

QCX  
Avro  
CF105  
P-AD-61

ANALYZED

C-105

P/Aero Data/61

LATERAL STABILITY DERIVATIVES

IN LEVEL FLIGHT

L.E. Droop, Notch and Extension

Copy (2)

July 1955

ANALYZED

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A. V. ROE CANADA LIMITED  
MILTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: C-105

REPORT No. P/Aero Data/61

FILE No. \_\_\_\_\_

NO. OF SHEETS: \_\_\_\_\_

TITLE:

Classification cancelled / Changed to UNCLASS  
 By authority of AVES  
 Date 27 Sept 96  
 Signature [Signature]  
 Unit / Rank / Appointment AVES 5

C-105

ELASTIC LATERAL STABILITY DERIVATIVES IN LEVEL FLIGHT

L.E. Droop, Notch and Extension

PREPARED BY \_\_\_\_\_ DATE July 1955  
 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
 SUPERVISED BY \_\_\_\_\_ DATE \_\_\_\_\_  
 APPROVED BY \_\_\_\_\_ DATE \_\_\_\_\_

ISSUE No	REVISION No	REVISED BY	APPROVED BY	DATE	REMARKS



AIRCRAFT

C-105

PREPARED BY

DATE

July 1955

CHECKED BY

DATE

INDEX

C-105 ELASTIC LATERAL DERIVATIVES IN LEVEL FLIGHT

1. Aileron Derivatives and Hinge Moments

$C_{l\delta_a}$	1.1
$C_{n\delta_a}$	1.2
$C_{y\delta_a}$	1.3
$C_{h\delta}$	1.4
$C_{h\delta}$	1.5
$C_{h\delta}$	1.6

2. Rudder Derivatives and Hinge Moments

$C_{n\delta_r}$	2.1
$C_{l\delta_r}$	2.2
$C_{y\delta_r}$	2.3
$C_{h\beta}$	2.4
$C_{h\delta}$	2.5

3. Sideslip Derivatives

$C_{n\beta}$	3.1
$C_{l\beta}$	3.2
$C_{y\beta}$	3.3



TECHNICAL DEPARTMENT (Aircraft)

SHEET NO.

AIRCRAFT

C-105

PREPARED BY

DATE

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DATE

4. Yawing Derivatives

$C_{n_r}$  4.1

$C_{l_r}$  4.2

$C_{y_r}$  4.3

5. Rolling Derivatives

$C_{n_p}$  5.1

$C_{l_p}$  5.2

$C_{y_p}$  5.3

P/AERO DATA/61 - 1.1.  
April 15 Kwaikhanh

C105  
ELASTIC  $C_{L\alpha}$  VS MACH No.

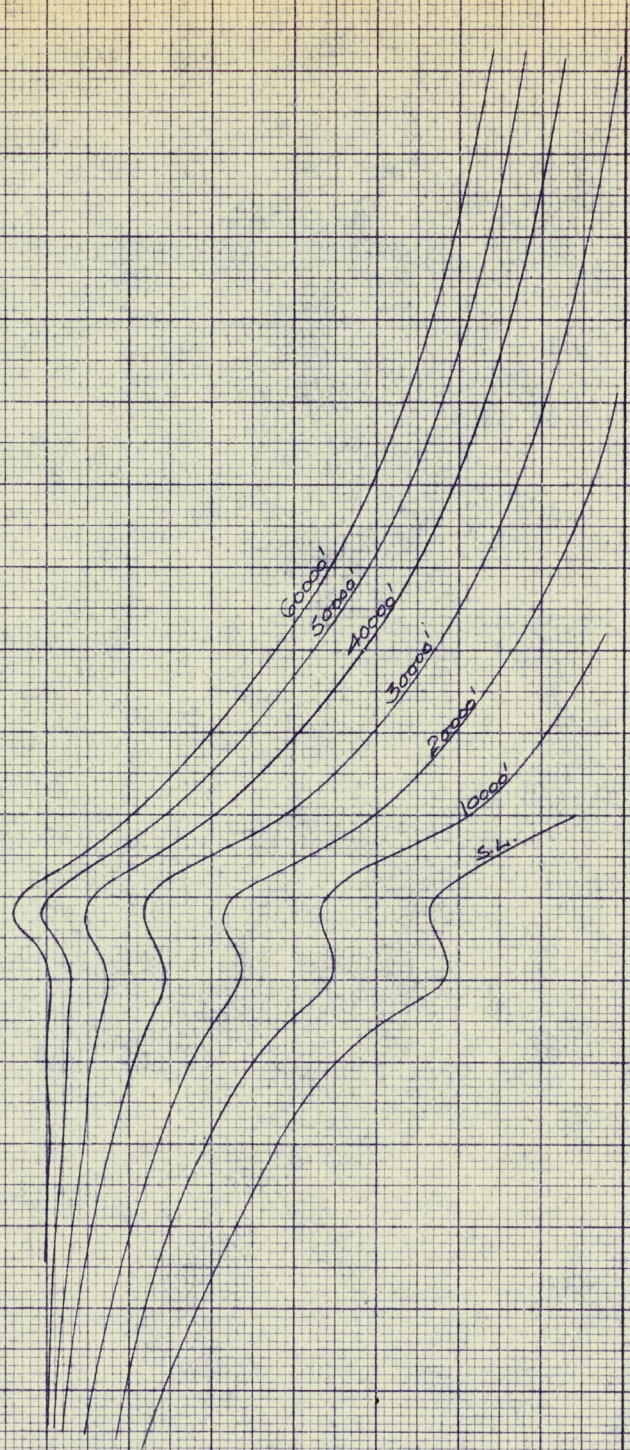
\* ALL FLIGHT CONDITIONS  
WING NOT LIFTED & EXTENDED

$C_{L\alpha}$   
PER 2°  
INCLUDED

-0005

-0010

-0015



MARCH No

20

18

16

14

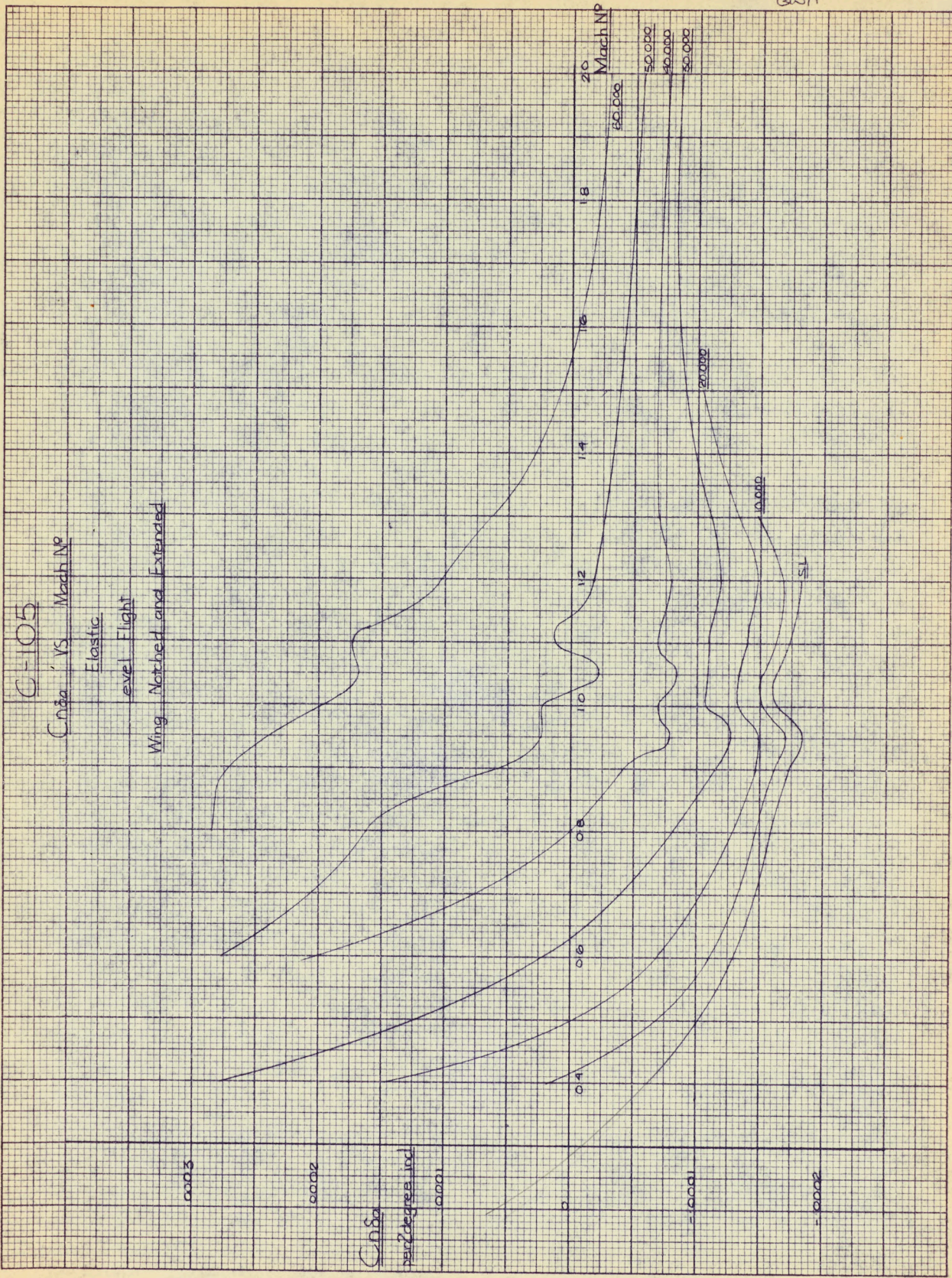
12

10

8

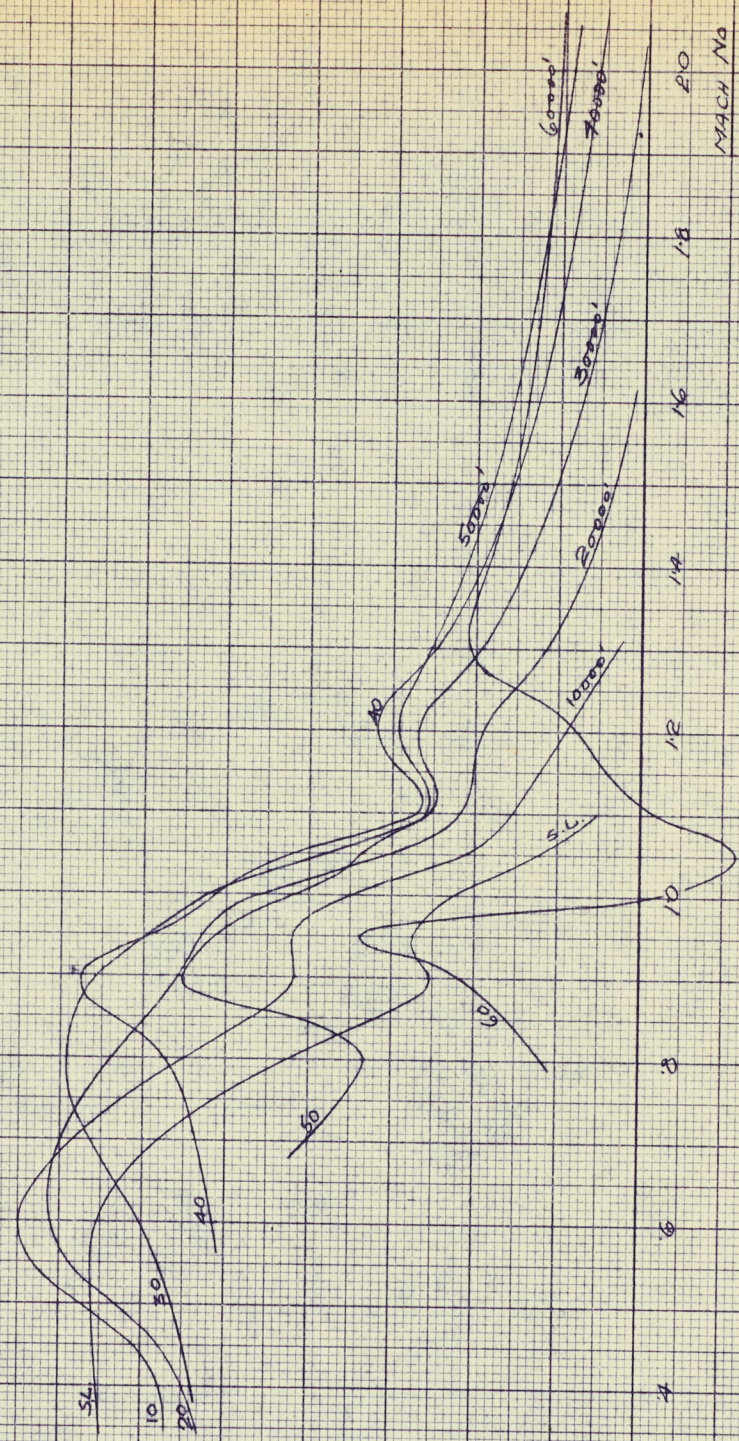
6

4

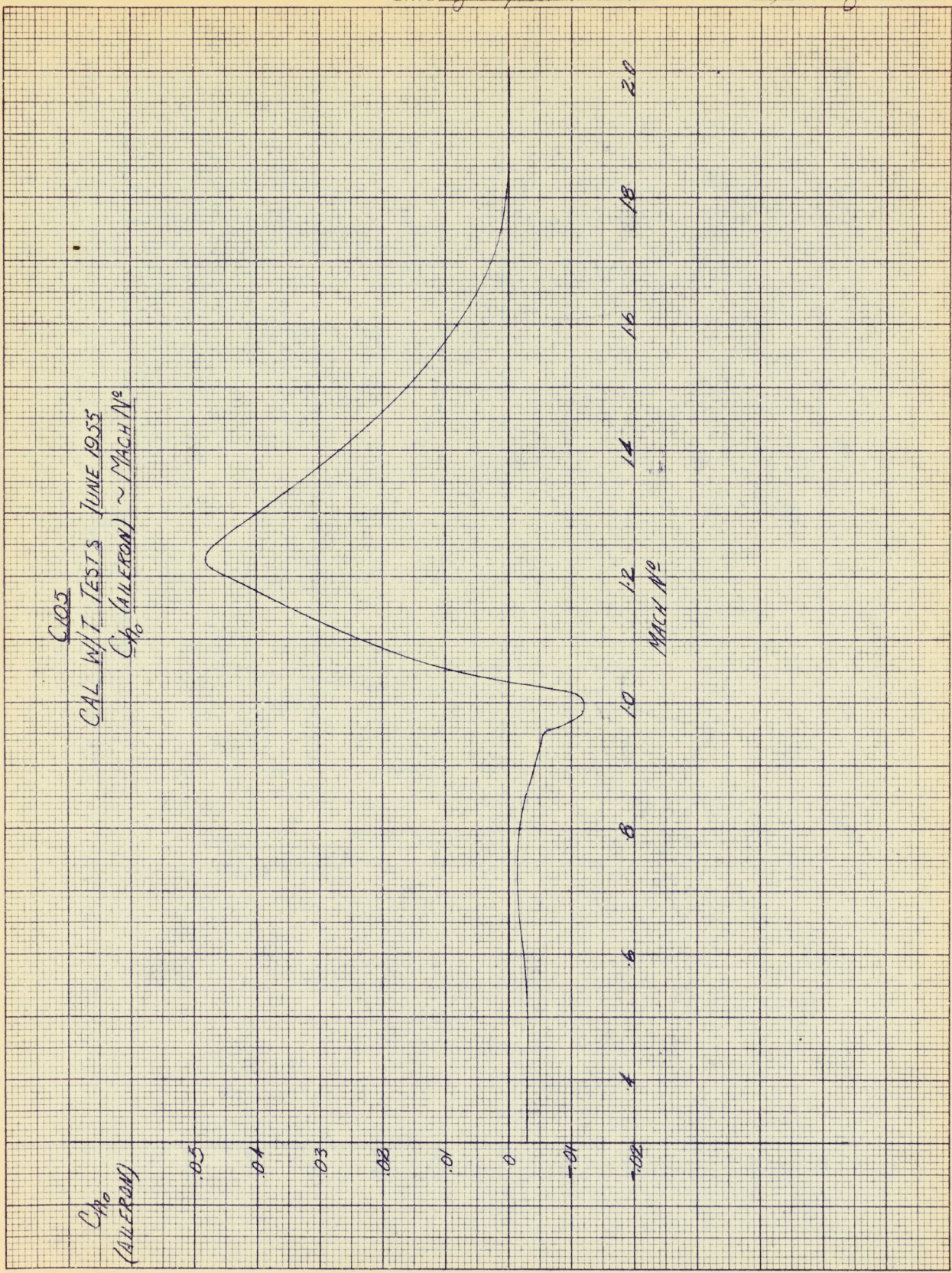


C105  
ELASTIC  $C_{da}$  VS MACH No  
IN LEVEL FLIGHT  
WINGS NOTCHED & EXTENDED.

$C_{da}$   
PER P.°  
INCLUDED  
00003  
00002  
00001  
0  
00004



MACH No



C103  
CAL W/T TESTS JUNE 1955  
 $C_p$  (AILERON) ~ MACH No

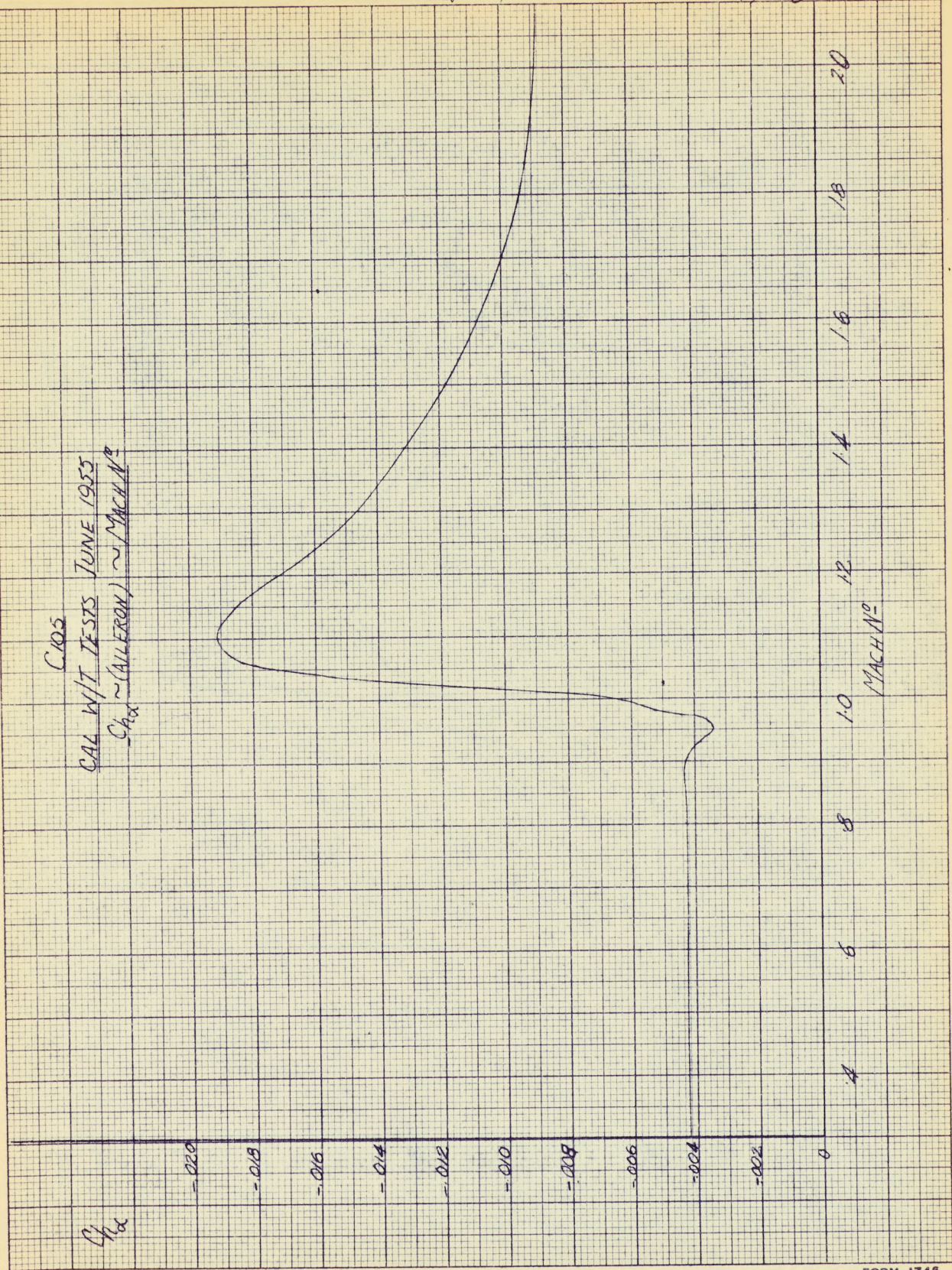
AIRCRAFT  
A. U. W.

COMPONENT

SHEET NO. 15  
DATE July 1955

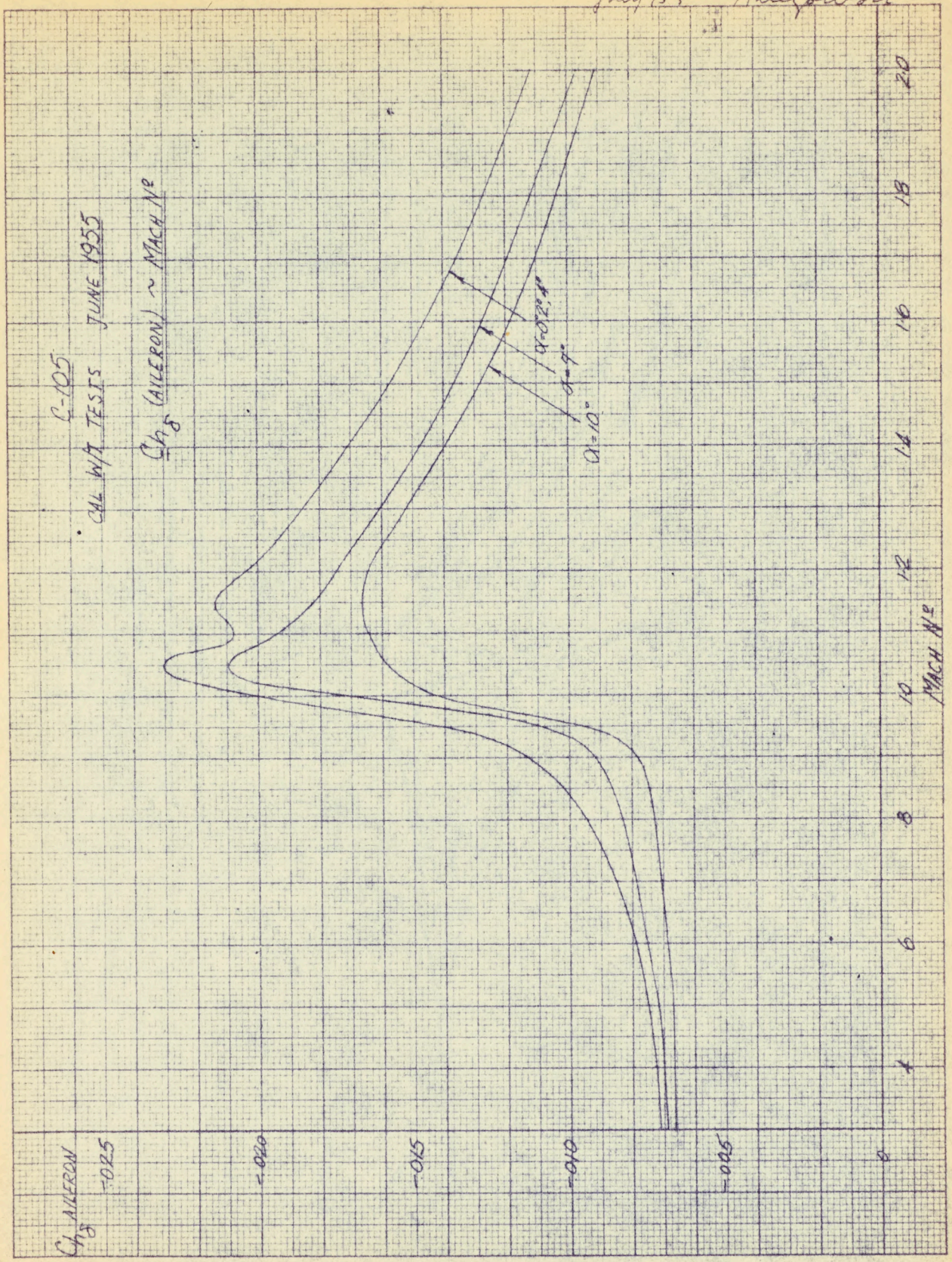
REPORT NO. P/AERO DATA/61  
PREP BY Zalesowski

C105  
CAL W/T TESTS JUNE 1955  
C<sub>Do</sub> ~ (ALLERON) ~ MACH N<sup>2</sup>



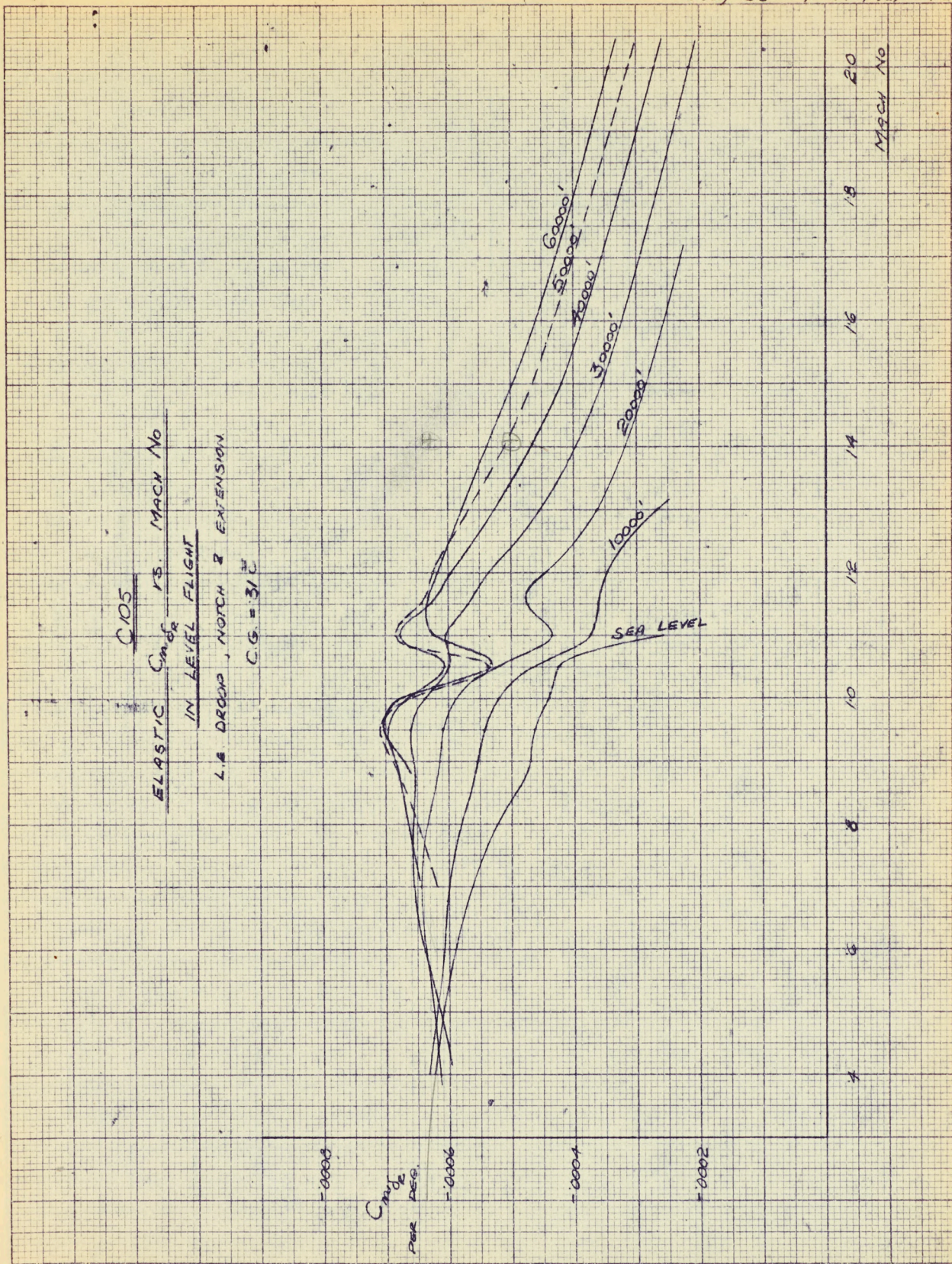
KE 10 X 10 TO THE 1/2 INCH  
KEUFFEL & ESSER CO.  
MADE IN U.S.A.

C-105  
CAL W/T TESTS JUNE 1955  
 $C_{L\delta}$  (AILERON) ~ MACH No



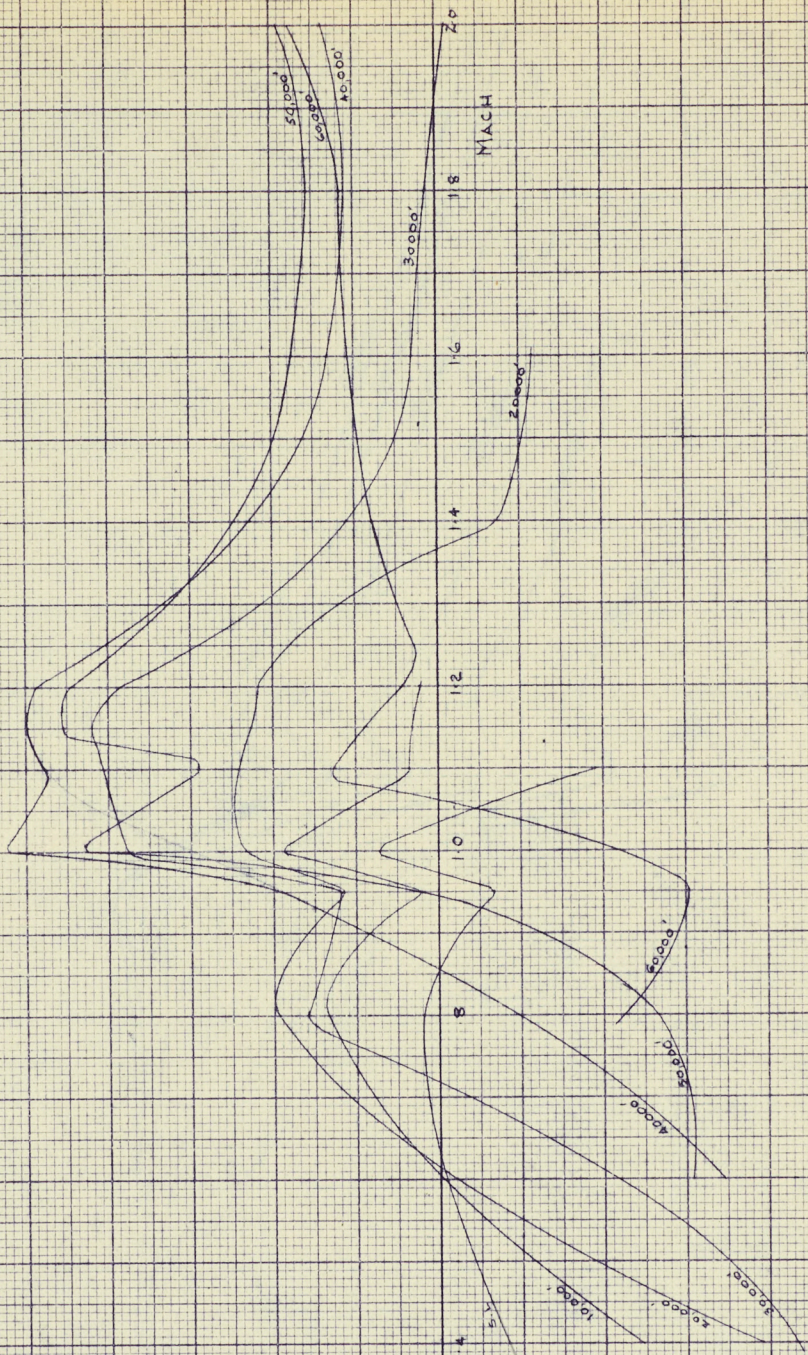
$C_{L\delta}$  AILERON  
-0.25  
-0.20  
-0.15  
-0.10  
-0.05  
0

MACH No



C105  
CAL W/T TESTS JUNE 55  
CL<sub>SE</sub> VS MACH No.

CL<sub>SE</sub>  
SCALE  
x 10<sup>5</sup>



C105  
ELASTIC  $C_{Y_{1/4}}$  IN LEVEL FLIGHT

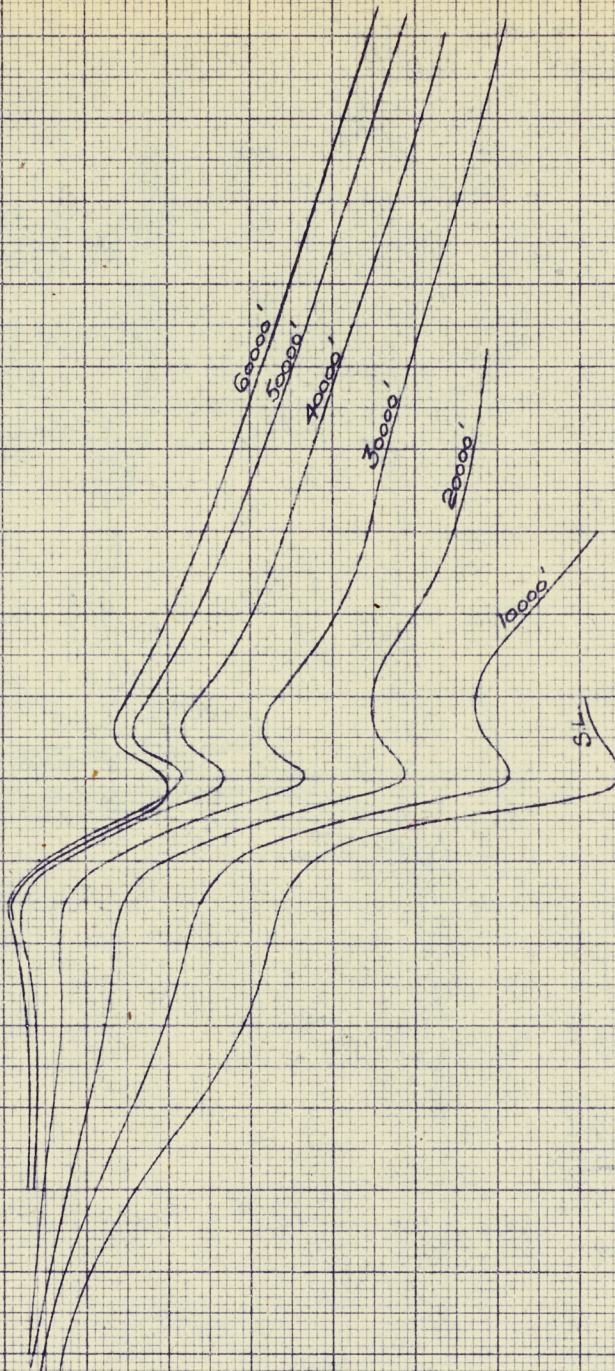
L.E. DROOP, NOTCH & EXTENSION

$C_{Y_{1/4}}$   
PER DEG

0015

0010

0005



4 6 8 10 12 14 16 18 20  
MACH NO

C-105  
CAL W/T TESTS JUNE 1955  
C<sub>Y3</sub> (RUDDER) ~ MACH N<sup>o</sup>  
-5 < β < +5

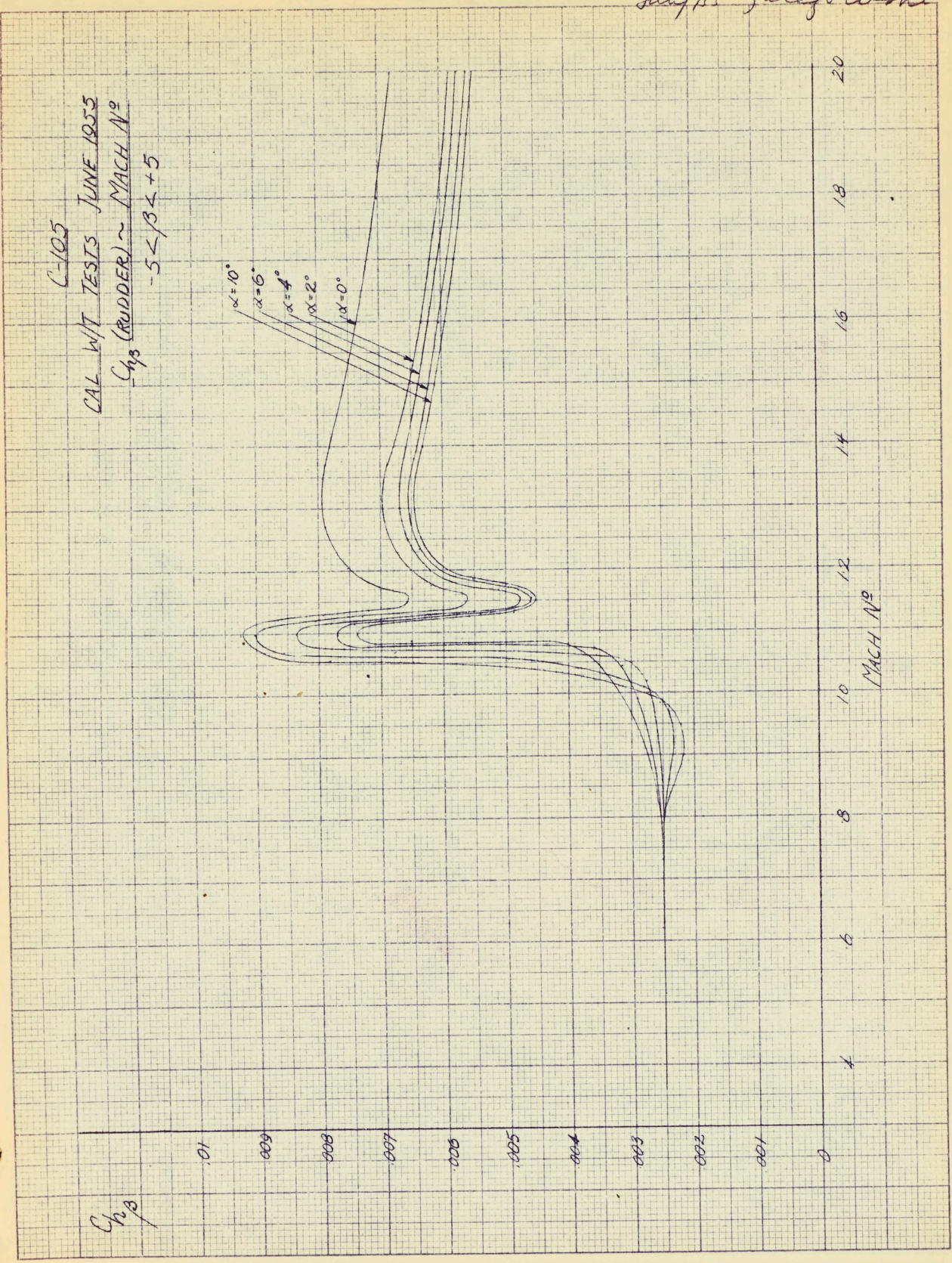
C<sub>Y3</sub>

01  
009  
008  
007  
006  
005  
004  
003  
002  
001  
0

α = 10°  
α = 6°  
α = 4°  
α = 2°  
α = 0°

20  
18  
16  
14  
12  
10  
8  
6  
4  
MACH N<sup>o</sup>

2.4 P/HERODATA/61  
July 1955 Galegow-shu



10 X 10 TO THE 1/2 INCH  
KEUFFEL & ESSER CO.  
MADE IN U.S.A.

C105  
CAL W/T TESTS JUNE 1955  
Ch<sub>δ</sub> ~ MACH No. FOR 0° ≤ α ≤ 10° (ACTUAL)

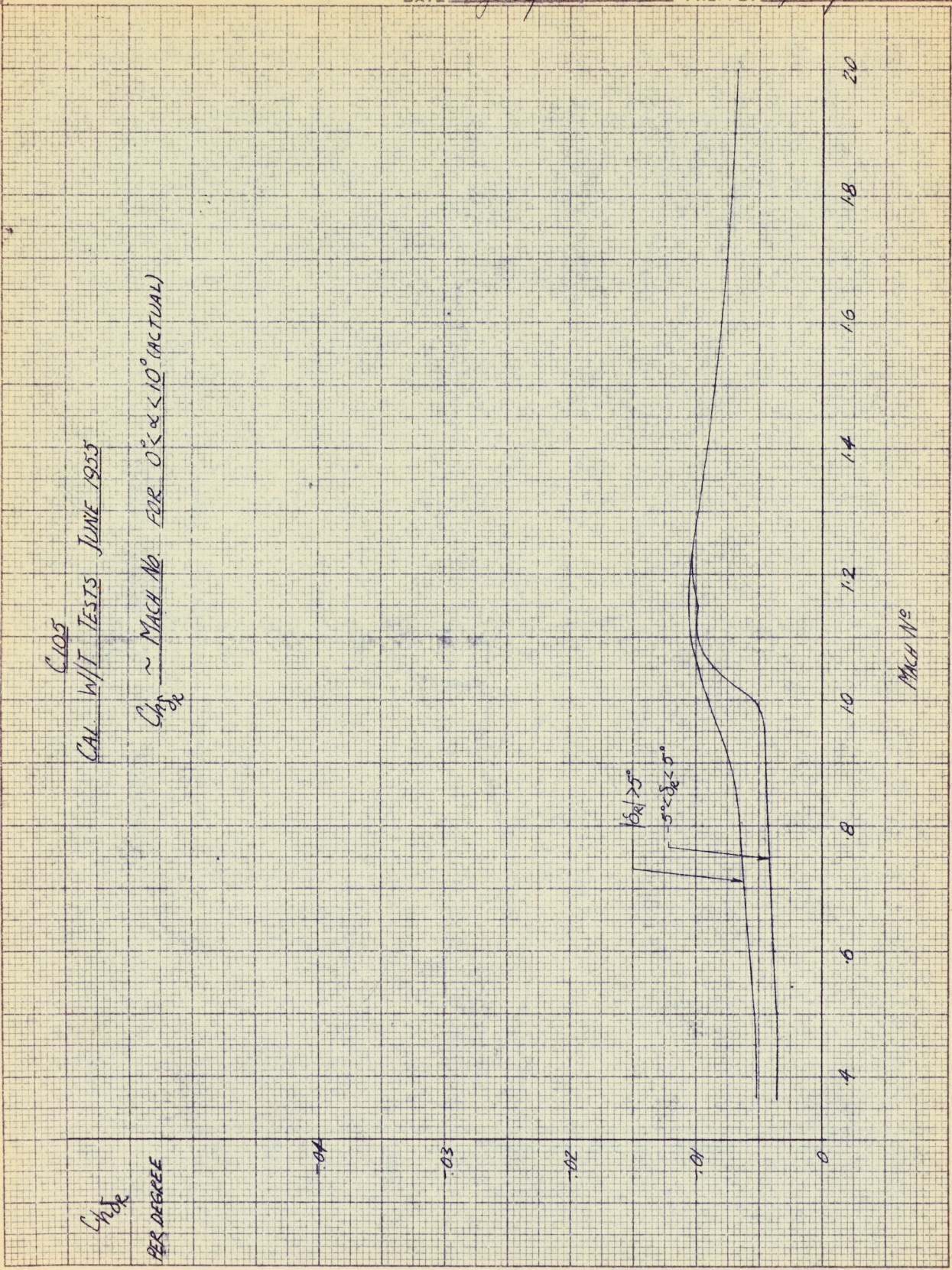
Ch<sub>δ</sub>  
PER DEGREE

0  
10  
20  
30  
40

10° > α  
5° ≤ α ≤ 10°

MACH No

4 6 8 10 12 14 16 18 20



C105  
ELASTIC CURVE IN LEVEL FLIGHT  
 $C_{D0} = .312$   
L.E. DROOP + EXTENSION + NOTCH  
 $\beta = 4.3^\circ$

$C_{D0}$

8000

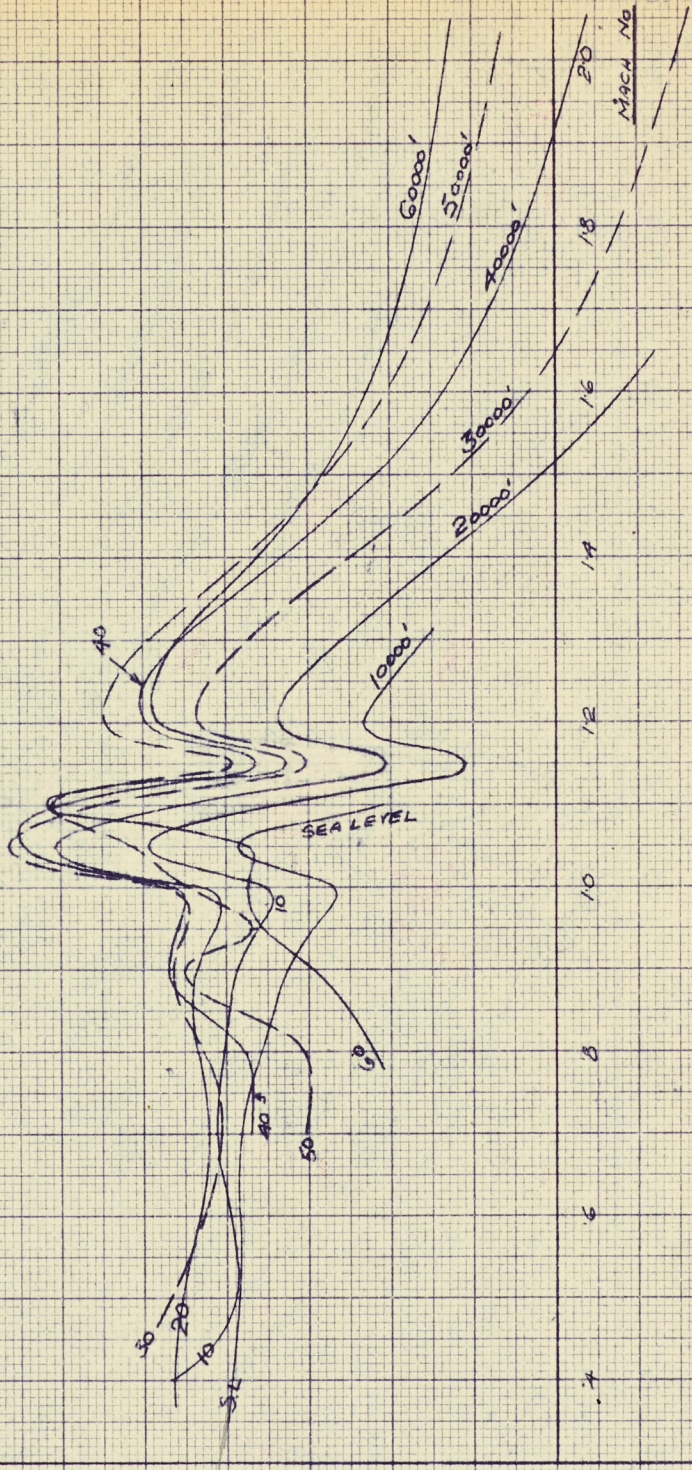
6000

4000

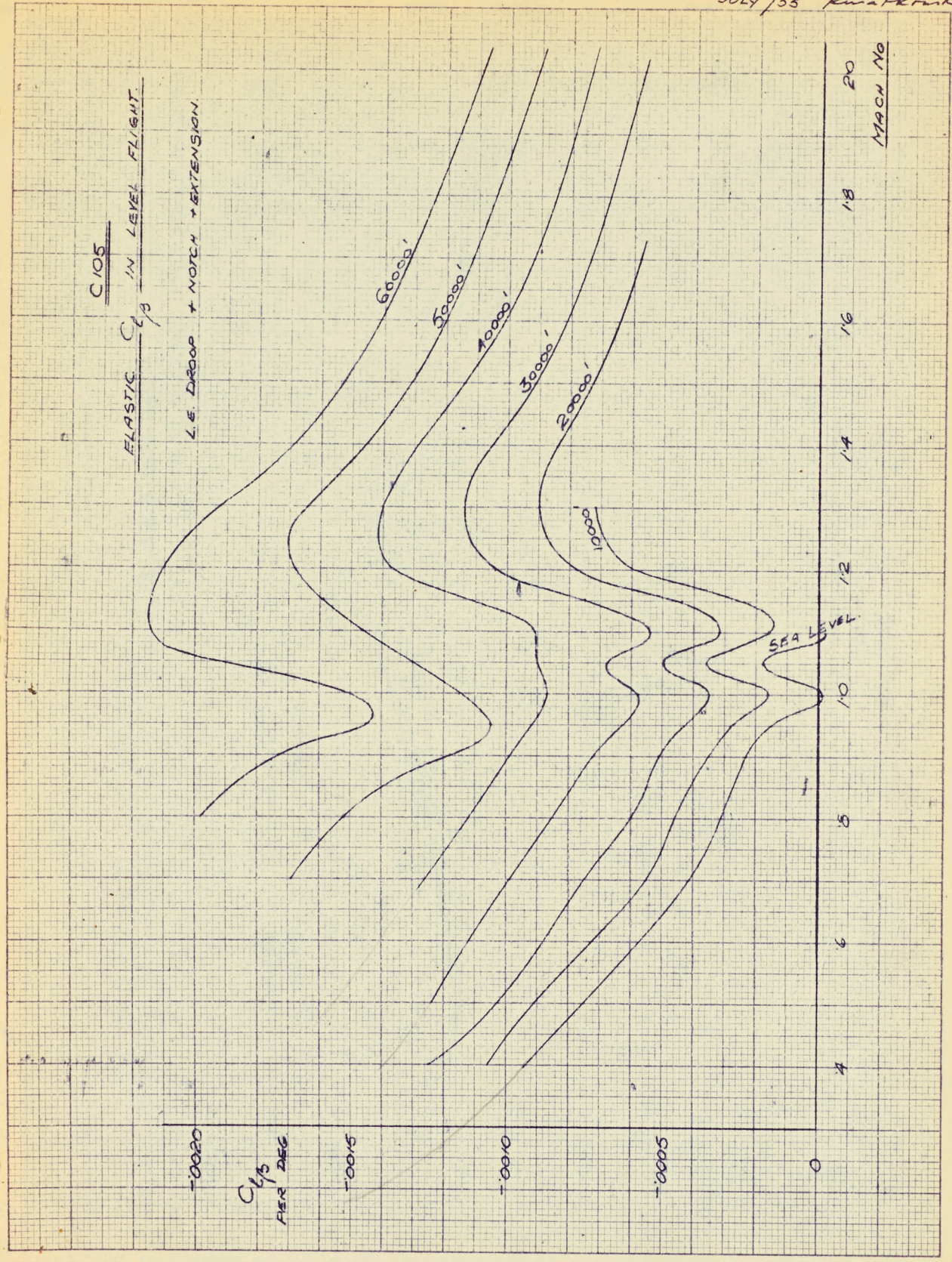
2000

0

-2000



KE 10 X 10 TO THE 1/2 INCH  
KEUFFEL & ESSER CO. MADE IN U.S.A. 359.12



C-105

CYCLE VS MACH NO  
ELASTIC A/S - WING NOTCHED, EXTENDED & DROPPED

Cycle  
per deg.

0.00

0.08

0.06

0.04

0.02

0

S.L.

10,000'

20,000'

30,000'

40,000'

50,000'

60,000'

20

18

16

14

12

10

8

6

4

2

MACH No.

$C_{nR}$  VS MACH NO

TAIL ELASTICS INCLUDED  $N=1$   $|\beta| < 4$   $B_2, V, W, E_0, N_5, D_2, 4$

MACH NO  
1.8 2.0

1.6

1.4

1.2

1.0

0.8

0.6

0

-.04

-.08

-.12

-.16

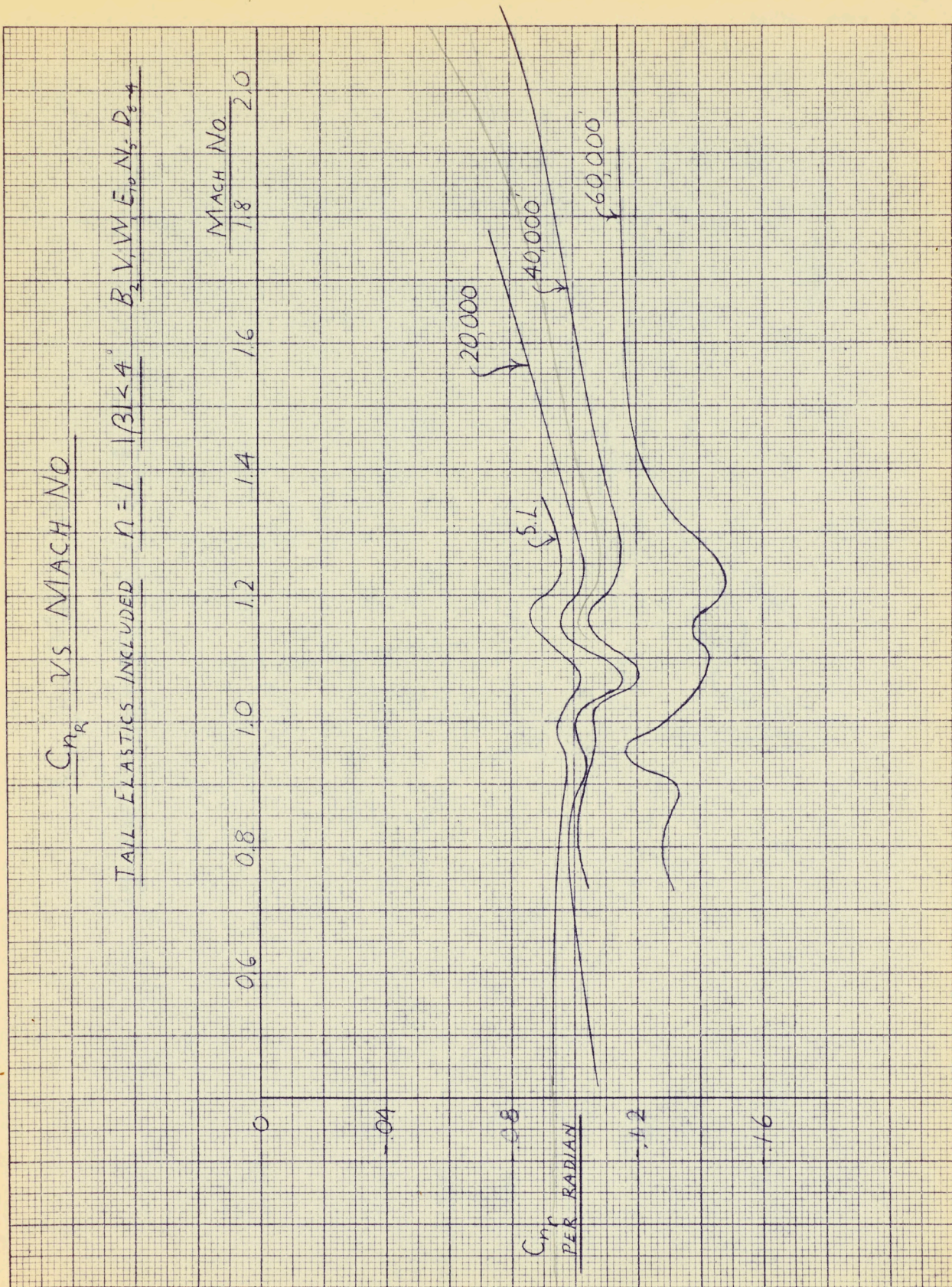
$C_{nR}$   
PER RADIAN

20,000

40,000

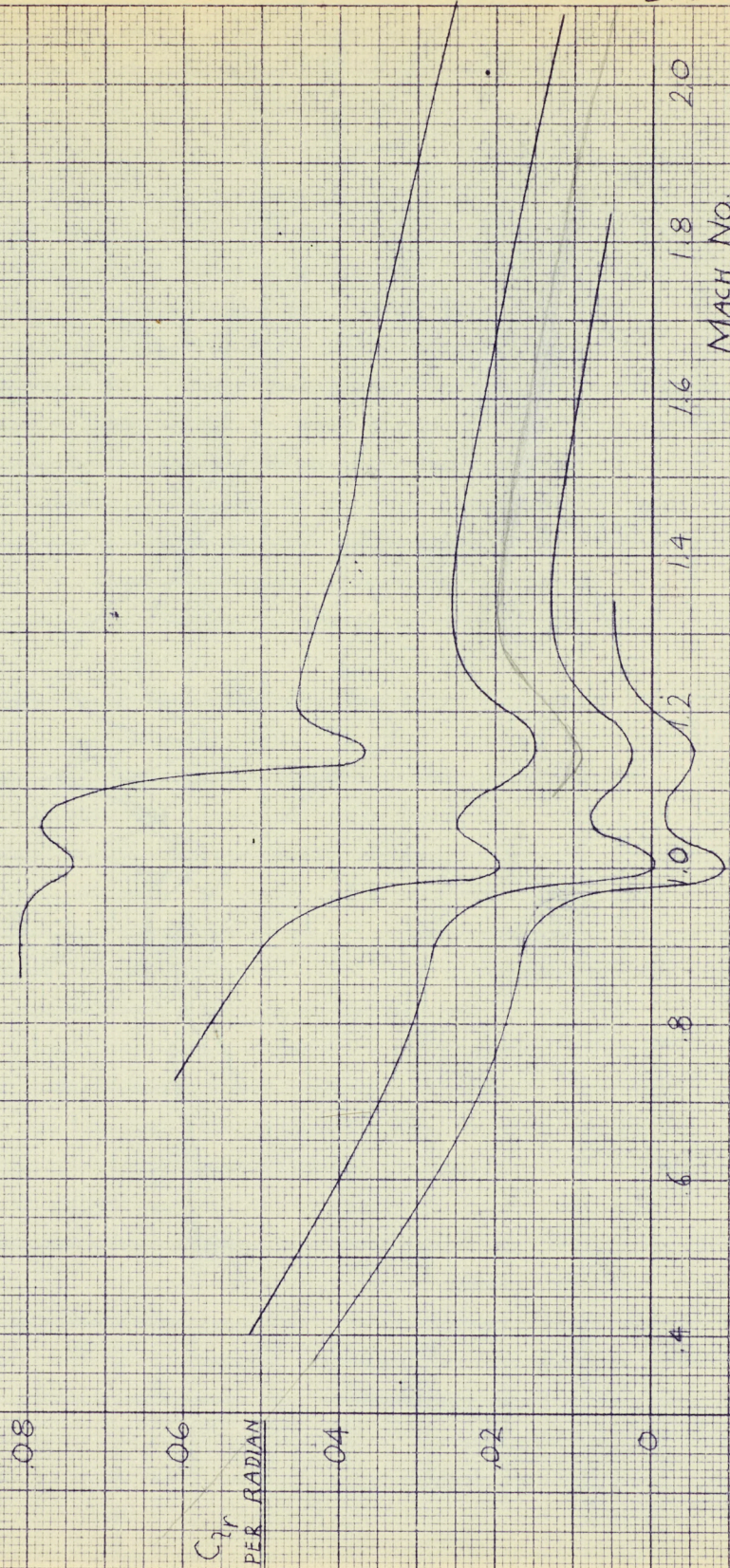
60,000

5.1



$C_{tr}$  vs MACH NO.

TAIL ELASTICS INCLUDED  $n=1$  13K4'  $B_2 V W F_2 N_5 D_{B-4}$



P/A.D/61 4.2  
GRL JULY 55

$C_{Yr}$  VS MACH NO.

TAIL ELASTICS INCLUDED  $n=1$   $|\beta| < 4^\circ$   $B_2 V W E N_5 D_8$

20

16

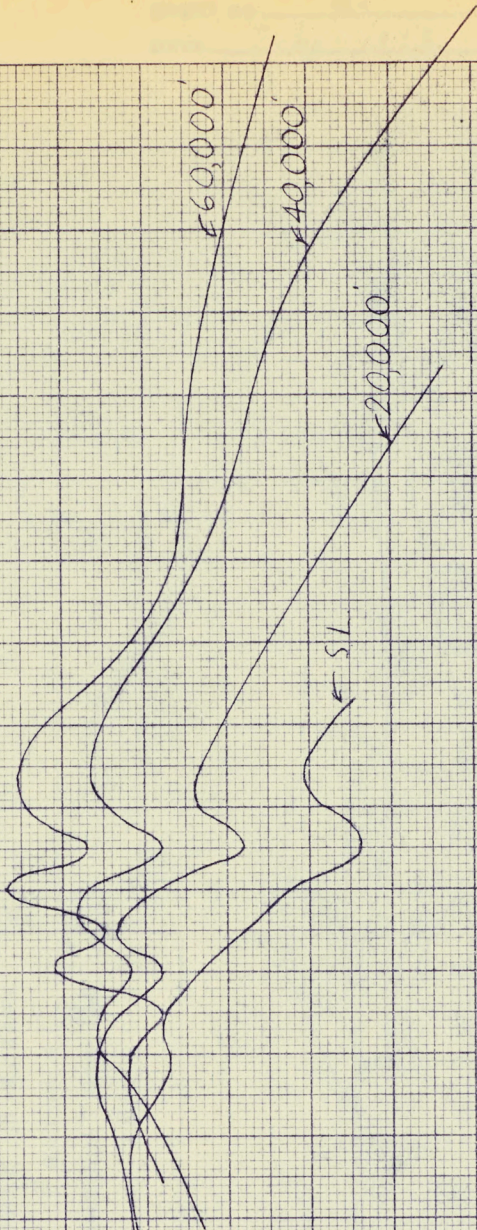
12

08

04

0

$C_{Yr}$   
PER RADIAN



06

08

10

12

14

16

18

20

MACH NO.

C-105

AEROELASTIC YAW DUE TO ROLL  $|B| < 3^\circ$

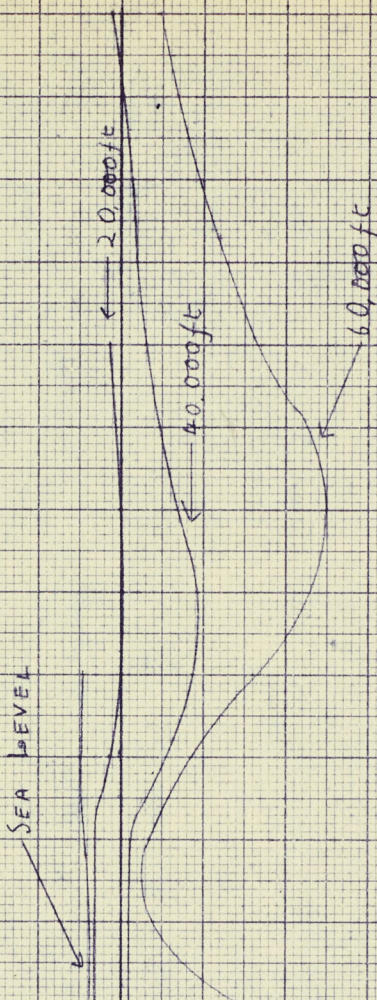
$C_{np}$  vs MACH No

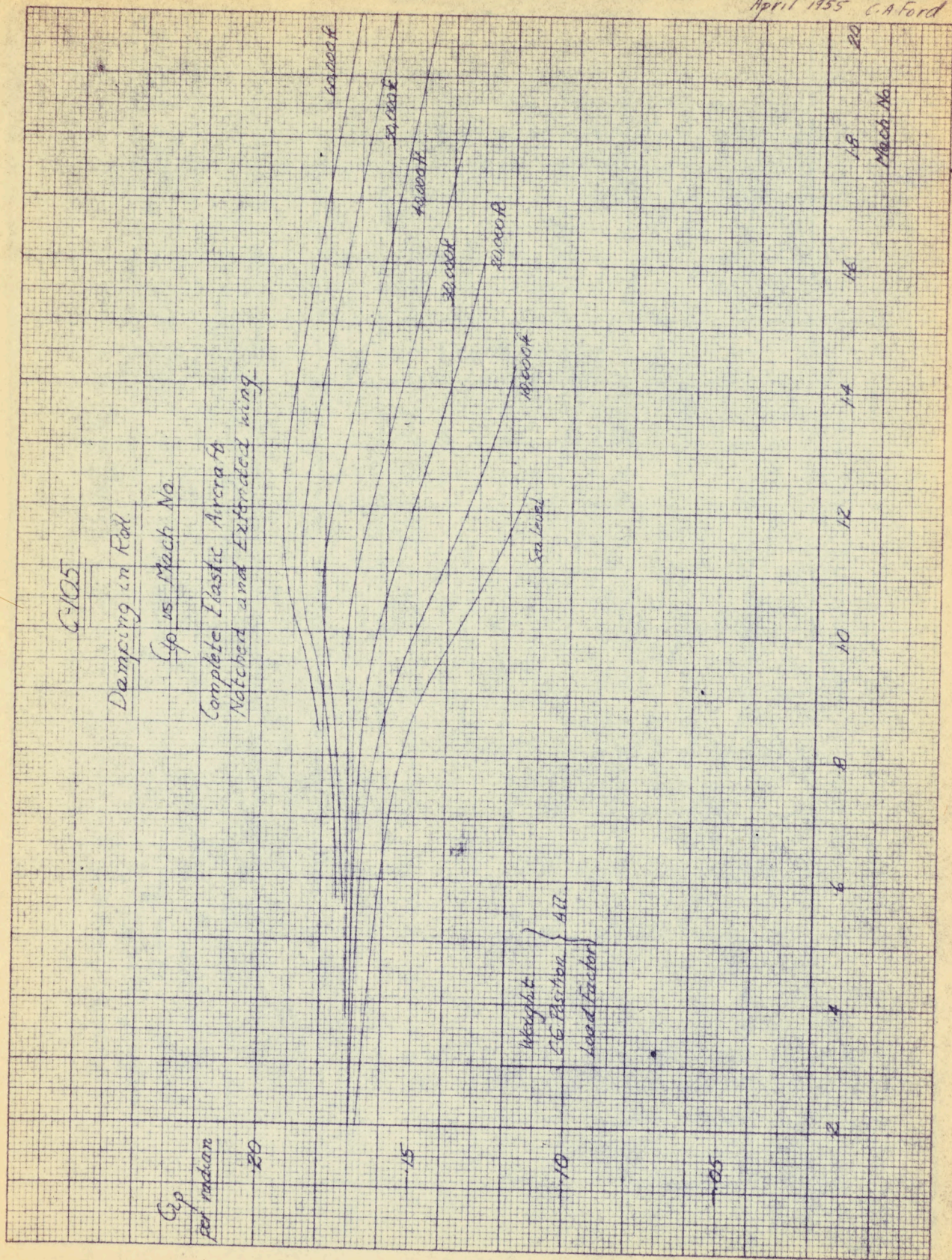
COMPLETE AIRCRAFT  
LOAD FACTOR = 1  
WEIGHT = 47,000 lbs  
C.G. AT 31%  
SEA LEVEL

$C_{np}$  PER RADIAN

0.08  
0.06  
0.04  
0.02  
0  
0.02  
0.04  
0.06  
0.08  
1.0

MACH No. 2.0  
1.8  
1.6  
1.4  
1.2  
1.0  
0.8  
0.6  
0.4  
0.2





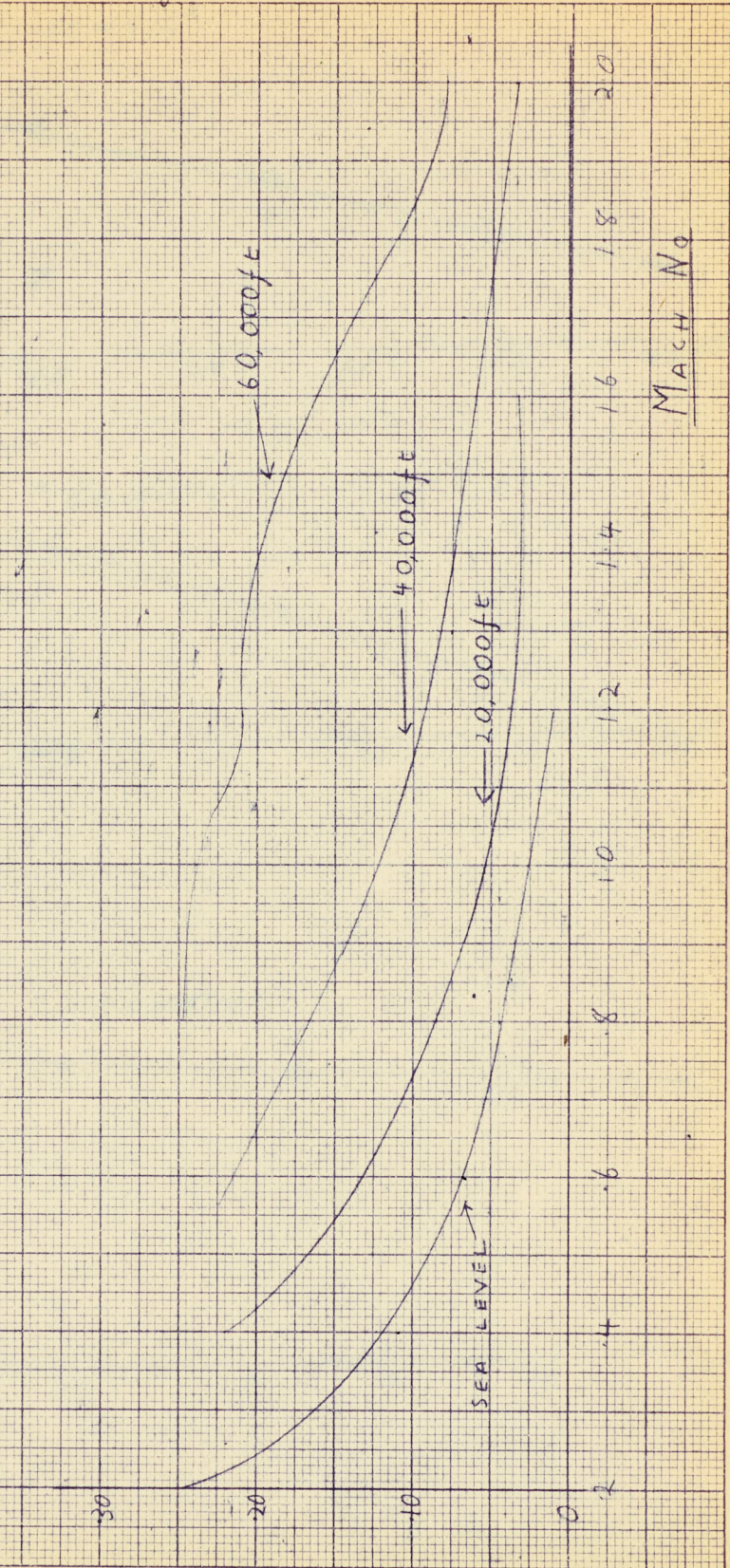
COMPLETE AIRCRAFT  
LOAD FACTOR = 1  
WEIGHT = 47,000 lb  
C.G. at 312

$C = 105$

AEROELASTIC SIDE FORCE DUE TO ROLLING  $1/3 / < 3^\circ$

$C_{ye}$  vs MACH No

$C_{ye}$  per radian



$\frac{dp}{d\alpha}$

.02

.01

0

.6

.8

1.0

1.2

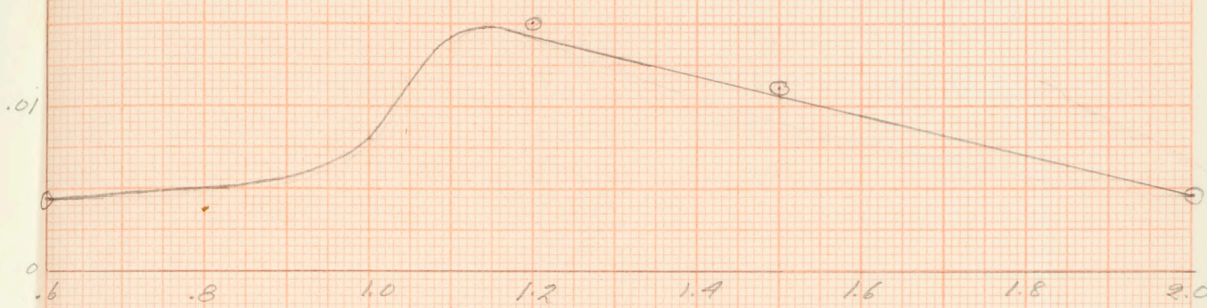
1.4

1.6

1.8

2.0 M

$0 < \alpha < 15^\circ$



$\frac{dp}{d\alpha}$

-.006

-.004

-.002

.6

.8

1.0

1.2

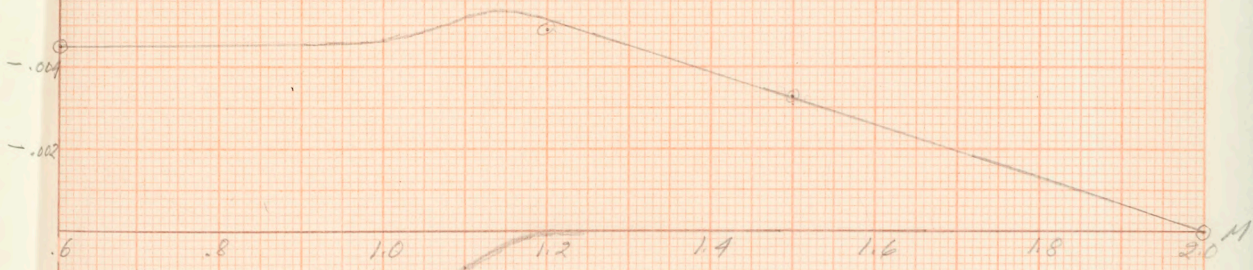
1.4

1.6

1.8

2.0 M

$0 < \alpha < 15^\circ$



Conv.  $\frac{dp}{d\alpha}$

+.02

+.01

.6

.8

1.0

1.2

1.4

1.6

1.8

2.0 M

$0 < \alpha < 15^\circ$

-.2

-.1

.6

.8

1.0

1.2

1.4

1.6

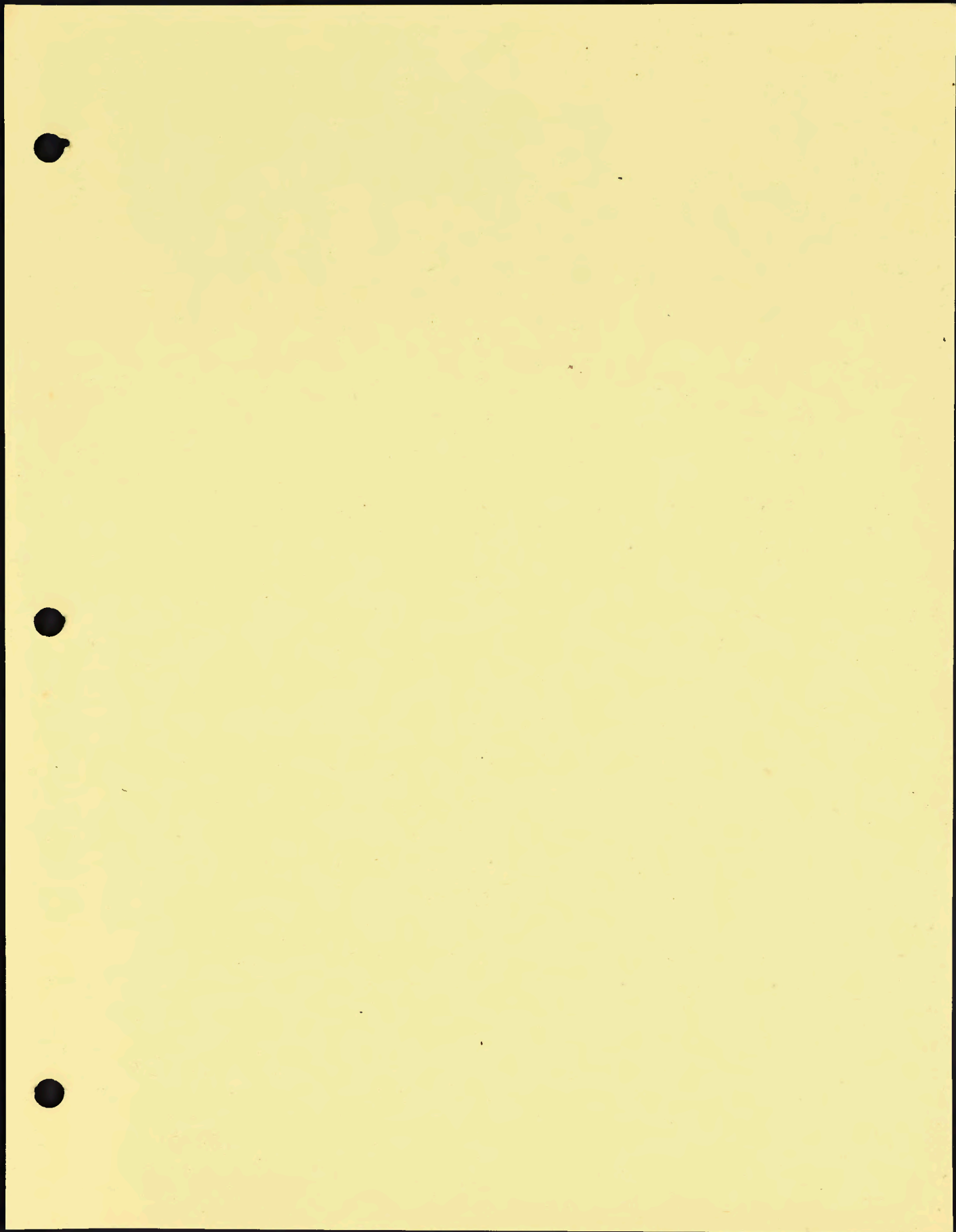
1.8

2.0 M

lp



K&E Venturer & Sabre 10 X 10 1/2 IN. 328-11



V.S. DE SOUZA  
1855-1911  
G.M.A. CO.  
NEW YORK