NRC A.M. 5924-1 ~~SECRET~~ UNCLASSIFIED

Wind Tunnel Tests on a Model of the AVRO CF-100 Aircraft Fitted with Wing Tip Tanks.

14 June 1950

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WIND TUNNEL TESTS ON A MODEL OF THE AVRO CF-100 AIRCRAFT FITTED WITH WING TIP TANKS

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Summary:

The effects of a true wing-tip drop tank arrangement on the lateral stability characteristics of the CF-100 aircraft have been investigated. The results show that with this drop tank arrangement lateral stability and flying qualities would be satisfactory.

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1. INTRODUCTION

The effect of the new type drop tanks on lateral stability characteristics of the CF-100 aircraft has been investigated in the No. 3 Wind Tunnel of the National Research Laboratories. The new type drop tank installation differs from the previous drop tank installation in that the new tanks are installed at the extreme tips of the wings, whereas the old tanks were underslung. A sketch of the installation is shown in Figure 1.

2. TESTS

Lift, drag and pitching moments were measured for both flaps up and flaps down cases at zero angle of yaw.

Rolling moment, yawing moment and cross wind force were measured at angles of attack 0° and 3° with flaps up and at angles of attack 3° and 6° with flaps down over the range -10°, -7½°, -5°, -2½°, 0°, 1°, 2°, 3°, 4°, 5°, 7½°, 10°, 12½° and 15° in angle of yaw.

3. RESULTS

Lift and drag coefficients plotted against angle of attack and pitching moment coefficient plotted against lift coefficient for the flaps up and flaps down cases are shown in Figures 2 and 3 respectively. The pitching moment coefficients have been calculated with respect to the aircraft centre of gravity.

The rolling moment coefficient C_l, yawing moment coefficient C_n and cross wind force C_c plotted against angle of yaw are shown in figures 4 to 9 for both the flaps up and flaps down cases.

The values of the derivatives $-\frac{dC_l}{d\beta}$ and $\frac{dC_n}{d\beta}$ are given in Table I. These may be compared with corresponding values for the tanks-off case, given in Ref. 1.

$$\frac{dC_l}{d\beta} = -\frac{dC_l}{d\psi},$$

$$\frac{dC_n}{d\beta} = -\frac{dC_n}{d\psi}$$

TABLE I

	Flaps Up		Flaps Down 60°	
	$\alpha = 0°$	$\alpha = 3°$	$\alpha = 3°$	$\alpha = 6°$
$\frac{dC_l}{d\beta}$	.0007	.0012	.0007	.0015
$\frac{dC_n}{d\beta}$	.0012	.0012	.0019	.0019

The quantity $-\frac{dC_l}{d\beta}$, which is a measure of effective dihedral, is seen to lie in the desirable range for flaps down as well as for flaps up.

The values of $\frac{dC_n}{d\beta}$ were found to be approximately the same for the new drop tanks configuration as for the underslung arrangement and are considered to be satisfactory.

4. CONCLUSIONS

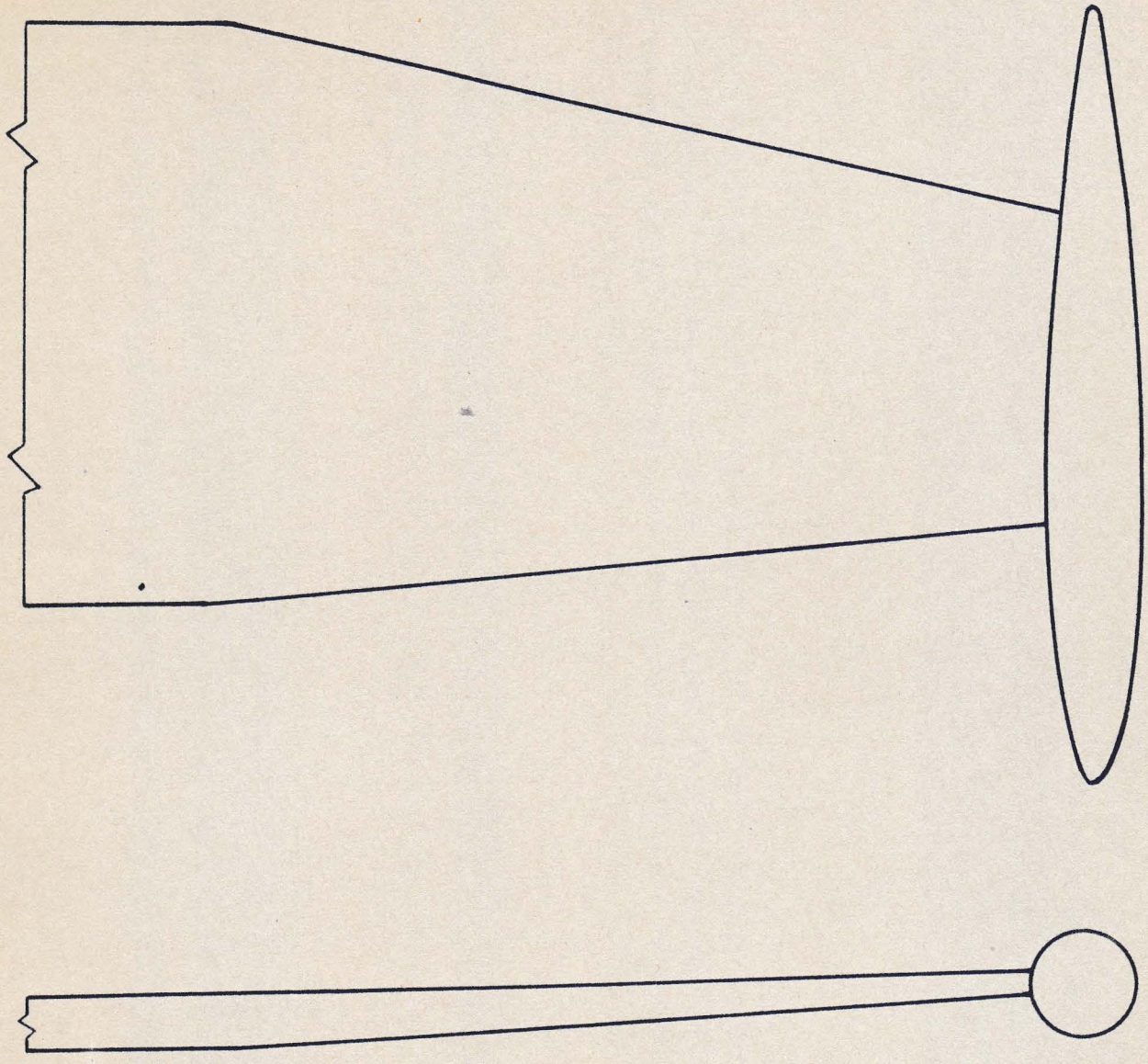
The rolling moment curve obtained with the new drop tank installation indicates satisfactory effective dihedral and stability. The relationship between rolling and yawing moments due to sideslip is such that satisfactory handling characteristics would be expected.

5. REFERENCES

1. L.T. Conlin — Wind Tunnel Tests on a Model of the Avro XC-100 aircraft Fitted with Wing Tip Tanks. N.R.C. Aero. Memo 5435-6.

/cm

FIG. 1



INSTALLATION OF WING TIP TANKS ON CF-100

WIND TUNNEL MODEL

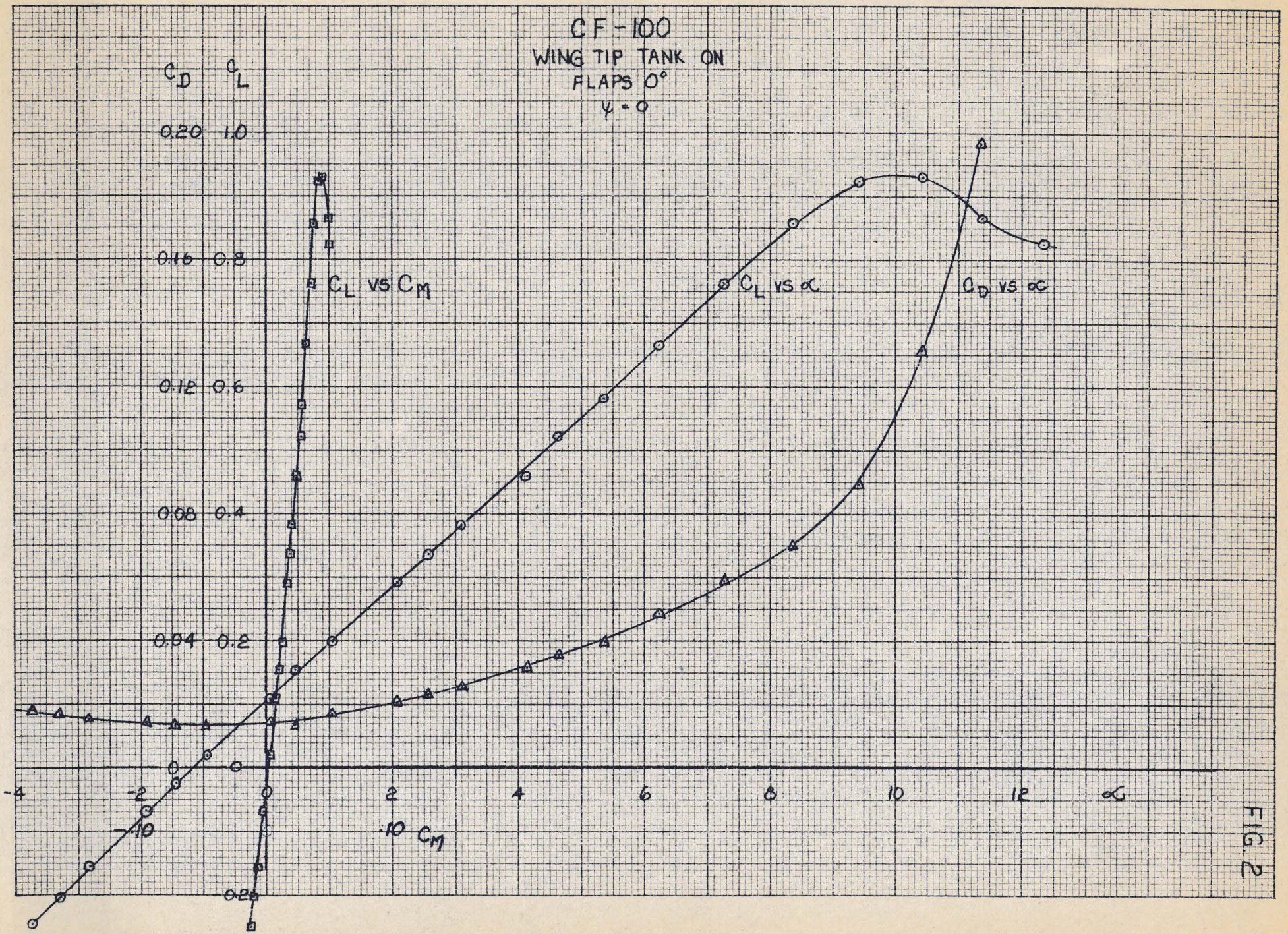


FIG 2

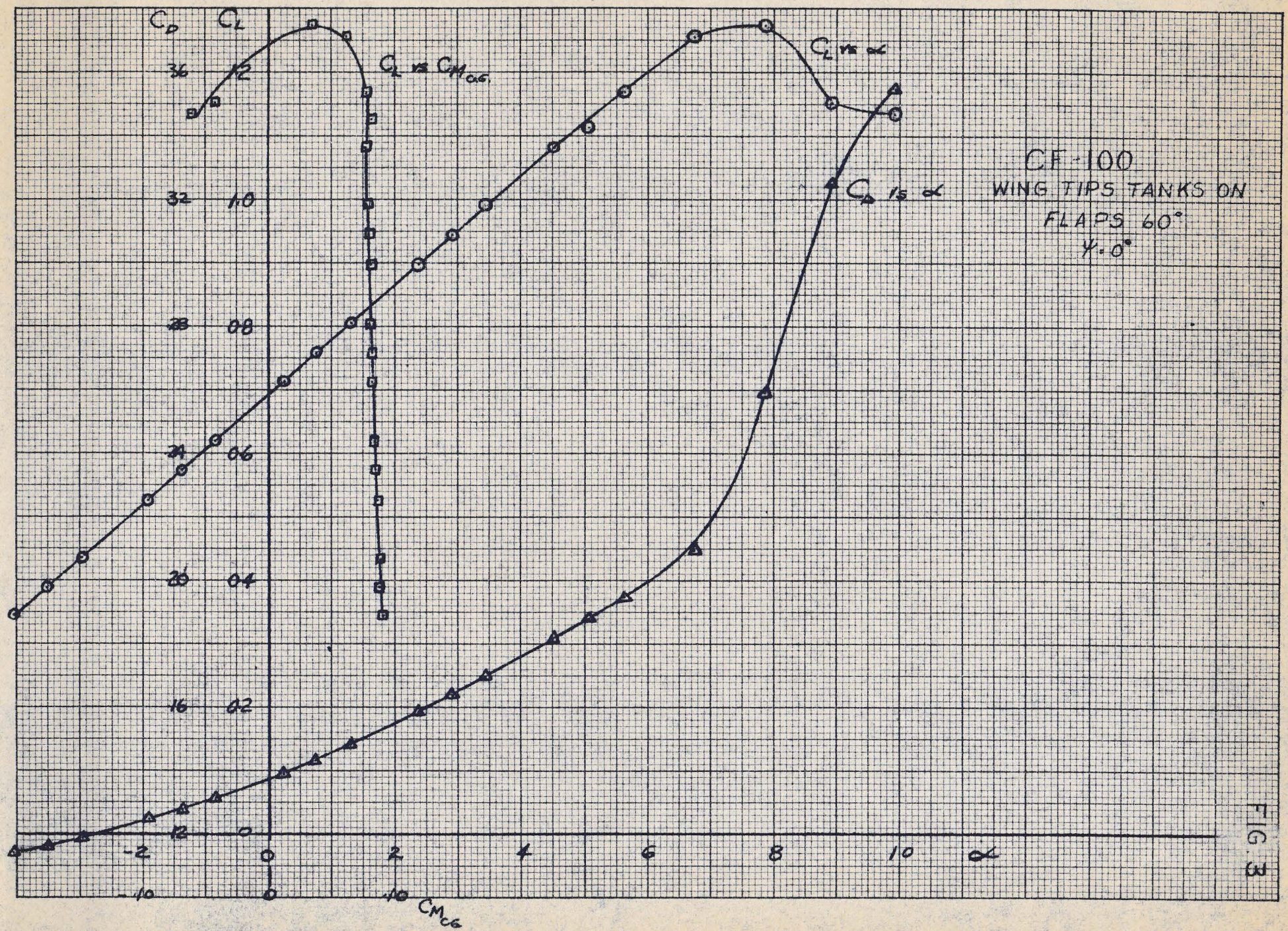


FIG. 3

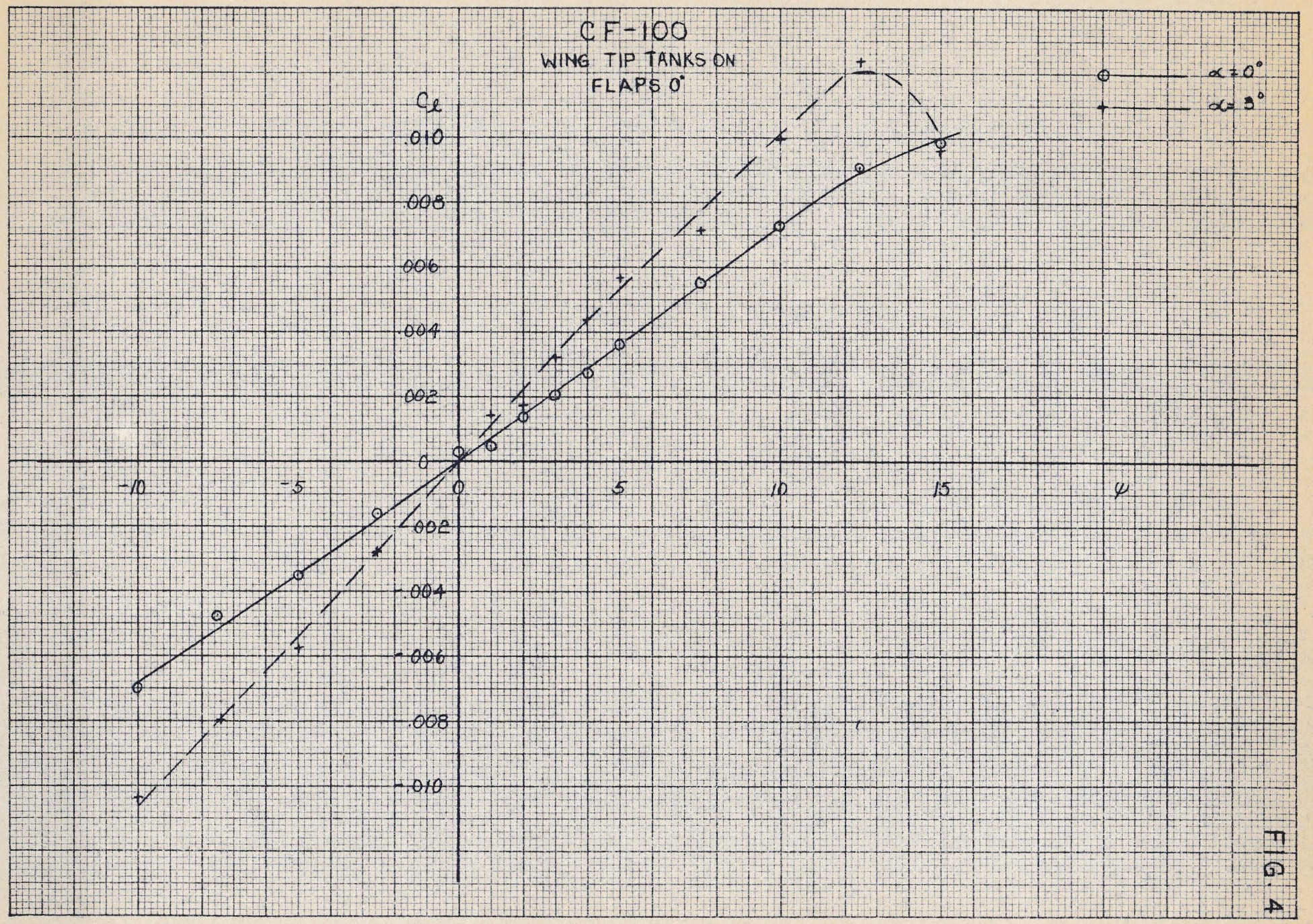


FIG. 4

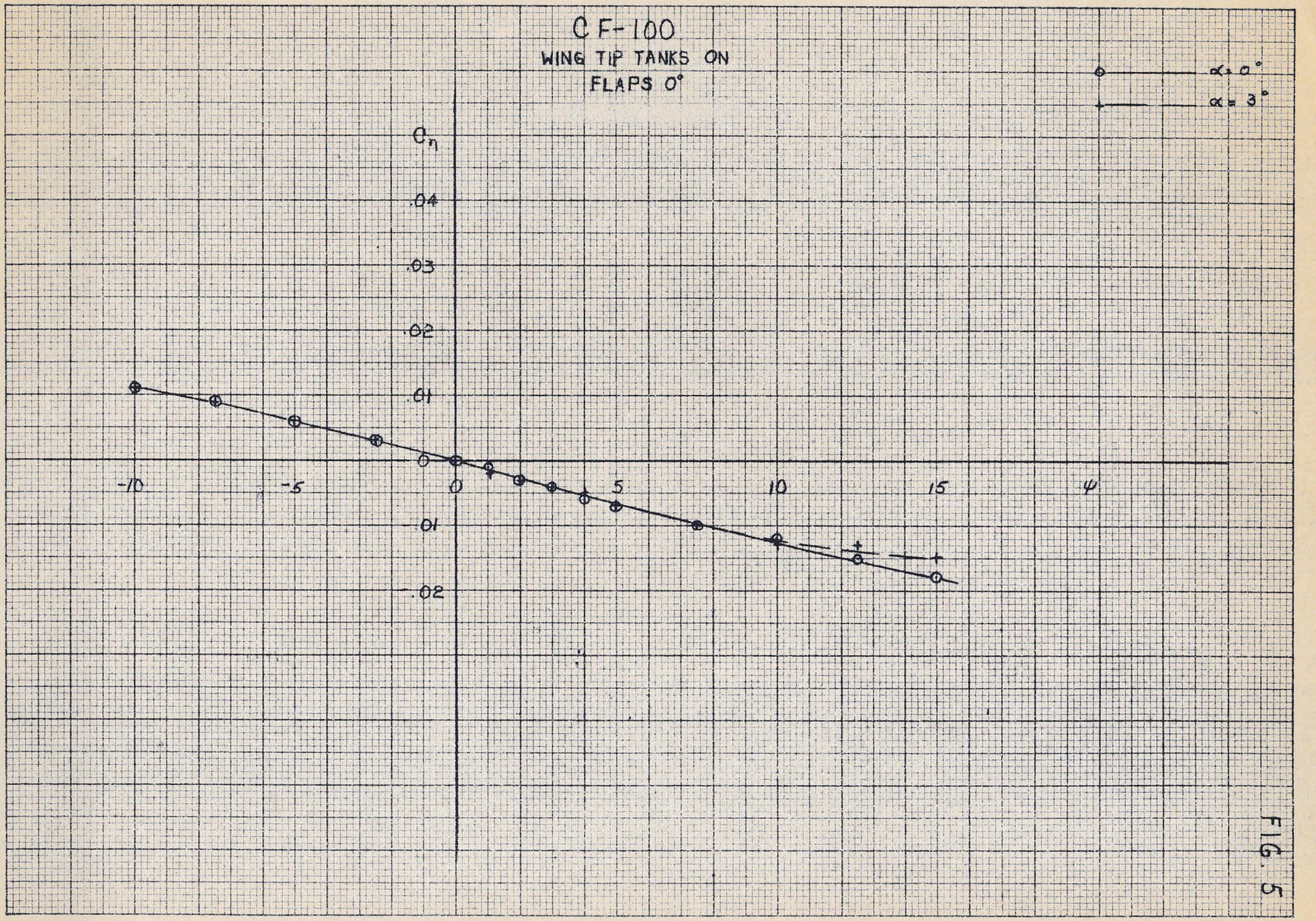
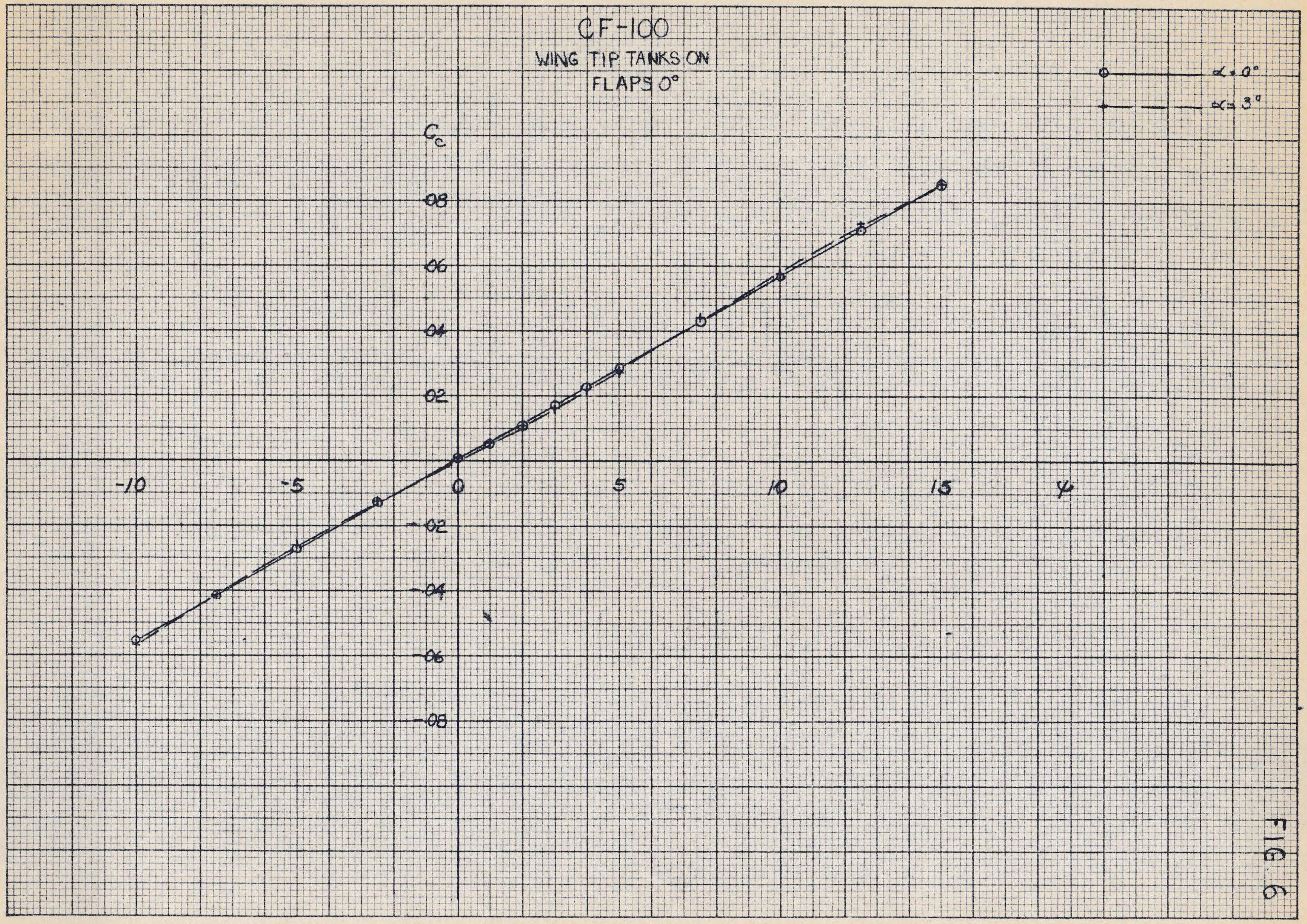


FIG. 5



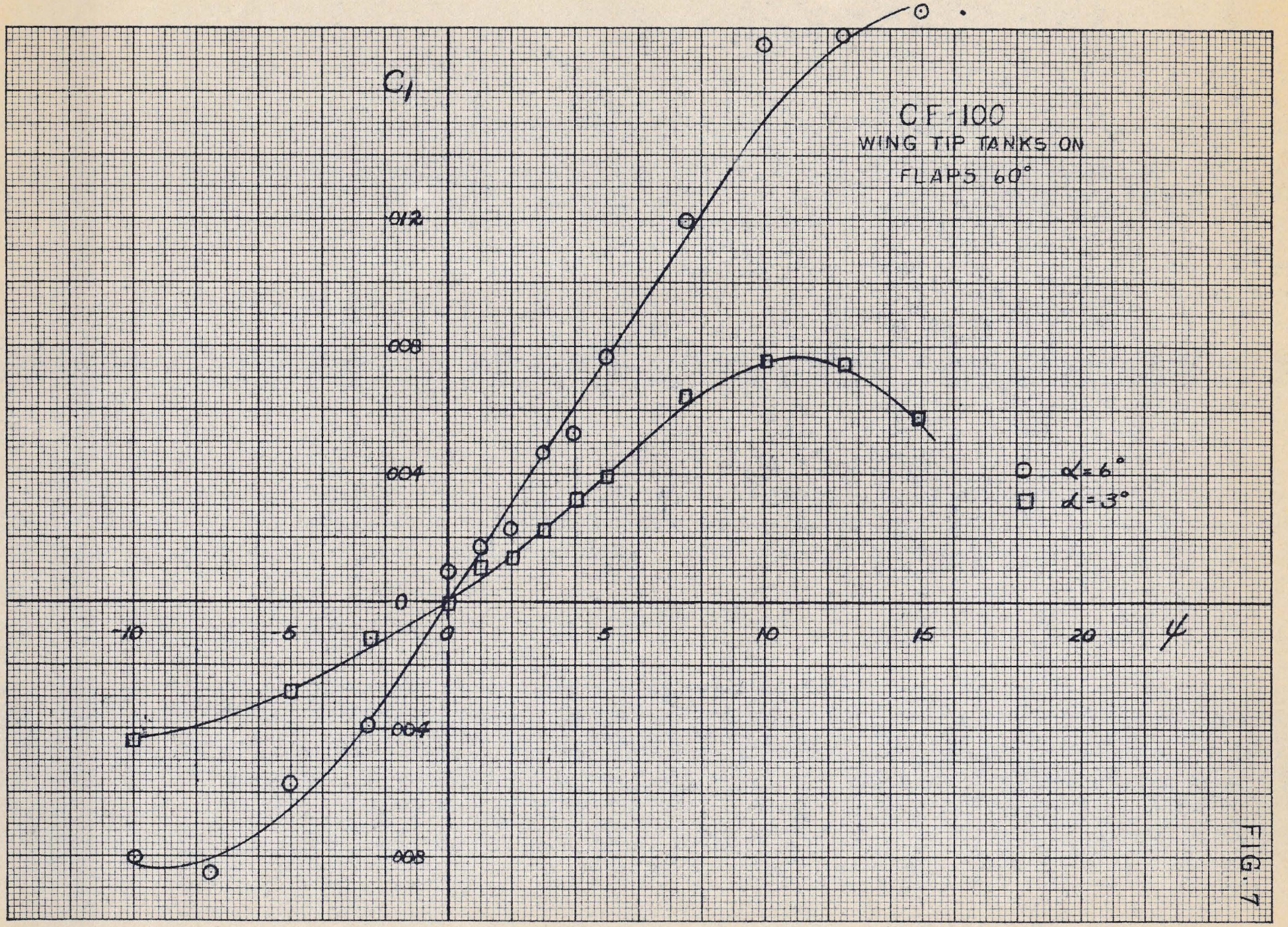


FIG. 7

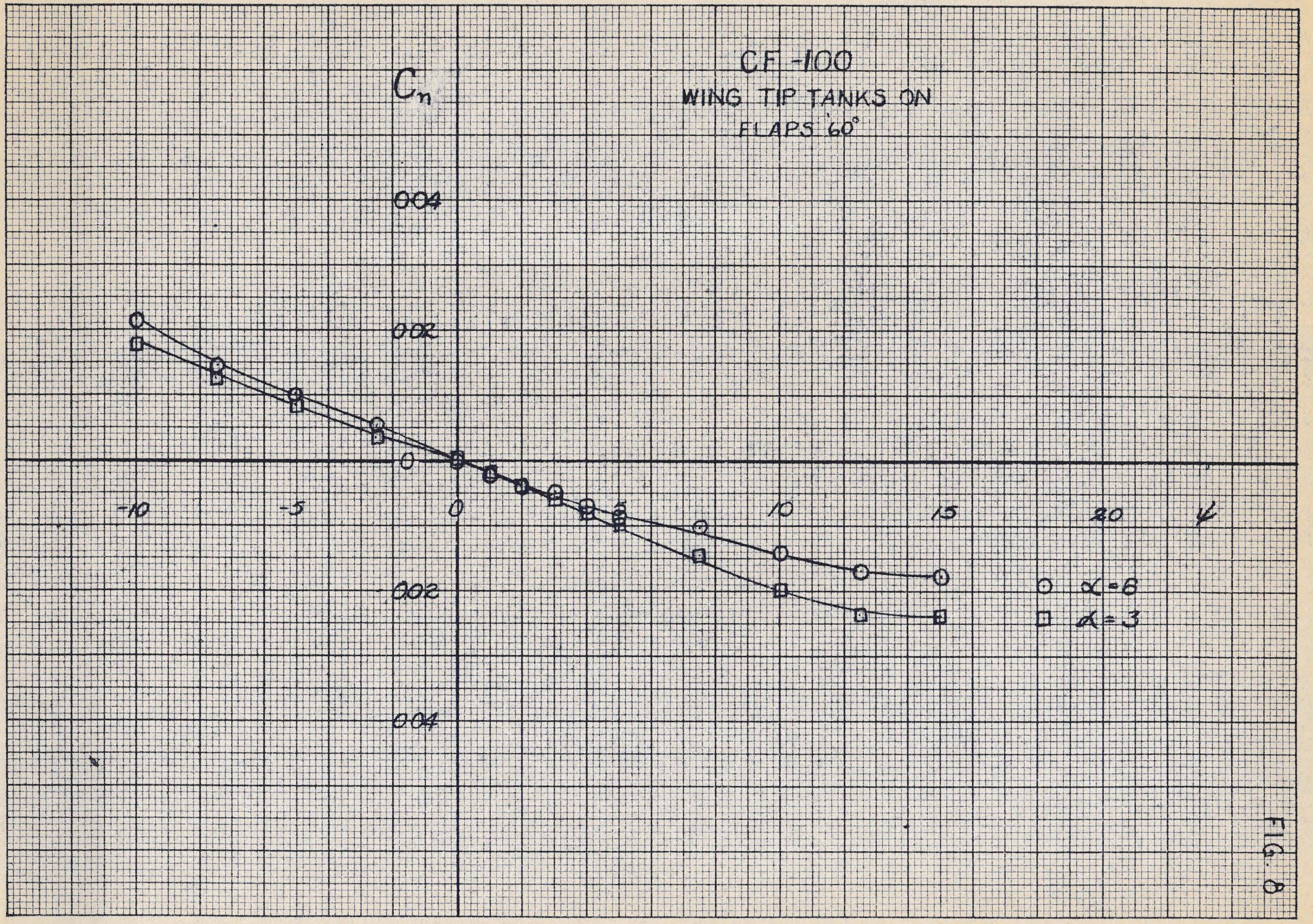


FIG. 8

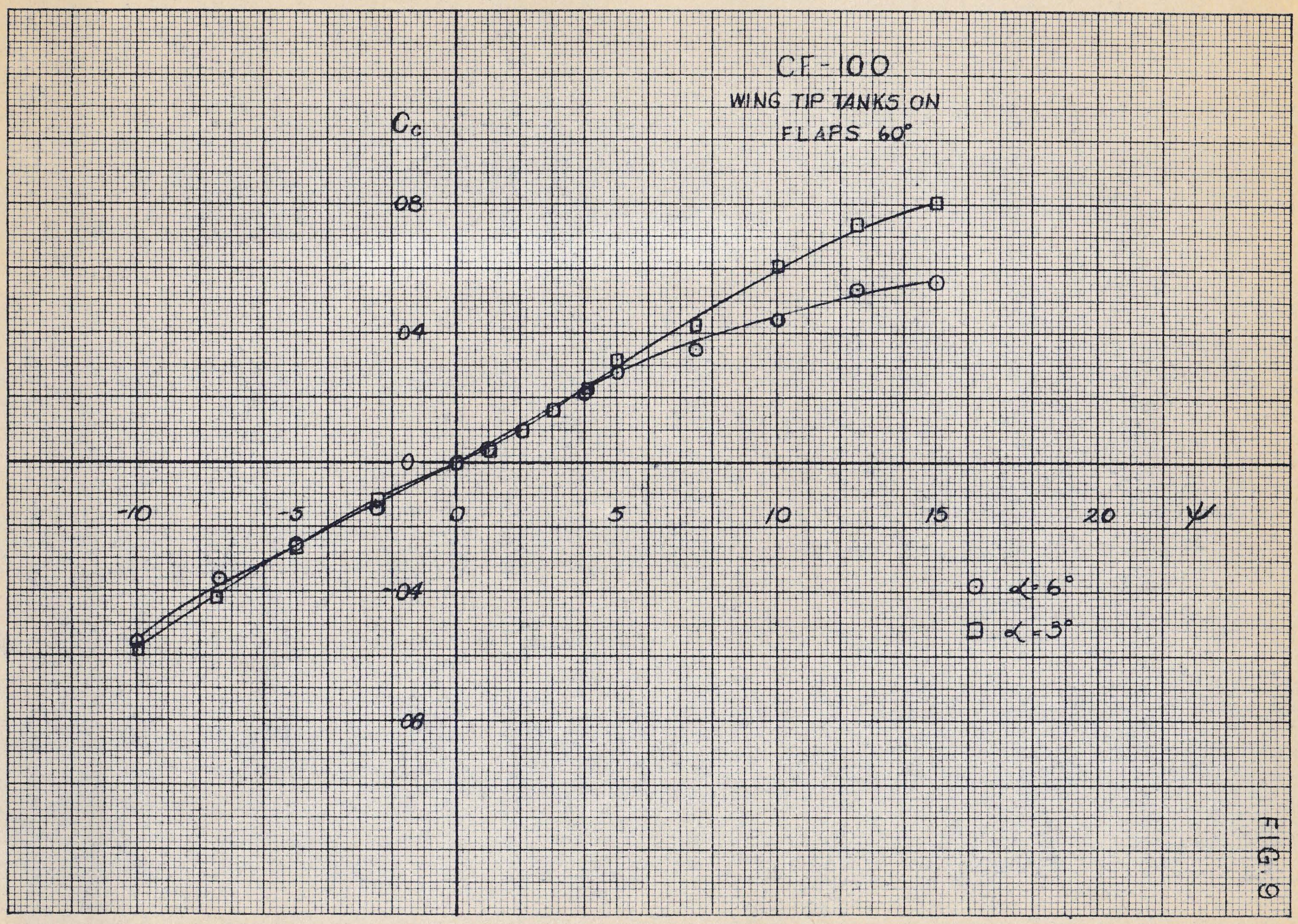

CF-100
WING TIP TANKS ON
FLAPS 60°
C_c
.08
.04
0
-.04
-.08
-10
-5
0
5
10
15
20
ψ
○ α = 6°
□ α = 3°

FIG. 9