ARROW 1 ~~CONFIDENTIAL~~ 71/FAR/26
A/C 25201

PRELIMINARY ANALYSIS OF FLIGHTS
NOS. 1 TO 9

Copy No. 1 SECRET

May 1958

A. V ROE CANADA LIMITED

MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: ARROW I
A/C 25201

REPORT NO 72/FAR/26

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UNCLASSIFIED

PRELIMINARY ANALYSIS OF FLIGHTS

NOS. 1 TO 9

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APPROVED BY C Landow DATE May 1958

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INTRODUCTION

This extract contains data available from a preliminary analysis of the telemetry Sanborn traces for the first nine flights of A/C 25201 and comparison with estimated values.

It should be remembered that the telemetry instrumentation was installed for the purpose of flight safety monitoring rather than for engineering evaluation. Selection of instrument ranges from monitoring standpoint resulted in relatively poor accuracy of data for engineering purposes. In spite of this a number of parameters has been measured with reasonable accuracy and only these parameters are presented in this report.

An excellent agreement with predictions was obtained. A few curves presented do not describe adequately handling qualities and therefore a detailed program is required for accurate evaluation of all of the parameters affecting handling qualities, damper performance etc.

ARROW 1

α TRIM VS. MACH NO

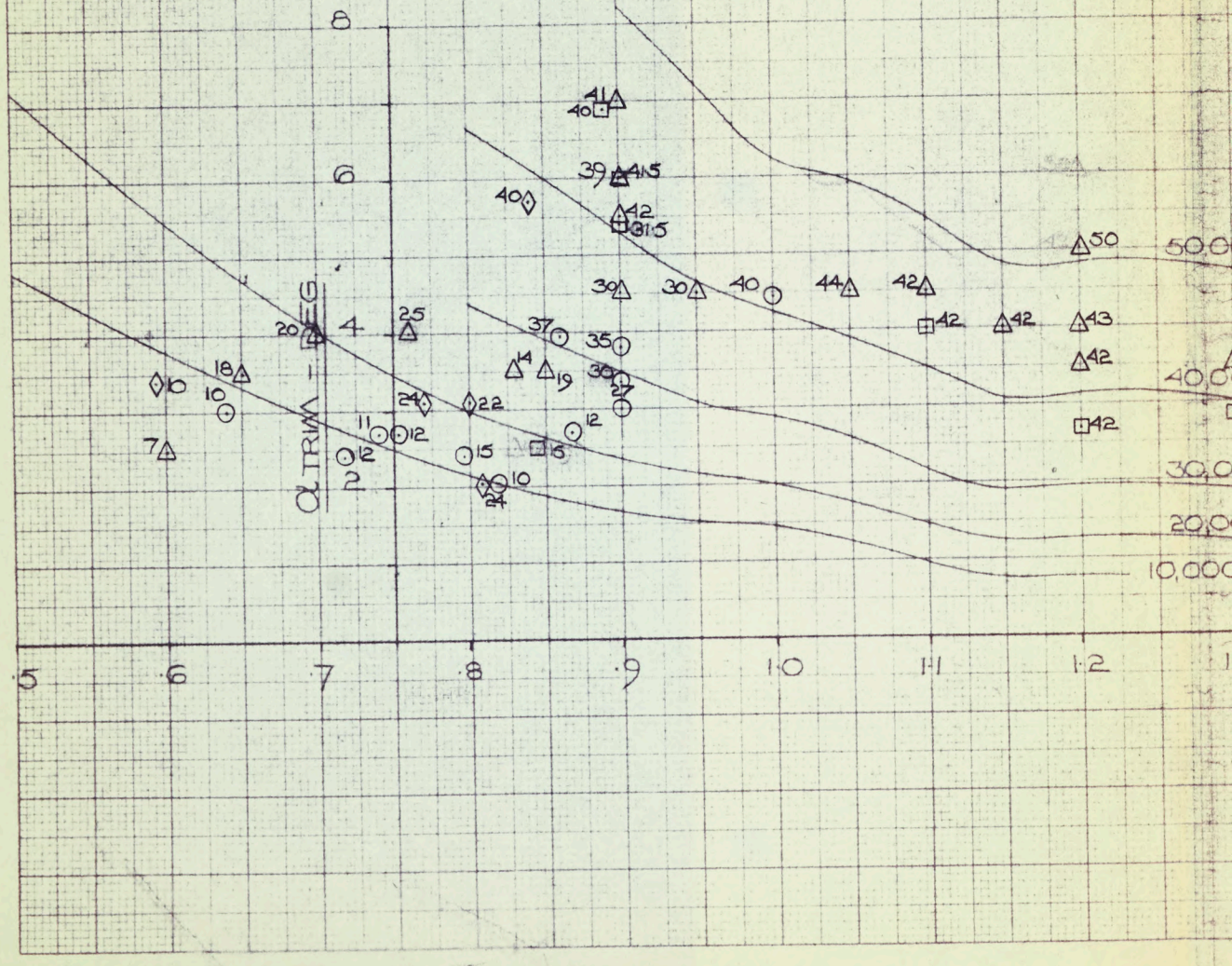

FIG. 1

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NO

W = 60,000 LB.
C.G. = .31 $\bar{c}$

⊙ FLIGHT # 6
△ FLIGHT # 7
⊡ FLIGHT # 8
◇ FLIGHT # 9

NUMBERS DENOTE ALTITUDE
IN THOUSANDS OF FEET

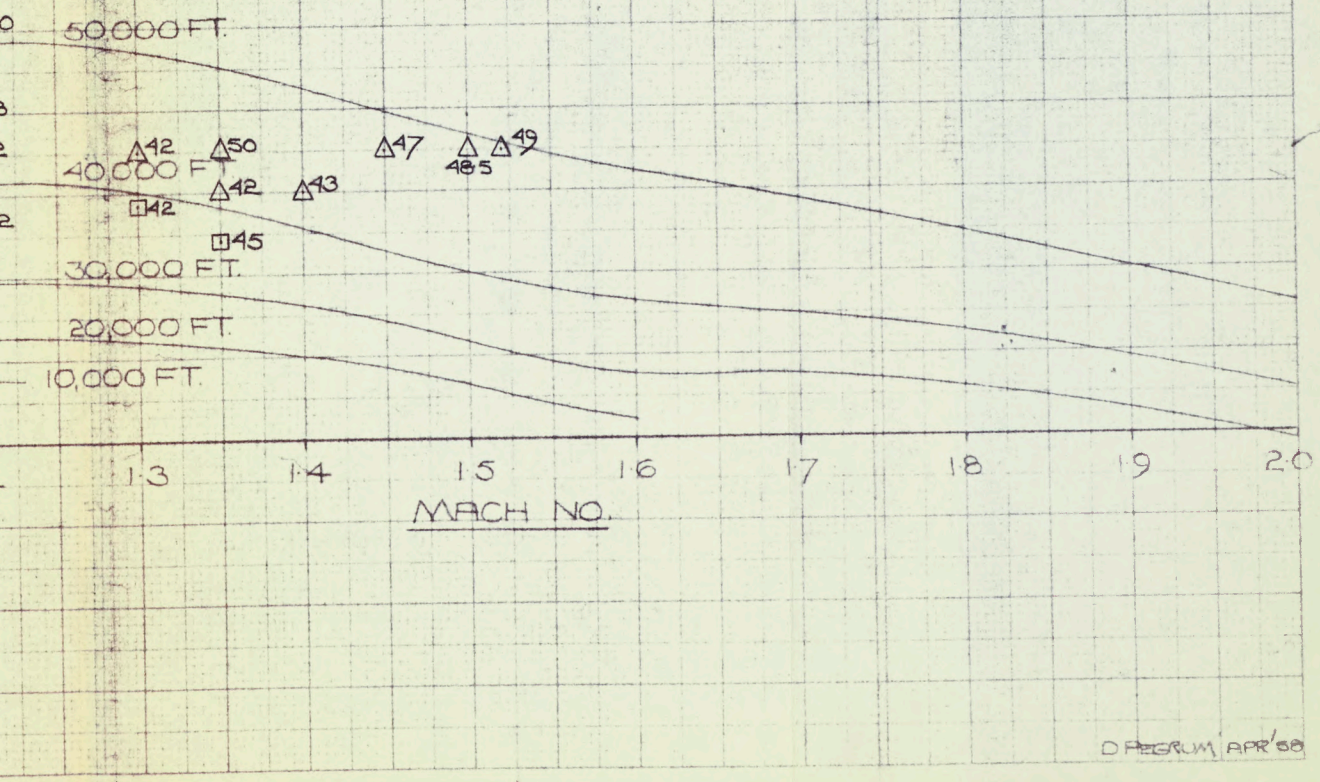

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FIG. 1. PERIOD (SECS) — MACH N°

$h = 0,\ 10000',\ 20000',\ 30,000',$ E.T.C...

$n = 1.0$

PERIOD (SECS)

9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0

SEA LEVEL
10,000'
20,000'
30,000'
40,000'
50,000'
60,000'

○ FLIGHT # 3
△ FLIGHT # 5

NUMBERS DENOTE ALTITUDE IN THOUSANDS OF FEET

$W = 60000$ lb
C.G. = 0.28 $\bar{c}$
$K_y = 178.95$ #

0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8

MACH N°

FIG. 2

EX. APR. 1958.

ARROW

LATERAL STABILITY

PERIODIC TIME OF DUTCH-ROLL OSCILLATION

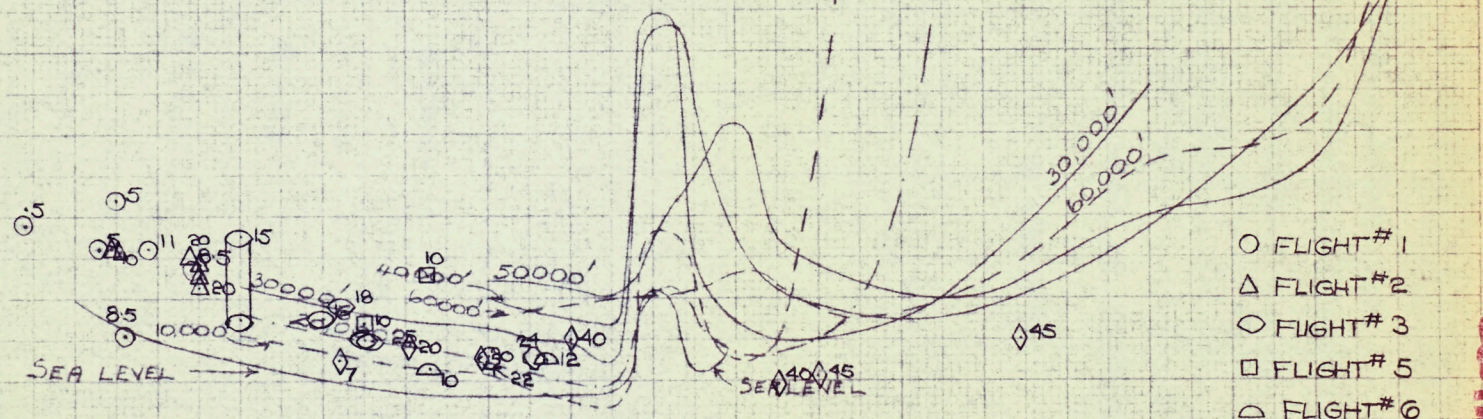
LEVEL FLIGHT

WEIGHT = 47000 LB C.G. = .31 $\bar{c}$

NUMBERS DENOTE ALTITUDES IN THOUSANDS OF FEET.

AT 40,000, 50,000 & 60,000', IN THE TRANSONIC REGION THERE ARE TWO OSCILLATIONS, ONLY ONE OF WHICH IS SHOWN HERE. BELOW IS A TABLE OF THESE DOUBLE OSCILLATIONS.

ALT.	MACH	PERIOD (SECS)
40,000'	1.00	12.46 AND 21.00
50,000	1.00	7.54 AND 28.44
	1.05	8.95 AND 37.91
60,000'	1.00	6.02 AND 53.60
	1.05	6.15 AND 58.16
	1.10	6.60 AND 61.66



PERIODIC TIME, T - SECS

MACH NUMBER

○ FLIGHT # 1
△ FLIGHT # 2
⬭ FLIGHT # 3
□ FLIGHT # 5
⌓ FLIGHT # 6
◇ FLIGHT # 7
⬡ FLIGHT # 9

FIG. 3

FIG. 4.1

ARROW

LATERAL STABILITY

TIME TO HALF AMPLITUDE OF DUTCH-ROLL OSCILLATION.

LEVEL FLIGHT.

ALT. = 10,000'

WEIGHT = 47000 LB C.G. = .31 E

- - - - DENOTES RANGE OF DIVERGENT OSCILLATIONS

● FLIGHT #6

● 12000 FT

● 12000 FT

● 12000 FT

TIME TO HALF AMPLITUDE - SECS.

MACH NUMBER

.4 .6 .8 1.0 1.2 1.4

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SEMI LOGARITHMIC
3 CYCLES X 70 DIVISIONS

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FIG. 4.2

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ARROW.

LATERAL STABILITY.

TIME TO HALF AMPLITUDE OF DUTCH-ROLL OSCILLATION.

LEVEL FLIGHT.

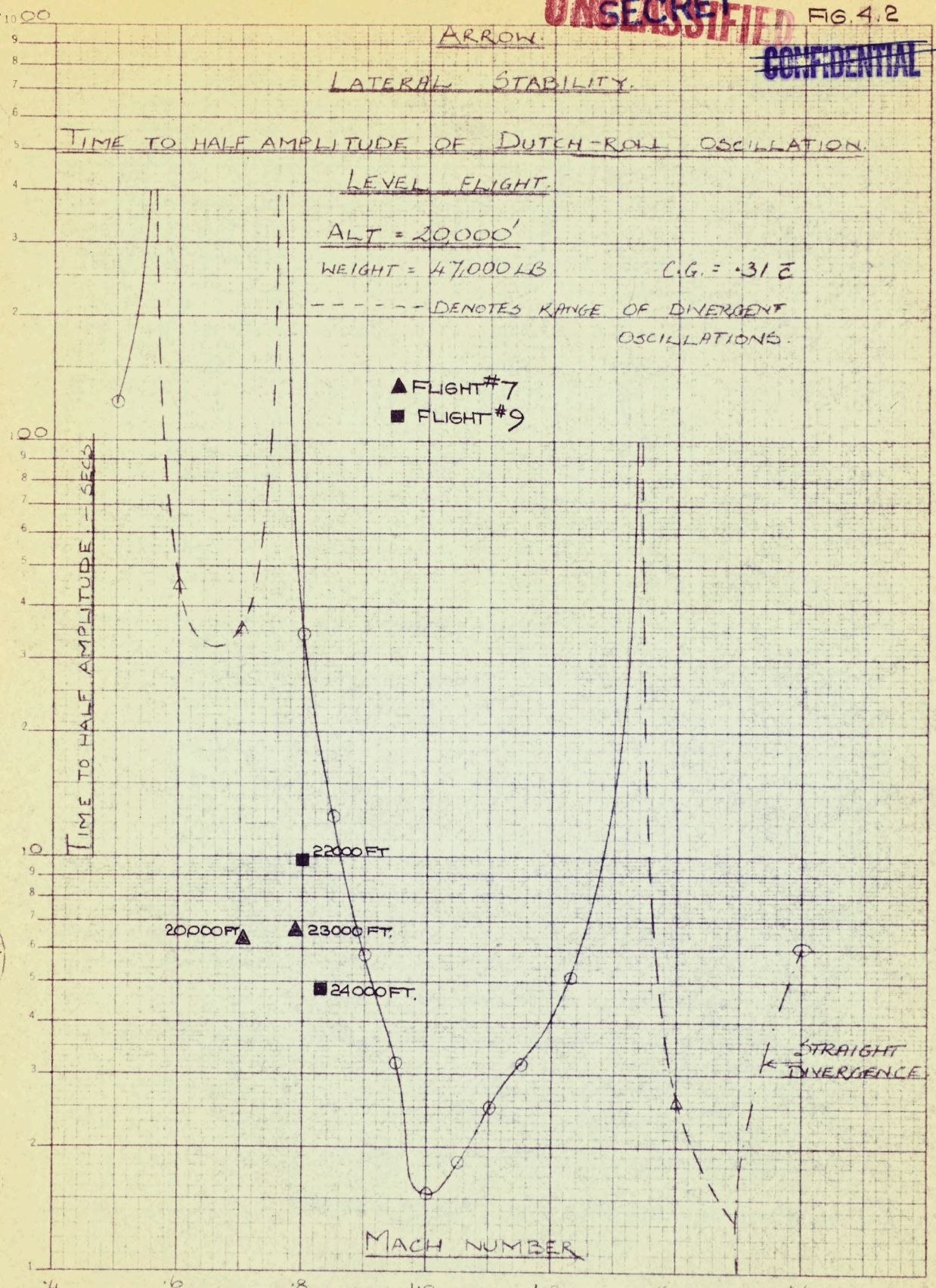
ALT = 20,000'

WEIGHT = 47,000 LB C.G. = .31 $\bar{c}$

- - - - - - DENOTES RANGE OF DIVERGENT OSCILLATIONS.

▲ FLIGHT #7

■ FLIGHT #9



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SEMI LOGARITHMIC
3 CYCLES X 70 DIVISIONS

MICRO RAPH

SECRET

FIG 4.3

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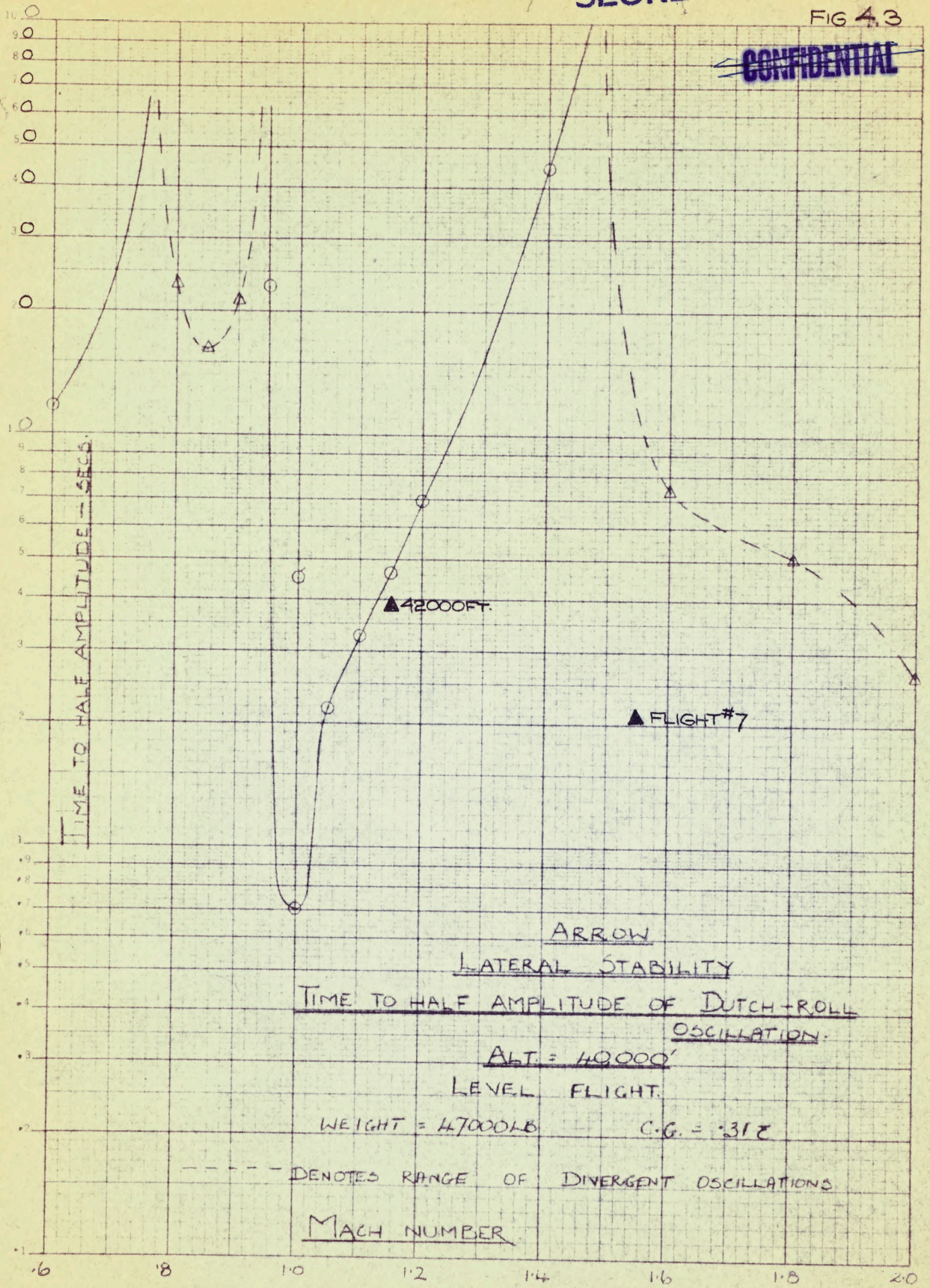

G9-71
SEMI LOGARITHMIC
3 CYCLES X 70 DIVISIONS

MICRO TRACE

ARROW

LATERAL STABILITY

TIME TO HALF AMPLITUDE OF DUTCH-ROLL OSCILLATION.

ALT. = 40000'

LEVEL FLIGHT.

WEIGHT = 47000LB C.G. = ·31c

- - - - - DENOTES RANGE OF DIVERGENT OSCILLATIONS