

QC
Avro
C-105
P/WT/20
Vol. III

QCX
Avro
CF105
P-WT-20
v.3 (25)

FILE IN VAULT

C-105 ANALYZED P/WIND TUNNEL/20
DERIVATIVES AND ZERO VALUES
VOLUME III
LATERAL CONTROL

Copy No. 2 June 1954

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DATE

Dec. 7, 1992

Report no.: QCX - AVRO - CF105- P-WT-20 V.3

has been ☐ downgraded to: _____

☒ de-classified

by (Name): Michel W. Drapeau

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

Date: Dec. 7, 1992

R. Angen
Signature



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MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: C-105

REPORT NO. P/W.T./20

FILE NO:

NO. OF SHEETS:

TITLE:

ANALYZED

DERIVATIVES AND ZERO VALVESVOLUME IIILATERAL CONTROL

Classification ^{confirmed as:} ~~cancelled / changed to:~~ UNCLASSIFIED
By authority of: DRDA 7/DARFT 5-8/DAS Eng 6-4-5
Date: 5 Nov 1992
Signature: B. Aubrey
Unit / Rank / Appointment: DSIS 3, Secretary CRAD HQ DRP



PREPARED BY

DATE June 54

CHECKED BY

DATE

SUPERVISED BY

DATE

APPROVED BY

DATE

ISSUE NO	REVISION NO	REVISED BY	APPROVED BY	DATE	REMARKS

45116

12416802

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

REPORT NO. F/W.T./20

SHEET NO. 1

PREPARED BY

DATE

J. Clark

June 54

CHECKED BY

DATE

AIRCRAFT

INDEX

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1. Rudder

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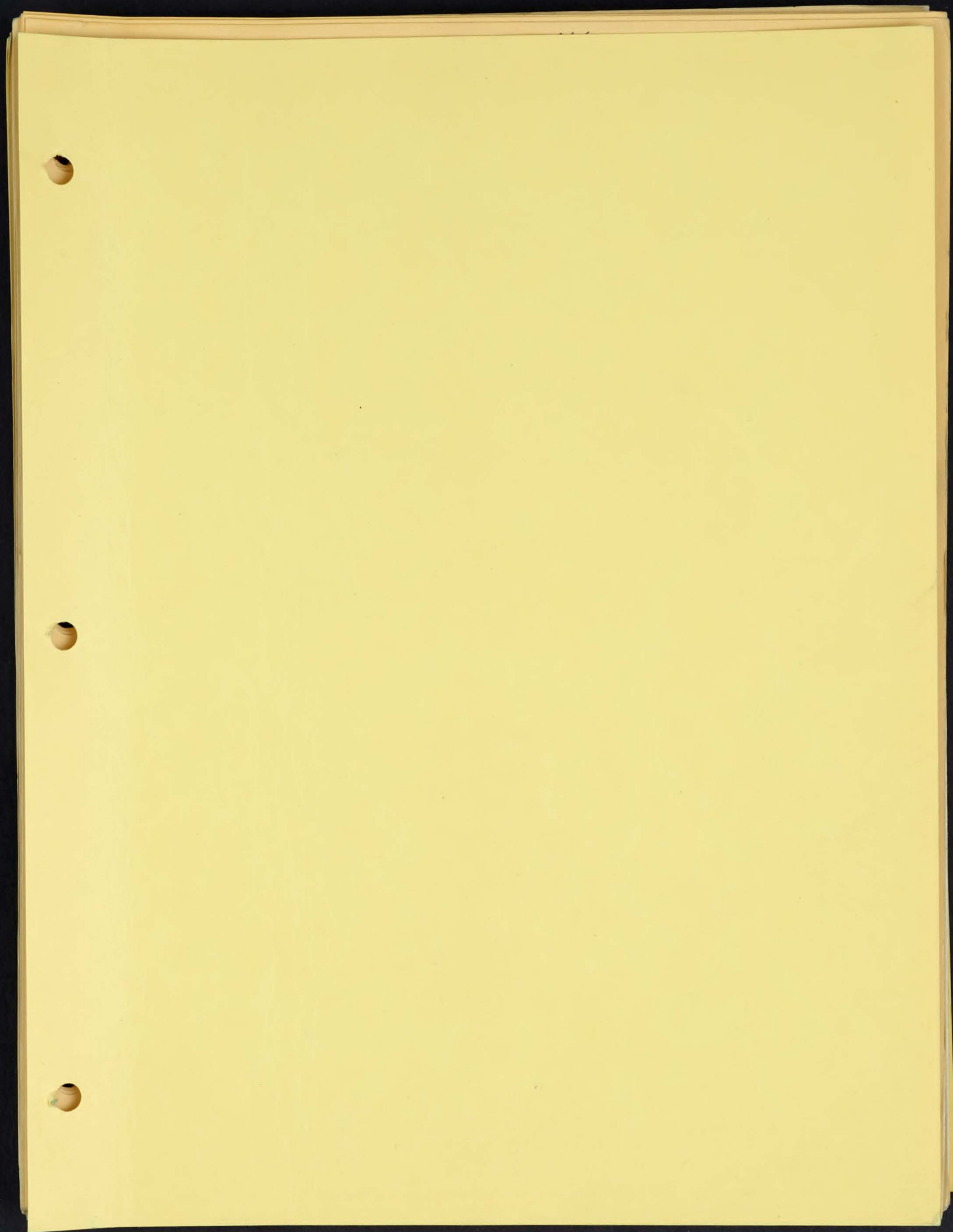
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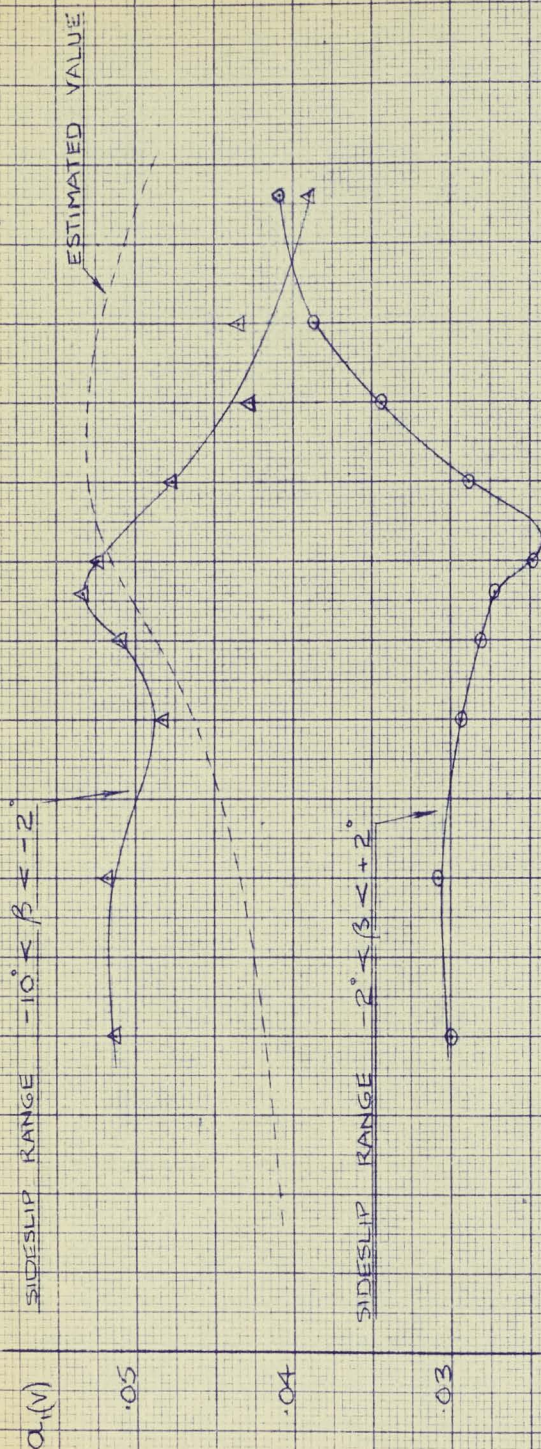
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C-105

G.A.L. WIND TUNNEL TESTS

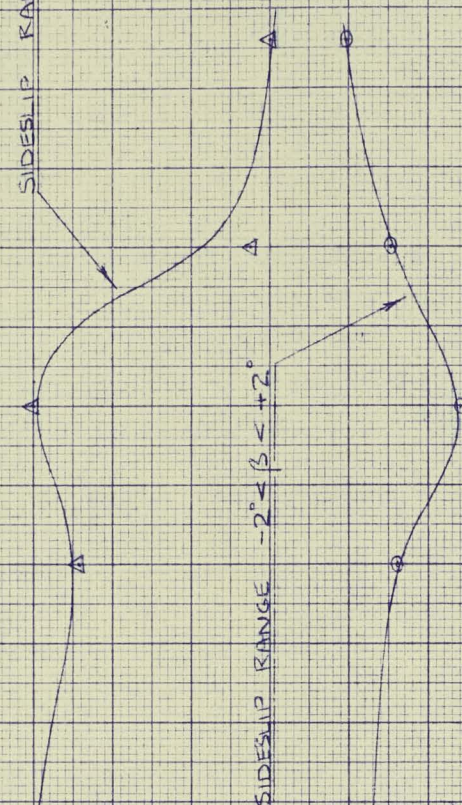
$a_1(V)$ vs M

$\alpha = 2.1^\circ$

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SIDESLIP RANGE $-10^\circ < \beta < -2^\circ$



SIDESLIP RANGE $-2^\circ < \beta < +2^\circ$

C-105

CAL WIND TUNNEL TESTS

CHORDWISE CENTRE OF PRESSURE ~ FIN & RUDDER

$\alpha = 0^\circ$

C.O.F P
(FRACTION
M.A.C.)

.6

.5

.4

.3

.5

.6

.7

.8

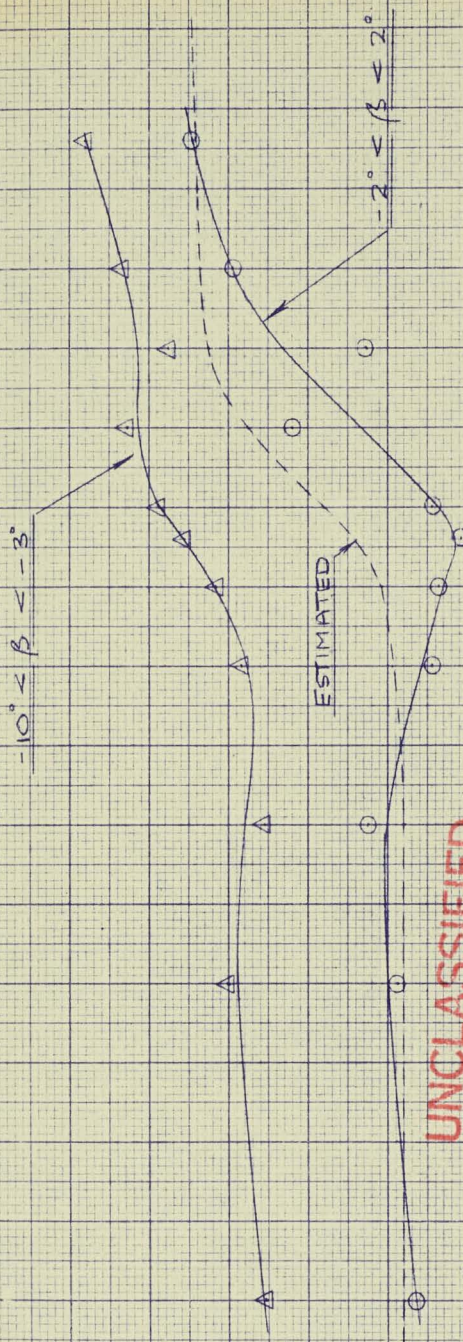
.9

1.0

1.1

1.2

M



ESTIMATED

$-10^\circ < \beta < -3^\circ$

$-2^\circ < \beta < 2^\circ$

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C.A.L. WIND TUNNEL TESTS

SPANWISE CENTRE OF PRESSURE ~ FIN & RUDDER

$\alpha = 2^\circ$

η_{cp}
(FRACTION
OF
SPAN)

.6

.5

.4

.3

.5

.6

.7

.8

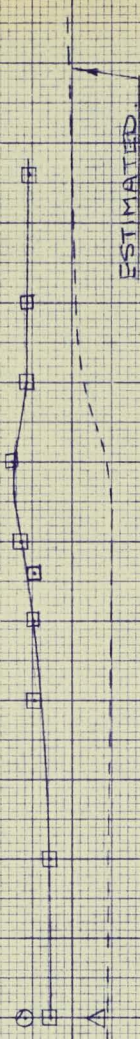
.9

1.0

1.1

1.2

M



ESTIMATED

○ $-2^\circ < \beta < +2^\circ$

△ $-10^\circ < \beta < -3^\circ$

□ $-8^\circ < \beta < +8^\circ$

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SHEET NO. 135

REPORT NO. p/w-120

DATE

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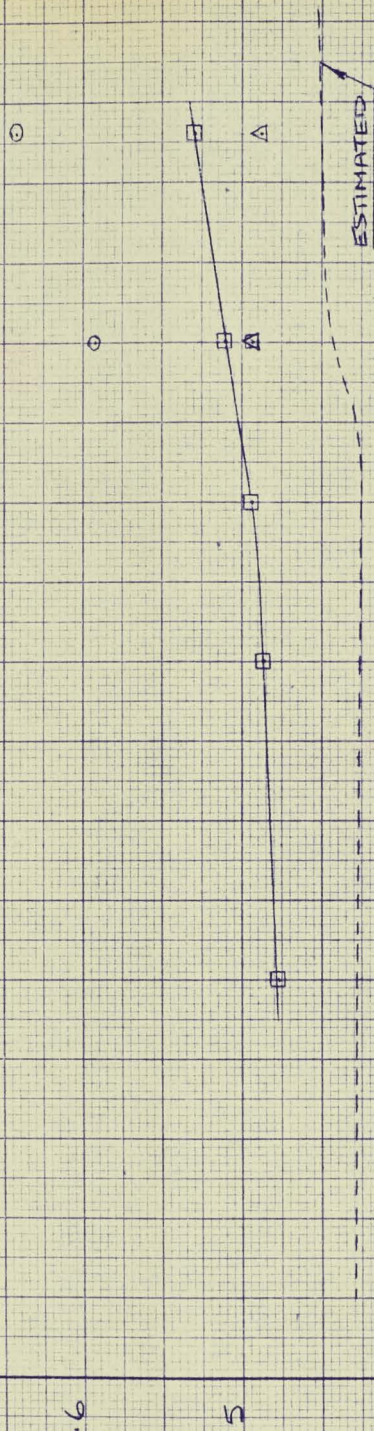
C-105

C.A.L. WIND TUNNEL TESTS

SPANWISE CENTRE OF PRESSURE ~ FIN & RUDDER

$\alpha = 6^\circ$

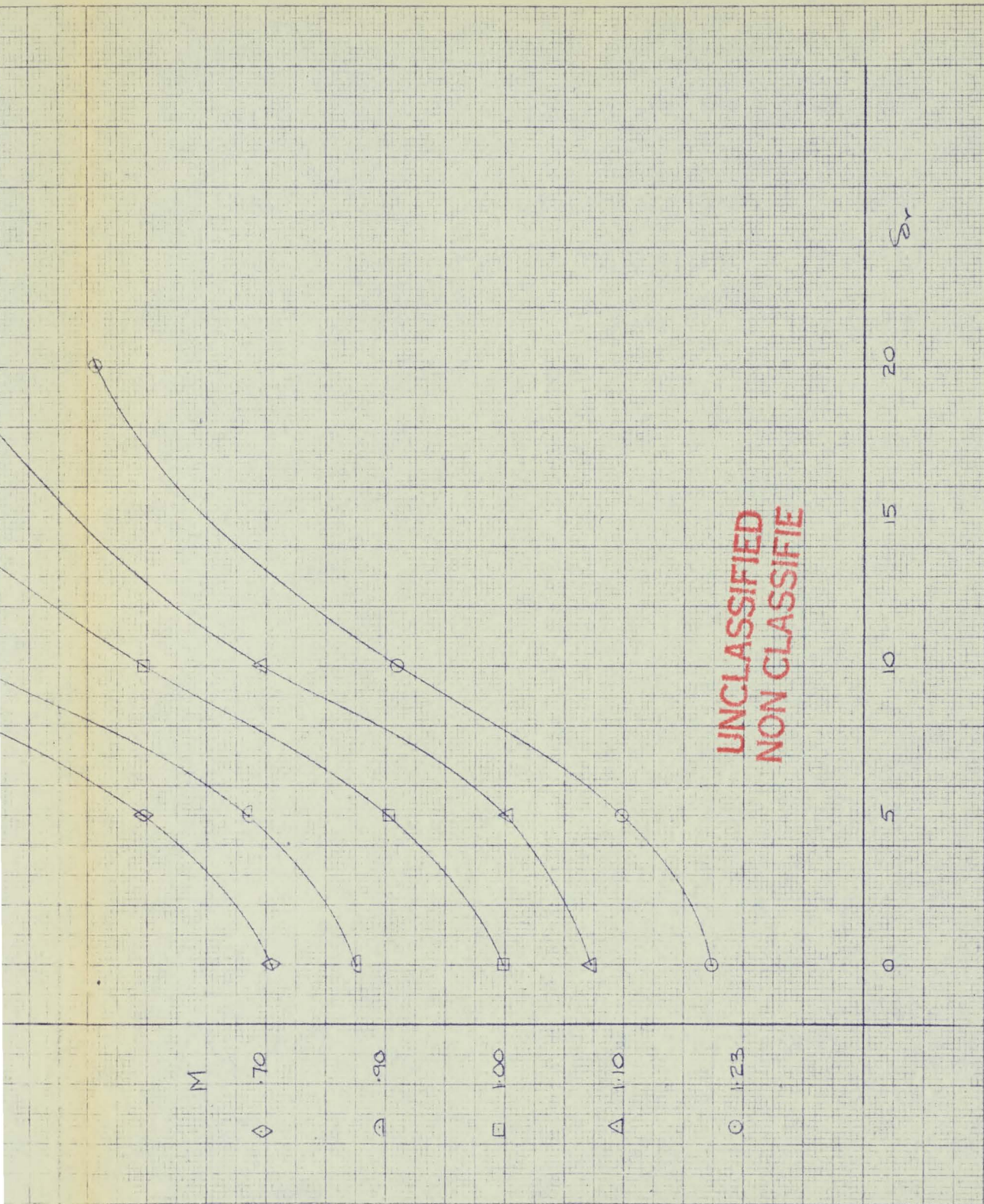
η_{cp}
(FRACTION
OF
SPAN)



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$\odot -2^\circ < \beta < 2^\circ$
 $\Delta -10^\circ < \beta < -3^\circ$
 $\square -8^\circ < \beta < 8^\circ$

0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 M



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SHEET NO.

1.4.10

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P/W.T/20

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FIN α_2 VS MACH NUMBER
 $\alpha = 6^\circ$ $\gamma = 0^\circ$

S_r
 5° 10° 15° 20°
 $\circ$ Δ $\square$ ∇

$(C_{N1})_{\alpha}$ PER DEGREE
OR
 α_2

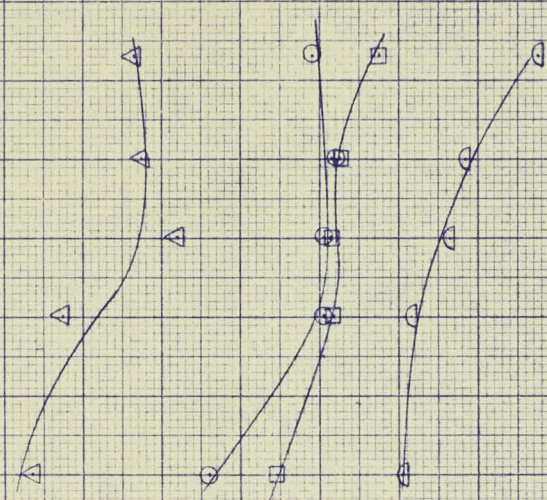
0.020

0.015

0.010

0.005

0



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MACH NUMBER
20
18
16
14
12
10
8
6
4

C105
 CHORDWISE C.P. POSITION
 RUDDER LOAD
 $\alpha = -2^\circ$ $\psi = 0$

$\alpha = 2^\circ$ (AVERAGE)

δ_r
 5° 10° 15° 20°
 $\bigcirc$ $\triangle$ $\square$ $\ominus$

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C.P.
 100
 % M.A.C.

20
 18
 16
 14
 12
 10
 8
 6
 4

MACH No

AIRCRAFT C105

COMPONENT

SHEET No. 1.5.9

REPORT No. P/W.T. 120

A. U. W.

DATE June 22/54

PREP BY H. K. K. K.

C105
CHORDWISE CR POSITION
RUDDER LOAD
 $\alpha = 6^\circ$ $\beta = 0$

 $\alpha = 2^\circ$ (AVERAGE)

δ
5° 10° 15° 20°
○ △ □ ▽

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NON CLASSIFIE

C.P.

100

% M.A.

90

80

70

60

50

20

10

16

14

12

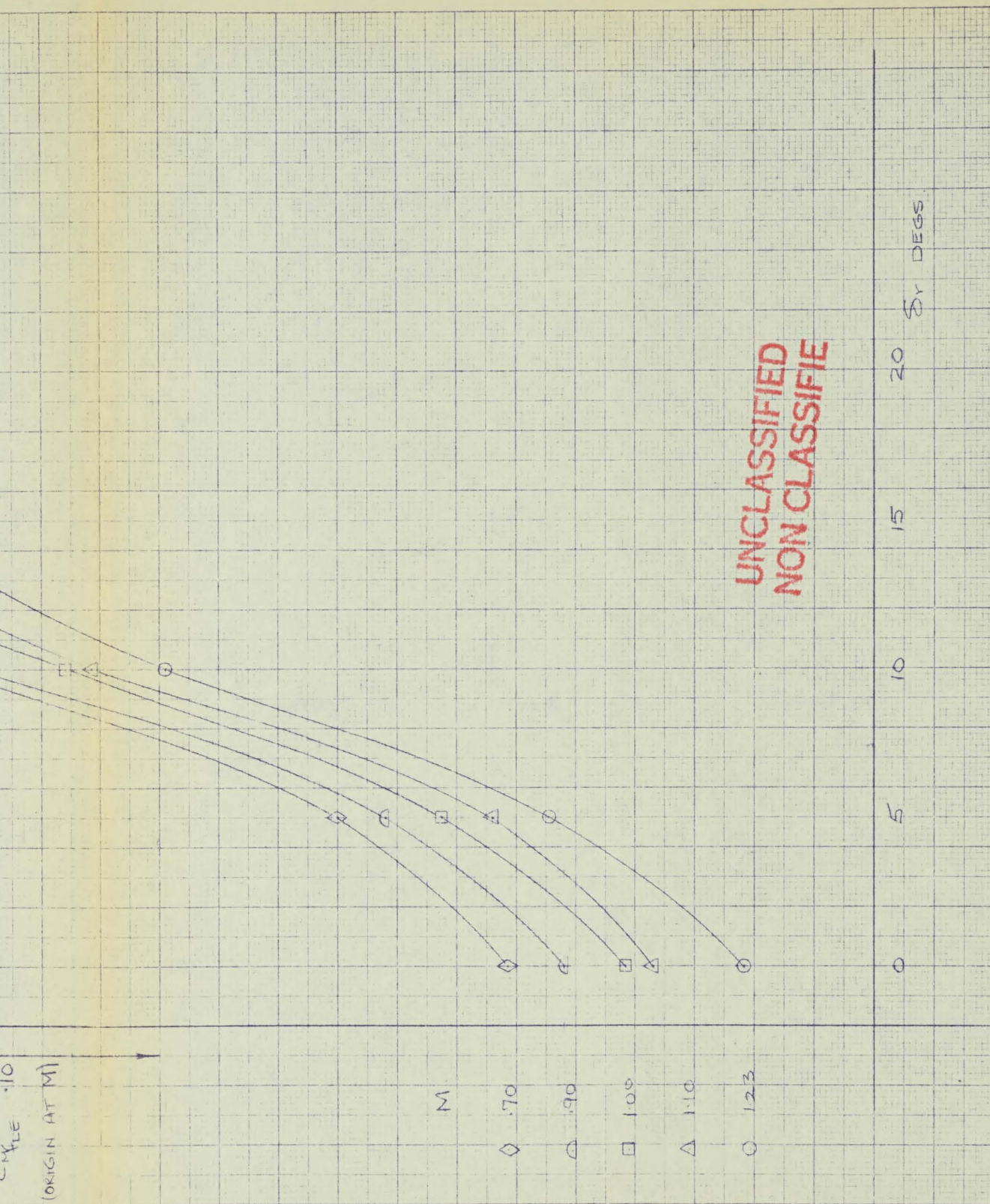
10

8

6

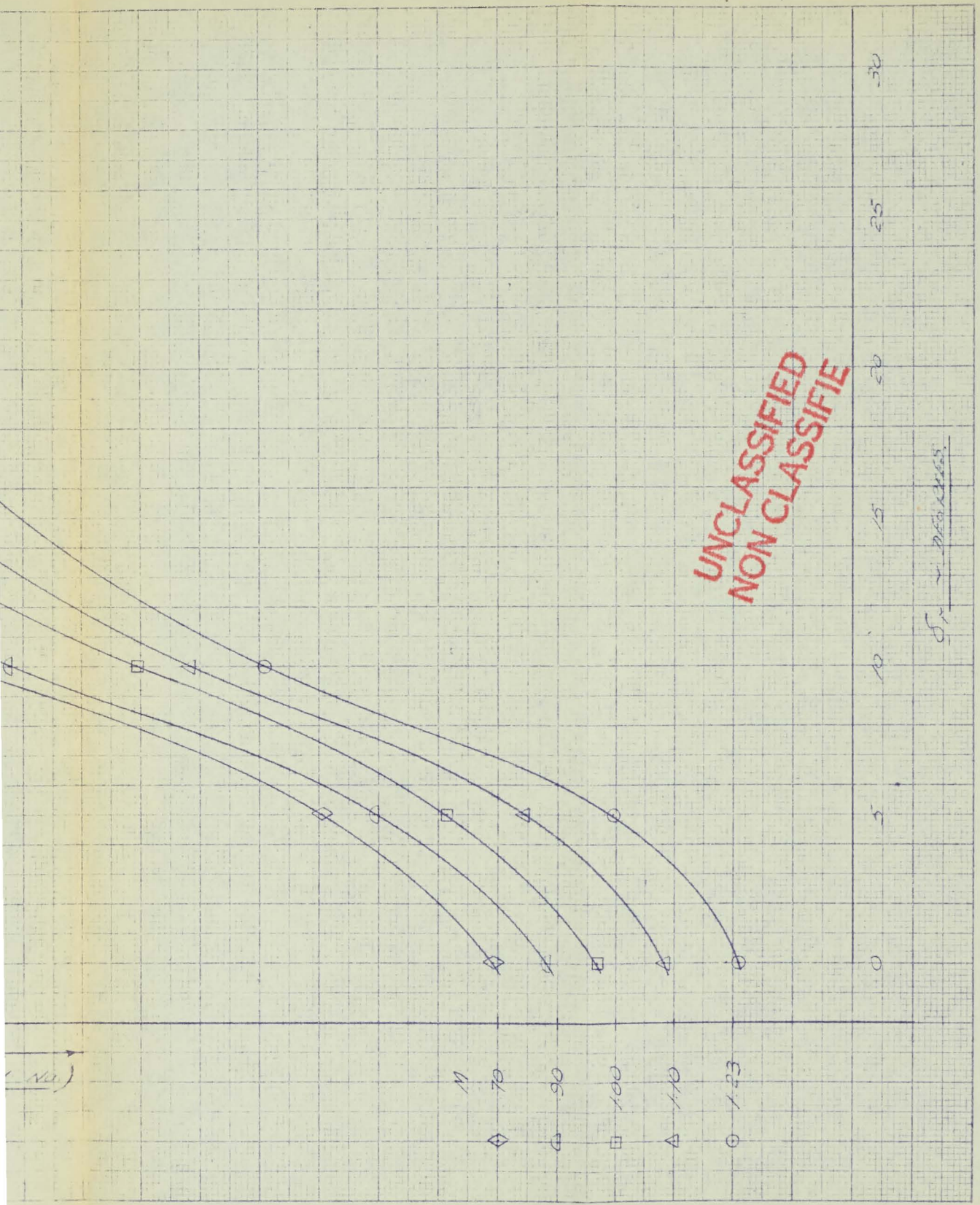
4

MACH 1.0



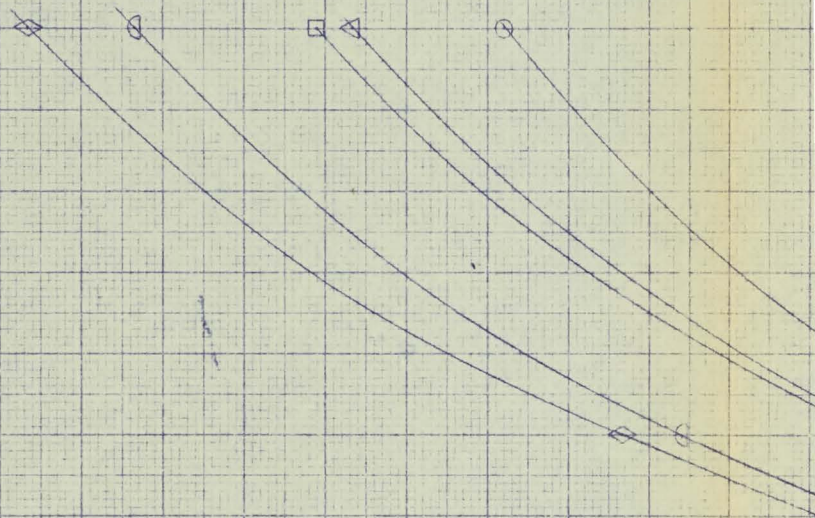
16.2.
MAY 54.

P/W.T/20
GARR.



C-105
 $C_{M_{LE}}$ vs δ_r
 $\alpha = -6^\circ$ $\psi = 0^\circ$

$-C_{M_{LE}}$



SCALE OF
 $C_{M_{LE}}$ 10
 (ORIGIN AT M)

AIRCRAFT C105

COMPONENT

SHEET No. 1.6.9

REPORT No. P/W.T./20

A. U. W.

DATE June 22/54

PREP BY Kuratkovsk

C105
 SPANWISE C.P. POSITION
 RUDDER LOAD
 $\alpha = 6^\circ$ $\beta = 0$

 $\alpha = 2^\circ$ (AVERAGE)

5° 10° 15° 20°
 ○ △ □ ▽

UNCLASSIFIED
 NON CLASSIFIED

MARCH No
 20

18

16

14

12

10

8

6

4

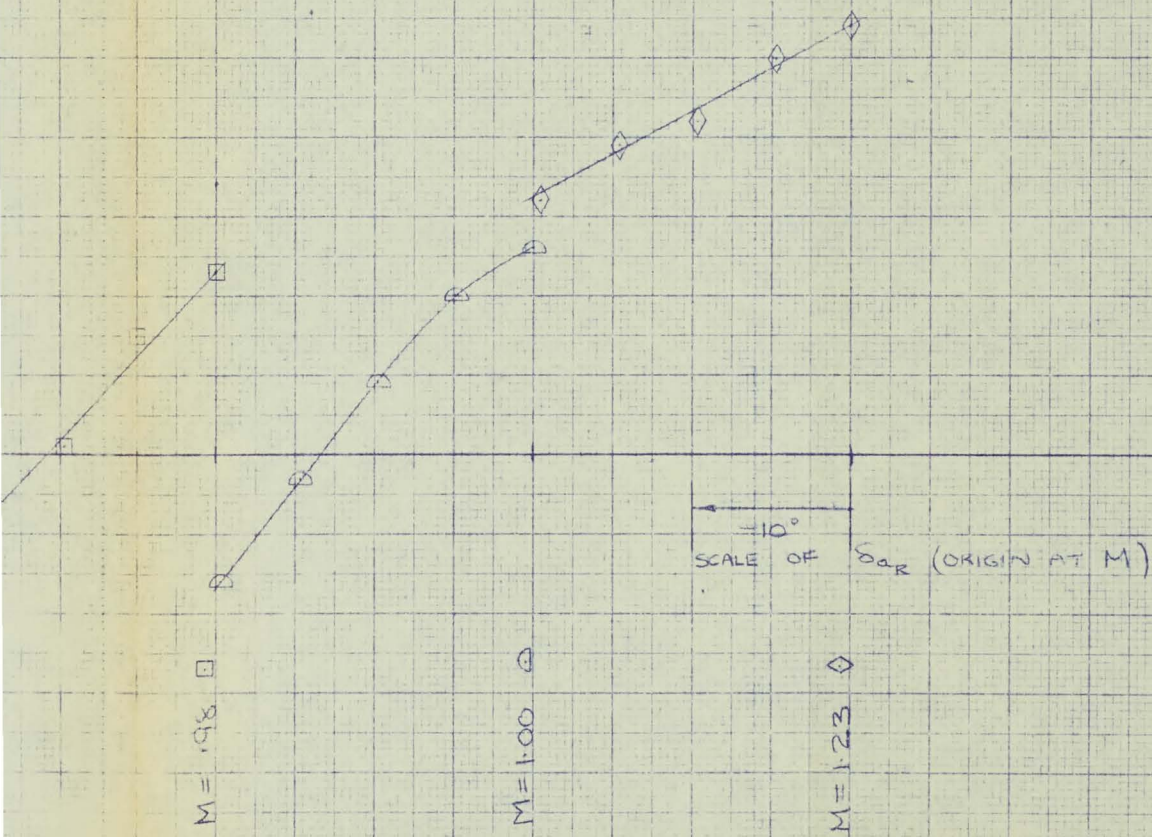
790

6

5

4

3

C-105C.A.L. WIND TUNNEL TESTS C_L vs. δ_{or} $(\delta_{or} = 0^\circ)$ $\alpha = -4^\circ$ UNCLASSIFIED
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C - 105

C.A.L. WIND TUNNEL

C_L vs S_{AL}

$\alpha = 4^\circ$

($S_{AL} = 0^\circ$)

C_L

.20

.18

.16

.14

.12

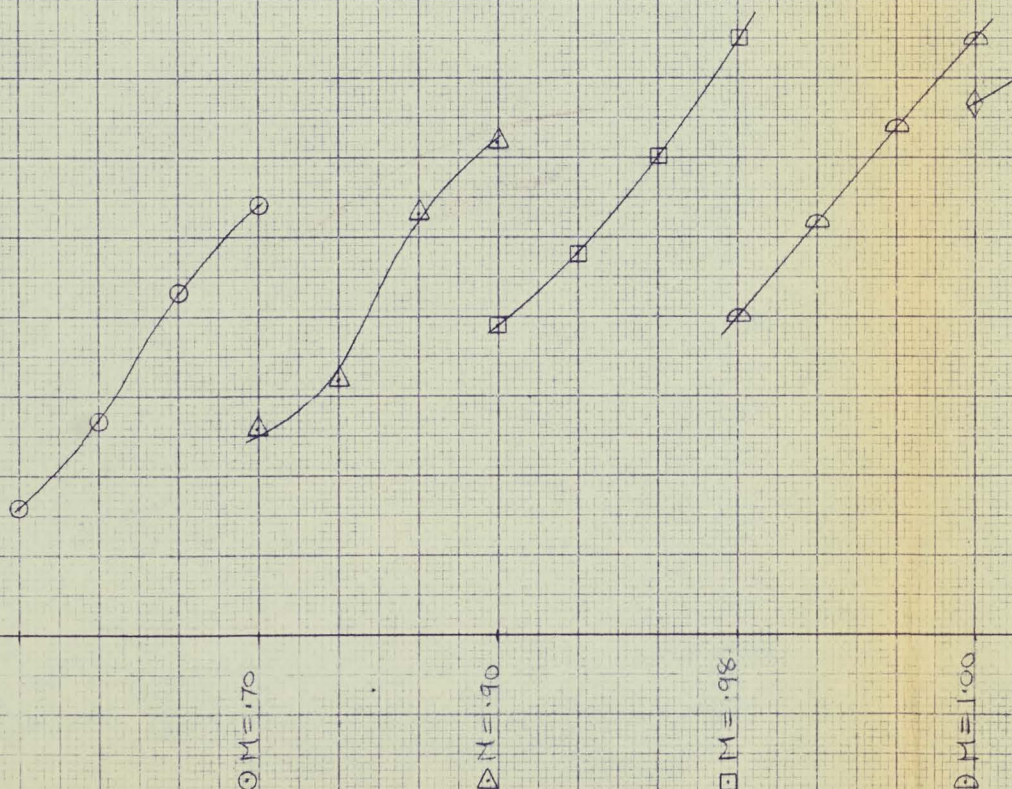
.10

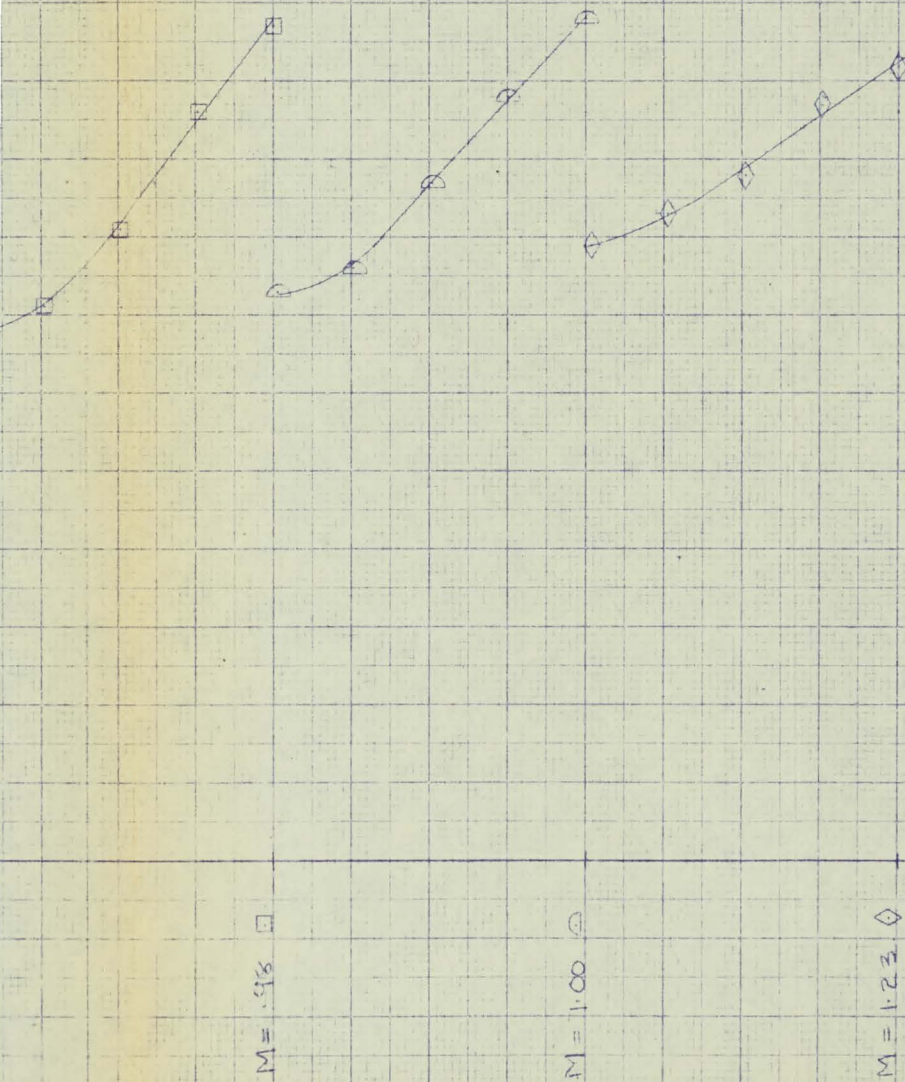
$M = .70$

$M = .90$

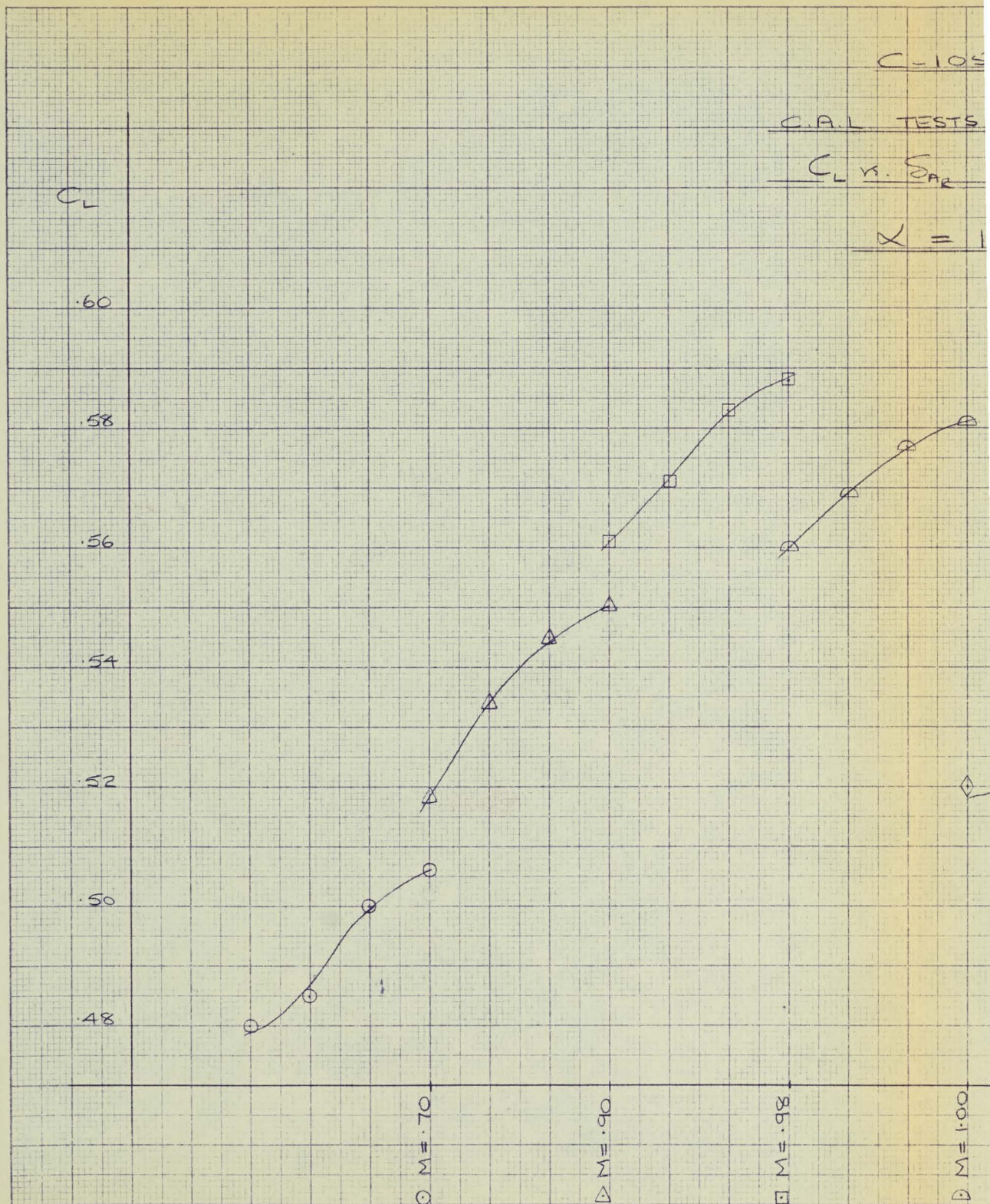
$M = .98$

$M = 1.00$





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C 105

C. A. L. WIND TUNNEL

CL 70-107 M

$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$
$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$
$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$
$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$	$\frac{0}{0} = \frac{0}{0}$

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Mach No

2.2

1.4

1.0

7

2

6

5

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G.A.L. WIND TUNNEL TESTS

C_L vs δ_{AR}

($\delta_{AR} = 0^\circ$)

$\alpha = 2^\circ$

C_L

.014

.012

.010

.008

.006

.004

.002

0

$M = .70$
(O)

$M = .90$
(Δ)

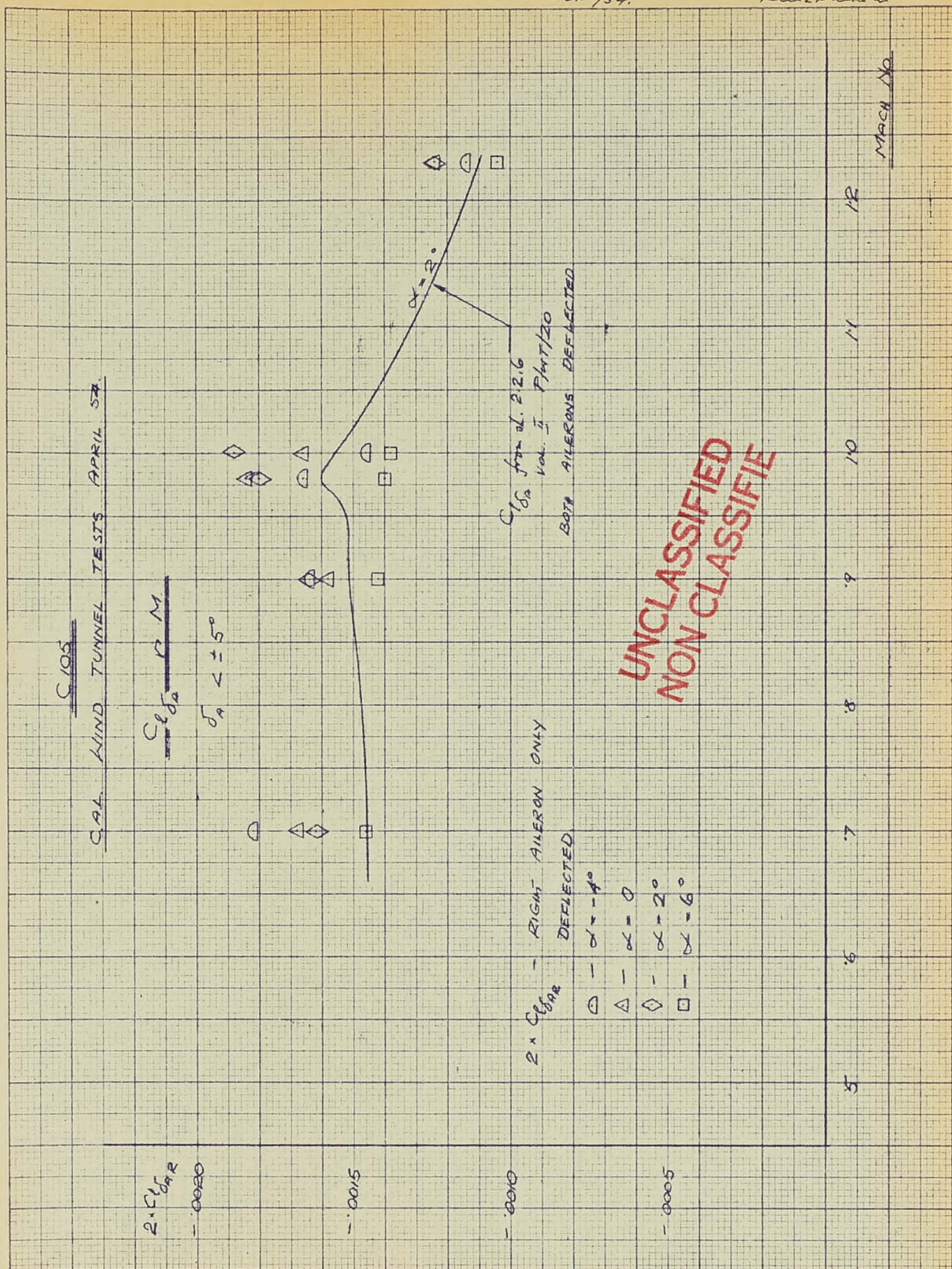
$M = .98$
(□)

$M = 1.00$
(Δ)

$M = 1.23$
(X)

2.1.12.
Oct /54.

P/WT/20 /54.
Knecht



C-105

C.A.L. WIND TUNNEL TESTS

SPANWISE POSITION OF AILERON LOADS
AS FRACTION OF AILERON SPAN

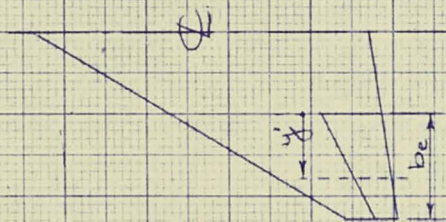
C.P. POSITION
(FRACTION OF
AILERON SPAN
~ FROM
INBOARD END
OF AILERON)

y/b_e

α
-4° 0° 2° 6°

◇ ○ △ □

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M

1.3

1.2

1.1

1.0

.9

.8

.7

.6

.5

.4

1.3

1.2

1.1

1.0

.9

.8

.7

.6

.5

.4

.3

1.3

1.2

1.1

1.0

.9

.8

.7

.6

.5

.4

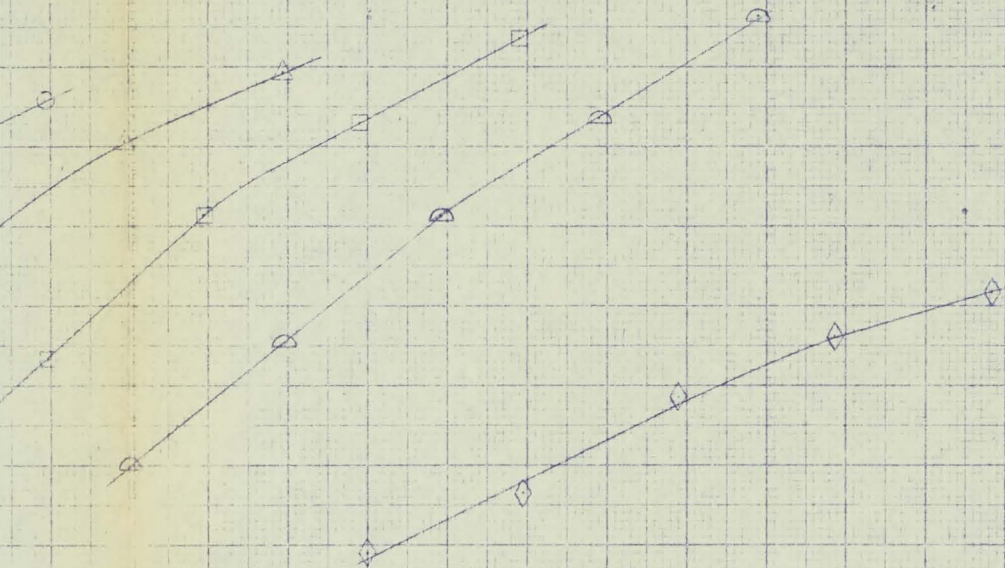
.3

- 105

TUNNEL TESTS

vs. ϵ_{aR} ($\epsilon_{aL} = 0^\circ$)

$L = 2'$



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-5°
SCALE OF ϵ_{aR} (ORIGINS AT M)

$M = 1.00$

$M = 1.23$

AIRCRAFT C105
A. U. W.

COMPONENT

SHEET No. 2.3.6.

REPORT No. P/H.T. 120

DATE June 57.

PREP BY K. K. K. K.

CAL. ALT. TESTS

$CM_{\delta_{trc}}$ vs M
($\delta_{trc} = 0$)

$\alpha = -4^\circ$
 $\alpha = 0$
 $\alpha = 2^\circ$
 $\alpha = 6^\circ$

$CM_{\delta_{trc}}$

δ_{trc}

δ_{trc}

$K.O.$

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12
11
10
9
8
7
6
5
MARCH NO

C-105

C.A.L. WIND TUNNEL TESTS

CLOCKWISE POSITION OF AILERON LOADS
AS FRACTION OF M.A.C. OUTER WING

$\alpha = -4^\circ$

M.A.C. OF WING
OUTBOARD OF
X-X

STARBOARD AILERON.
AILERON ANGLE $-10^\circ \leq \delta_{AR} \leq 0^\circ$
(DEFLECTED DOWN)

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C.P. POSITION
(FRACTION M.A.C.
OUTER WING)

1.0
.9
.8
.7
.6
.5
.4
.3

.7
.8
.9
1.0
1.1
1.2
1.3
M

C-105

C.A.L. WIND TUNNEL TESTS

CHORDWISE POSITION OF AILERON LOADS
AS FRACTION OF M.A.C. OUTER WING

$$\alpha = 0^\circ$$

C.P. POSITION.
(FRACTION M.A.C.
OUTER WING)

1.0

.9

.8

.7

.6

.5

.4

.3

.7

.8

.9

1.0

1.1

1.2

1.3

M

X

M.A.C. OF WING
OUTBOARD OF
X-X

X

STARBOARD

AILERON

AILERON ANGLE $-10^\circ < \delta_{AK} < 0^\circ$

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C.A.L. W-T Tests

Deflection of Loaded Controls

$$\Delta \delta^{\circ} = \frac{HM}{G} \times \frac{G \Delta \delta}{HM}$$

	Surface	δ°	$\frac{+HM}{G}$	$\frac{-HM}{G}$	δ°	$\frac{+HM}{G}$	$\frac{-HM}{G}$
			$\frac{G \Delta \delta}{HM}$	$\frac{G \Delta \delta}{HM}$		$\frac{G \Delta \delta}{HM}$	$\frac{G \Delta \delta}{HM}$
$\frac{\pm HM}{G}$	Aileron	0	.00633	-.00527	0	.00479	-.00428
	-(R.H.)	+5	—	-.00469	-5	.00472	-.00428
	+(L.H.)	+10	—	-.00383	-10	.00304	-.00544
		+15	—	-.00602	-15	.00428	-.00414
		+20	—	-.00428	-20	.00369	-.00434
	Elevator (L.H.)	-30	.00502	—			
		-20	.00461	—			
		-10	.00469	—			
		-5	.00576	.00494			
		0	.00510	.00535			
		+10	—	.00518			
	Rudder	0	.00430	.00495			
		+5	.00499	.00438			
		+10	—	.00231			
		+20	—	.00430			

300

250

200

M=1.23

M=1.15

M=1.10

M=1.05

M=0.98

M=0.95

M=0.90

M=1.00

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A. U. W.

C-105 COMPONENT

SHEET No. 325.

REPORT No. P/W 7/20.

DATE 23 April 1954

PREP. BY C.A. Ford.

C-105
C.A.L. W-T. Tests

Chp vs M

$\alpha = 2^\circ$

Chp
per degree

.0080

.0060

.0040

.0020

0

Estimate

$|\beta| > 3^\circ$

$-3^\circ \leq \beta \leq 3^\circ$

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.6

.7

.8

.9

1.0

1.1

1.2

March Number

C-105

C.A.L. W-T Tests.

$C_{p, \text{outer}}$
 $C_{p, \text{inner}}$

Δ Air

$\circ$ Cap

2.0

1.5

1.0

.6

.7

.8

.9

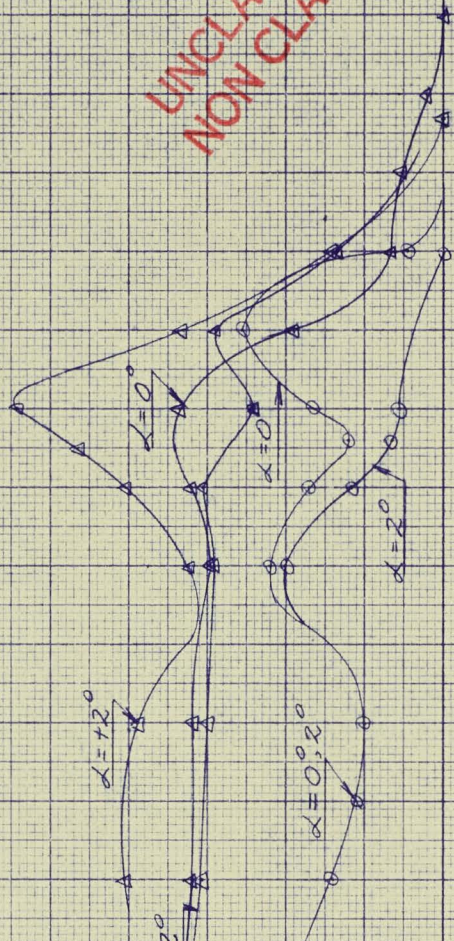
1.0

1.1

1.2

Mach Number

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C105 COMPONENT C_{HR} vs δ_R

SHEET NO.

332.

REPORT NO.

P/WT/20

DATE

1/6/54

PREP. BY

R. MCKEE

C105

C.A.L. WIND TUNNEL TESTS

APRIL 1954

C_{HR} vs δ_R

$\alpha = +6^\circ$

C_{HR}

.02

DATUM

POINTS

M

1.23

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1.10

1.00

.90

.70

0 2 4 6 8 10 12 14 16 18 20

CORRECTED δ_R - deg.

FORM 1746

249-12 - NEUFEL & ESSER CO.
10 x 10 to 10 1/2 inch, 5th lines included.
MADE IN U.S.A.

C-105

C.A.L. W-T Tests

[Chas] 15 Mach Number

$-5^\circ < \alpha < 5^\circ$

Right Hand Aileron

Left Hand Aileron

Estimate for Either Aileron

Mach Number

[Chas]

0.10

0.05

0

-0.05

1.2

1.1

1.0

0.9

0.8

0.7

0.6

0.5

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C.A.L. W-T Tests

Chox vs Mach Number

69° < 12°

Chox
per degree

-.06

-.04

-.02

0

New Estimate - either aileron

Left Aileron

Right Aileron

Estimate $P_{control}/46$
($\lambda = 0$)

12

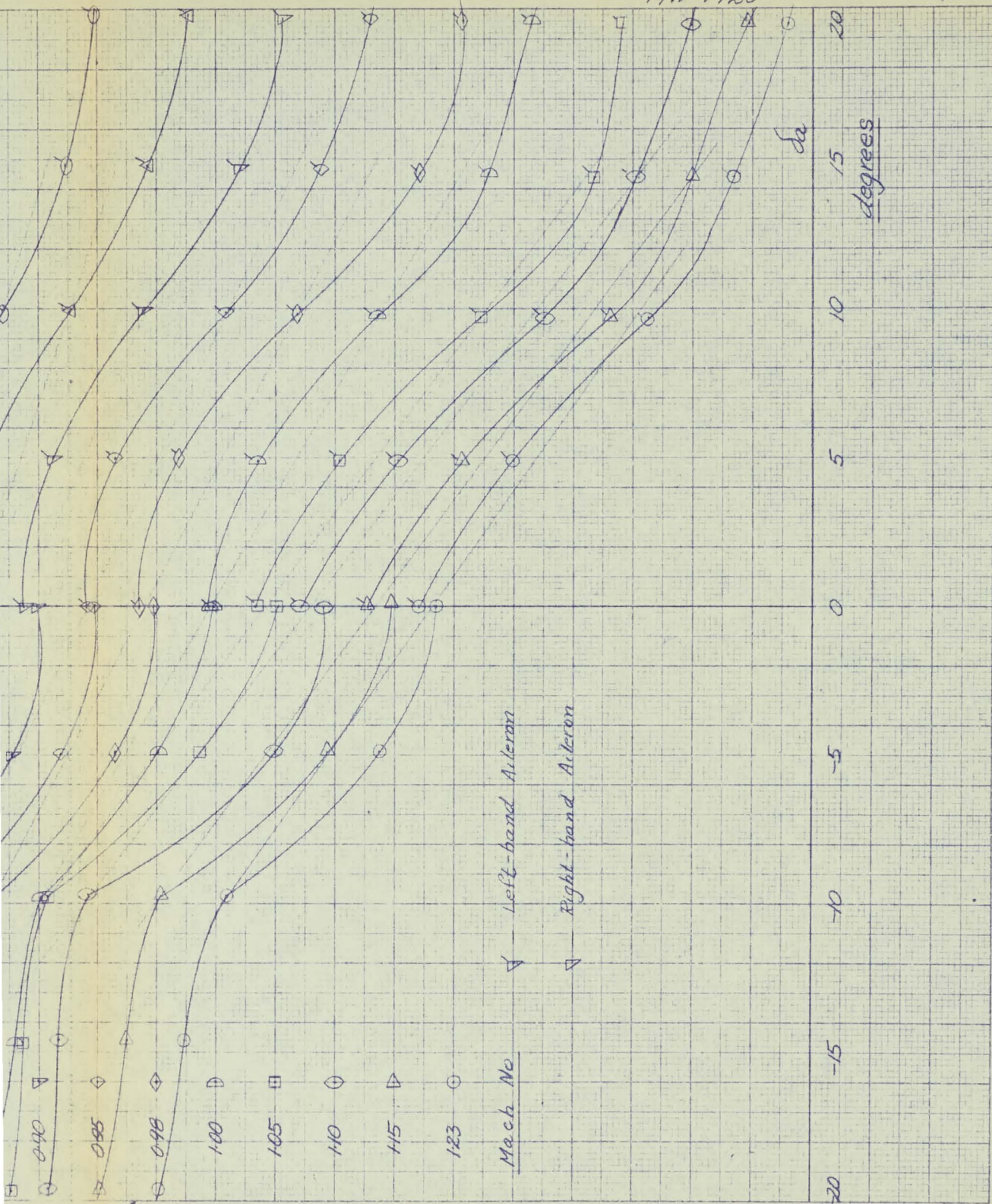
Mach Number

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CA. Ford
P/W-T/20

May 1954

A 3.1.



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