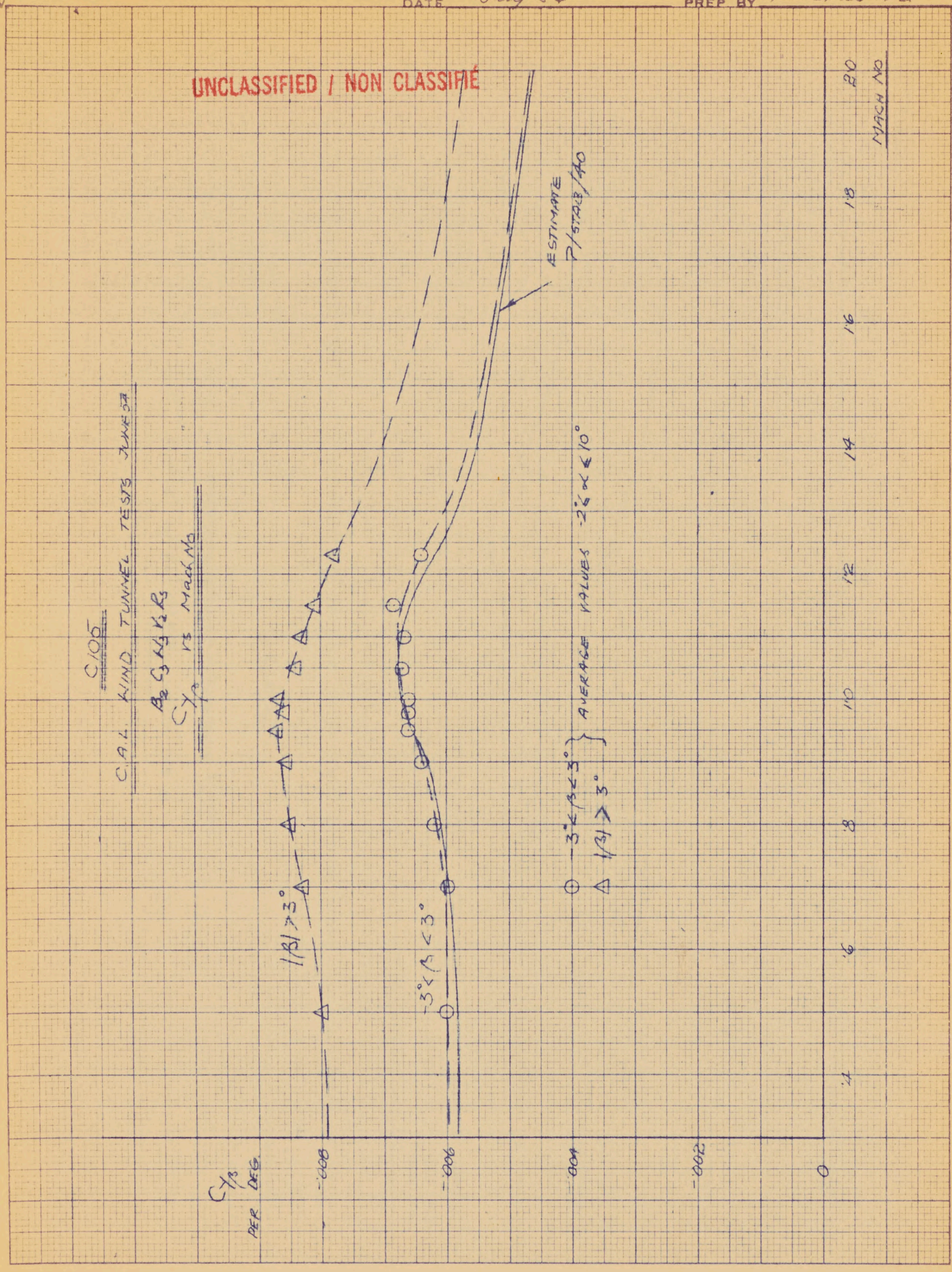


AIRCRAFT C105 COMPONENT SHEET No. 3.3.1 REPORT No. P/W.T./31

A.U.W. DATE July 54 PREP. BY Kuethuschi



AIRCRAFT C105 COMPONENT

A. U. W.

SHEET No. 3.3.2 REPORT No. P/WT/31

DATE Sept/54 PREP. BY Kuriyhoshi

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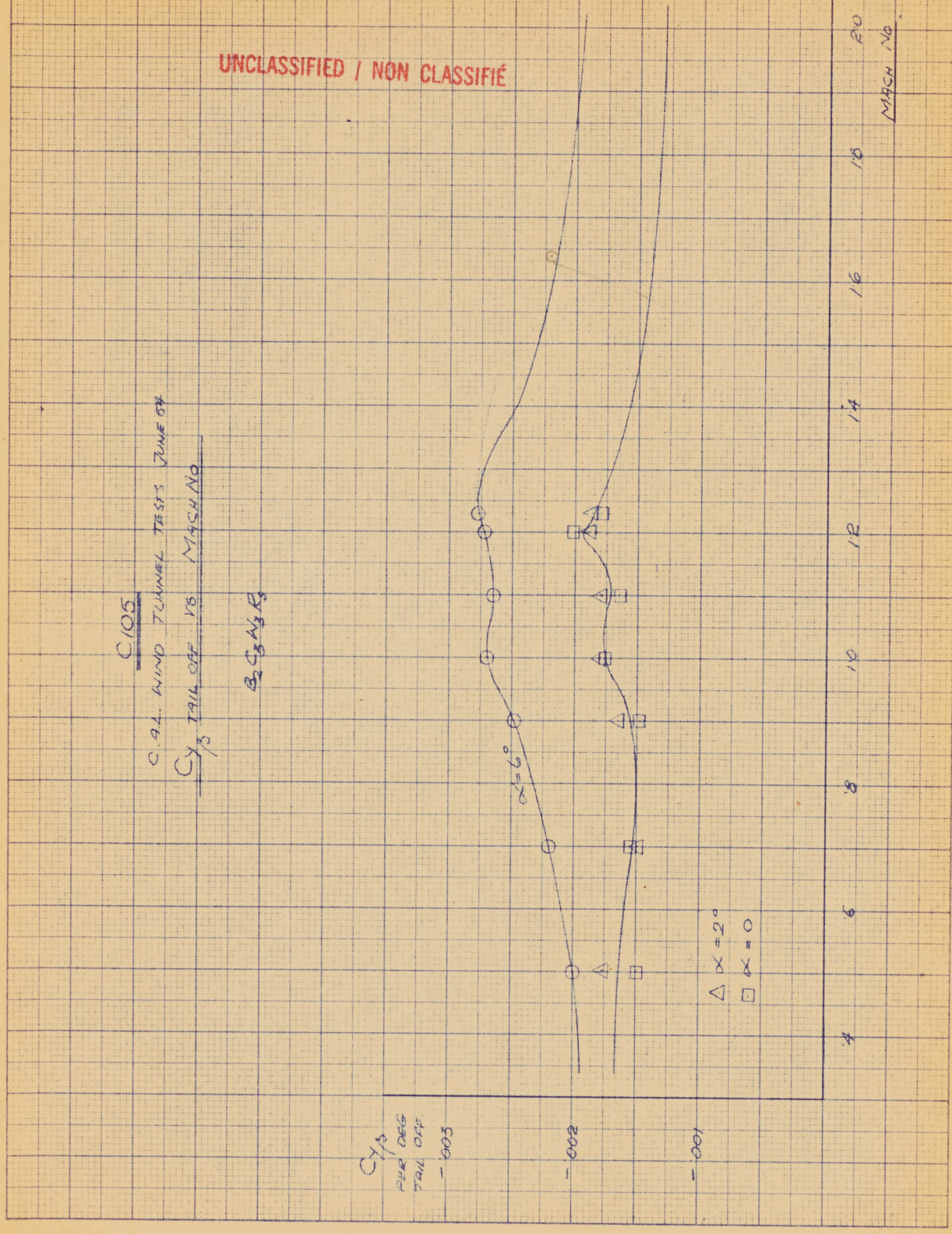
C105

0.92 WIND TUNNEL TESTS JUNE 54

$C_{Y_{T/3}}$ TAIL OFF VS MACH NO

$B_2 C_3 M_3 R_3$



10 X 10 TO THE ½ INCH 359-12
KEUFFEL & ESSER CO. MADE IN U.S.A.

FORM 1746

AIRCRAFT C-105 COMPONENT
A.U.W.

SHEET No. 4.1.4. REPORT No. P/WT/31
DATE Aug 31, 1954 PREP. BY L. Cutcliffe

UNCLASSIFIED / NON CLASSIFIÉ

C-105

C.A.L. Wind Tunnel Tests, June 1954

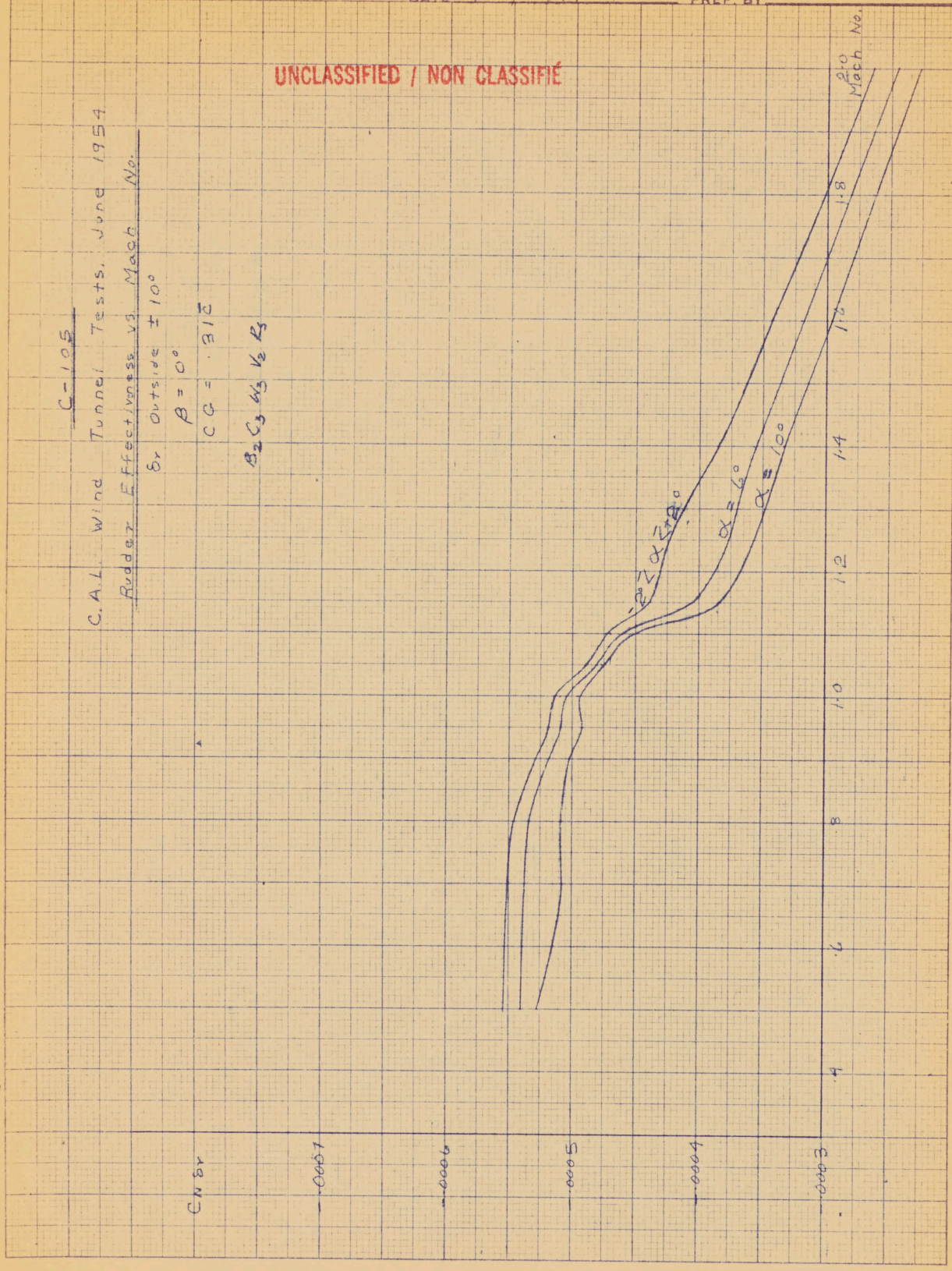
Rudder Effectiveness vs Mach No.

δ_r Outside ±10°

$\beta = 0°$

$C_G = .312$

$B_2 C_3 C_4 V_2 P_3$



FORM 1746

AIRCRAFT C-105 COMPONENT

A U W

SHEET No. 4.1.3 REPORT No P/W.T./31

DATE Aug 31, 1954 PREP BY L. Cutcliffe

C-105

C.A.L. Wind Tunnel Tests, June 1954

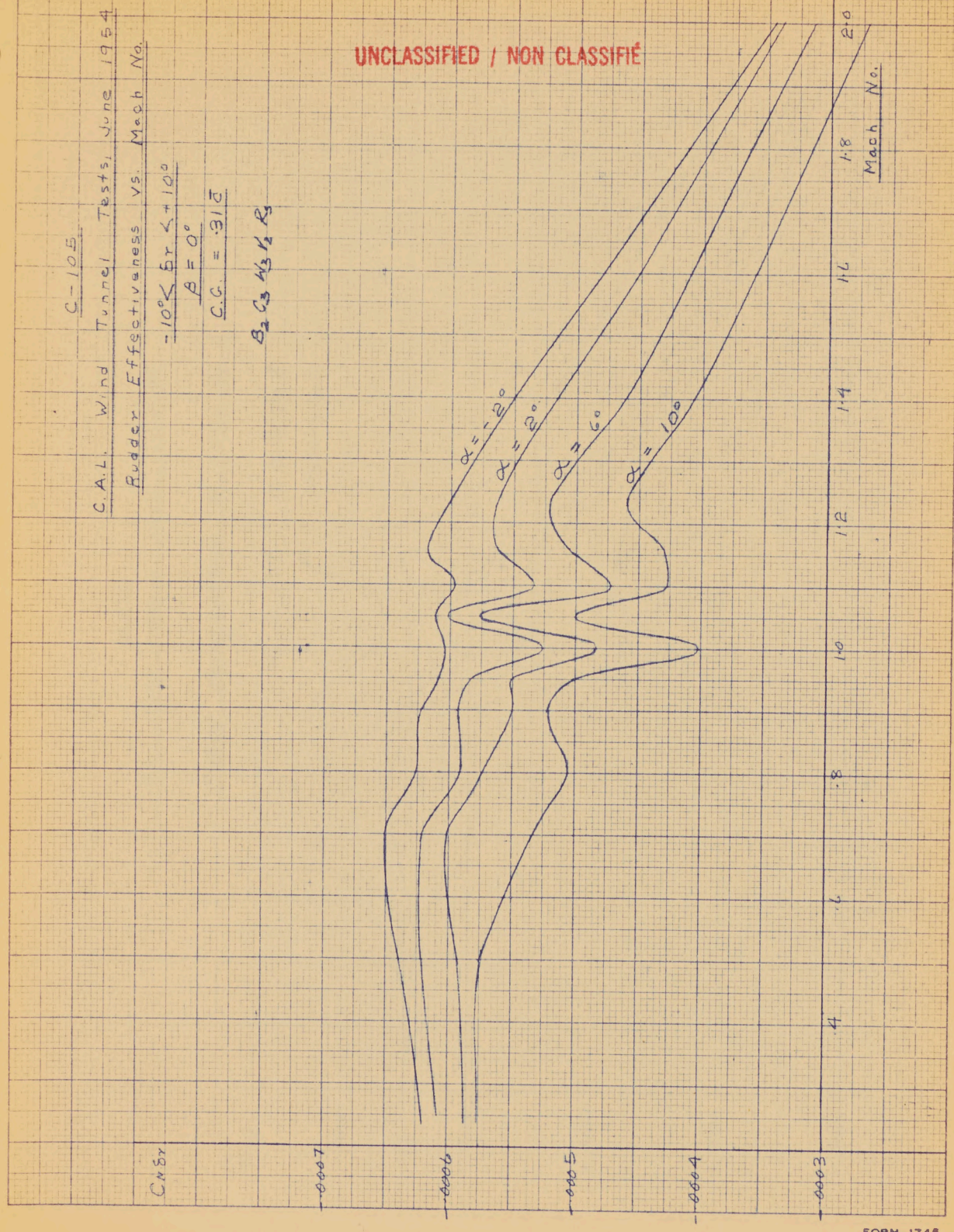
Rudder Effectiveness vs. Mach No.

$-10° < \delta r < +10°$

$\beta = 0°$

C.C. = .31$\bar{c}$

$\beta_2 C_3 W_3 V_2 R_3$



FORM 1746

AIRCRAFT C105 COMPONENT SHEET No. 4.8.20. REPORT No P/W.T/31.
A.U.W. DATE Sept /57 PREP. BY Kwathouski

C105

C.G. WIND TUNNEL TESTS JUNE 57

RUDDER EFFECTIVENESS AT MACH NO

$\beta = -3°$ C.G. = 28 $\bar{c}$

$\delta_r < 110°$ $B_2C_3W_3H_2E_3$

$\alpha = -2°$

$\alpha = 2°$

$\alpha = 6°$

$\alpha = 10°$

$C_{N_{\delta_2}}$

-.0007

-.0006

-.0005

-.0004

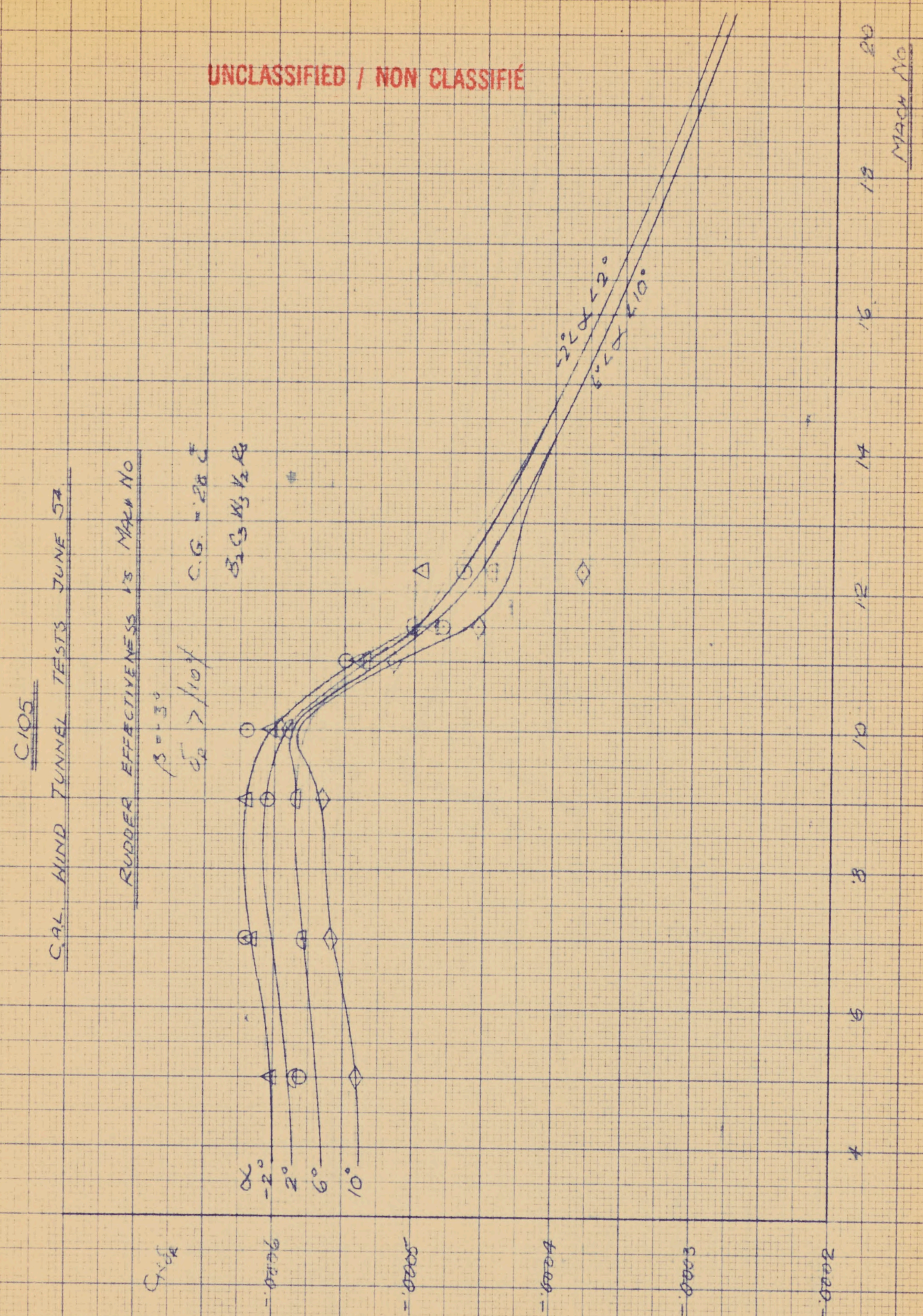
-.0003

1 .6 .8 1.0 1.2 1.4 1.6 1.8 2.0 MACH NO

FORM 1746

AIRCRAFT C105 COMPONENT SHEET No. 4.1.21. REPORT No P/W.T./31

A.U.W. DATE Sept /57 PREP. BY Kwatkowski



FORM 1746

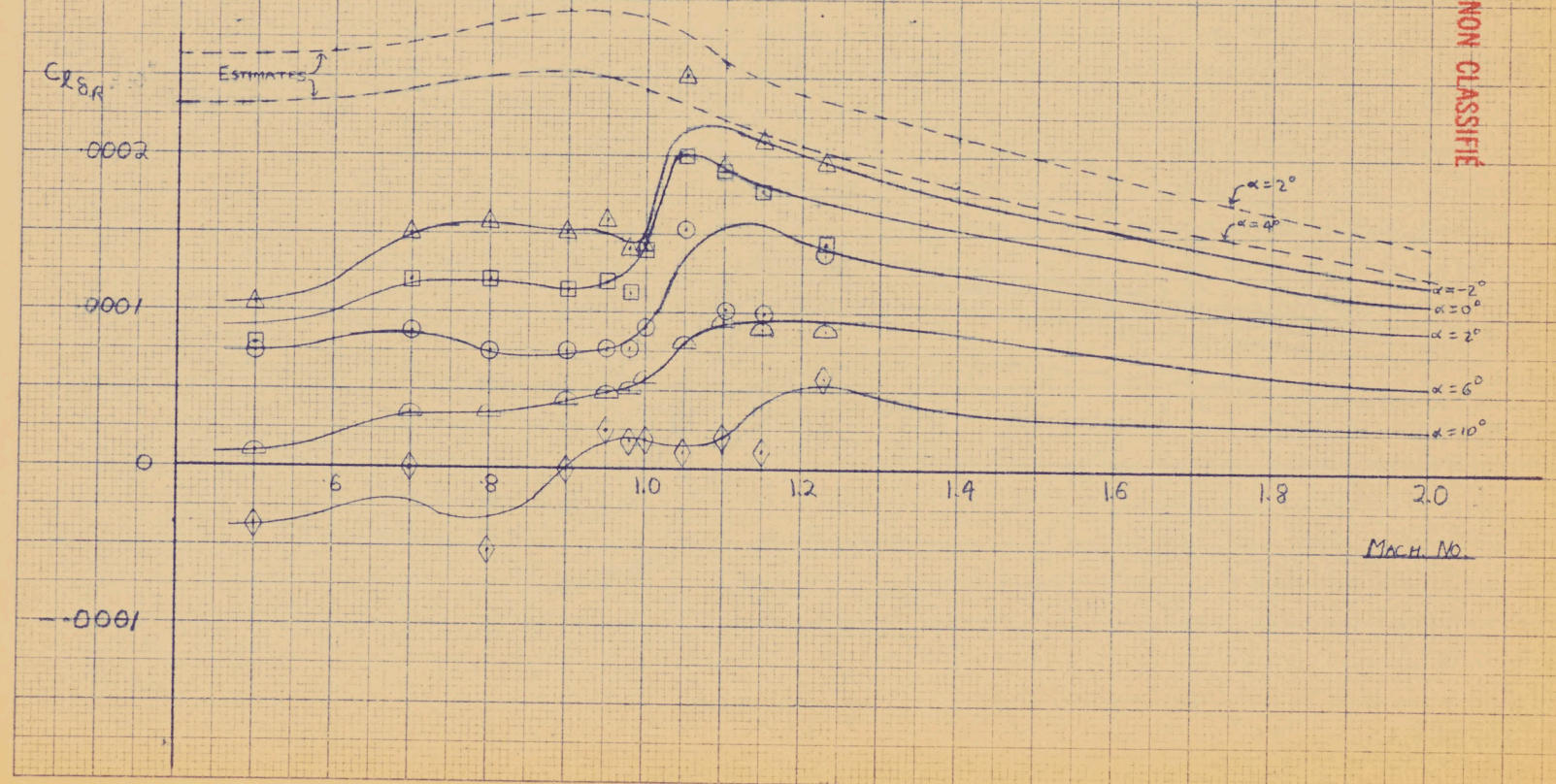
C-105

CAL. WIND TUNNEL TESTS JUNE '54

$C_{l\delta_R}$ VS MACH NO.

$\delta_R < 11°9'$ $\beta = 0$

$B_2\ C_3\ W_3\ V_2\ R_3$



P/W. T/31 4.2.2.
SEPT/54

P/W.T./31 4.2.3

SEPT/54 30 Nonrecked

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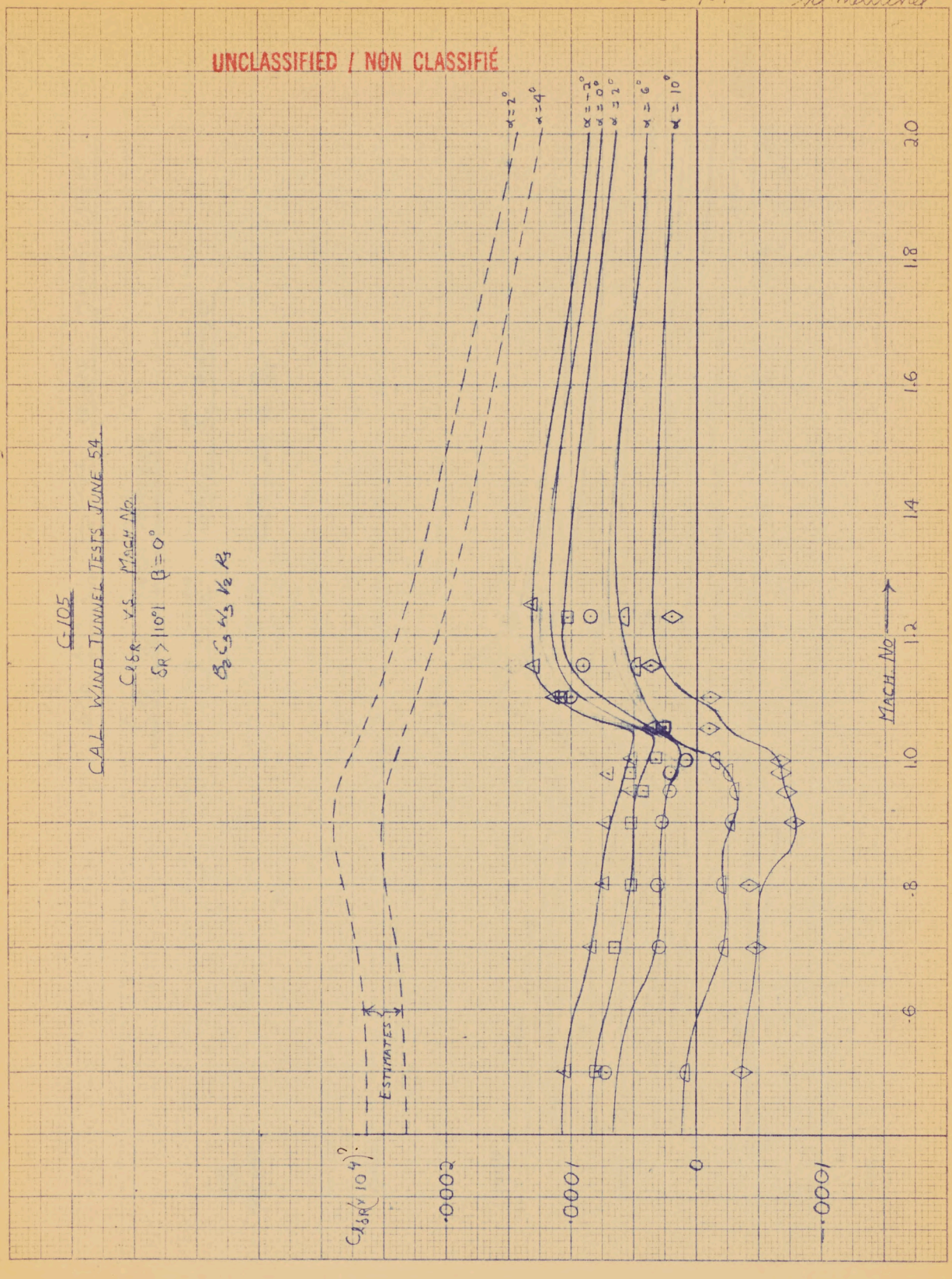
G.105

CAL. WIND TUNNEL TESTS JUNE 54

C_{lSR} V.S. MACH NO.

$S_R > |10^{\circ}|$ $\beta = 0^{\circ}$

$\beta C_3 K_3 K_2 K_3$



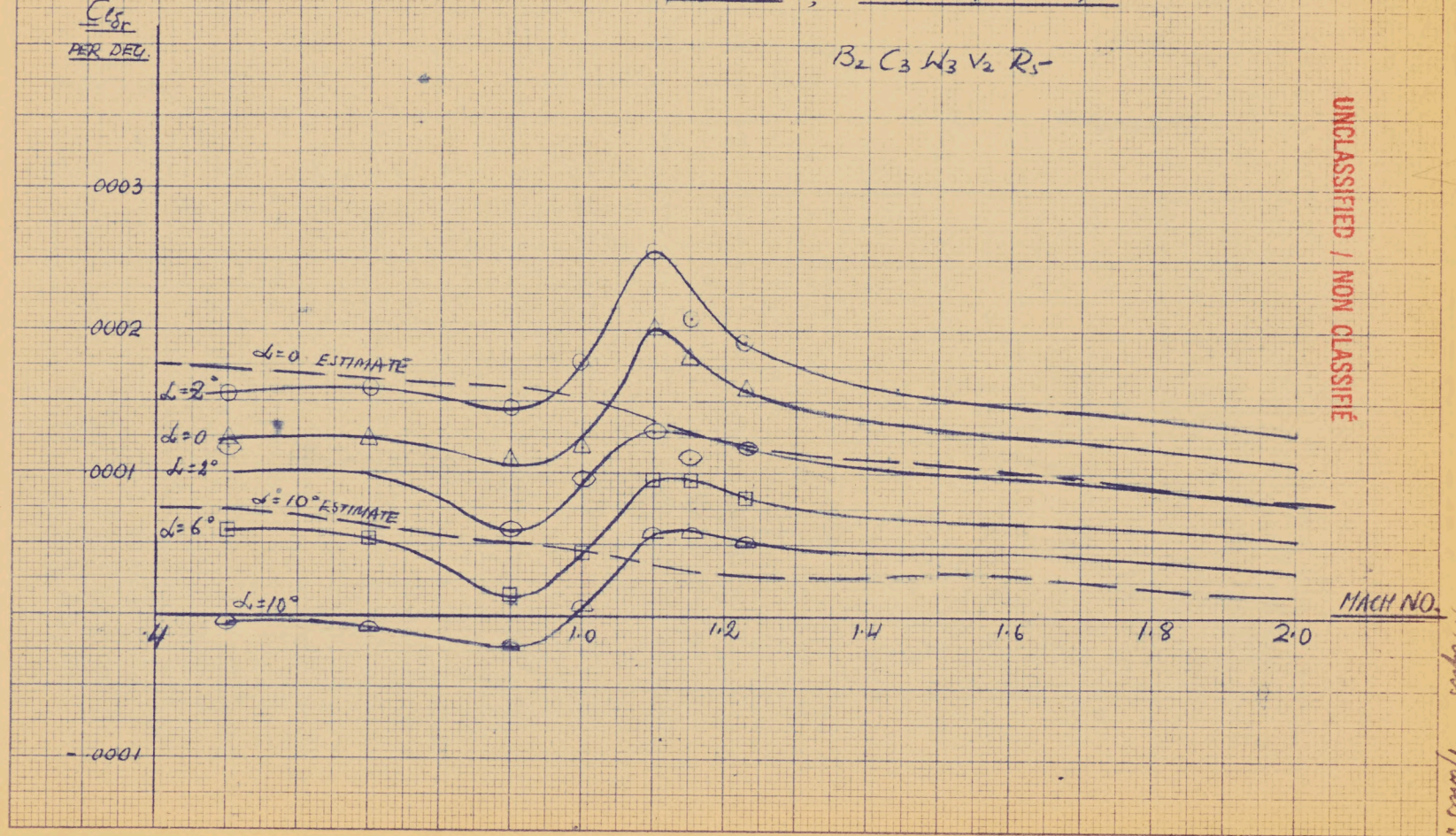
C 105

CAL WIND TUNNEL TESTS, JUNE 1954

$C_{l_{\delta_r}}$ vs MACH NUMBER

$\beta = -3°$, FULL δ_r RANGE

$B_2 C_3 W_3 V_2 R_5$-



AIRCRAFT C-105 COMPONENT SHEET No. 4.3.1 REPORT No. P/W.T./31

A.U.W. DATE July 1954 PREP. BY L. Cutcliffe

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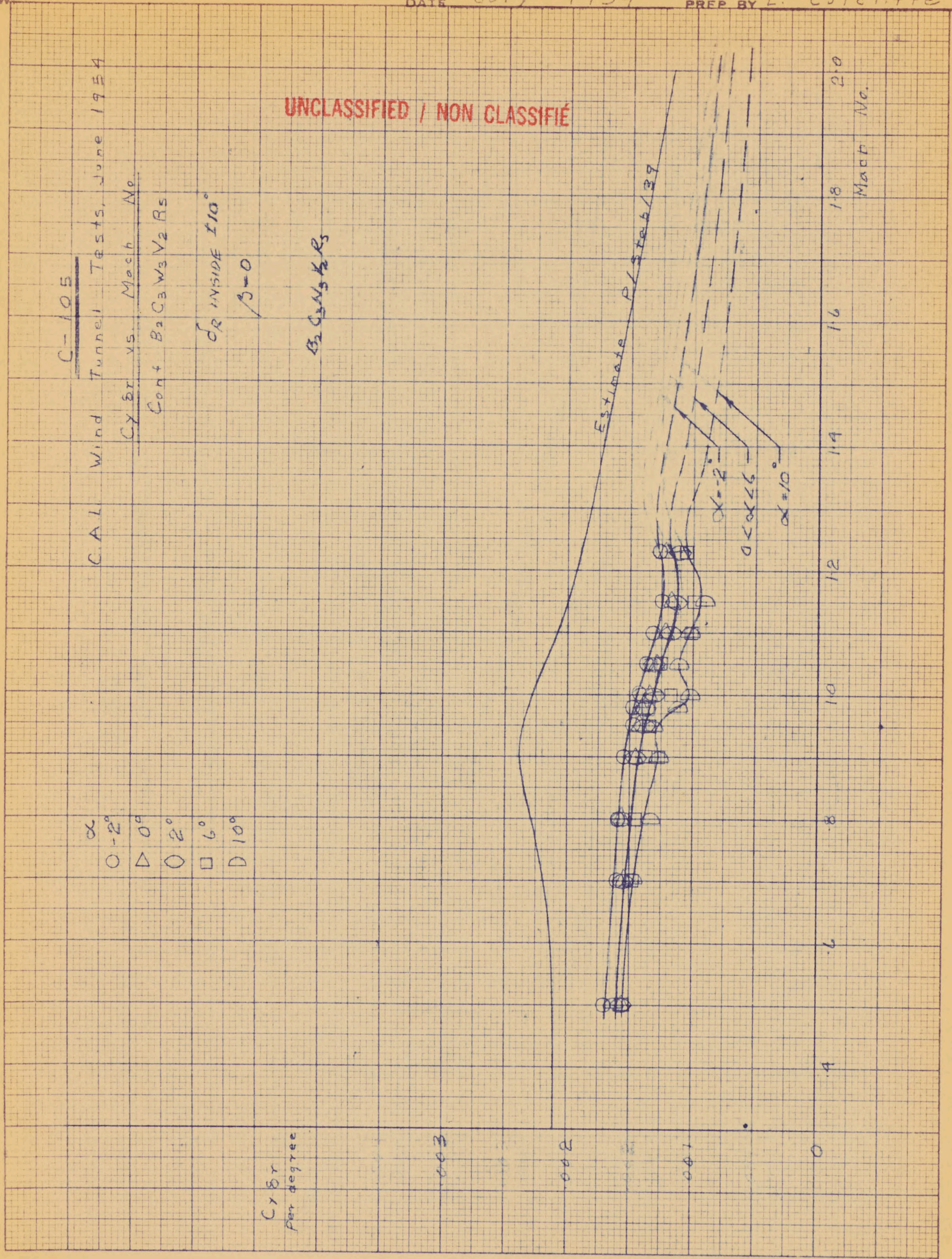

359-12 KEUFFEL & ESSER CO.
10 x 10 to the 1/2 inch, 5th lines accented
MADE IN U.S.A.

FORM 1746

AIRCRAFT C105 COMPONENT
A. U. W.

SHEET NO. 4,32. REPORT NO D/H.T./31.
DATE Sept /54 PREP. BY K. Mathieu

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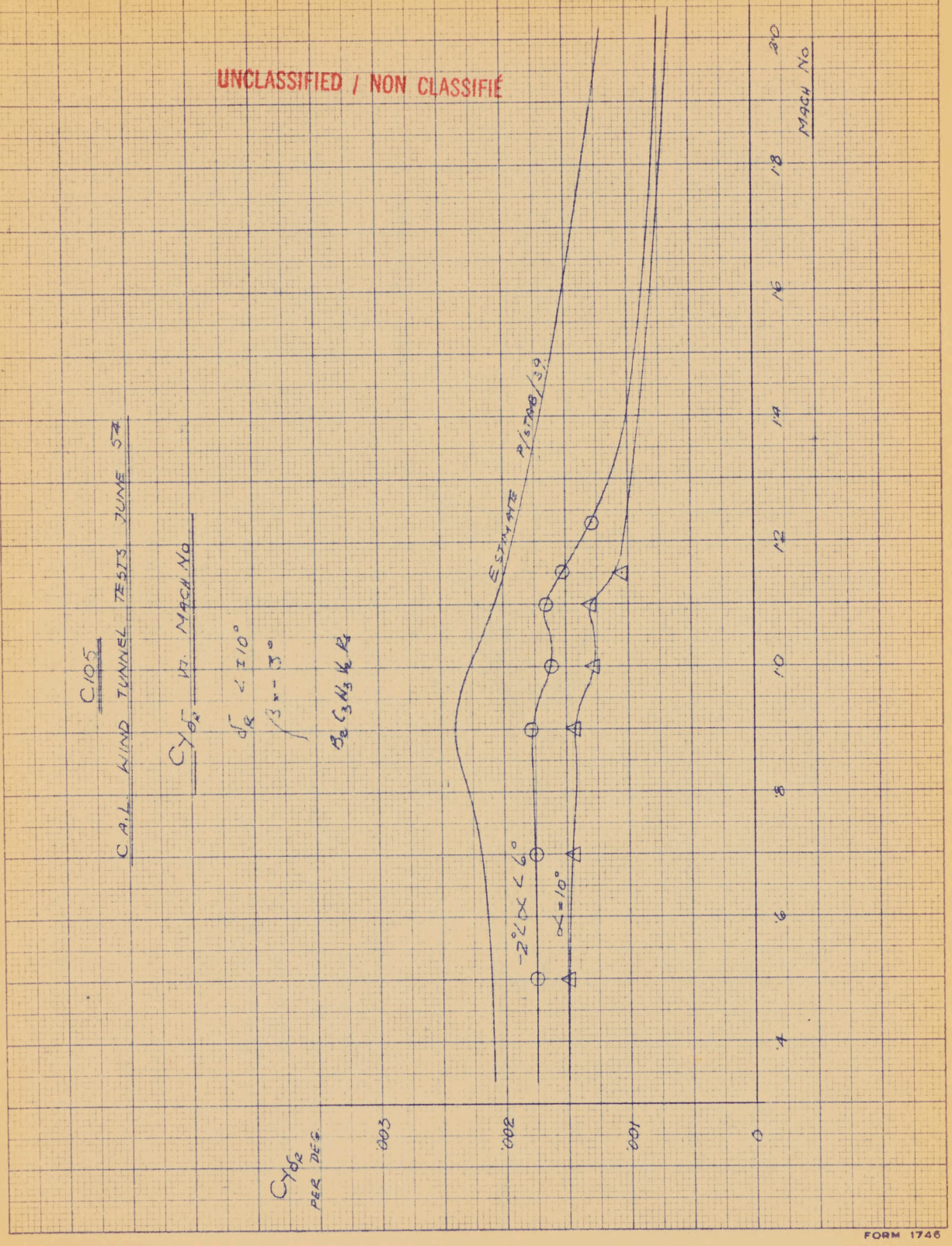
C105
C.A.L. WIND TUNNEL TESTS JUNE 54

$C_{Y\delta_r}$ VS MACH NO

d_r < ±10°
13 x - 13°

$\beta_2 C_3 M_3 K_2$



10 X 10 TO THE INCH 359-12
KEUFFEL & ESSER CO.

FORM 1746

C-105

CAL. WIND TUNNEL TESTS JUNE '54

C_{lv} VS MACH NO.

CONFIG $B_2C_3W_3V_2R_5$

$-3° < \beta < 3°$

$B_2 C_3 W_3 V_2 R_5$

C_{lv} PER°

○ $\alpha = -2°$

△ $\alpha = 0°$

⬠ $\alpha = 2°$

□ $\alpha = 6°$

⬡ $\alpha = 10°$

.06

.04

.02

0

ESTIMATE P/CONTR/37

.2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0

MACH NO.

UNCLASSIFIED / NON CLASSIFIE

P/W.T/131 29/7/54 S.I.I.

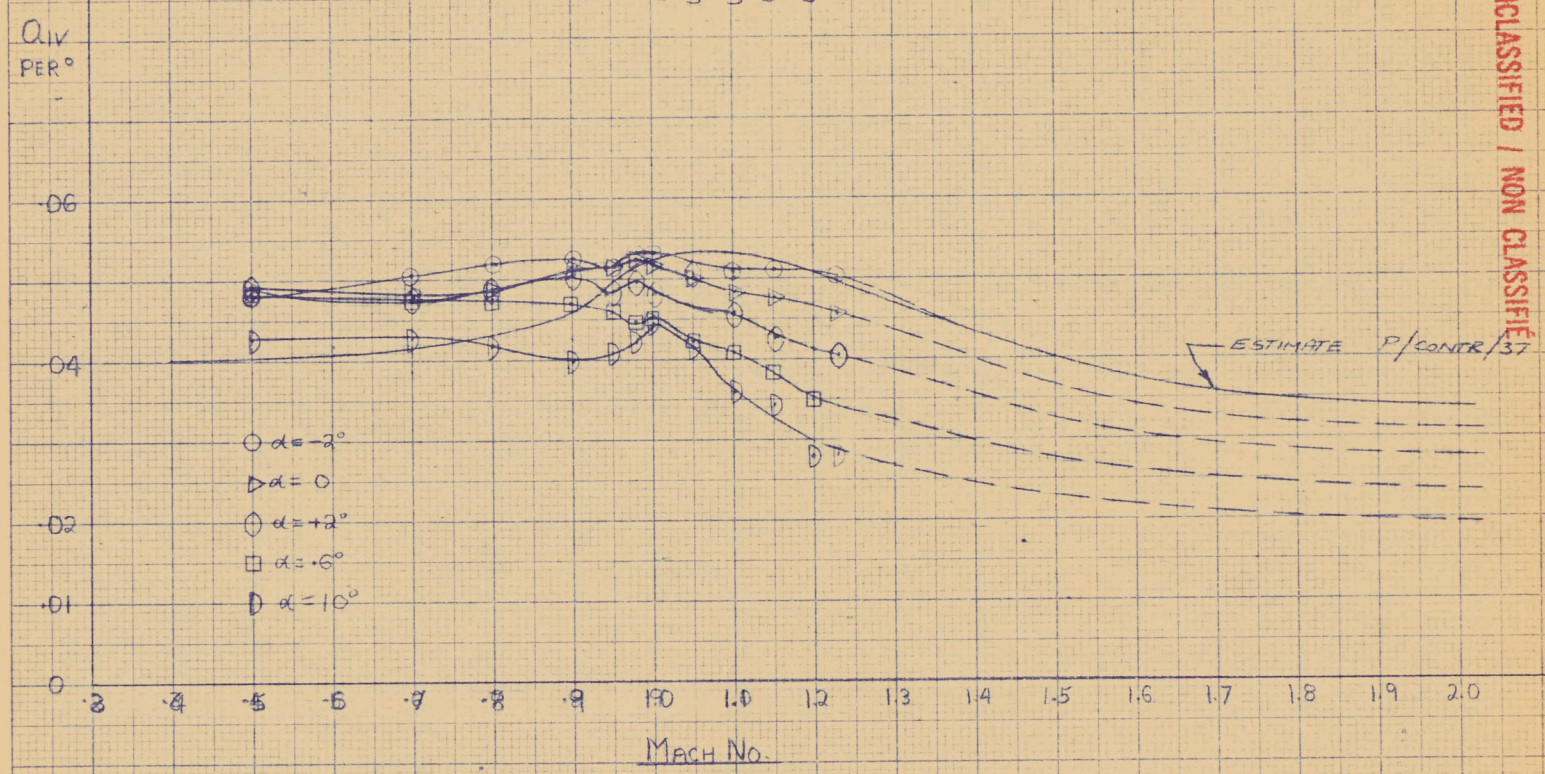
C-105

CAL. WIND TUNNEL TEST – JUNE '54

Q_{IV} VS MACH NO.

CONFIG. $B_1C_3W_3V_2R_S$ $i_B 1 > 4°$

$B_2C_3W_3V_2R_S$



P/W.T.T.31

29/7/54

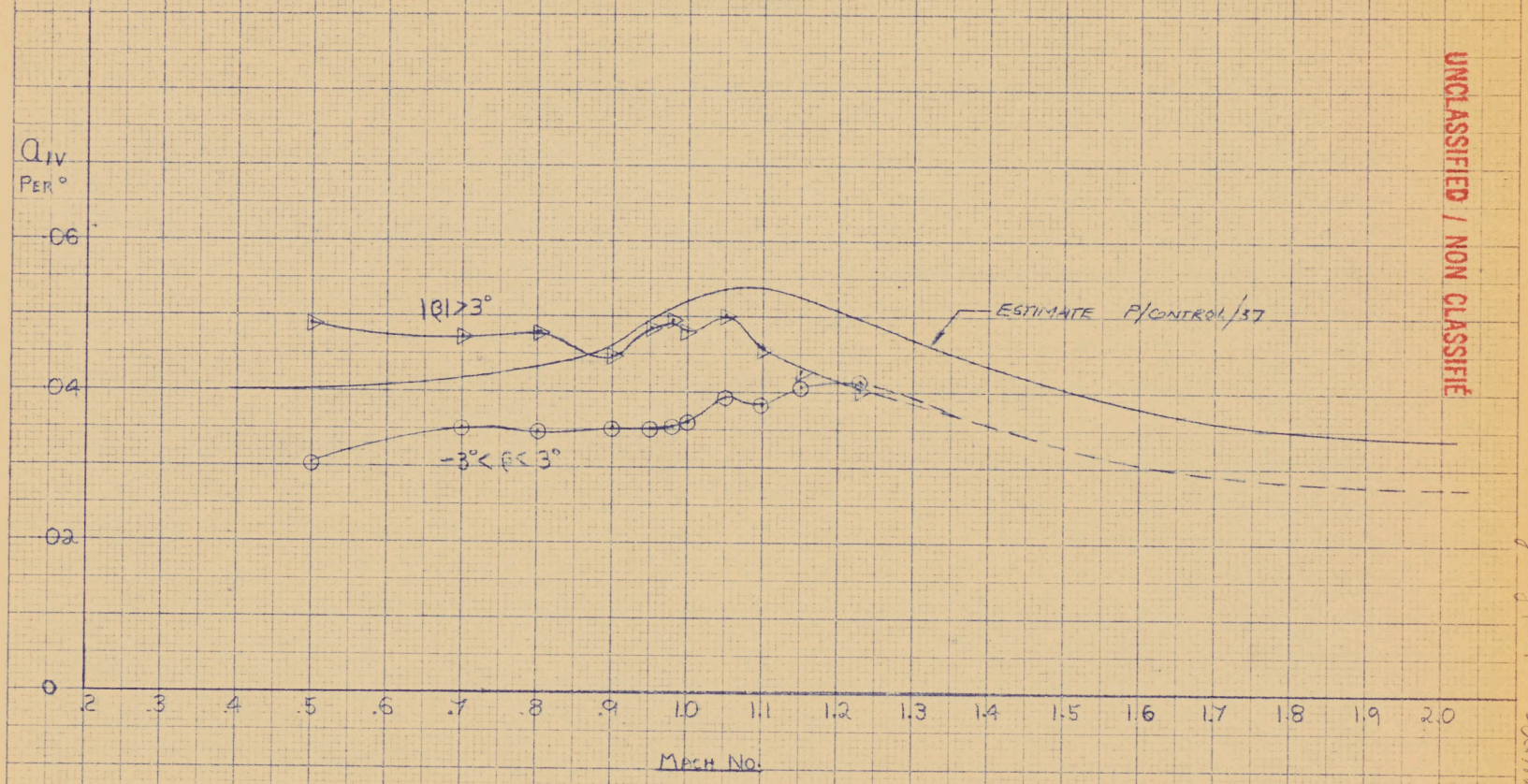
3.1.2

C-105

C.A.L. WIND TUNNEL TESTS - JUNE '54

C_{l_V} VS MACH NO.

CONFIG $B_2C_3W_3V_2R_5$ $\alpha = 2°$



PW. 1130
July 154
S.T.S.

AIRCRAFT C-105 COMPONENT SHEET NO. 5.2.1 REPORT NO P/W T/30

A.U.W. DATE July 1954 PREP BY L. Cutcliffe

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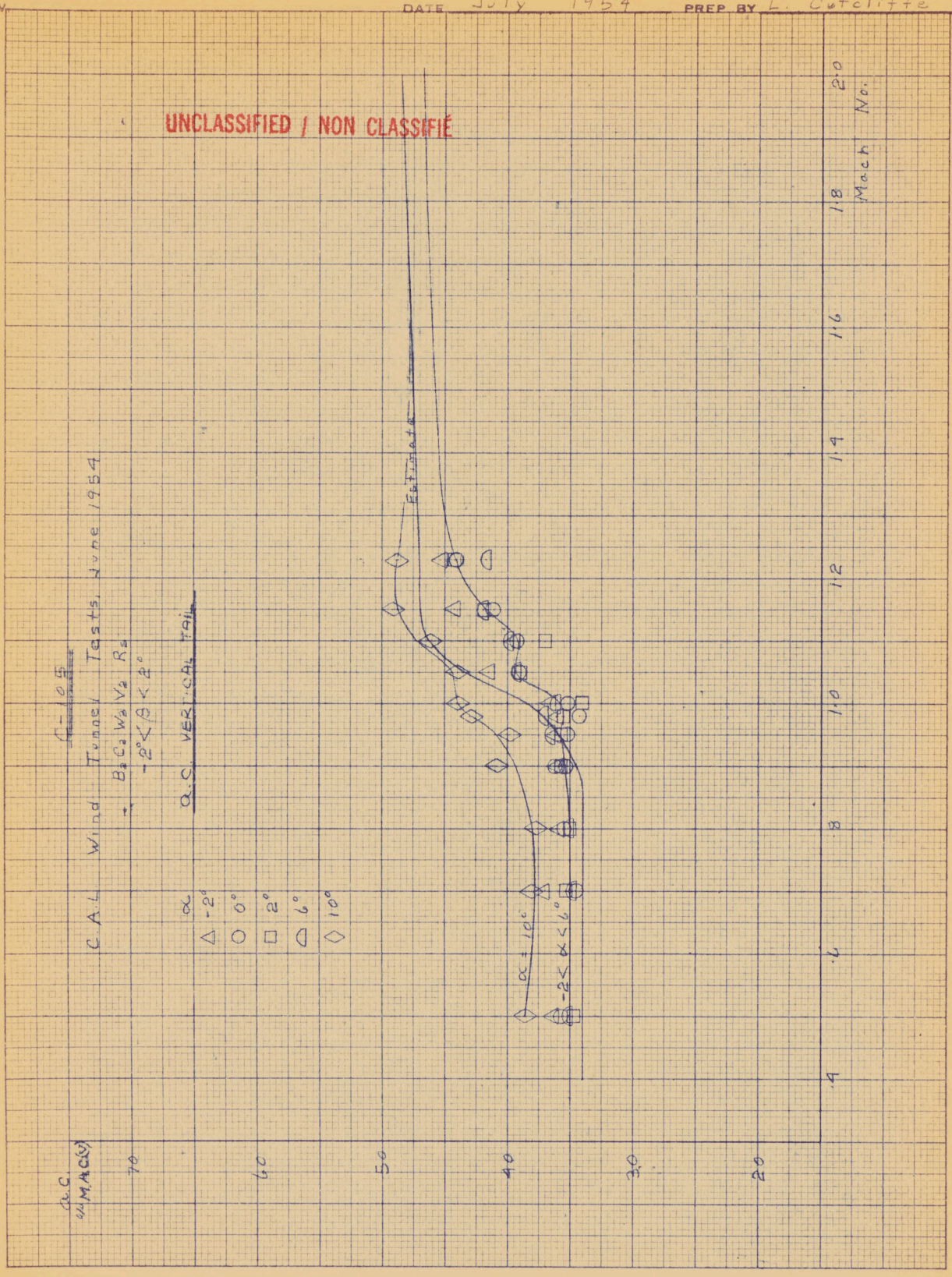

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AIRCRAFT C-105 COMPONENT SHEET No. [illegible] REPORT No P/W.T./31

A.U.W. DATE July 1954 PREP. BY L. Cutcliffe

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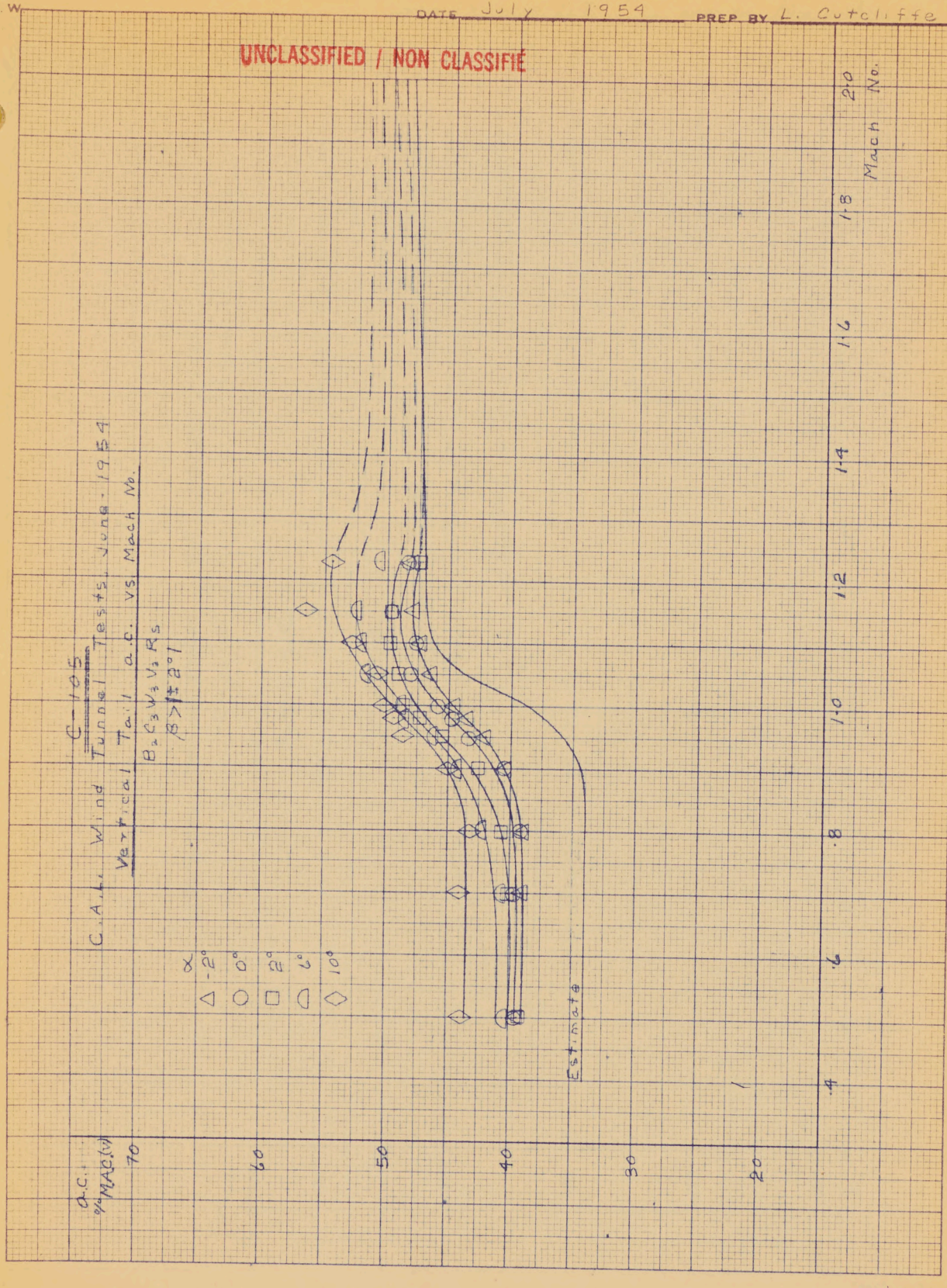

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AIRCRAFT C105 COMPONENT SHEET No. F.3.1 REPORT No. P/W.T./31

A.U.W. DATE August /54 PREP. BY [illegible]

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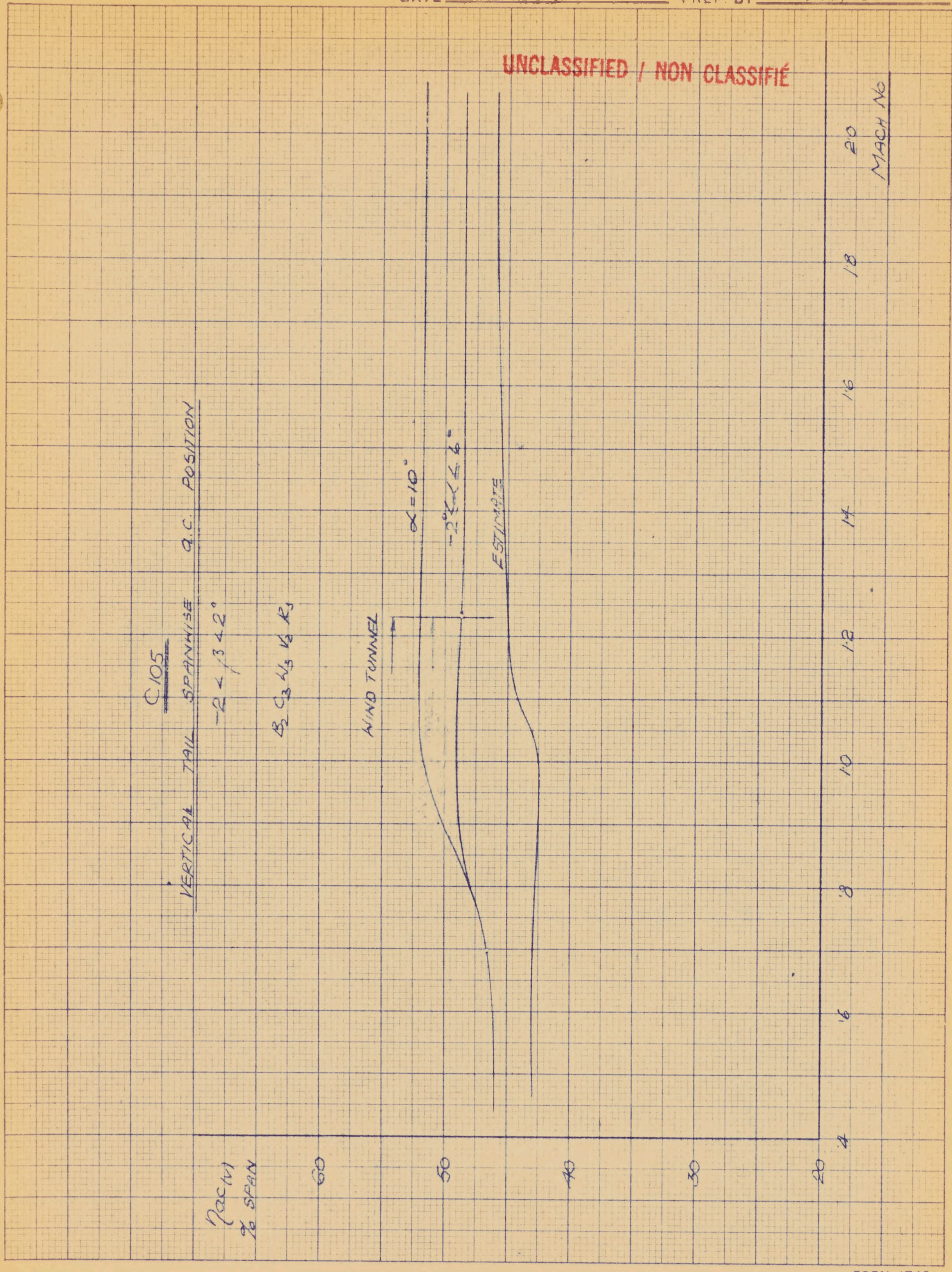
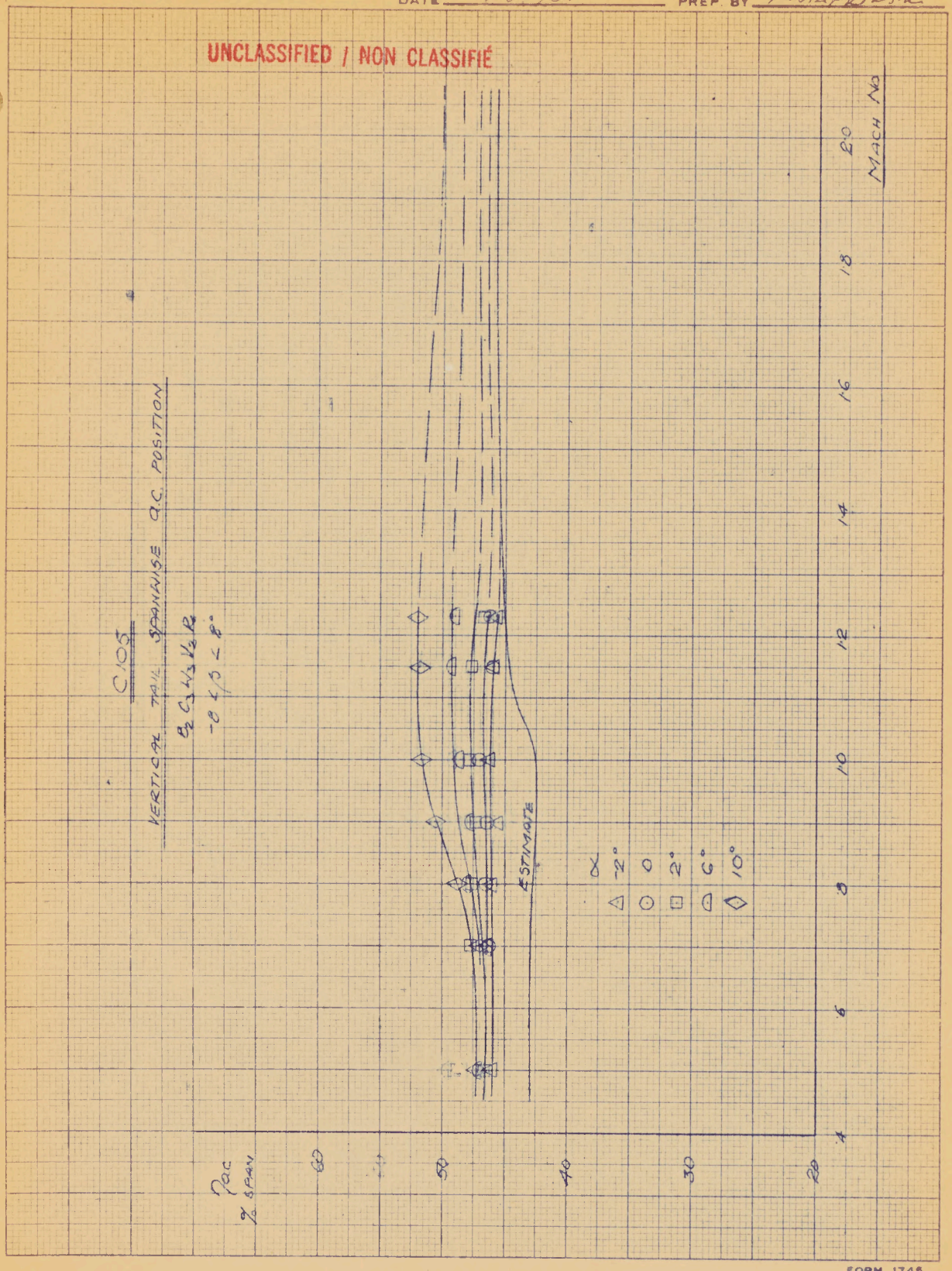


AIRCRAFT C105 COMPONENT SHEET No. T.B.2. REPORT No P/W.T./31
A.U.W. DATE DEC 1/53 PREP. BY Kisatkoski

UNCLASSIFIED / NON CLASSIFIÉ



FORM 1746

C105

C.A.I. WIND TUNNEL TESTS

$C_{D_2}(N)$ VS. MACH NO

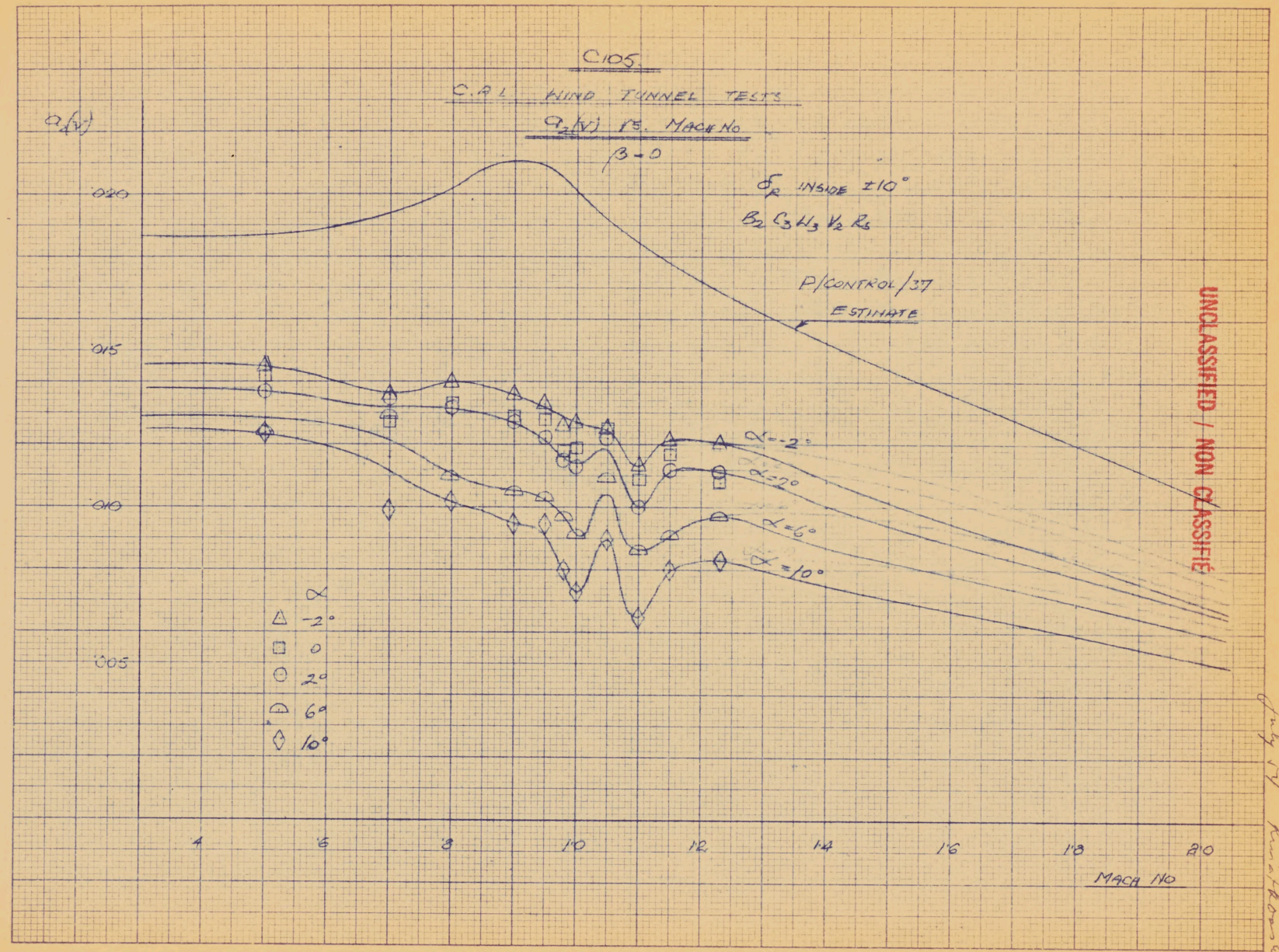
$\beta = 0$

δ_R INSIDE $\pm 10°$

$B_2 C_3 H_3 V_2 R_5$

P/CONTROL/37

ESTIMATE



G.T.T. July 17 1951 Kinkaid

6.1.2. P/W.T. 131

July 54 Kwiatkowski

C105

C.9.L. 4 INCH TUNNEL TESTS

$C_{D(A)}$ vs MACH No

$\beta = 0$

$\frac{1}{2}$ OUTSIDE 5 NO

$B_2 C_3 A_3 V_4 A_5$

P/COUTREAU/37 ESTIMATE

$-2° < \alpha < 2°$

$\alpha = 6°$

$\alpha = 10°$

α $-2°$ $0°$ $2°$ $6°$ $10°$

$C_{D(A)}$

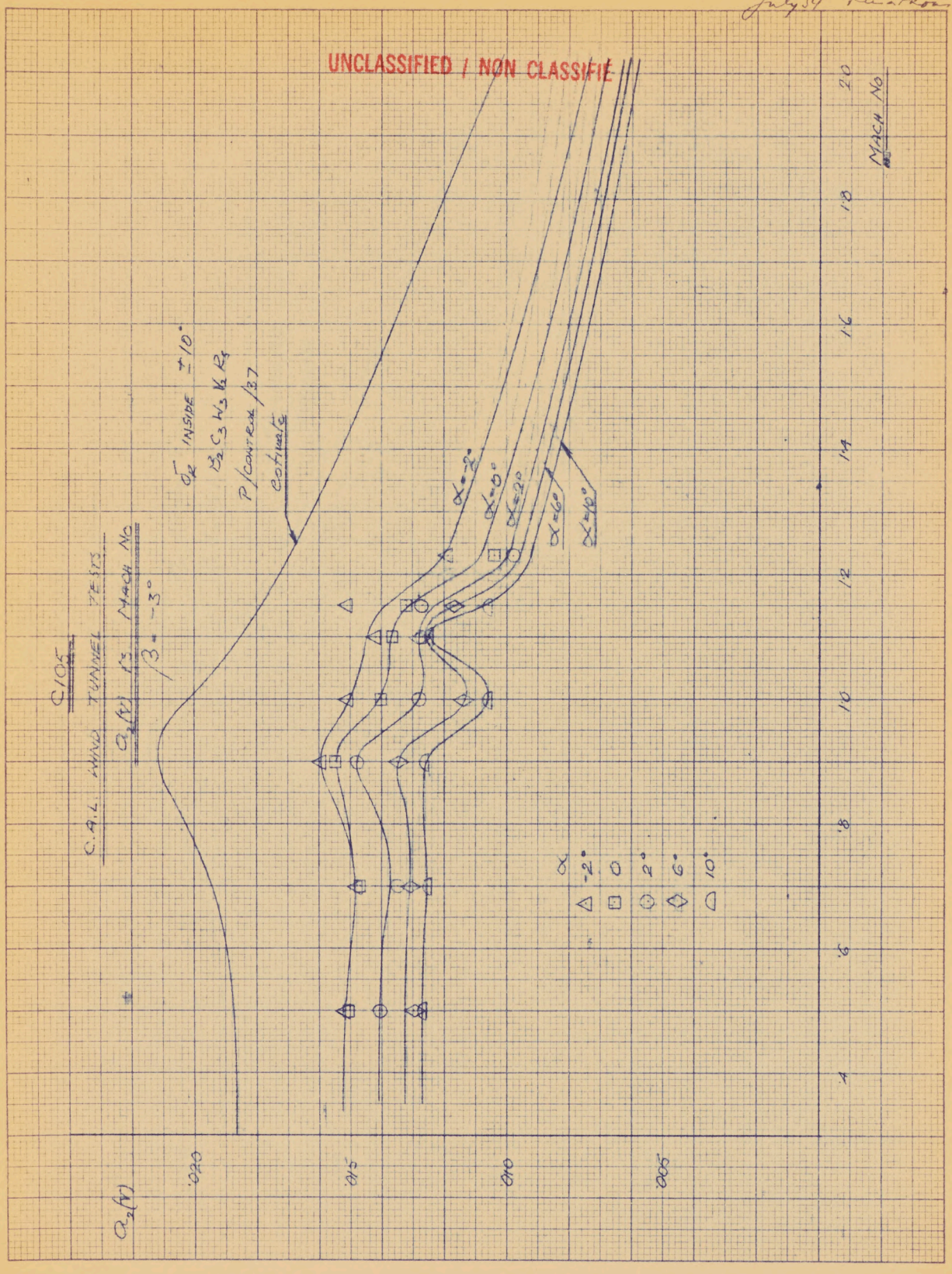
.020 .015 .010 .005

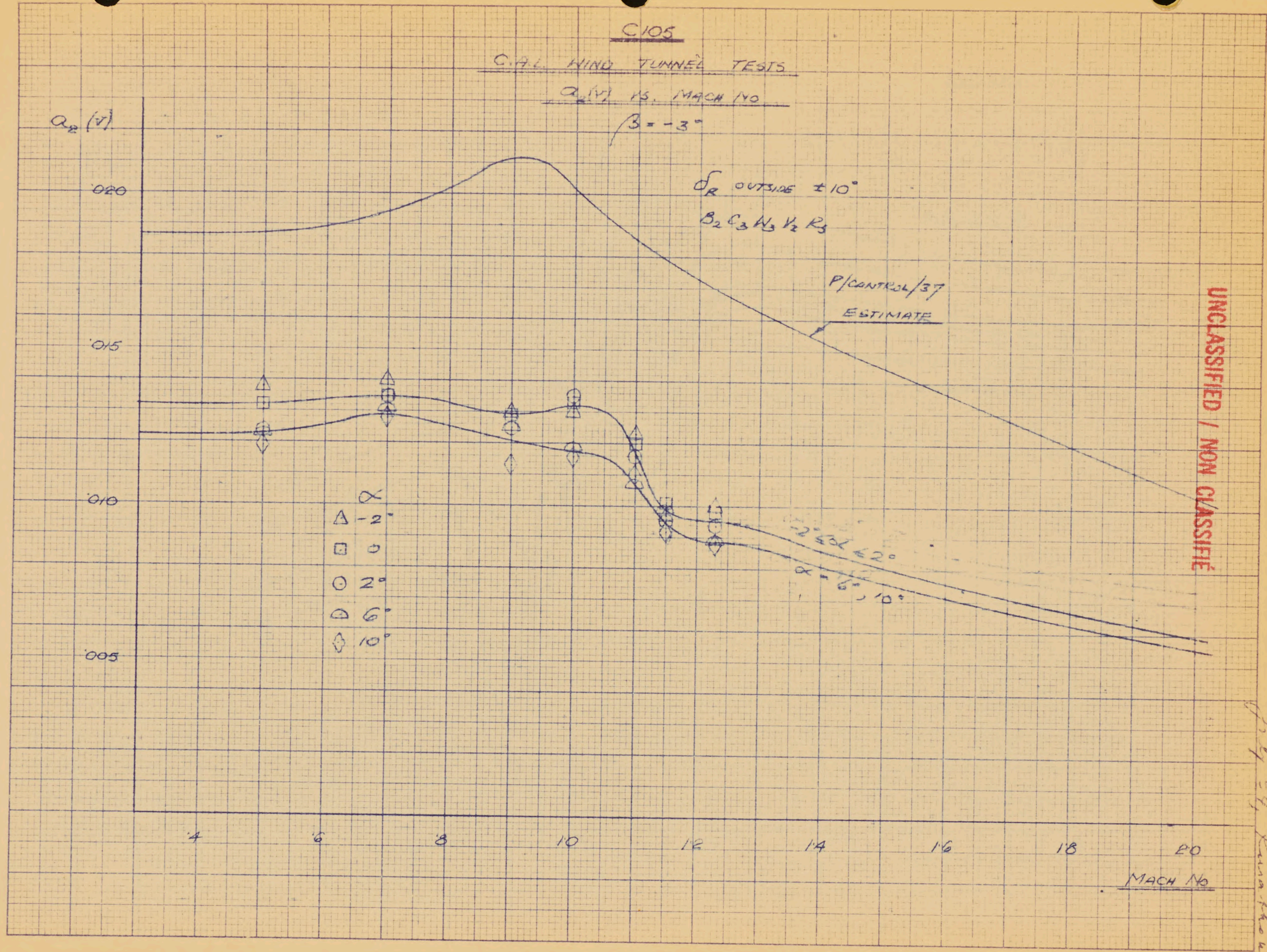
MACH No

.6 .8 1.0 1.2 1.4 1.6 1.8 2.0

6.1.3. P/W.T./31

July 54 Kwiatkowski

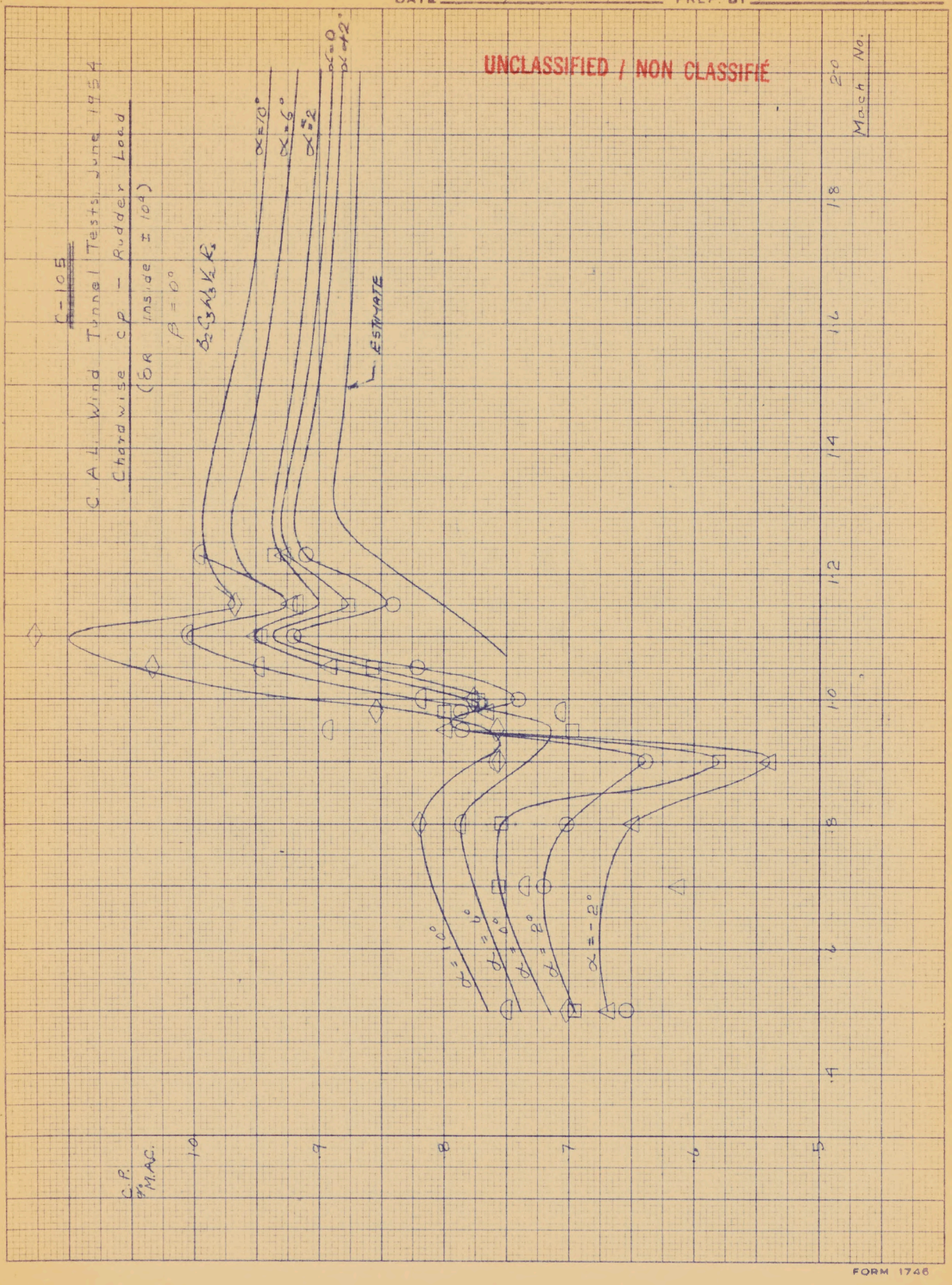




6.1.4 P/H.T. 131
July 54, Kuiathoush.

AIRCRAFT C-105 COMPONENT
A.U.W.

SHEET No. 6.2.1 REPORT No. P/W T/31
DATE July 1954 PREP. BY L Cutcliffe

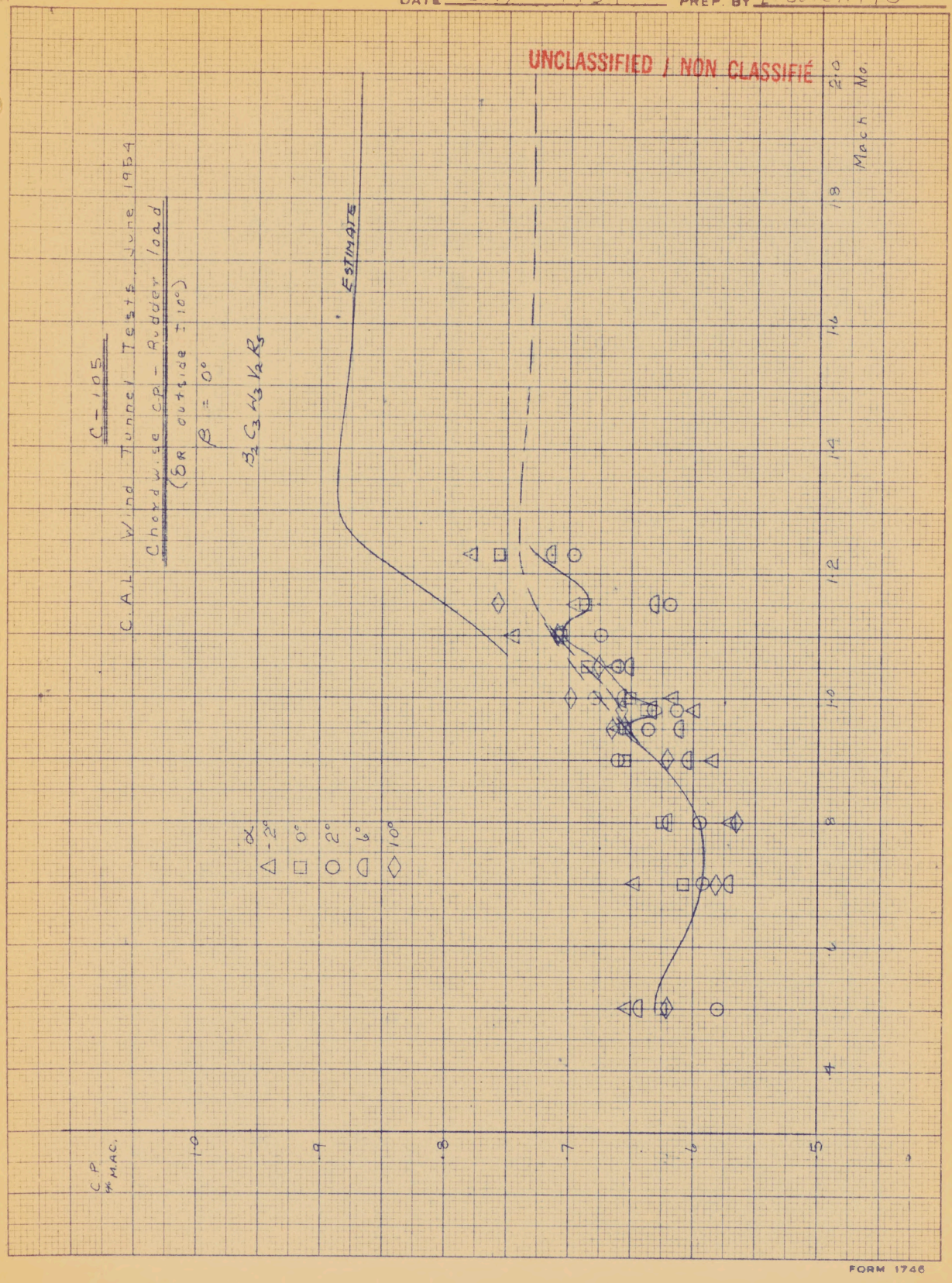


FORM 1746

AIRCRAFT C-105 COMPONENT
A.U.W.

SHEET No. 6.2.2. REPORT No. F/W.T/31

DATE July 1954 PREP. BY L. Cutcliffe



AIRCRAFT C-105 COMPONENT
A.U.W.

SHEET No. 6.2.3. REPORT No. P/W.T/31
DATE July 1954 PREP. BY L. Cutcliffe

C-105
C.A.L. Wind Tunnel Tests, June 1954
Chordwise c.p. - Rudder load
(δR inside ± 10°)
β = -3°
R = 3.43 x 10^6

ESTIMATE

α -2° 0° 2° 6° 10°

c.p. %M.A.C.

Mach No.

FORM 1746

AIRCRAFT C-105 COMPONENT
A.U.W.
SHEET NO. G.2.4.
DATE July 1954
REPORT NO. FLW 7231
PREP BY L. Cutcliffe

C-105

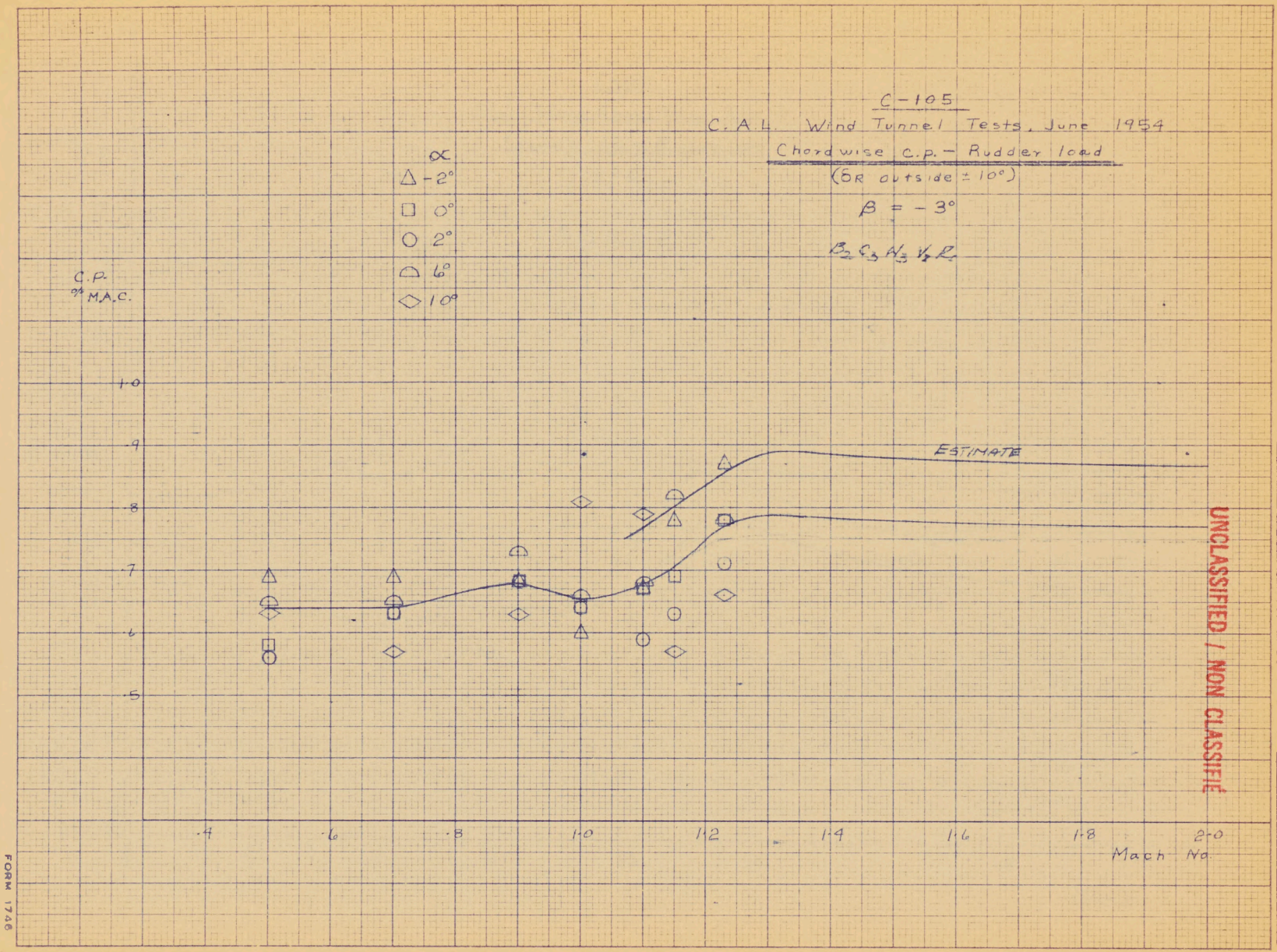
C.A.L. Wind Tunnel Tests, June 1954

Chordwise c.p. – Rudder load

(δ_R outside ± 10°)

$\beta = -3°$

$B_2 C_3 H_3 V_3 R_c$



UNCLASSIFIED / NON CLASSIFIÉ

FORM 1746

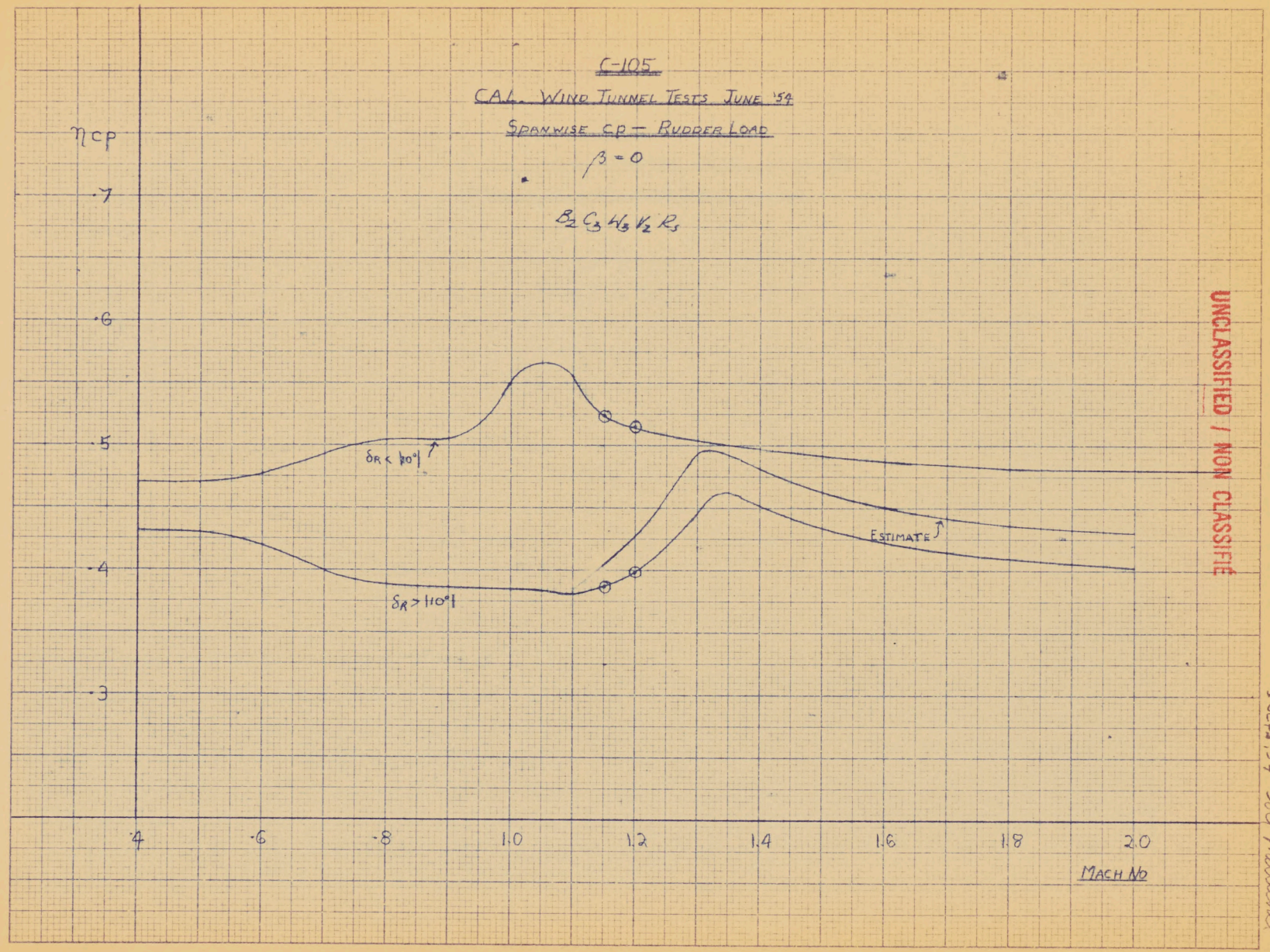
C-105

CAL. WIND TUNNEL TESTS JUNE '54

SPANWISE CP — RUDDER LOAD

$\beta = 0$

$B_2 C_3 W_3 V_2 R_5$



#6.3.1 P/W.T./31
1 SEPT, 54 B.C. Brownhill

AIRCRAFT C105 COMPONENT

A.U.W.

SHEET No. 6.3.2. REPORT No. P/WIND TUNNEL/31

DATE Sept / 54. PREP. BY Kwakkenbush

C105

C.A.L. WIND TUNNEL TESTS JUNE 54

SPANWISE C_D – RUDDER LOAD

$\beta > 3°$

$\beta C_D K_3 K_2 K_1$

ESTIMATE

$\sigma_2 < 110°$

$\sigma_2 > 110°$

O, Δ AVERAGE $-2° < \alpha < 10°$

η SPAN

Mach No

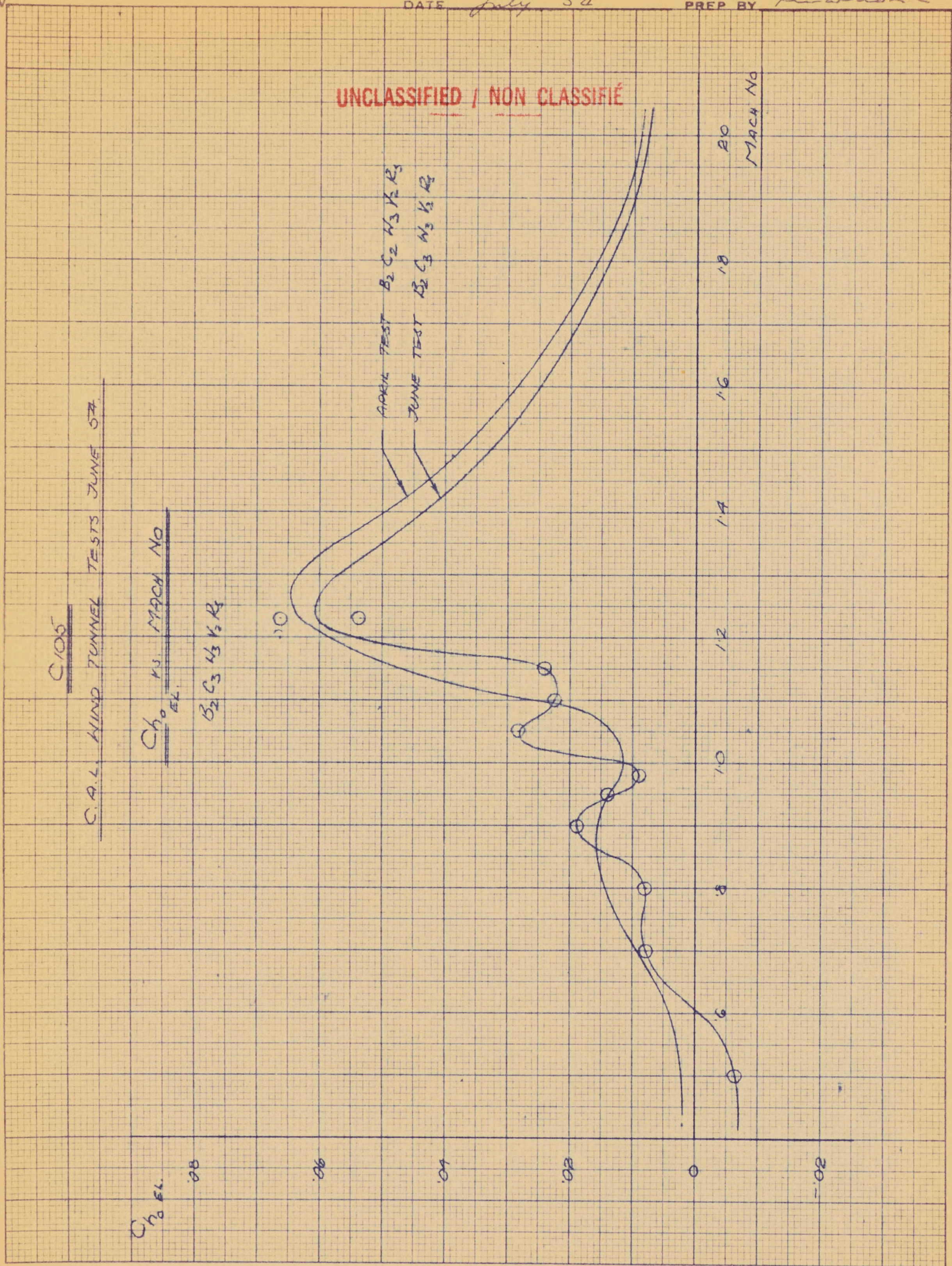
10 X 10 TO THE INCH 359-12
KEUFFEL & ESSER CO.

FORM 1746

AIRCRAFT C105 COMPONENT SHEET No. 7.1 REPORT No. P/W.T./31

A.U.W. DATE July 54 PREP BY

UNCLASSIFIED / NON CLASSIFIÉ



FORM 1746

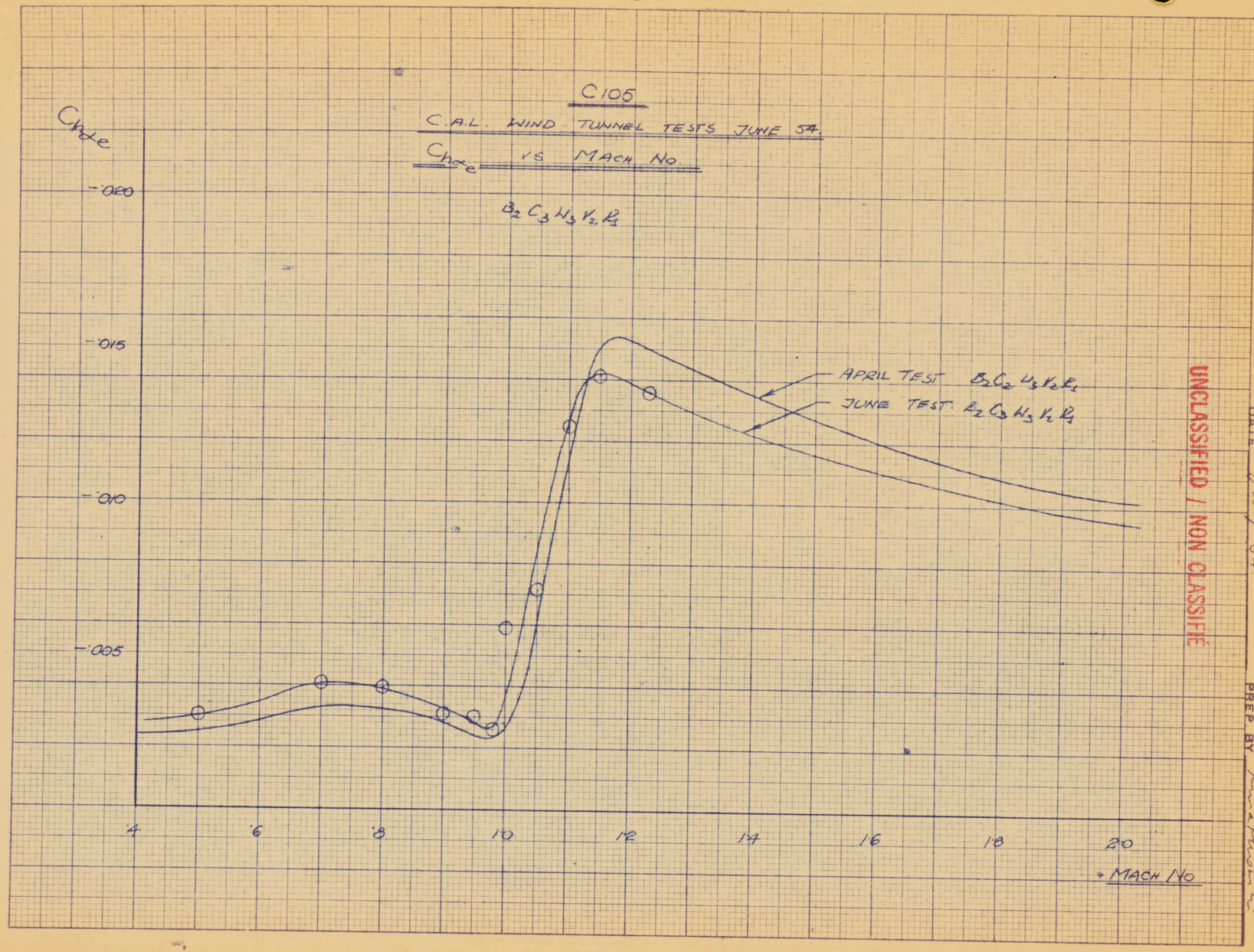
AIRCRAFT C105 COMPONENT SHEET NO. 7.2.
A.U.W. DATE July 54 REPORT NO. Pilot 131
PREP. BY Knathen C.

C105

C.A.L. WIND TUNNEL TESTS JUNE 54.

$C_{h_{\alpha_e}}$ VS MACH NO.

$B_2 C_3 H_3 V_2 R_2$



FORM 1746

C105

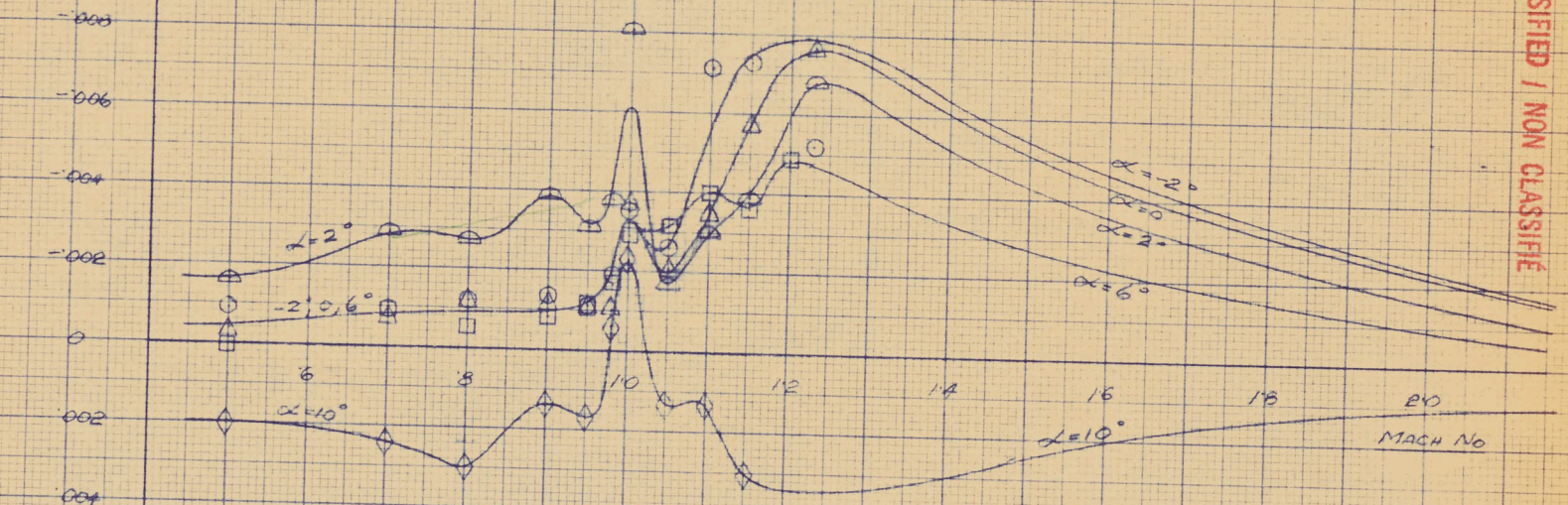
CAL WIND TUNNEL TESTS JUNE 57.

$B_2C_2H_1V_2P_4$

C_{he_β} VS MACH NO

$\beta < 6°$ for $-2° \leq \alpha \leq 6°$

$\beta \leq 2°$ for $\alpha = 10°$



P/NT/31 7.5.

AIRCRAFT C-105 COMPONENT A.U.W. SHEET NO. 8.1.

DATE 12/7/54 REPORT NO P/W/T/31

PREP BY C.A. Ford

C-105

C_{h_β} (Rudder) vs Mach Number

April W-T Tests Modified for New Canopy

$B_2 C_3 H_3 V_3 R_3$

C_{h_β} per degree

$\alpha = 2°$

Estimate P/Control/37

Wind Tunnel

.015
.010
.005
0

.2 .4 .6 .8 1.0 1.2 1.4 1.6 1.8 2.0

Mach Number

AIRCRAFT C-105 COMPONENT
A. U. W.

SHEET No. 8.2. REPORT No. P/W.T./31
DATE 19/7/54 PREP BY C.A. Ford

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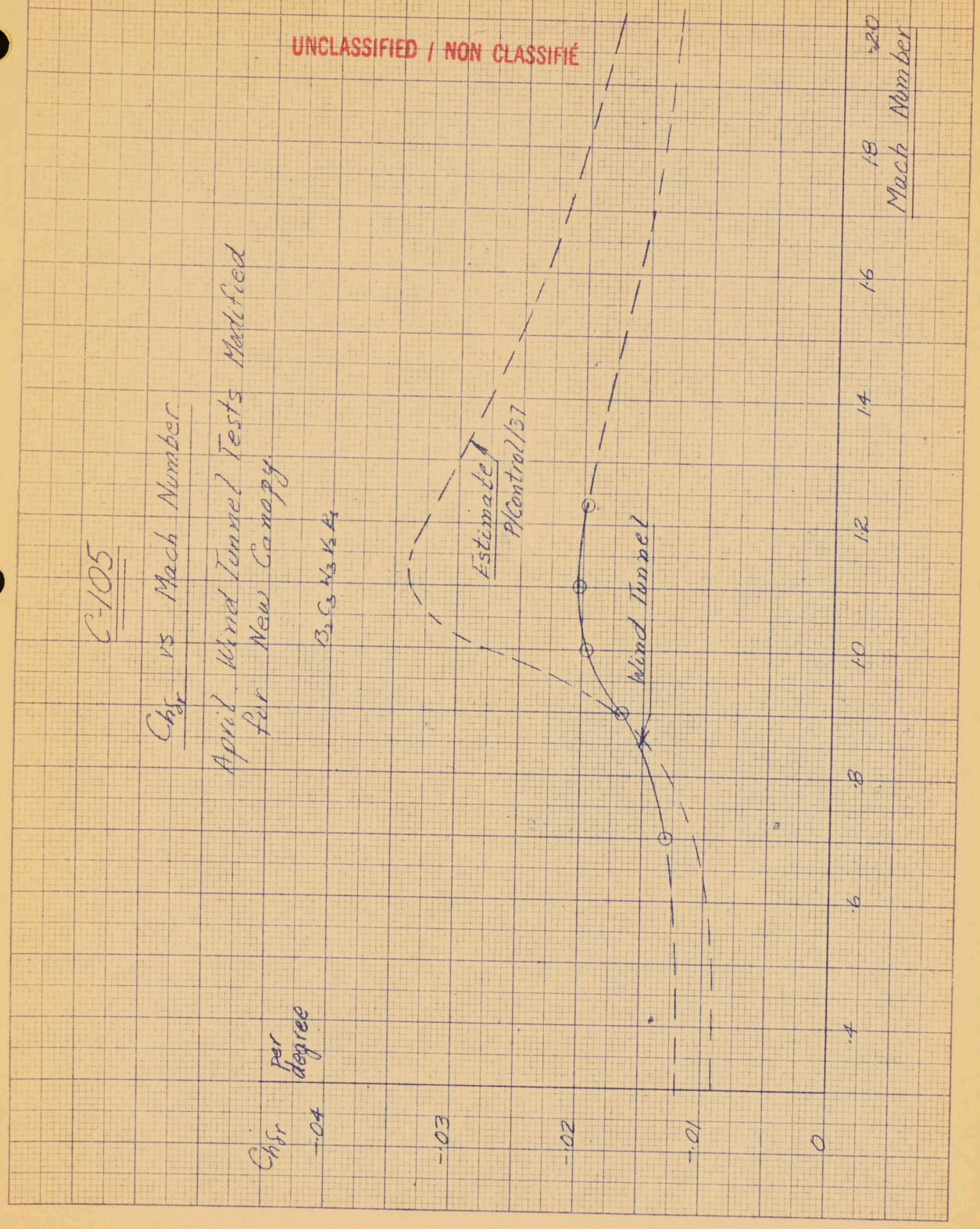
C-105

C_{hsr} vs Mach Number

April Wind Tunnel Tests Modified for New Canopy

$B_2 C_3 H_3 V_2 A_4$



FORM 1746