

QcX
Avro
CF105
P-AD-88

(12)

FILE IN VAULT

C-105 P/Aero Data/88

CONFIDENTIAL
CLASSIFIED
COMPARISON OF O.3 LANGLEY WIND TUNNEL

RESULTS WITH C.A.L. RESULTS AND

ANALYZED ESTIMATES

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Report no.: QCX-AVR0-CF105- P-AD-88

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



45005



A. V. ROE CANADA LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: C-105

REPORT NO. P/Aero Data/88

FILE NO.

NO OF SHEETS:

TITLE:

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COMPARISON OF .03 LANGLEY WIND TUNNEL RESULTS

WITH C.A.L. RESULTS AND ESTIMATES

Classification cancelled / changed to: UNCLASSIFIED

By authority of: DRDA 7/DARET 5-8/DAS Eng 6-4-5

Date: 5 Nov 1992

Signature: Bauley

Unit / Rank / Appointment: DSIS 3, Secretary CRAD HQ DRP

PREPARED BY: E. R. Fish

DATE Jan. 1957

CHECKED BY: W. Earl

DATE

SUPERVISED BY:

ORIGINAL SIGNED BY
S. KWIATKOWSKI

DATE

APPROVED BY:

DATE

ISSUE NO.	REVISION NO.	REVISED BY	APPROVED BY	DATE	REMARKS

12422365

TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. P/AERO DATA/88

SHEET NO. 1

AIRCRAFT:

C-105

PREPARED BY

DATE

R. Rangl

May 1956

CHECKED BY

DATE

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COMPARISON OF 0.3 LANGLEY WIND TUNNEL RESULTSWITH C.A.L. RESULTS AND ESTIMATESINDEXLONGITUDINAL STABILITYSECTION1. Lift1. $C_{L\alpha}$

1.1

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2.2

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3.2

3. $C_{M\delta}$ at constant α

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3.4

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2. $C_{Y\beta}$

4.2

3. $C_{Y\beta}$

4.3



AVRO AIRCRAFT LIMITED
MALTON, ONTARIO

TECHNICAL DEPARTMENT

REPORT NO. P/AERO DATA/33

SHEET NO.

AIRCRAFT:

PREPARED BY

DATE

E.R. Fish

January 1957.

CHECKED BY

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INTRODUCTION

In this report, a comparison of the rigid longitudinal and lateral stability derivatives obtained from Langley Wind Tunnel Tests has been made with Cornell Series III wind tunnel tests and extrapolations.

The Cornell tests were conducted between 0.5 and 1.23 Mach Numbers and theoretical estimates were made for values between 1.23 and 2.0 Mach Numbers.

The Langley tests were run at 1.4, 1.6, 1.8 and 2.0 Mach Numbers to confirm the theoretical estimates.

The comparison was made using the basic wing configuration including drooped leading edge, notch and extension.

The centre of gravity was taken as .23c on M.A.C.

The details of the tests were as follows:-

WIND TUNNEL	DATE	MODEL SCALE	MACH NO.	REYNOLDS NO.
C.A.L. 4' x 4' Transonic	Series III May 1955	.04	0.5 to 1.23	1.64×10^6 to 2.45×10^6
Langley 4' x 4' Supersonic	April 1956	.03	1.41	1.74×10^6
Langley 4' x 4' Unitary	July 1956	.03	1.6 1.8 2.0	2.68×10^6 2.50×10^6 2.31×10^6

AIRCRAFT
A U. W

COMPONENT

SHEET No 1-1

REPORT No P/AERO DATA/88

DATE May 1956

PREP BY R-S-R

FROM P/WT/80
SHEET 1-1

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C105

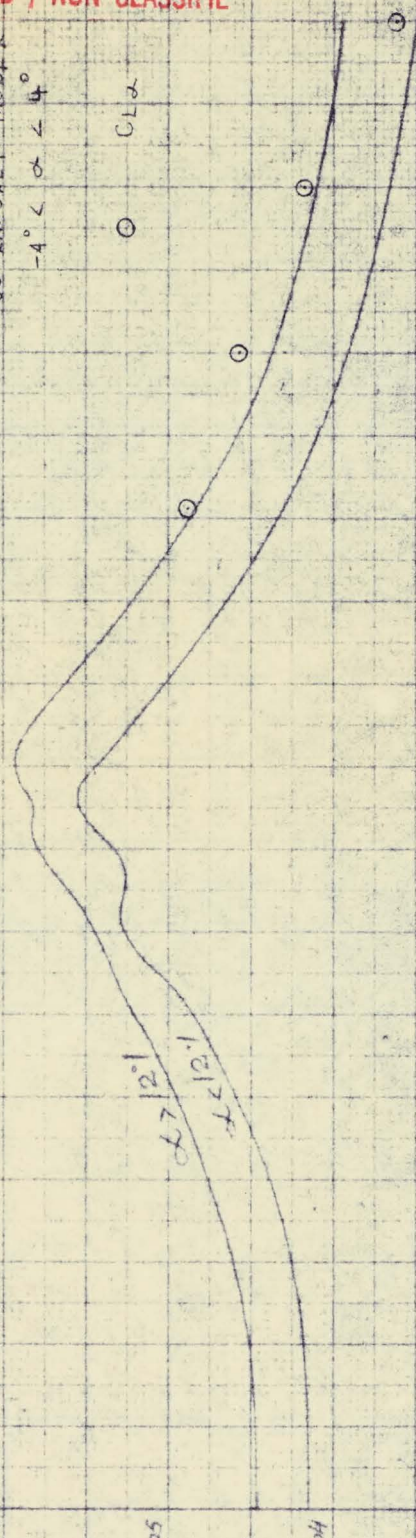
C_{DA} vs MACH NO.

CDA'S B₂ V. W. E₁₀ N5 D8.4

03 LANSLEY MODEL

-4° < α < 4°

C_{DA}



MACH NO.

18

16

14

12

10

8

6

4

2

C_{DA}
MACH NO.

0.06

0.05

0.04

0.03

0.02

FORM 174B

AIRCRAFT
A U W

COMPONENT

SHEET NO 1.2
DATE May 1956

REPORT NO P/AERO DATA/88
PREP BY R.S.R

FROM P/WT/80
SHEET 1.2

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03 LANGLEY MODEL

C105

α_0 MACH NO

CONF 2 B.V. M.E. Ns D.S.W

α_0
DEGREES

30

20

10

4

6

8

10

12

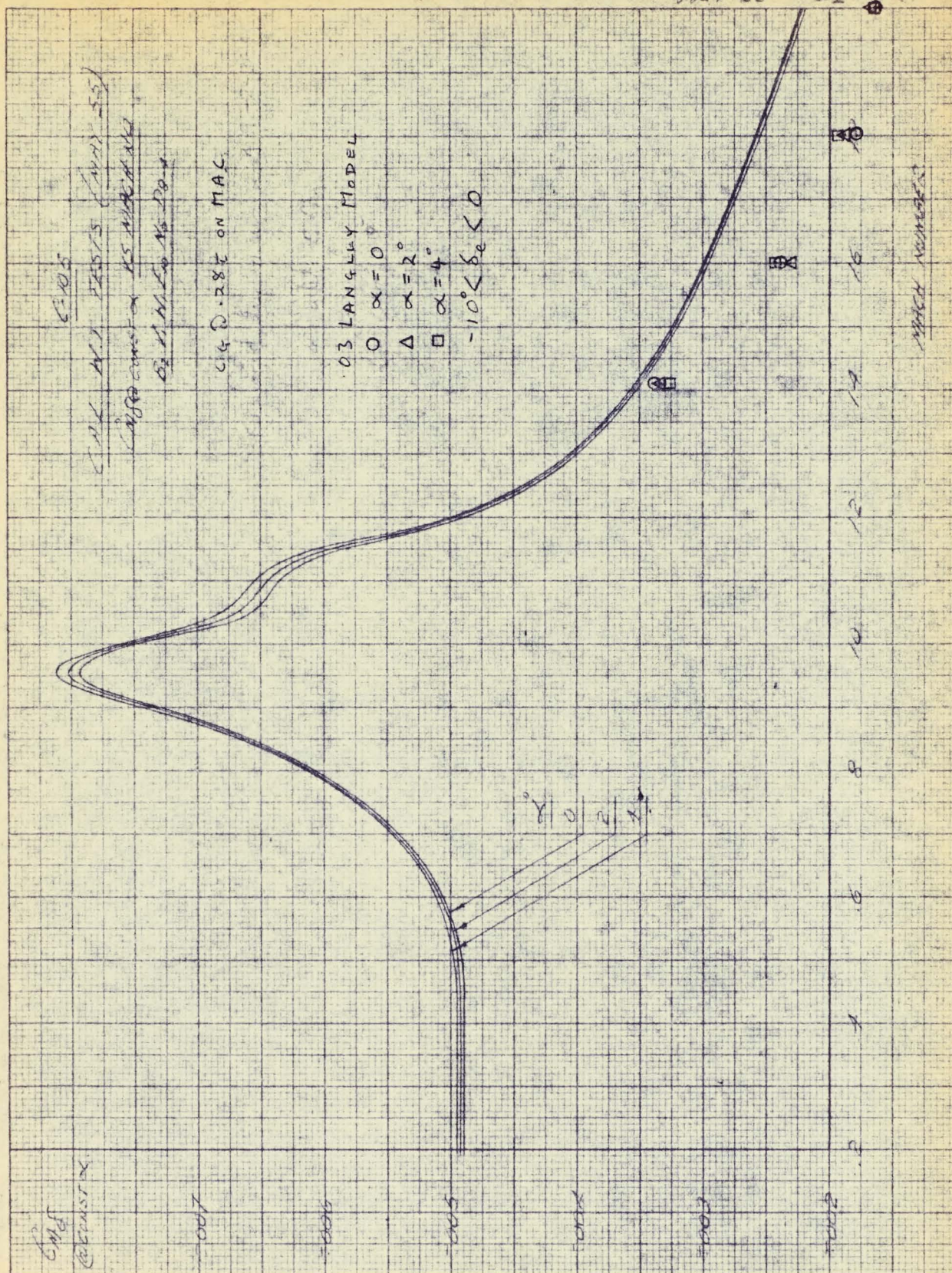
14

16

18

MACH NO

JULY 55 - 2200K



P/WT/80

FROM P/AERO DATA/60
 SHEET 3.1.1

(COPIED FROM P/W/80 4.1.2)

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C-105

C_{np} TAIL-ON
 VS MACH NUMBER

$\alpha = 3^\circ$
 RIGID CG AT 0.28Z

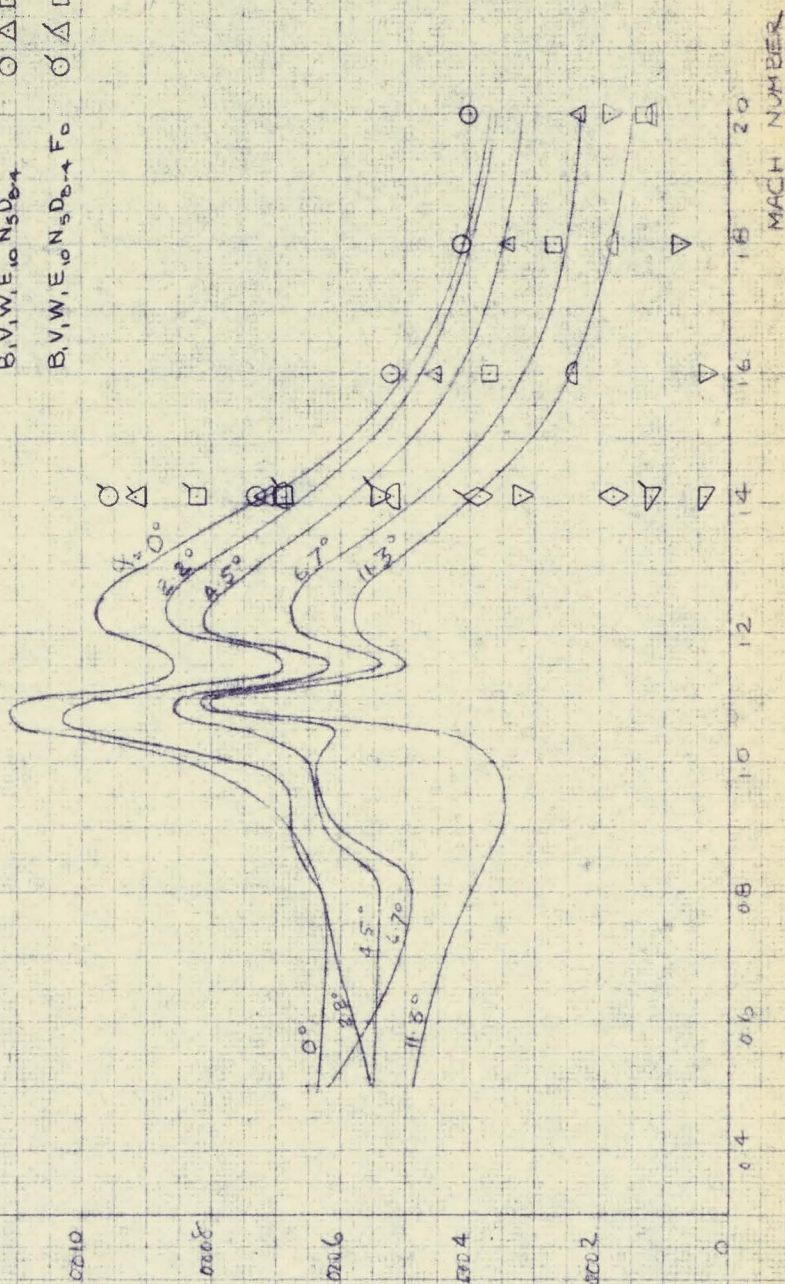
C_{np} TAIL-ON
 per degree

CONFIG:

B, V, W, E, $N_5 D_{0.4}$

B, V, W, E, $N_5 D_{0.4} F_0$

α°
 0 2 4 6 8 10 4
 0 Δ $\square$ ∇ $\diamond$ ∇ $\diamond$ ∇ $\diamond$ ∇
 0 Δ $\square$ ∇ $\diamond$ ∇ $\diamond$ ∇ $\diamond$ ∇



3.1.2 FROM P/AD/60

(COPIED FROM P/NT/60 4.1.1)

44-1 V/AERO DATA/88

MAY 56

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0.03 LANGLEY MODEL

α
0 2 4 6 8 10 14

C-105

C_{np} TAIL-OFF VS MACH NUMBER

TAIL-OFF

$\beta < 4^\circ$

C_{np} TAIL-OFF
per degree

-0.016

-0.014

-0.012

-0.010

-0.008

-0.006

20

18

16

14

12

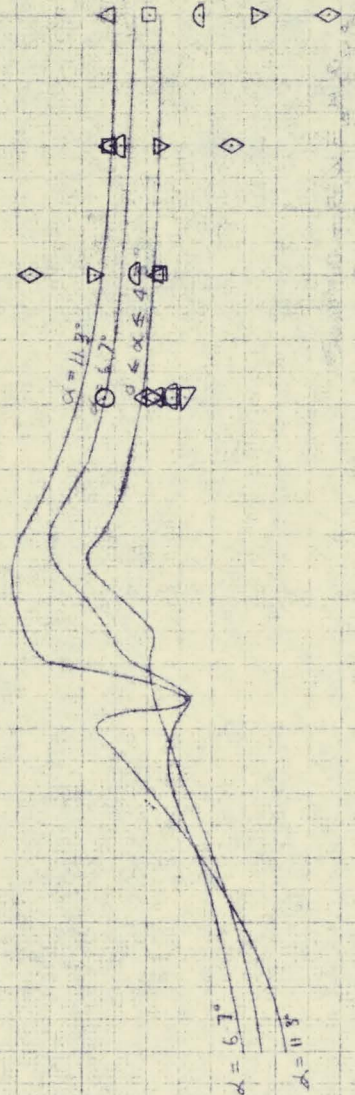
10

08

06

04

MACH NUMBER



AIRCRAFT
A U W.

COMPONENT

SHEET No. 422

REPORT No P/AD 88

DATE May 1956

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FROM P/AD/60
SHEET 3.2.2

03 LANGLEY MODEL

$|\beta| < 4^\circ$

α°
14 ▽
12 ▽
10 ◇
8 ▽
6 ▽
4 ▽
2 ▽
0 ▽
0 ▽
0 ▽

MACH NUMBER

$C_{1/3}$ TAIL-OFF VS MACH NUMBER

C-105

$C_{1/3}$ TAIL-OFF

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$C_{1/3}$
TAIL-OFF

- 003

- 002

- 001

0

001

FROM P/AERO DATA/60
SHEET 3.3.1

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C-105

Estimated C_{D} vs Mach No

Rigid A/c wing washed, extended & draped
Based on CAC Wind Tunnel Tests, May 1955

C_{D} TAIL ON
per leg

0.10

$-4^{\circ} \leq \beta \leq 4^{\circ}$

500

100

100

100

0

2

4

6

8

10

12

14

16

18

20

Mach No.

0.03 LANGLEY MODEL

α°

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

0 2 4 6 8 10 12

AIRCRAFT
A U W.

C-105

COMPONENT

SHEET No. 5-3

REPORT No.

P/hero Data/88

DATE May 1956

PREP BY

R.S.R

FROM P/AD/60
Sht 2-3

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0.03 LANGLEY MODEL

0° 0° $\leq$ σ $\leq$ 10°
2° 4° 6° 10° 14°

C-105

Cy 15 Mach No.

Rigid A/C

Based on Wt Data May 1955

Cy per deg

003

002

001

0

2

4

6

8

10

12

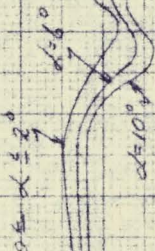
14

16

18

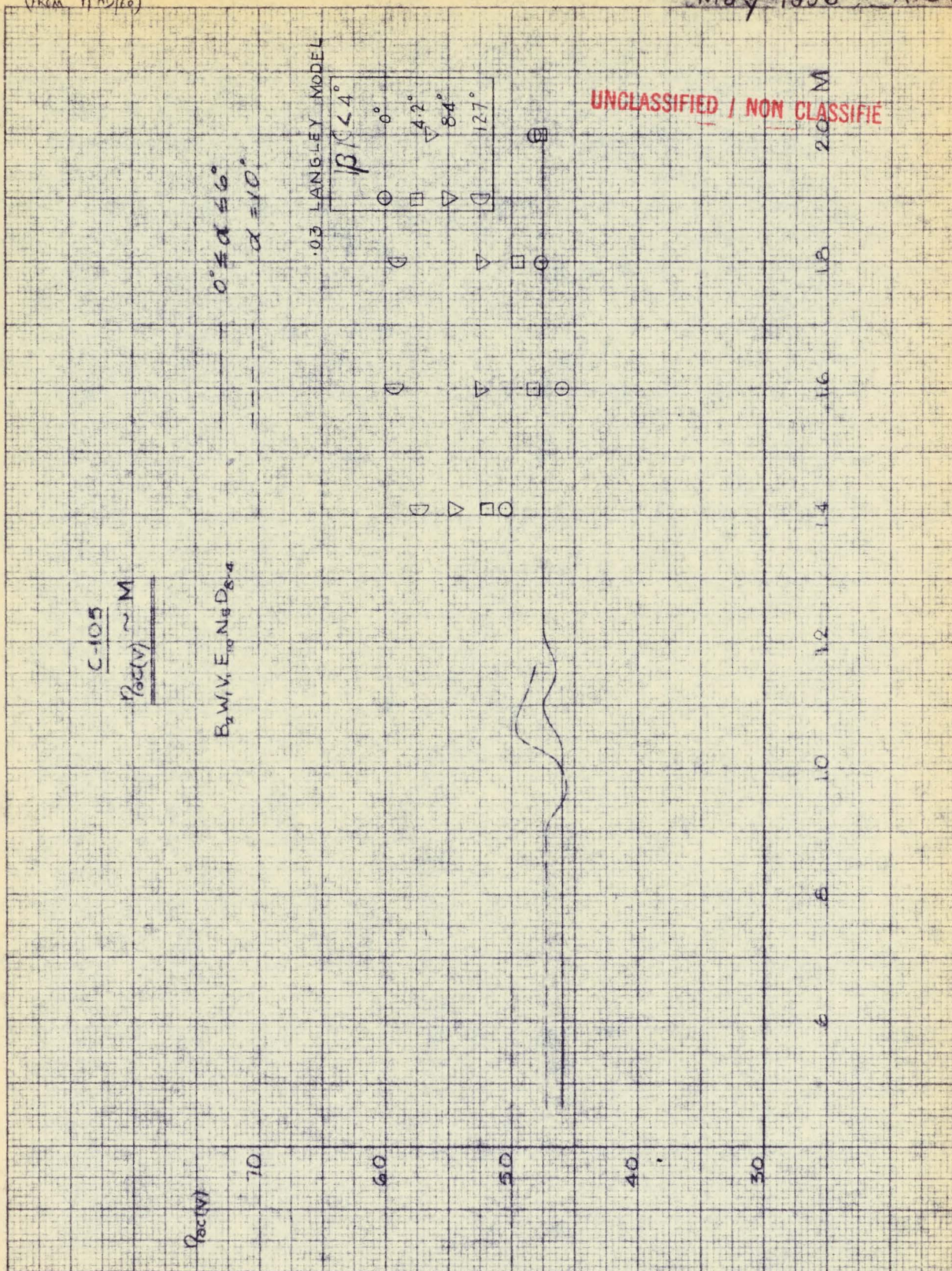
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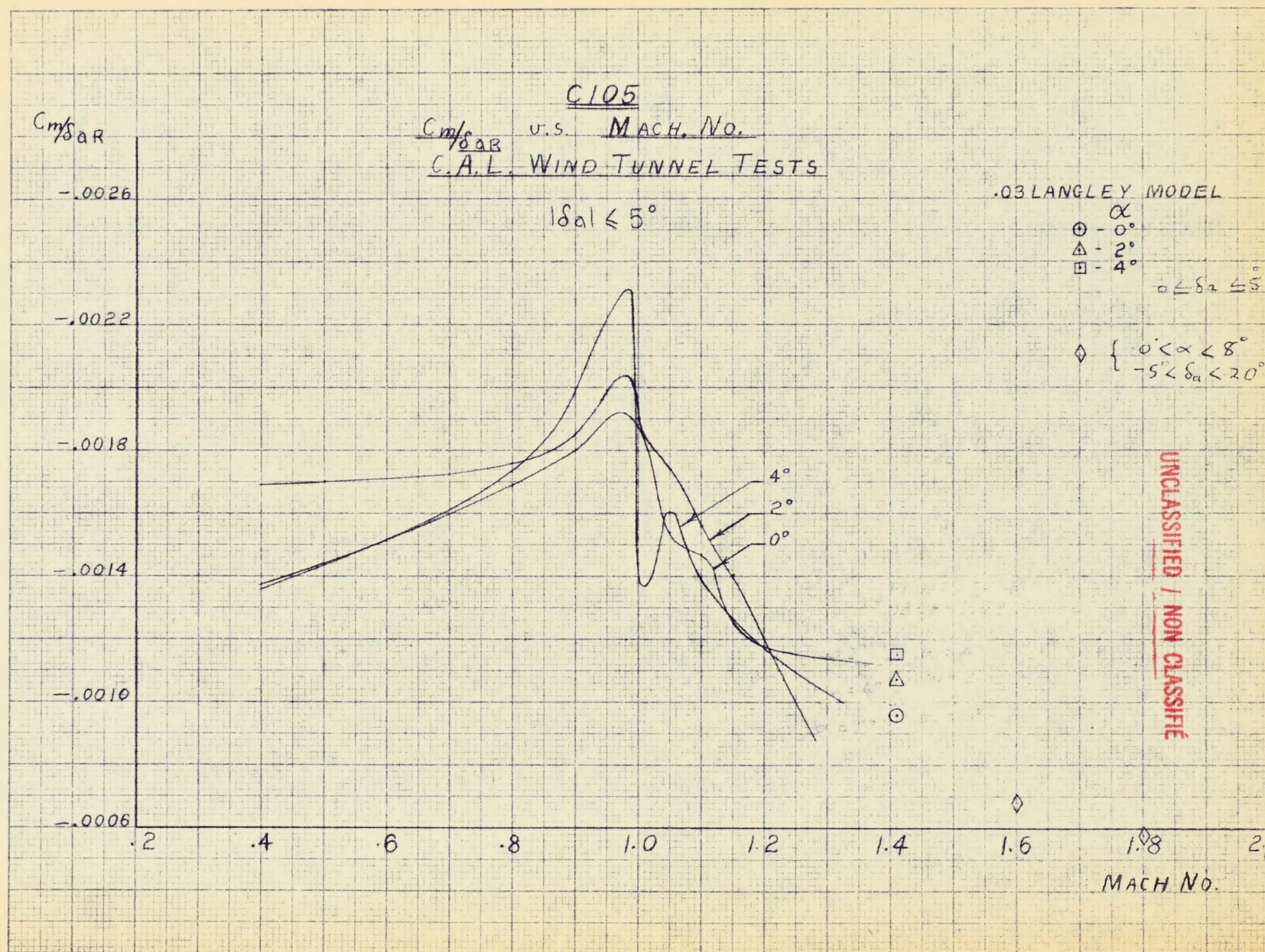
Mach No.



(FROM P/AD/60)

6.3 P/AD/88
May 1956 R.S.R





C-105

$C_{L_{\alpha}}$ vs MACH NUMBER

$C_{L_{\alpha}}$ per 2° incl.

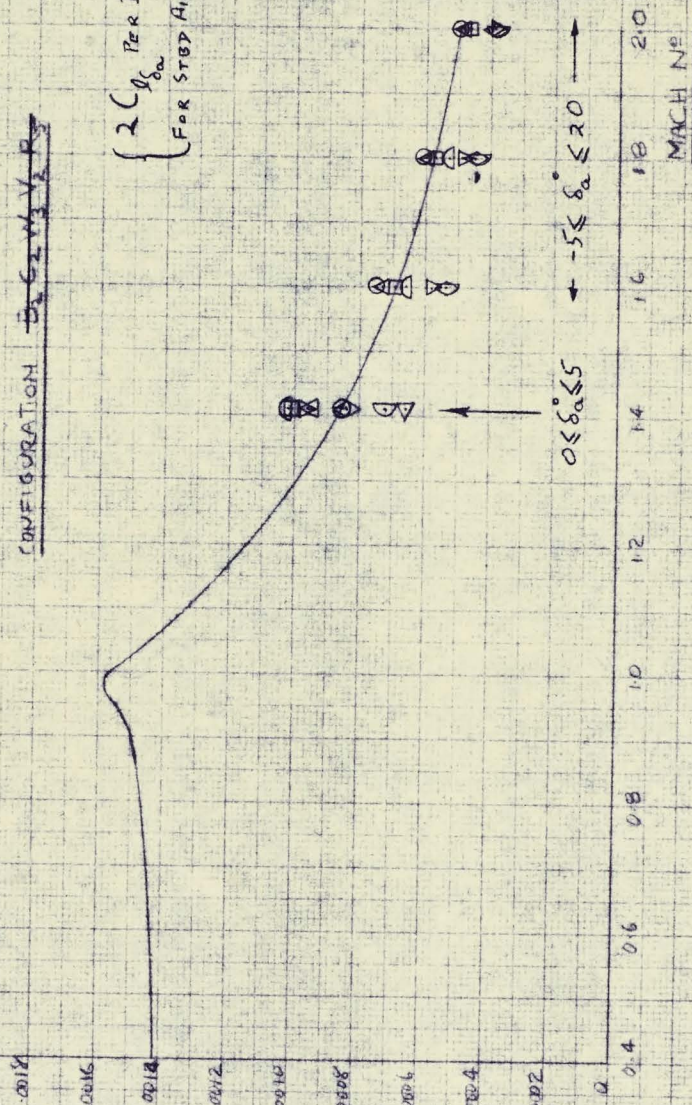
$-5^{\circ} < \delta_{\alpha} < +5^{\circ}$

CONFIGURATION B-62 W3 V2 R

POINTS FROM
03 LANGLEY MODEL

- $\alpha = 0^{\circ}$
 $\alpha = 2^{\circ}$
 $\alpha = 4^{\circ}$
 $\alpha = 6^{\circ}$
 $\alpha = 8^{\circ}$
 $\alpha = 10^{\circ}$
 $\alpha = 12^{\circ}$
 $\alpha = 14^{\circ}$
- $\left\{ \begin{array}{l} 2 (C_{L_{\alpha}} \text{ PER DEG}) \\ \text{FOR STBD AILERON} \end{array} \right\}$

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8.3

P/AERO DATA/88

(FROM P/W/T/S)

gbsl

May 1956

C-105
C.R.L. WT TESTS JUNE '55

CL SER VS MACH NO.

$0^\circ \leq \delta_{SR} \leq 10^\circ$

$\begin{cases} 0^\circ < \delta < 8^\circ \\ -5^\circ < \delta < 20^\circ \end{cases}$

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POINTS FROM
OB LANGLEY
MODEL

$\rho \approx 3.6 \pm 5$

$\begin{matrix} 0^\circ & 2^\circ & 4^\circ & 6^\circ & 8^\circ & 10^\circ & 12^\circ & 14^\circ \end{matrix}$



δ_2

CL/SR
004
PER DEG

003

002

001

0

.4

.6

.8

1.0

1.2

1.4

1.6

1.8

2.0

MACH NO.

9.1 FROM P/WT/80

0.03 LANGLEY MODEL

CAL W/T TESTS JUNE 1953
C_{DB} ELEVATOR ~ MACH 10

C_{DB}
ELEVATOR

04

03

02

01

0

01

9.1
May 1956

P/AERO DATA/88
R.S.R.

20

18

16

14

12

10

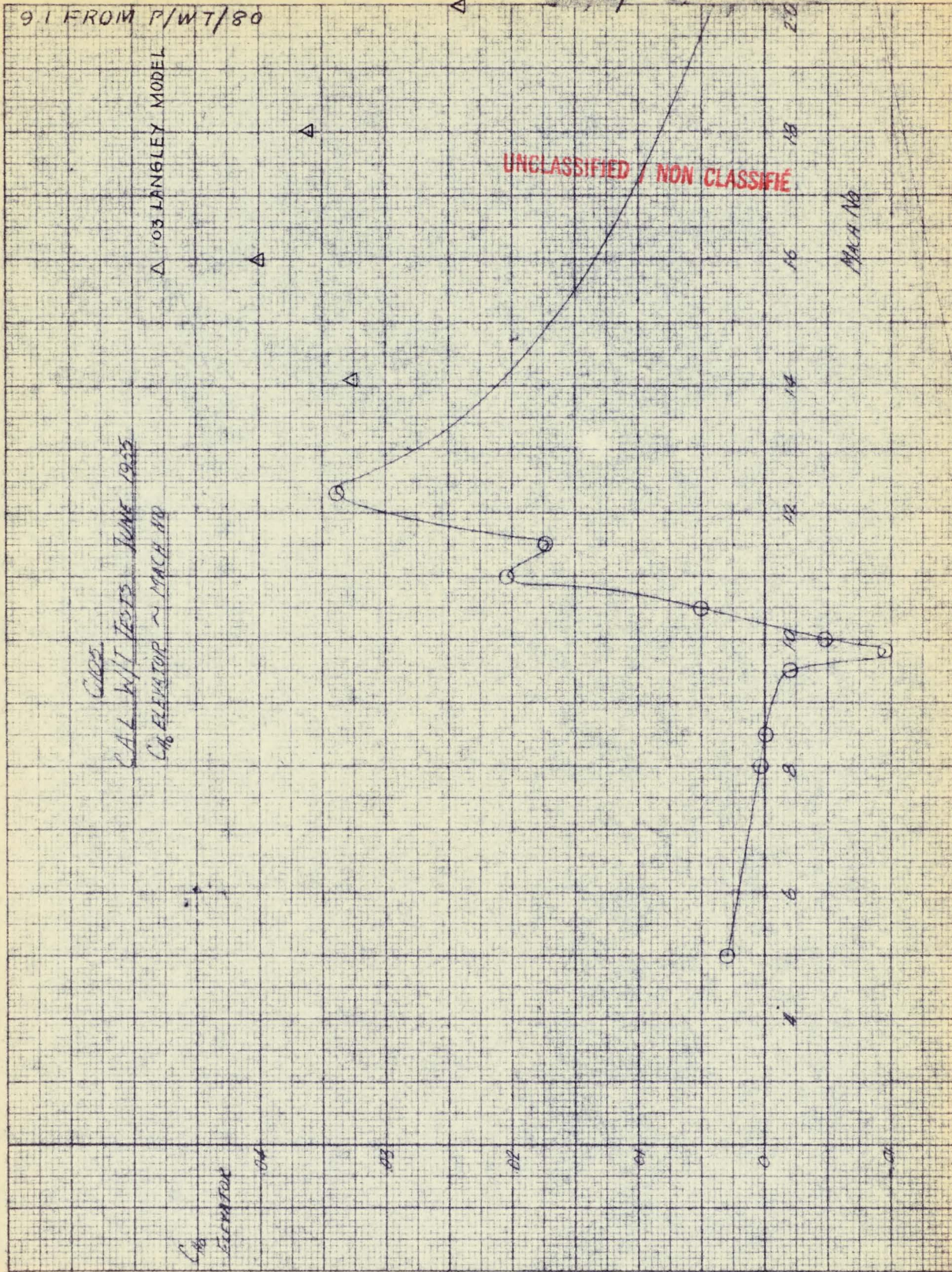
8

6

4

MACH 10

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9.3

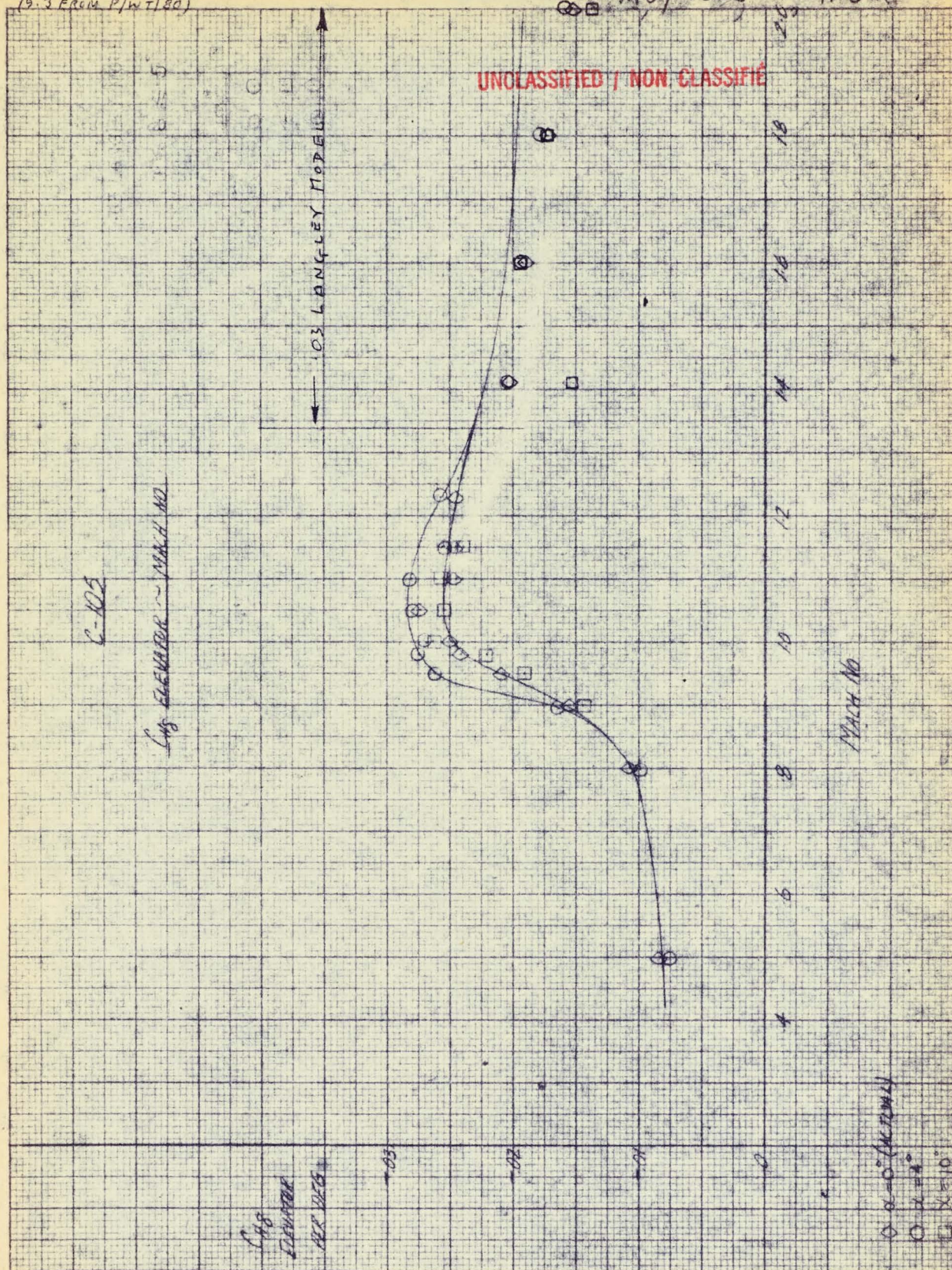
P/AERO DATA/88

(9.3 FROM P/WI/80)

May 1956

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$\alpha = 0^\circ$ (NORMALLY)
 $\alpha = 2^\circ$
 $\alpha = 10^\circ$

AIRCRAFT

COMPONENT

SHEET NO.

10.1

REPORT NO.

P/AERODATA/88

A. U. W.

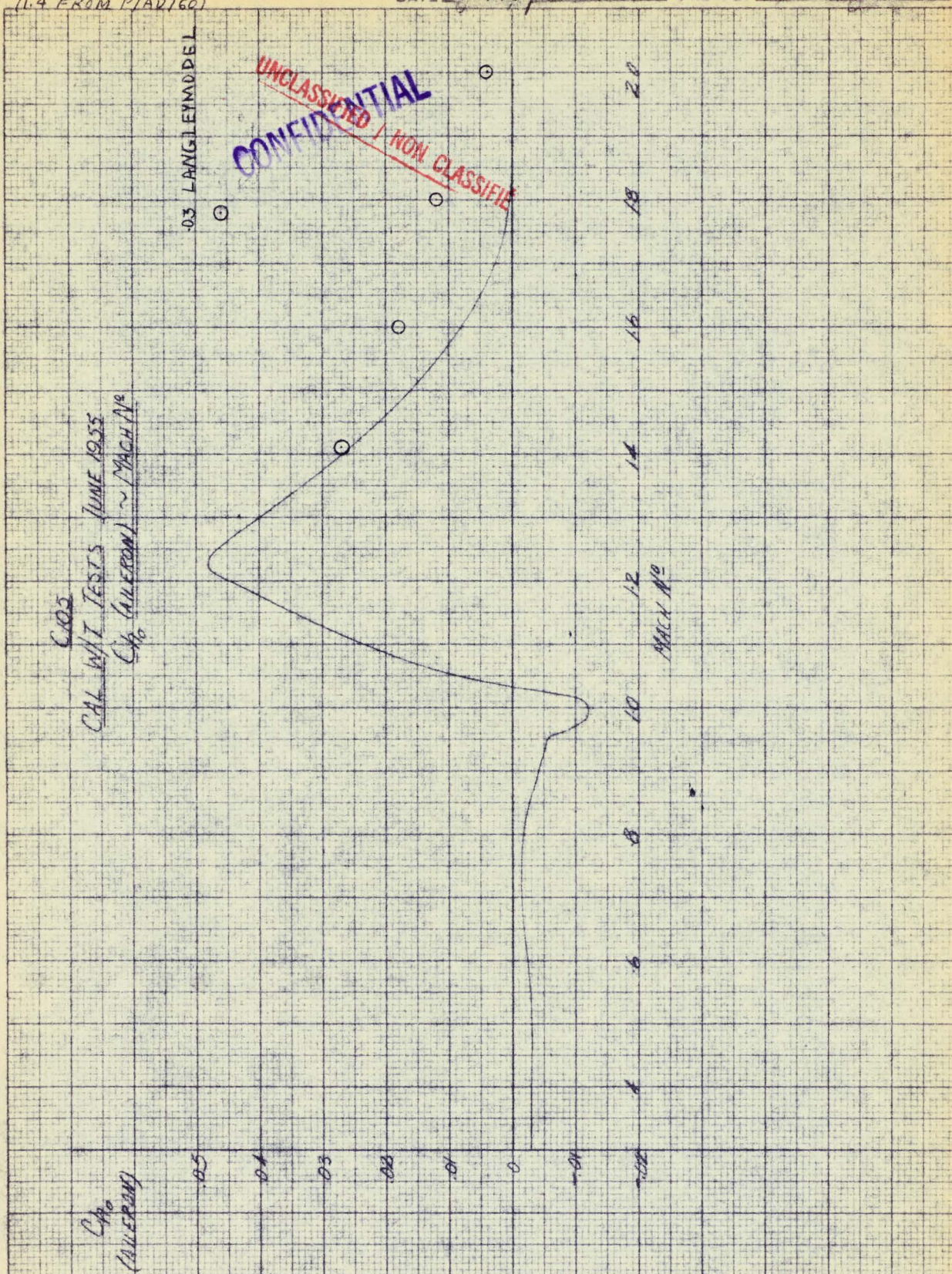
(L. 9 FROM P/AD/60)

DATE

May 1956

PREP BY

R. S. R.



K&W 10x10 to the 1/2 inch 359-12 KEUFFEL & ESSER CO. MADE IN U.S.A.

FORM 1746

P/AD/60

AIRCRAFT

A.U.W. (1.5 FROM P/AD/60)

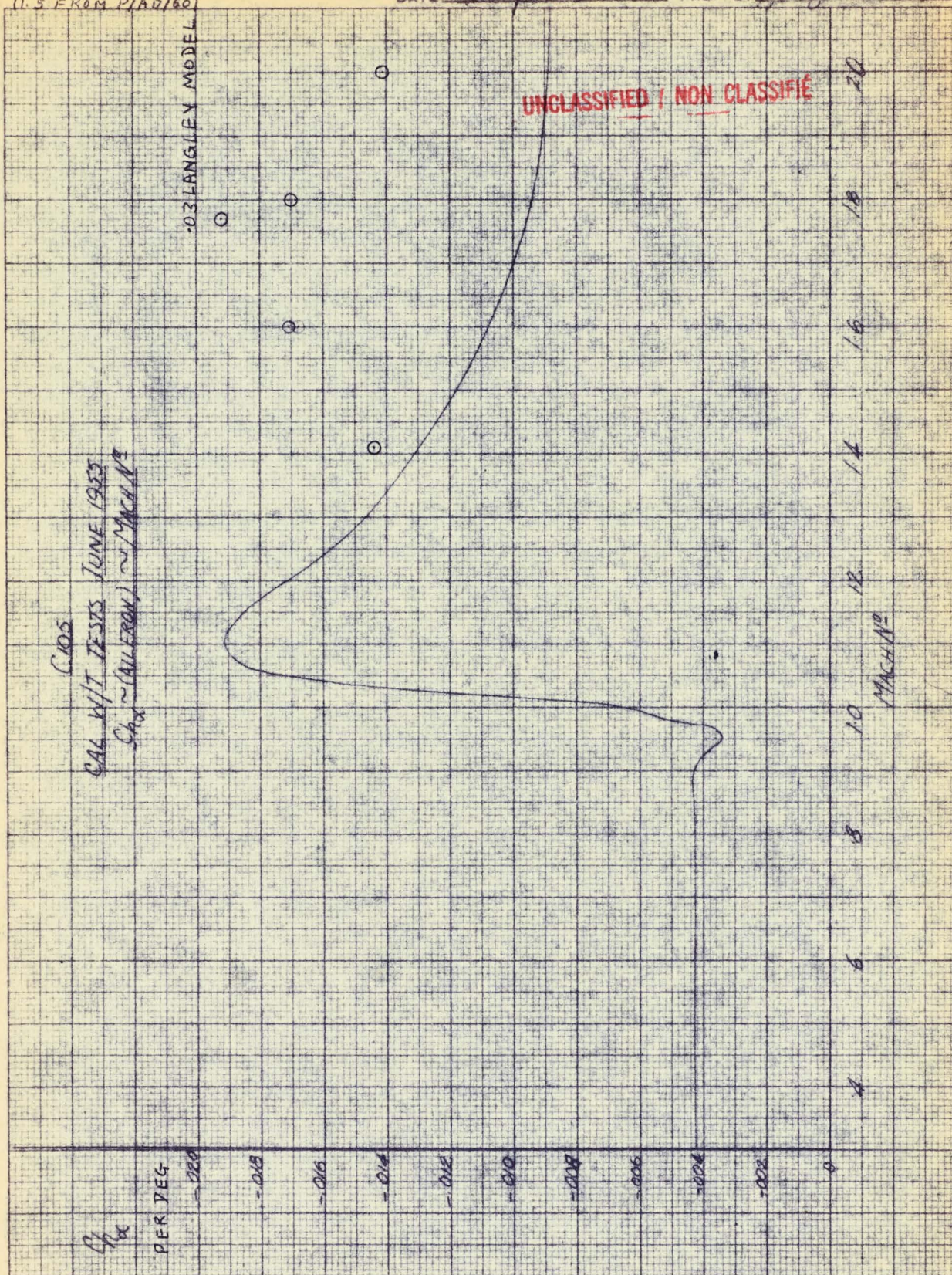
COMPONENT

SHEET NO. 10.2

REPORT NO. P/AERO DATA/88

DATE May 1956

PREP BY R.S.R.



359-12

10X10 TO THE 1/2 INCH
KLOFFEL & ESSER CO.

K.M.

FORM 1748

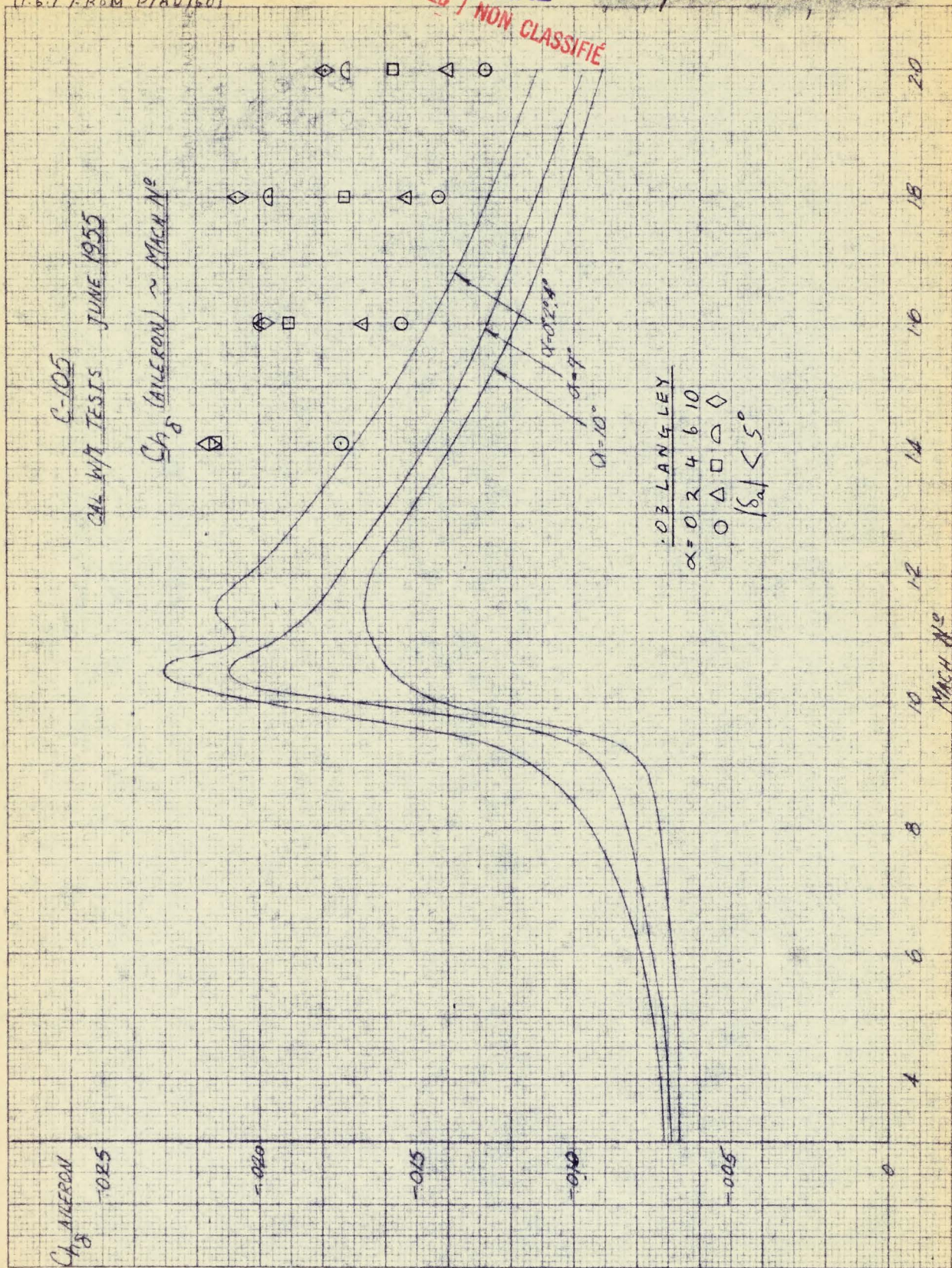
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P/AERO DATA/88 10.3

May 1956

R. S. R.



2.5.2 FROM P/AD/60

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C-47
RUDDER HINGE MOMENT
 $C_{H_0} \sim \text{MACH N}^2$
 $\delta_r > 5^\circ$

CAL WIT TESTS JUNE 1955

○ FOR 0.3 LANGLEY TESTS
 $C_{H_0} = 0.45 \cdot C_{H_{\delta_r}}$
TAKEN
FOR $0 \leq \delta_r \leq 20^\circ$

$\alpha = 6^\circ 10'$ (ACTUAL)
 $\alpha = 0^\circ 2' 4''$ (ACTUAL)

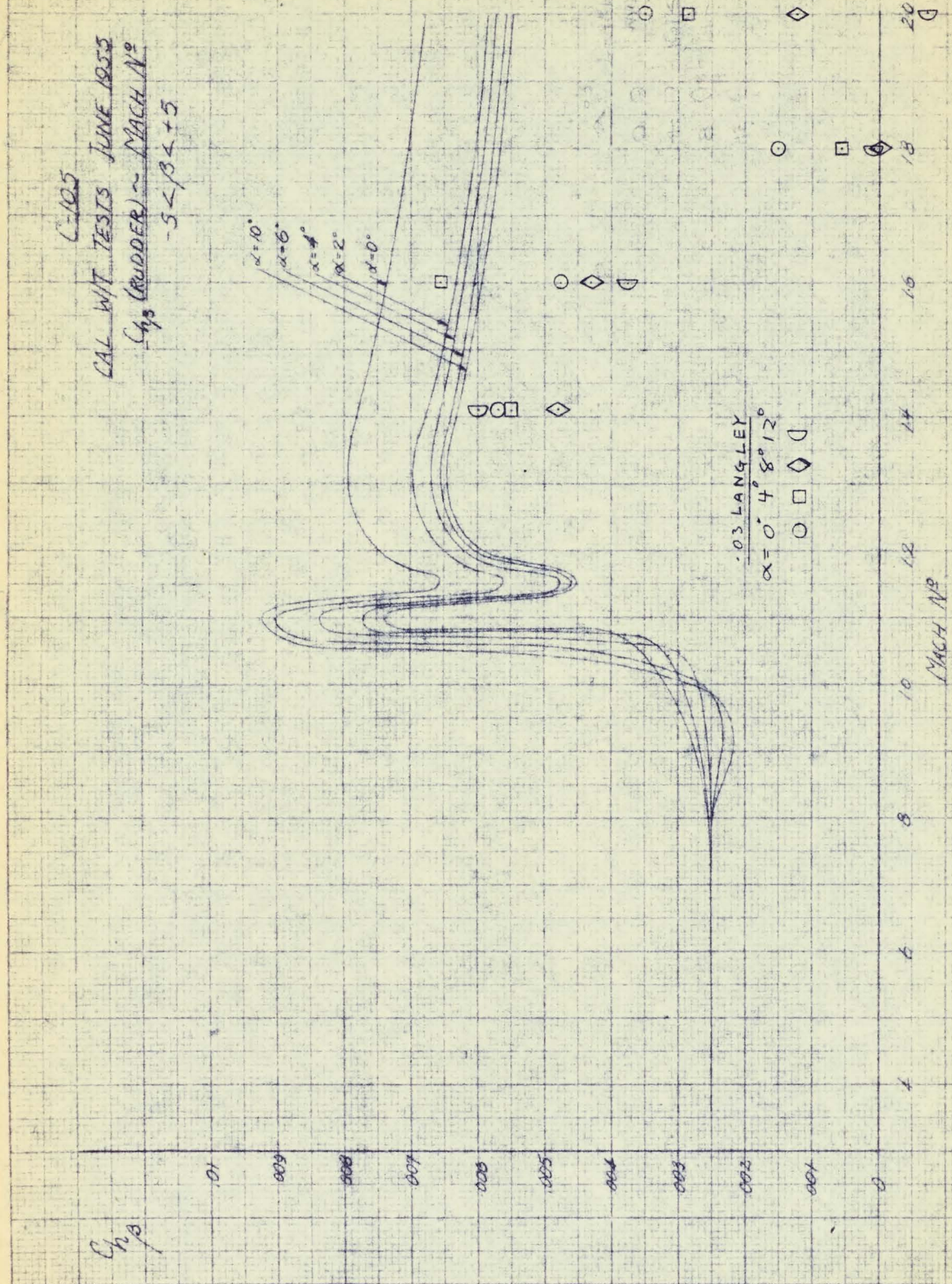
C_{H_0}

MACH N²

11-2 P/HERODATA/88
 May/55, R.S.R.

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C-105
 CAL W/T TESTS JUNE 1955
 C_{D3} (RUDDER) ~ MACH N°
 -5 < β < +5



C_{D3}

P/20/50

