

UNCLASSIFIED

AD NUMBER

ADA800634

CLASSIFICATION CHANGES

TO: unclassified

FROM: restricted

LIMITATION CHANGES

TO:  
Approved for public release; distribution is unlimited.

FROM:  
Distribution authorized to DoD only;  
Administrative/Operational Use; 10 JUN 1947.  
Other requests shall be referred to National  
Aeronautics and Space Administration,  
Washington, DC. Pre-dates formal DoD  
distribution statements. Treat as DoD only.

AUTHORITY

NACA Research Abstracts no. 57 dtd 27 Jan 1954;  
NASA TR Server website

THIS PAGE IS UNCLASSIFIED

# Reproduction Quality Notice

This document is part of the Air Technical Index [ATI] collection. The ATI collection is over 50 years old and was imaged from roll film. The collection has deteriorated over time and is in poor condition. DTIC has reproduced the best available copy utilizing the most current imaging technology. ATI documents that are partially legible have been included in the DTIC collection due to their historical value.

If you are dissatisfied with this document, please feel free to contact our Directorate of User Services at [703] 767-9066/9068 or DSN 427-9066/9068.

**Do Not Return This Document  
To DTIC**

Reproduced by  
**AIR DOCUMENTS DIVISION**



**HEADQUARTERS AIR MATERIEL COMMAND**  
**WRIGHT FIELD, DAYTON, OHIO**

*The*  
**U.S. GOVERNMENT**

**IS ABSOLVED**

**FROM ANY LITIGATION WHICH MAY  
ENSUE FROM THE CONTRACTORS IN-  
FRINGING ON THE FOREIGN PATENT  
RIGHTS WHICH MAY BE INVOLVED.**

**HEADQUARTERS AIR MATERIEL COMMAND**

**WRIGHT FIELD, DAYTON, OHIO**

REEL - C

3 4 0

A.T.I.

1 0 1 7 8

**RESTRICTED**

RESTRICTED

FM No. L7E13

**NACA**

ATI No. **10/78**

# RESEARCH MEMORANDUM

EFFECTS OF A FUSELAGE ON THE AERODYNAMIC CHARACTERISTICS OF  
A SWERTBACK WING AT REYNOLDS NUMBERS TO 8,000,000

By

Reino J. Salmi, D. William Conner  
and Robert R. Graham

Langley Memorial Aeronautical Laboratory  
Langley Field, Va.

ADVANCE COPY

MAY 18 1947

TRANSMITTED ON

AIR DOCUMENTS DIVISION, 12  
AND, WASHINGTON FIELD  
MICROFILM NO.  
R 6-390 10178

CLASSIFIED INFORMATION

This document contains classified information  
relating to the national defense of the United  
States which, in the event of the disclosure  
of its contents in any manner to an  
unauthorized person is prohibited by law.  
Information so classified may be released only  
to persons in the military and naval services of  
the United States, appropriate civilian officials,  
and employees of the Federal Government who  
have a legitimate interest therein, and in  
United States citizens of known loyalty and  
character who, in the interest of the national  
defense.

**NATIONAL ADVISORY COMMITTEE  
FOR AERONAUTICS**

WASHINGTON

RESTRICTED

RESTRICTED

NACA RM No. L7E13

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

RESEARCH MEMORANDUM

EFFECTS OF A FUSELAGE ON THE AERODYNAMIC CHARACTERISTICS OF  
A 42° SWEEPBACK WING AT REYNOLDS NUMBERS TO 8,000,000

By Reino J. Salmi, D. William Conner  
and Robert R. Graham

SUMMARY

The effects of a fuselage on the low speed aerodynamic characteristics of a sweptback wing were investigated in the Langley 19-foot pressure tunnel. Tests were made in pitch at Reynolds numbers of 3,040,000 and 8,090,000 and in yaw at Reynolds numbers of 1,720,000 and 5,300,000. The wing had an aspect ratio of 4, taper ratio of 0.625, 42° sweepback at the leading edge and NACA 64<sub>1</sub>-112 airfoil sections normal to the 0.273 chord line. A representative fuselage of circular cross section was tested with the wing mounted in the high-wing, low-wing, and midwing positions. Tests were made without flaps and with 18.4 percent chord split flaps extending from 12.3 to 50 percent of the semispan.

The presence of the fuselage had negligible effect on the values of maximum lift coefficient and the slope of the lift curve. The fuselage caused a destabilizing shift in the rate of change of pitching moment with lift. This effect remained fairly constant regardless of the vertical position of the wing on the fuselage except in the high lift range for the flaps off condition at a Reynolds number of 8,090,000, at which the effects caused by the high-wing and midwing fuselage combinations increased rapidly with lift.

The fuselage effects on the drag characteristic were small, and the vertical position of the wing had little effect except with the flaps on. The fuselage added increments to the effective dihedral and directional stability parameters,  $C_{l_y}$  and  $C_{y_y}$ , which were of the same magnitude as those observed for wings having little or no sweep. When the Reynolds number was reduced from 5,300,000 to 1,720,000, these increments in  $C_{l_y}$  had unsystematic variations at moderate and high lifts.

RESTRICTED

### INTRODUCTION

The use of sweptback wings as a means of reducing compressibility effects in flight at high subsonic and supersonic speeds, has presented problems in obtaining adequate stability and control at low speeds and high lifts for any such aircraft. Simple theory and wind-tunnel tests have shown that wings with high angles of sweepback may become longitudinally unstable at the stall and may also have undesirably large positive dihedral effects in the high lift range.

Considerable data is available on the effects of interference due to design components such as fuselage and nacelles, on the longitudinal and lateral stability characteristics of unswept wings, but little data is available on the effects of any such additional bodies on the aerodynamic characteristics of wings with high angles of sweepback. Accordingly, tests were conducted to determine the aerodynamic characteristics of a  $42^\circ$  sweptback wing mounted on a fuselage at high-wing, low-wing, and midwing positions. The tests were made with and without split flaps at Reynolds numbers of 3,040,000 and 8,090,000 for tests in pitch and 1,720,000 and 5,300,000 for tests in yaw. These data are presented together with corresponding wing alone data from reference 1.

### COEFFICIENTS AND SYMBOLS

The data are referred to a system of axes shown in figure 1. Moments are referred to the quarter-chord point of the mean aerodynamic chord and all coefficients are based on the area of the basic wing.

$C_L$	lift coefficient ( $lift/qS$ )
$C_D$	drag coefficient ( $D/qS$ )
$C_X$	longitudinal-force coefficient ( $X/qS$ )
$C_Y$	lateral-force coefficient ( $Y/qS$ )
$C_l$	rolling-moment coefficient ( $L/qSb$ )
$C_m$	pitching-moment coefficient ( $M/qSb$ )
$C_n$	yawing-moment coefficient ( $N/qSb$ )

R	Reynolds number ( $\rho V \delta / \mu$ )
$M_0$	free-stream Mach number ( $V/a$ )
$\alpha$	angle of attack measured in plane of symmetry, degrees
$\psi$	angle of yaw, positive when right wing is back, degrees
$C_{l\psi}$	rate of change of rolling-moment coefficient with angle of yaw, $\partial C_l / \partial \psi$ , per degree
$C_{n\psi}$	rate of change of yawing-moment coefficient with angle of yaw, $\partial C_n / \partial \psi$ , per degree
$C_{Y\psi}$	rate of change of lateral-force coefficient with angle of yaw, $\partial C_Y / \partial \psi$ , per degree
$\Delta C_{l\psi}$	increment in $C_{l\psi}$
$dC_m/dC_L$	rate of change of pitching-moment coefficient with lift coefficient
$dC_L/d\alpha$	rate of change of lift coefficient with angle of attack
Lift	$= -Z$
D	drag $= -X$ at zero yaw
X	longitudinal force
Y	lateral force
Z	vertical force
M	pitching moment
L	rolling moment
N	yawing moment
S	wing area
b	wing span
$\bar{c}$	mean aerodynamic chord measured parallel to plane of symmetry $\left( \frac{2}{S} \int_0^{h/2} c^2 dy \right)$

h	
c	local chord, parallel to plane of symmetry
y	spanwise coordinate
q	free-stream dynamic pressure ( $\frac{1}{2}\rho V^2$ )
V	free-stream velocity
$\rho$	mass density of air
$\mu$	coefficient of viscosity
a	velocity of sound

## APPARATUS AND TESTS

## Model

The wing and fuselage (fig. 2) were constructed of laminated mahogany, lacquered and sanded to an aerodynamically smooth finish. The wing has a sweepback angle of  $42.05^\circ$  along the leading edge and has NACA 64<sub>1</sub>-112 sections normal to the 0.273 chord line. The 0.273 chord line of the swept wing, is the quarter-chord line of a straight wing panel which has been rotated  $40^\circ$  about the quarter-chord point of the root chord. The aspect ratio is 4, taper ratio 0.625 and the tips are rounded in plan form and cross section beginning at 97.5 percent of the semispan. There is no geometric dihedral or twist.

The fuselage is circular in cross section and tapers to a point at each end. The maximum diameter, which is constant at the wing intersection, is equal to 40 percent of the wing chord (measured at the plane of symmetry), and the finess ratio is 10.2. The center portion of the fuselage has removable blocks to permit the mounting of the wing at high-wing, low-wing, and midwing positions with  $2^\circ$  incidence between the wing chord plane and the fuselage center line. No fillets were used at the wing-fuselage juncture for any wing position.

The split flaps were fabricated of sheet steel and extended from 12.3 to 50 percent of the wing semispan. The center gap was maintained to facilitate flap deflection. The flap chord is 18.4 percent of the local wing chord. The flap deflection measured from the lower surface of the wing and in a plane normal to the hinge line is  $60^\circ$ .

### Tests

The model was tested in the Langley 19-foot pressure tunnel and was mounted on a two-support system for the pitch tests (figs. 3(a) and 3(b)) and on a single support for the yaw tests (fig. 3(c)). In the low-wing fuselage combination the top of the yaw support was shielded by the same fairing used for the wing alone tests (reported in reference 1). The pitch tests were made at Reynolds number values of 3,000,000 ( $M_0 = 0.069$ ) and 8,090,000 ( $M_0 = 0.190$ ). The tests were made with and without split flaps. Stall characteristics were studied by means of wool tufts attached to the upper surface of the wing beginning at 20 percent of the wing chord. The lateral stability parameters were obtained from tests through an angle-of-attack range of yaw angles of  $0^\circ$  and  $\pm 5^\circ$ , at Reynolds number values of 1,720,000 ( $M_0 = 0.10$ ) and 5,300,000 ( $M_0 = 0.12$ ). Tests through a yaw range of  $-10^\circ$  to  $25^\circ$  angle of yaw were made with flaps off at  $15^\circ$  angle of attack and with flaps on at  $14.2^\circ$  angle of attack at a Reynolds number of 5,300,000.

### CORRECTIONS TO DATA

The same corrections applied to the fuselage-off data of reference 1 and discussed therein, have been applied to the fuselage-on data. These corrections account for model support and interference effects, model blocking and jet boundary effects. No jet boundary corrections were applied to the rolling-moment, yawing-moment and lateral-force coefficients.

### RESULTS AND DISCUSSION

#### Aerodynamic Characteristics in Pitch

The lift, drag, and pitching-moment characteristics of the wing mounted on a fuselage at the high-wing, low-wing, and midwing positions and of the wing alone, with and without flaps, are presented in figures 4 to 7. The variation of  $dC_m/dC_L$  with lift coefficient is shown in figure 8.

Lift and stalling characteristics.— Figures 4(a) and 5(a) show that at a Reynolds number of 8,090,000, the presence of the fuselage had very little effect on the maximum lift coefficient and the slope of the lift curve. The Reynolds number of the data for the wing

alone with flaps on is 6,080,000; but, the tests of reference 1 show that in the range of Reynolds numbers from 6,080,000 to 8,090,000 there is negligible scale effect on the aerodynamic characteristics of the wing. Figure 6(a) shows that at a Reynolds number of 3,040,000, the fuselage effects were also negligible. No data were obtained at the lower Reynolds number for the wing alone with flaps on. Visual observations of wool tufts attached to the upper surface of the wing showed that the presence of the fuselage had no effects on the stalling characteristics of the wing except for a small rough area at the wing-fuselage juncture of the low-wing combination. The fuselage effects may differ considerably when the air flow over the wing is changed by devices such as leading-edge flaps.

Pitching-moment characteristics.— Figures 4(a) and 5(a) show that at a Reynolds number of 8,090,000 and at a  $C_L$  of 0.1 the presence of the fuselage displaced the pitching-moment curves of the wing by increments in  $C_m$  varying from  $-0.006$  to  $-0.013$  with flaps off and  $-0.021$  to  $-0.027$  with flaps on for the high-wing to low-wing fuselage combination, respectively. Figure 3 shows that the fuselage produced a positive change in  $dC_m/dC_L$  of about 0.02 with flaps off and 0.03 with flaps on at a Reynolds number of 8,090,000 except in the range of lift coefficients above 0.8 for the flaps off condition, where the midwing and high-wing fuselage combinations caused rapidly increasing values of  $dC_m/dC_L$  with  $C_L$ . The pitching-moment curves of figures 6 and 7 show that the increments in  $dC_m/dC_L$  at a Reynolds number of 3,040,000, were of approximately the same magnitude as those in the low lift range at the higher Reynolds number.

Drag characteristics.— The results indicate that the effects of fuselage position on the drag characteristics are small for the wing without flaps but were appreciable when the split flaps were on. The drag of the plain wing without flaps was increased about 0.0040 throughout the lift range for all wing-fuselage combinations. With flaps on the increment in drag due to the fuselage in the low-wing combination was about the same as with flaps off, but in the midwing combination it was zero and in the high-wing combination it was negative. There was no appreciable scale effect on the increments in drag.

#### Aerodynamic Characteristics in Yaw

The lateral stability parameters  $C_{Y\dot{\psi}}$ ,  $C_{N\dot{\psi}}$ , and  $C_{Y\dot{\psi}}$  are presented in figures 9 and 10 as functions of lift coefficient for the three wing-fuselage combinations and the wing alone, with

and without split flaps. Increments in  $C_{L\psi}$  due to changes in the vertical location of the fuselage are given in figure 11. The aerodynamic characteristics through a yaw range at a constant angle of attack near maximum lift are presented in figures 12 and 13.

**Effective dihedral parameter.**— Figure 11 shows that at a Reynolds number of 5,300,000 and with the flaps off, the presence of the fuselage in the midwing combination caused no change in the effective dihedral parameter  $C_{L\psi}$  at zero lift, but that the high-wing and low-wing positions added increments in  $C_{L\psi}$  equal to 0.00065 and -0.00065, respectively. The increments in  $C_{L\psi}$  due to the fuselage decreased linearly with increasing lift coefficient up to values of lift coefficient of about 0.7. With the flaps on, the high-wing and low-wing positions produced almost constant increments in  $C_{L\psi}$  through the lift range, equal to about 0.00050 and -0.00030, respectively, and the midwing position had no effect.

The increments in  $C_{L\psi}$  produced by the various wing positions, tend to become irregular in the high lift range due to the unsteady conditions associated with initial separation over the wing tips. A comparison of this data with corresponding data from reference 2 shows that the increments in  $C_{L\psi}$  produced by the fuselage for various vertical locations of the  $42^\circ$  sweptback wing are approximately of the same order as have been measured on wings having little or no sweep.

Reducing the Reynolds number from 5,300,000 to 1,720,000 caused the increments in  $C_{L\psi}$  to be shifted in a positive direction at low lifts with flaps off, for the high-wing and low-wing combinations, but did not affect  $\Delta C_{L\psi}$  at zero lift for the midwing combination. With flaps on, the high-wing and low-wing positions had values of  $\Delta C_{L\psi}$  approximately equal to those at the higher Reynolds number while the midwing position had a more negative value. All combinations showed unsystematic variation of  $\Delta C_{L\psi}$  at moderate and high lifts.

Figures 9 and 10 show that the scale effect on  $C_{L\psi}$  with the fuselage on is the same as was noted in reference 1; in that, reducing the Reynolds number from 5,300,000 to 1,720,000, considerably reduced the linear range of the variation of  $C_{L\psi}$  with  $C_L$ .

Directional stability parameters.— The effect of the fuselage on directional stability parameter  $C_{Y\dot{\psi}}$  of the wing alone is indicated by the almost constant unstable increment through the lift range as shown in figures 9 and 10. Varying the vertical location of the wing had little effect on the magnitude of the increment in  $C_{Y\dot{\psi}}$ , although it may be observed that the midwing position caused the smallest increment in  $C_{Y\dot{\psi}}$ , with and without flaps. There was no Reynolds number effect on the increment in  $C_{Y\dot{\psi}}$  in the range of lift coefficient up to the beginning of the wing stall.

Characteristics through a yaw range.— The tests at high angles of attack through an extended yaw range (figs. 12 and 13) reveal that the fuselage interference effects at small yaw angles continued with little change to the highest angle of yaw tested. The reversals in  $C_n$  at high angles of yaw that appeared in the wing alone tests of reference 1 were also evident with the fuselage on. The fuselage effected a constant positive increment in  $C_{Y\dot{\psi}}$  which had a maximum value of 0.0025 for the wing in the midposition.

SUMMARY OF RESULTS

The principal results from an investigation of the effects of a fuselage on a  $42^\circ$  sweptback wing are as follows:

1. The presence of the fuselage had negligible effect on the values of maximum lift coefficient and the slope of the lift curve.
2. The fuselage caused a destabilizing shift in the rate of change of pitching moment with lift. This effect remained fairly constant regardless of the vertical position of the wing on the fuselage except for the effects caused by the high-wing and midwing fuselage combinations increased rapidly with lift.
3. The effects of fuselage position on the drag characteristics were small for the wing without flaps but were appreciable when the split flaps were on.
4. The fuselage added increments to the effective dihedral and directional stability parameters,  $C_{L\dot{\psi}}$  and  $C_{Y\dot{\psi}}$ , which were of the same magnitude as observed for wings having little or no sweep.

5. When the Reynolds number was reduced from 5,300,000 to 1,720,000, the increments in  $C_{L\alpha}$  had unsystematic variations at moderate and high lifts.

Langley Memorial Aeronautical Laboratory  
National Advisory Committee for Aeronautics  
Langley Field, Va.

*Reino J. Salmi*  
Reino J. Salmi  
Aeronautical Engineer

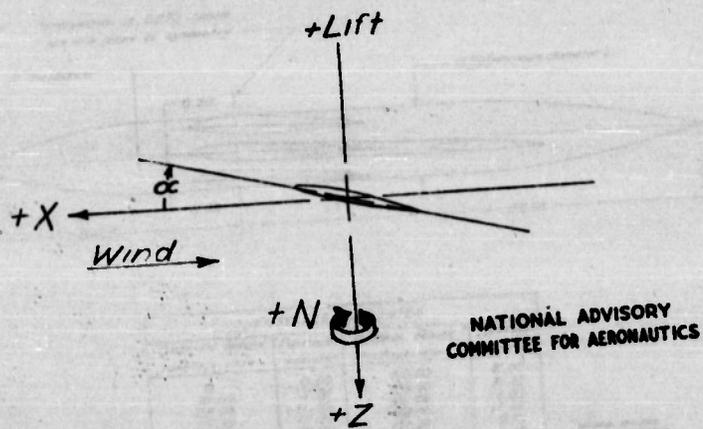
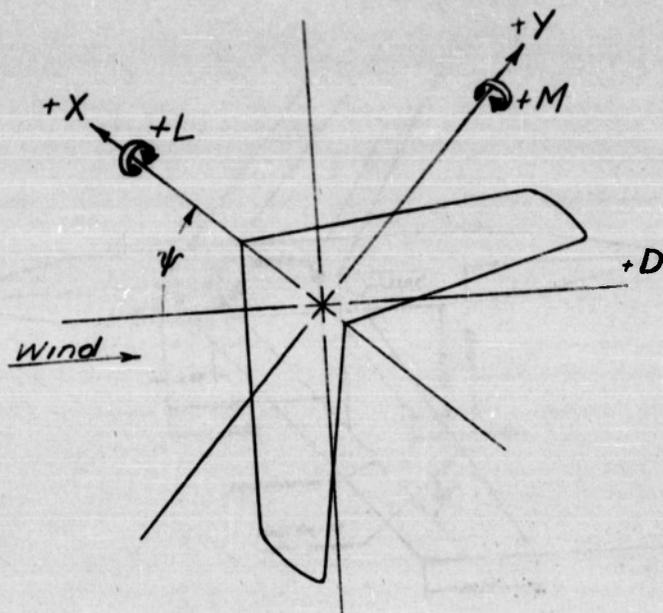
*D. William Conner*  
D. William Conner  
Mechanical Engineer

*Robert R. Graham*  
Robert R. Graham  
Aeronautical Engineer

Approved: *Clinton H. Dearborn*  
Clinton H. Dearborn  
Chief of Full-Scale Research Division

## REFERENCES

1. Neely, Robert H. and Conner, D. William: Aerodynamic Characteristics of a  $42^\circ$  Sweptback Wing with Aspect Ratio 4 and NACA 64<sub>1</sub>-112 Sections at Reynolds Numbers from 1,700,000 to 9,500,000. NACA RM No. L7D14, 1947.
2. House, Rufus O. and Wallace, Arthur R.: Wind-Tunnel Investigation of Effect of Interference on Lateral-Stability Characteristics of Four NACA 23012 Wings, an Elliptical and a Circular Fuselage, and Vertical Fins. NACA Rep. No. 705, 1941.



NATIONAL ADVISORY  
COMMITTEE FOR AERONAUTICS

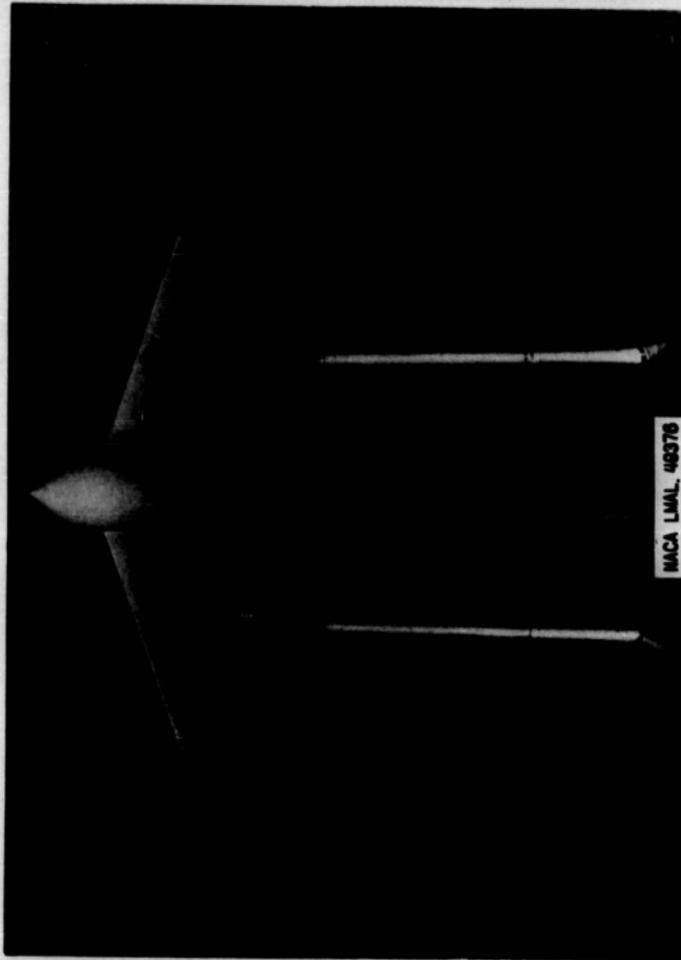
Figure 1.- System of axes used.



2125

NACA RM No. L7E13

13



(a) High-wing fuselage combination on pitch supports.

Figure 3.- The 42° sweptback wing and fuselage mounted for testing in the Langley 19-foot pressure tunnel.

Fig. 3a

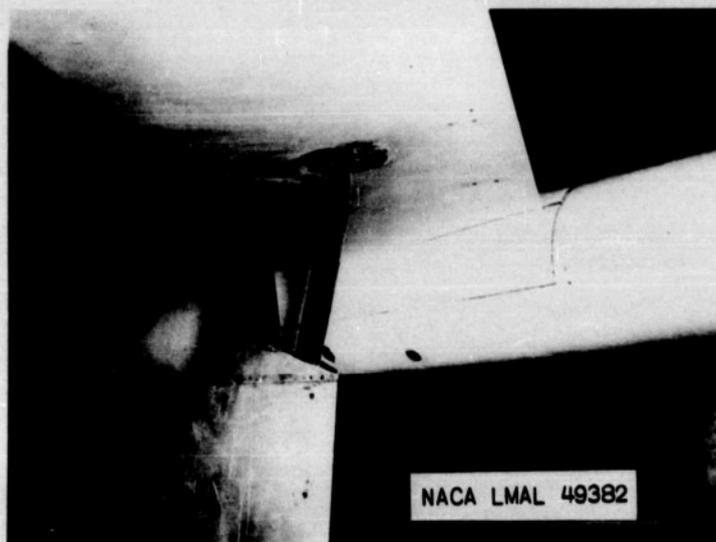
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS  
LANGLEY MEMORIAL AERONAUTICAL LABORATORY - LANGLEY FIELD, VA.

5  
4  
3  
2  
1

14

NACA RM No. L7E13

Fig. 3b



(b) Pitch support details.

Figure 3.- Continued.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS  
LANGLEY MEMORIAL AERONAUTICAL LABORATORY - LANGLEY FIELD, VA

3  
2  
2

NACA RM No. L7E13

15  
Fig. 3c



(c) Low-wing fuselage combination on yaw support.

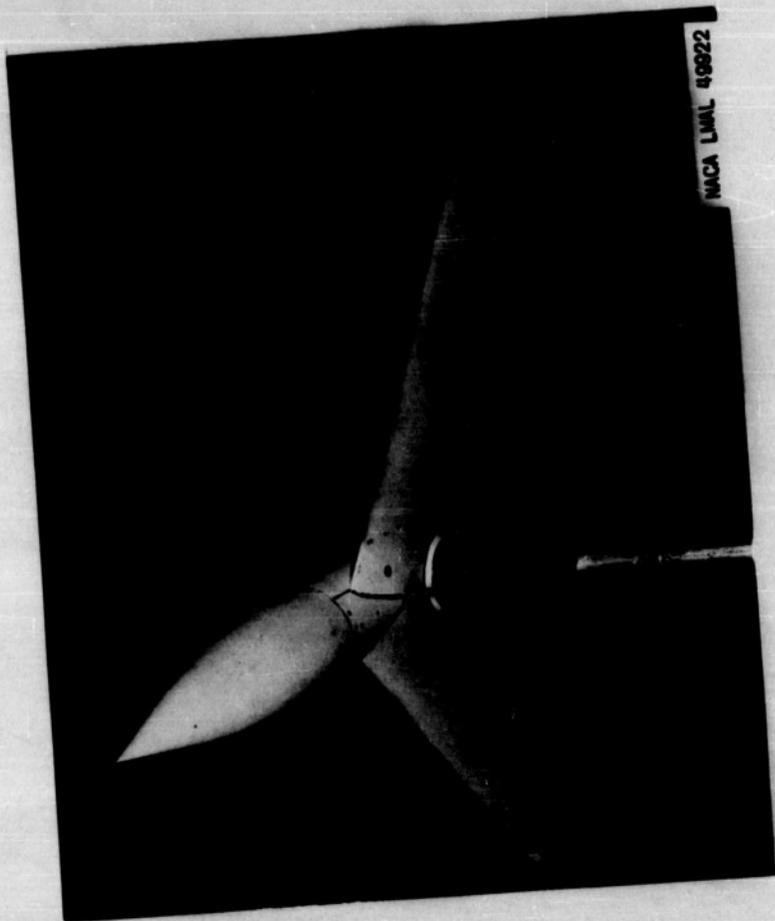
Figure 3.- Concluded.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS  
LANGLEY MEMORIAL AERONAUTICAL LABORATORY - HAMBLEY FIELD, VA.

7  
9  
4  
4

NACA RM No. L7E13

15  
Fig. 3c



(c) Low-wing fuselage combination on yaw support.

Figure 3.- Concluded.

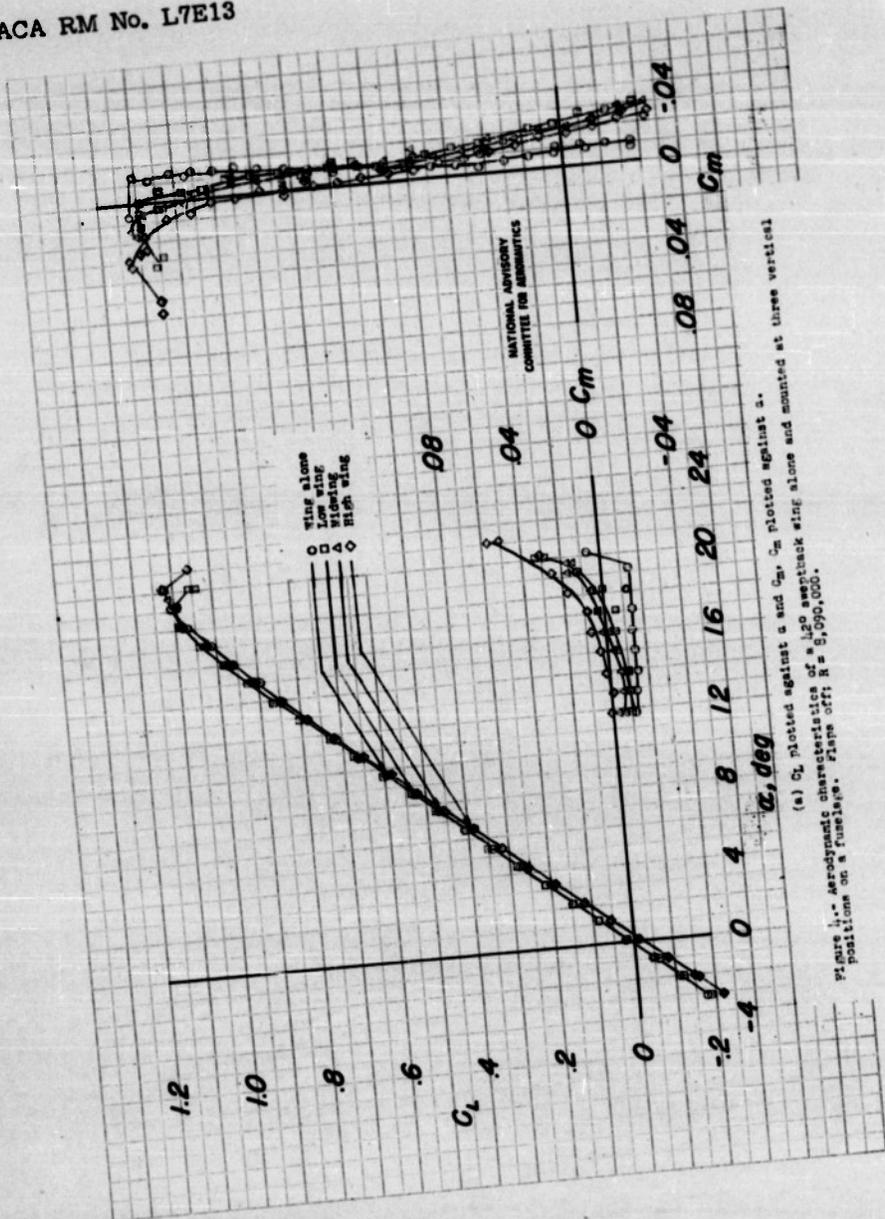
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS  
LANGLEY MEMORIAL AERONAUTICAL LABORATORY - LANGLEY FIELD, VA.

2125

NACA RM No. L7E13

16

Fig. 4a



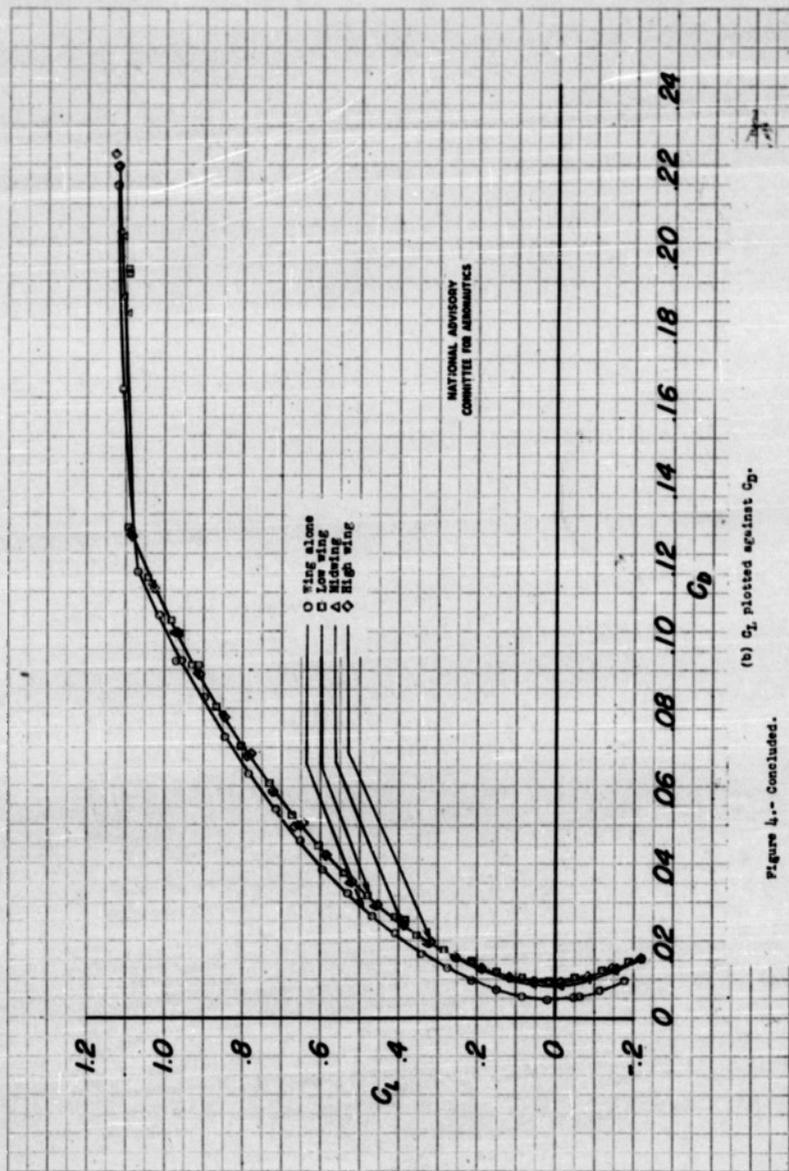
(a)  $C_L$  plotted against  $\alpha$  and  $C_m$ ,  $C_m$  plotted against  $C_L$ .  
 Figure 4.- Aerodynamic characteristics of a 130 sweepback wing alone and mounted at three vertical positions on a fuselage. Flap off;  $R = 8,000,000$ .

NATIONAL ADVISORY  
 COMMITTEE FOR AERONAUTICS

225

17

Fig. 4b



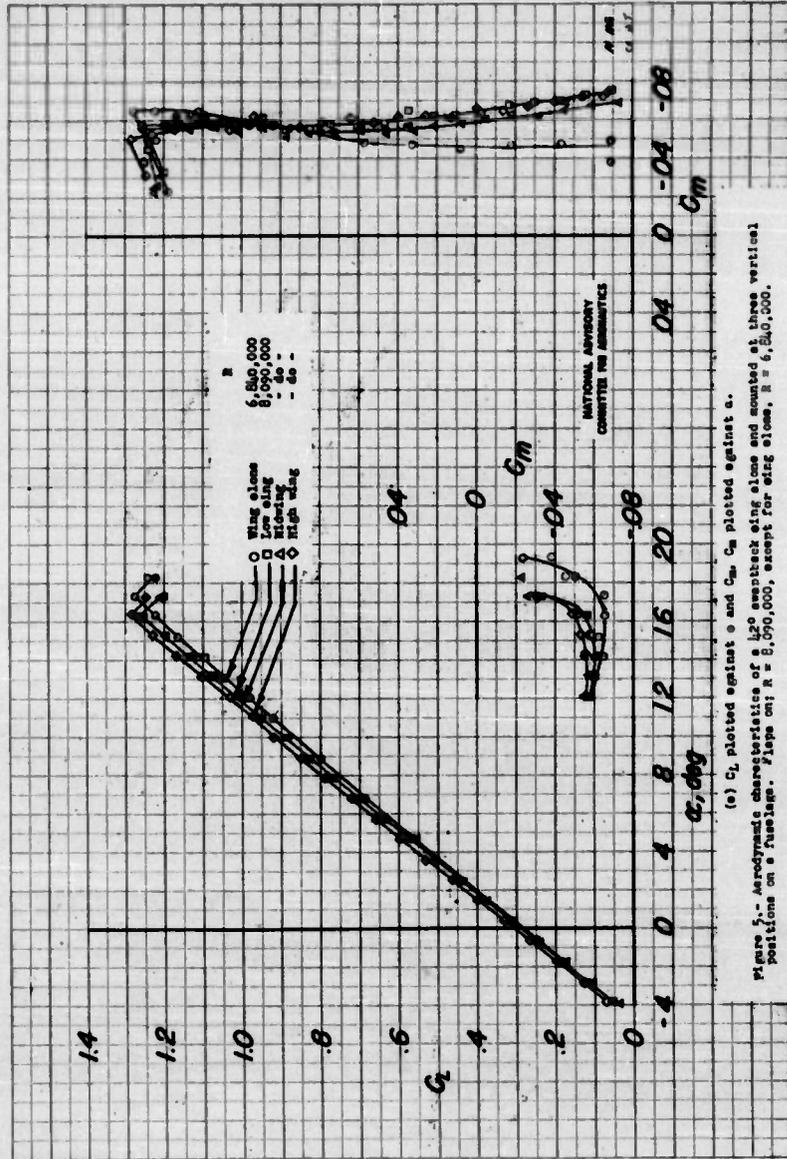
(b)  $C_L$  plotted against  $C_D$ .

Figure 4.- Concluded.

21250

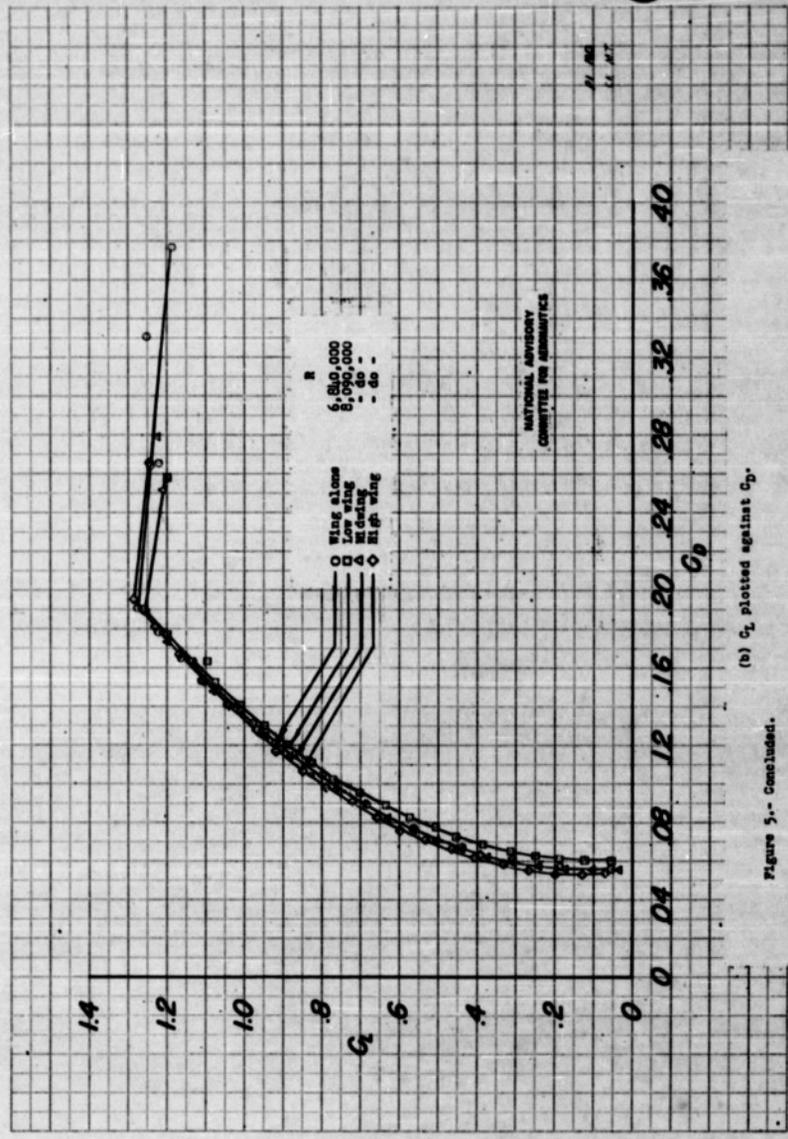
18

Fig. 5a



(e)  $C_L$  plotted against  $\alpha$  and  $C_m$ ,  $C_m$  plotted against  $\alpha$ .  
 Figure 5.- Aerodynamic characteristics of a flap on a fuselage. Flaps on: R = 6,500,000, except for wing alone, R = 6,000,000.

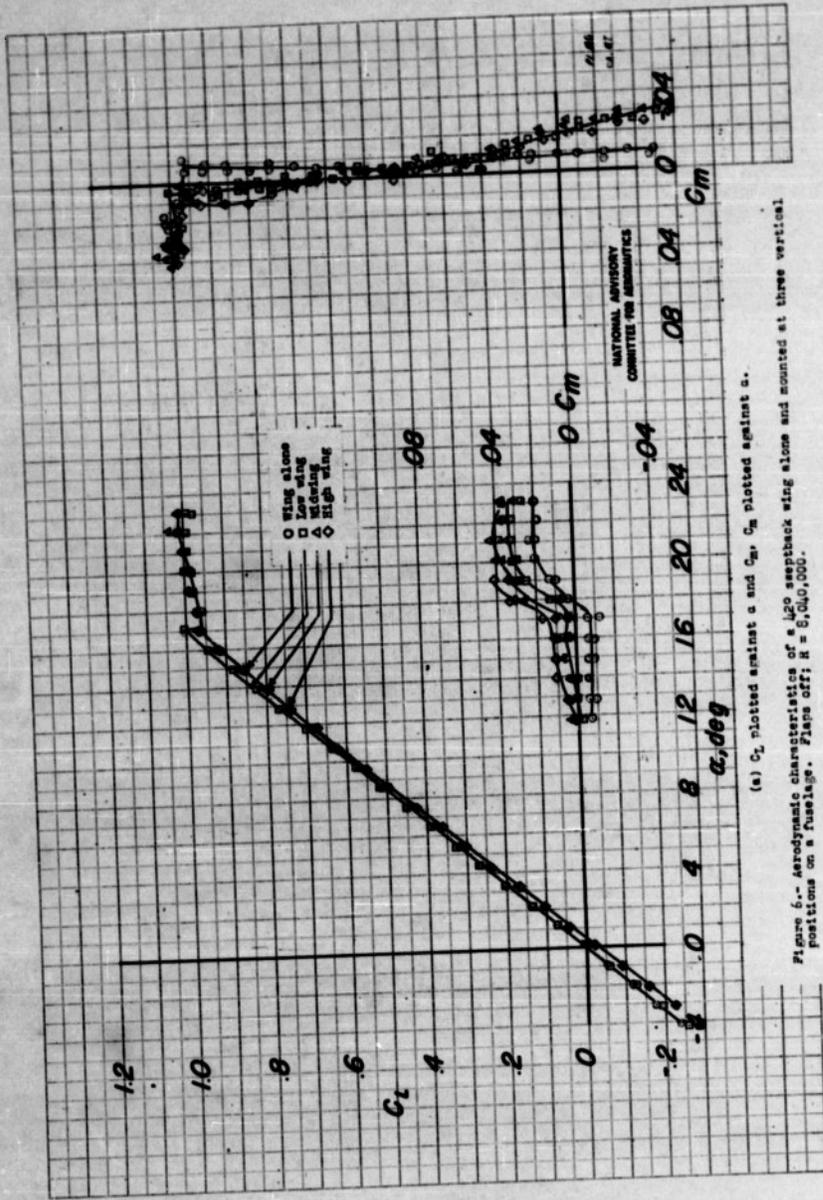
2125



(b)  $C_L$  plotted against  $C_D$ .

Figure 5.- Concluded.

2125



(a)  $C_L$  plotted against  $\alpha$  and  $C_m$ ,  $C_m$  plotted against  $\alpha$ .  
 Figure 6.- Aerodynamic characteristics of a 1/20 sweepback wing alone and mounted at three vertical positions on a fuselage. Flaps off;  $M = 0.040,000$ .

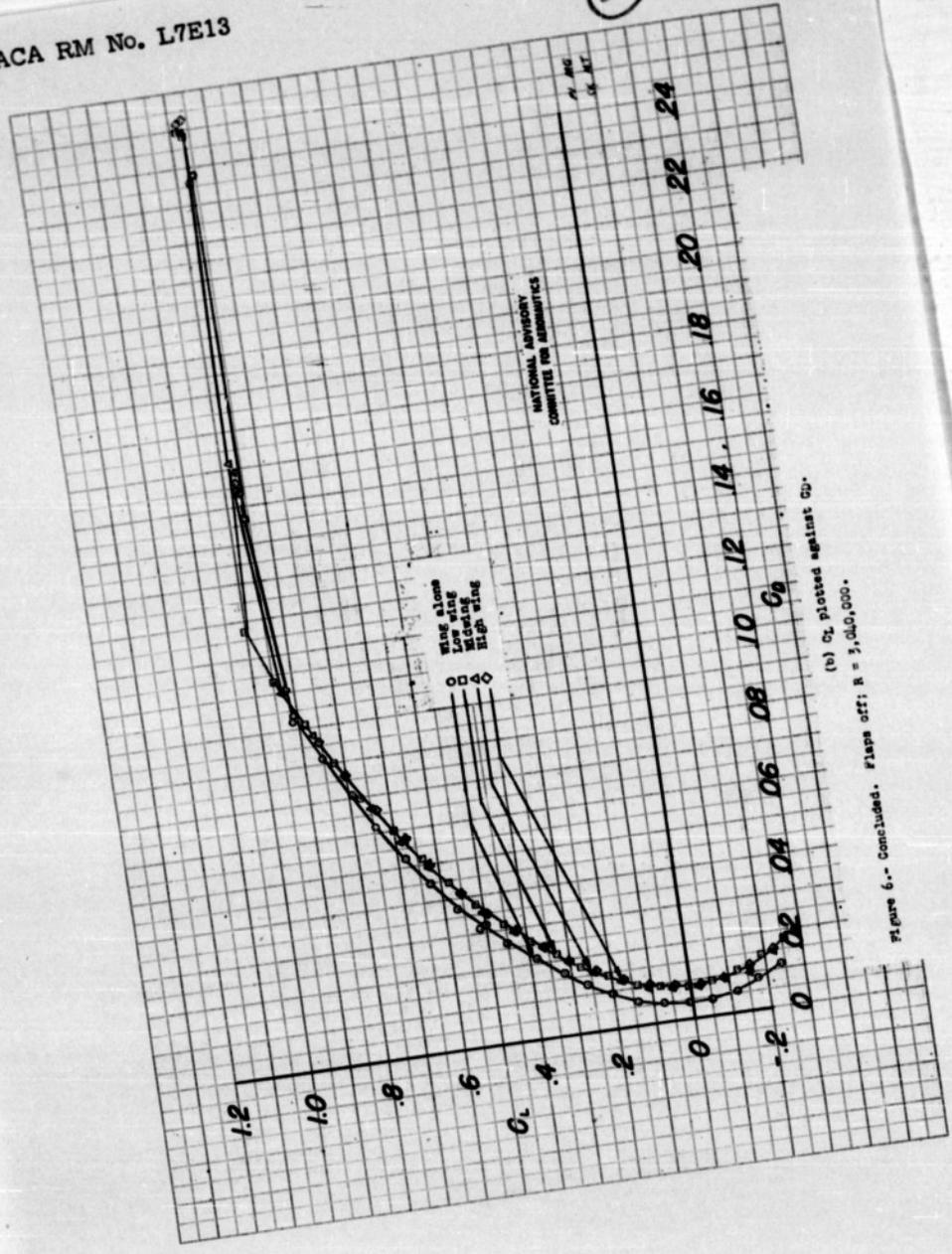
2125



NACA RM No. L7E13

(21)

Fig. 6b

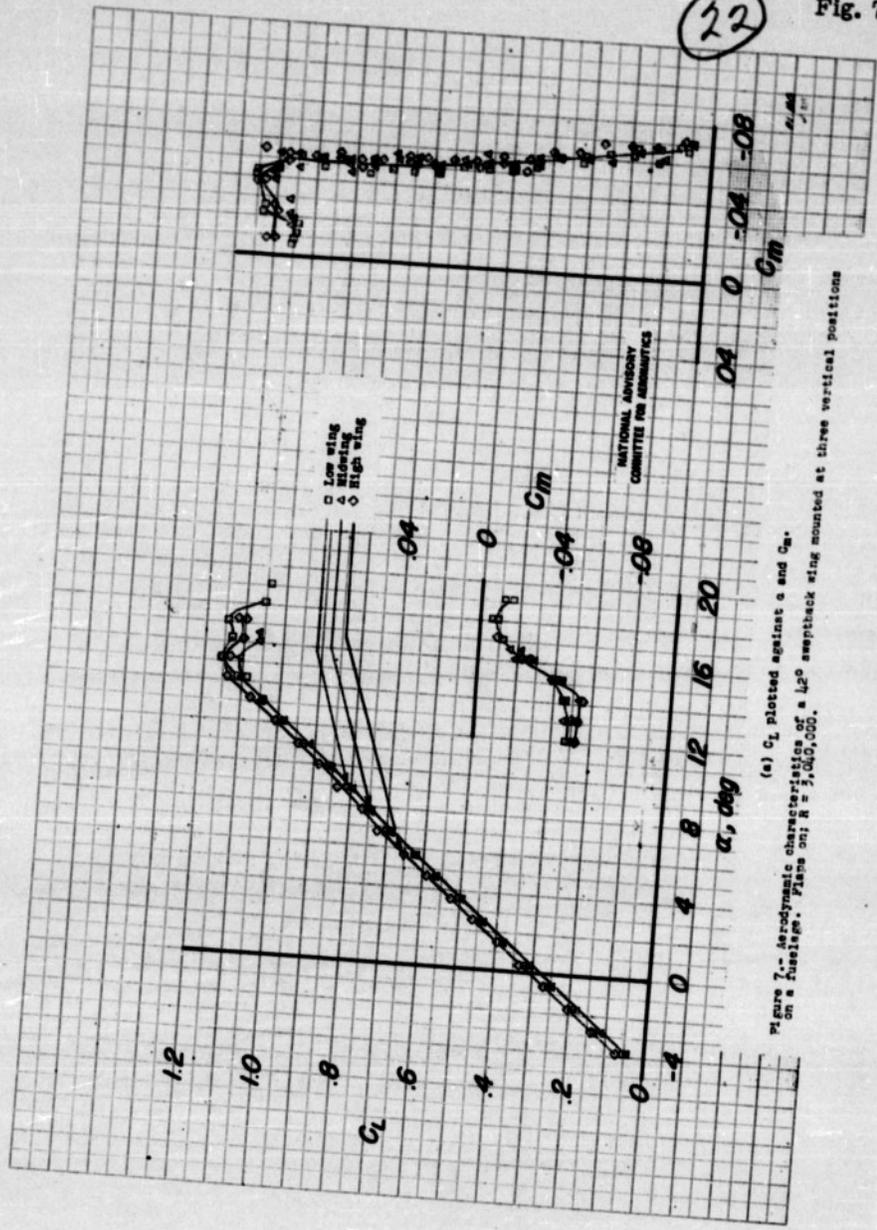


(b)  $C_L$  plotted against  $C_D$ .  
(c)  $C_D$  plotted against  $C_L$ .  
Figure 6.- Concluded. Flaps off;  $R = 3,000,000$ .

2252

22

Fig. 7a



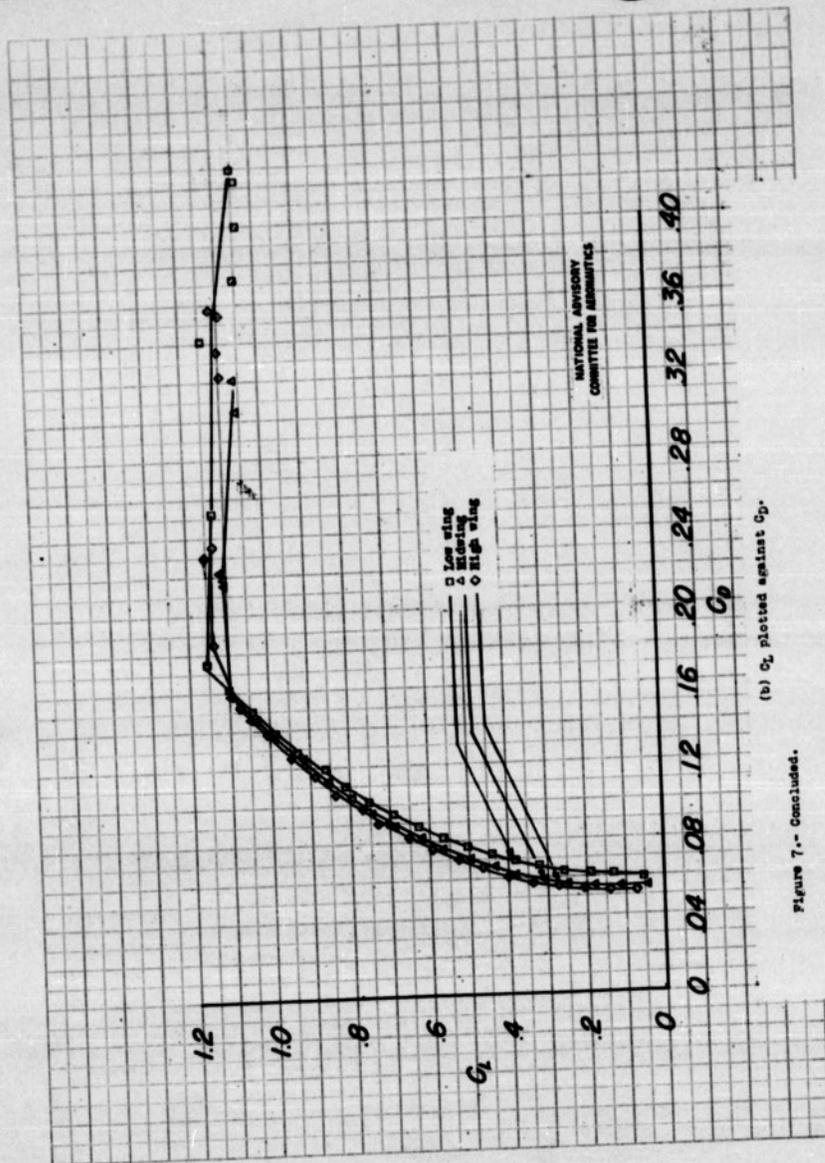
(a)  $C_L$  plotted against  $\alpha$  and  $C_m$ .  
 Figure 7.- Aerodynamic characteristics of a  $1/2^\circ$  sweptback wing mounted at three vertical positions on a fuselage. Flaps set;  $M = 2,000,000$ .

235

NACA RM No. L7E13

23

Fig. 7b

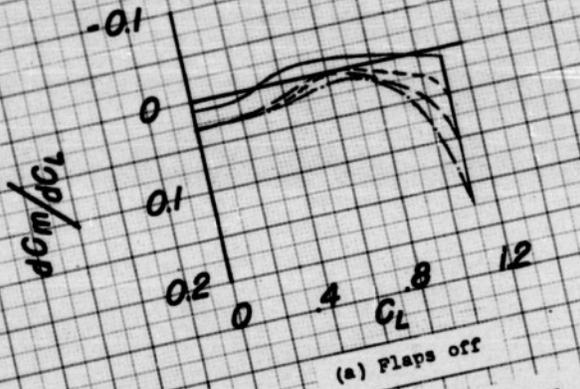


NATIONAL ADVISORY  
COMMITTEE FOR AERONAUTICS

(b)  $C_L$  plotted against  $\alpha$ .

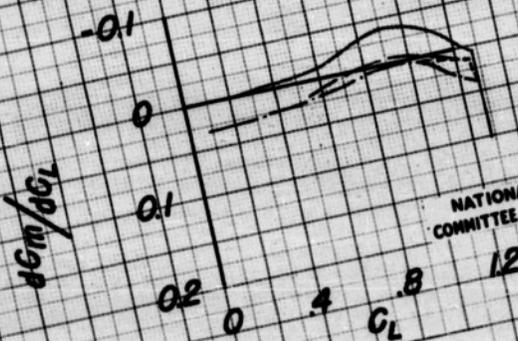
Figure 7.- Concluded.

24



(a) Flaps off

- Wing alone
- - - Low wing
- · - Midwing
- - - High wing



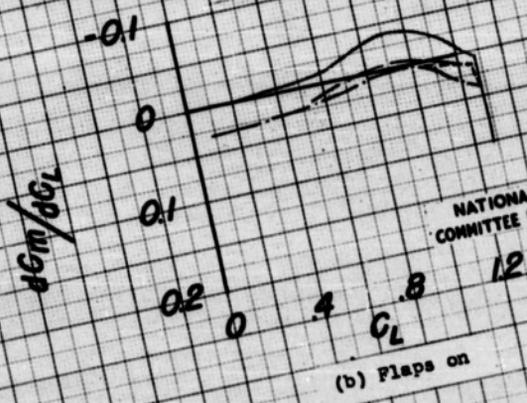
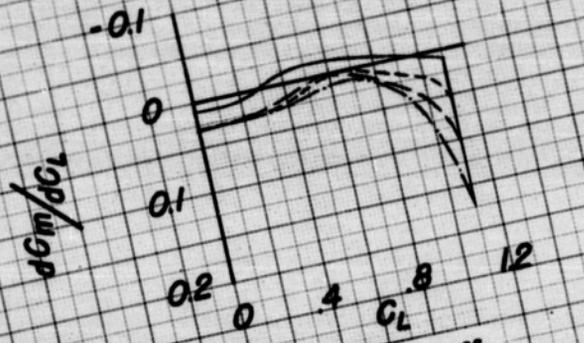
(b) Flaps on

NATIONAL ADVISORY  
COMMITTEE FOR AERONAUTICS

Figure 8.- Variation of  $dC_m/dC_L$  with  $C_L$  for a 420 sweptback wing alone and mounted at three vertical positions on a fuselage.  $R = 8,090,000$ .



24



NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

Figure 8.- Variation of  $dC_m/dC_L$  with  $C_L$  for a 420 sweptback wing alone and mounted at three vertical positions on a fuselage.  $R = 8,090,000$ .

25

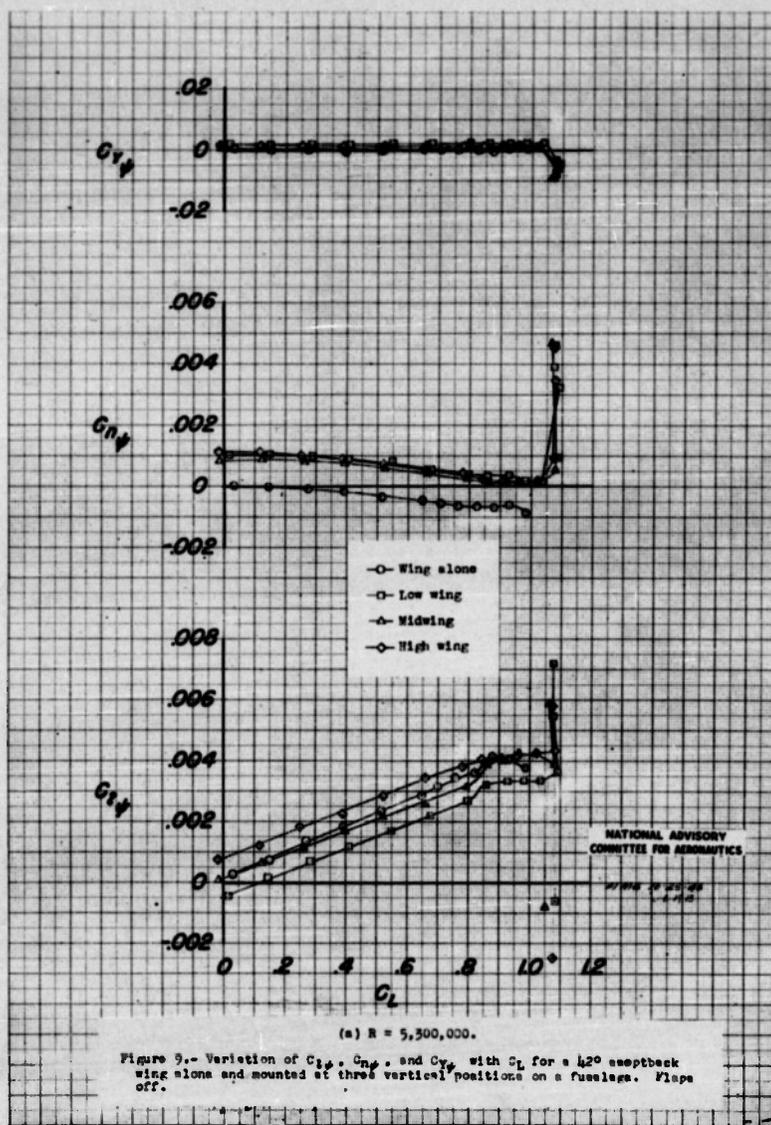


Figure 9.- Variation of  $C_x$ ,  $C_y$ , and  $C_z$  with  $C_L$  for a 42° sweptback wing alone and mounted at three vertical positions on a fuselage. Flaps off.

0  
1  
2  
3  
4

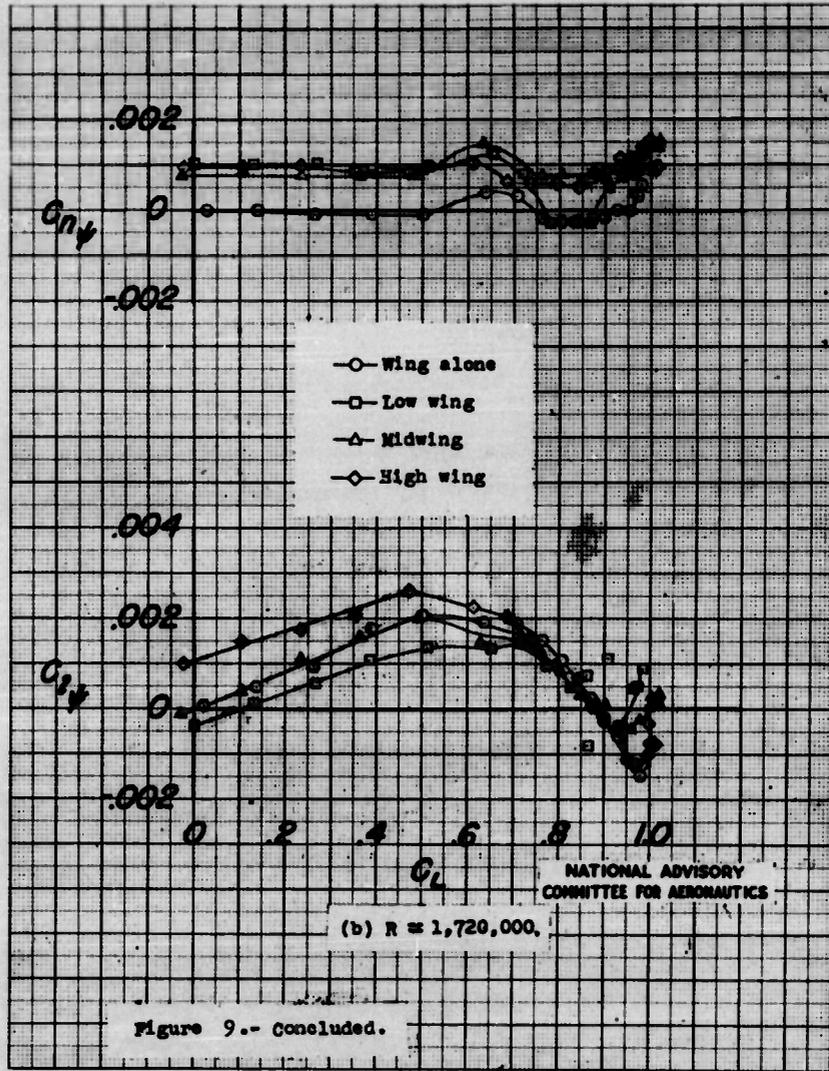


Figure 9.- Concluded.

27

27

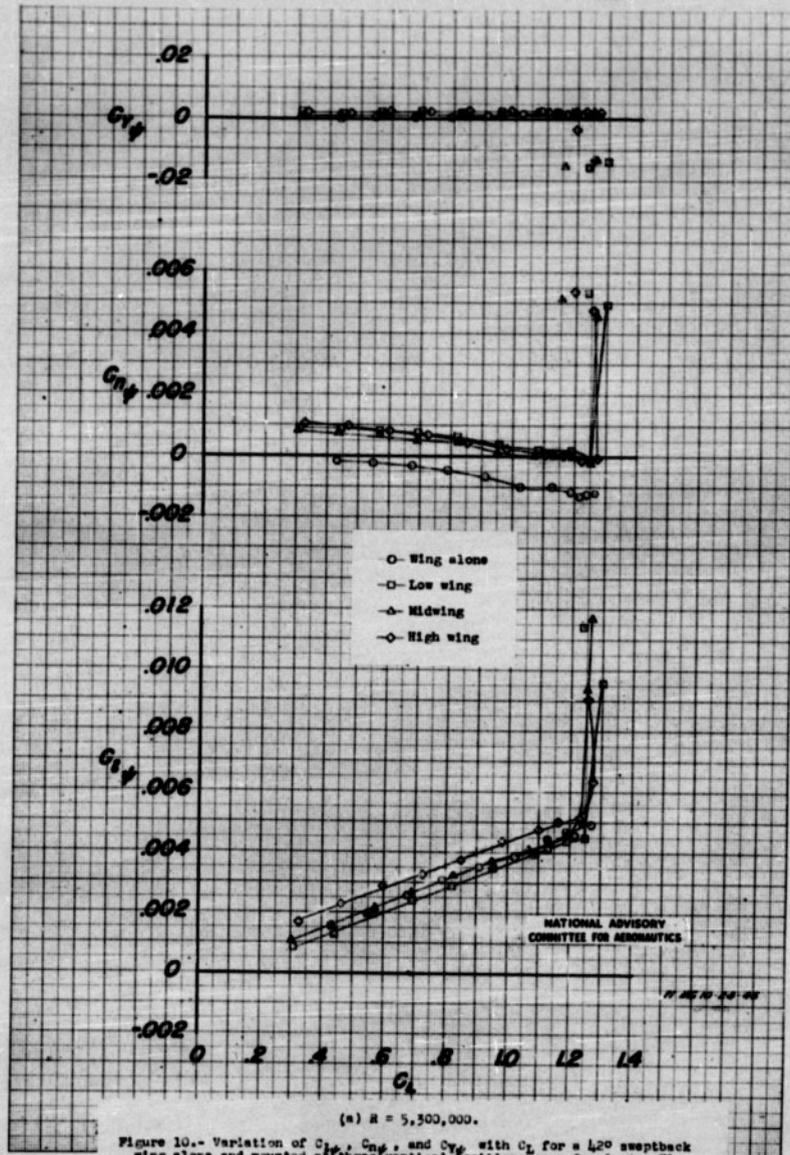


Figure 10.- Variation of  $C_x$ ,  $C_y$ , and  $C_z$  with  $C_L$  for a 120 sweepback wing alone and mounted at three vertical positions on a fuselage. Flaps on.

2  
3  
4  
5  
6

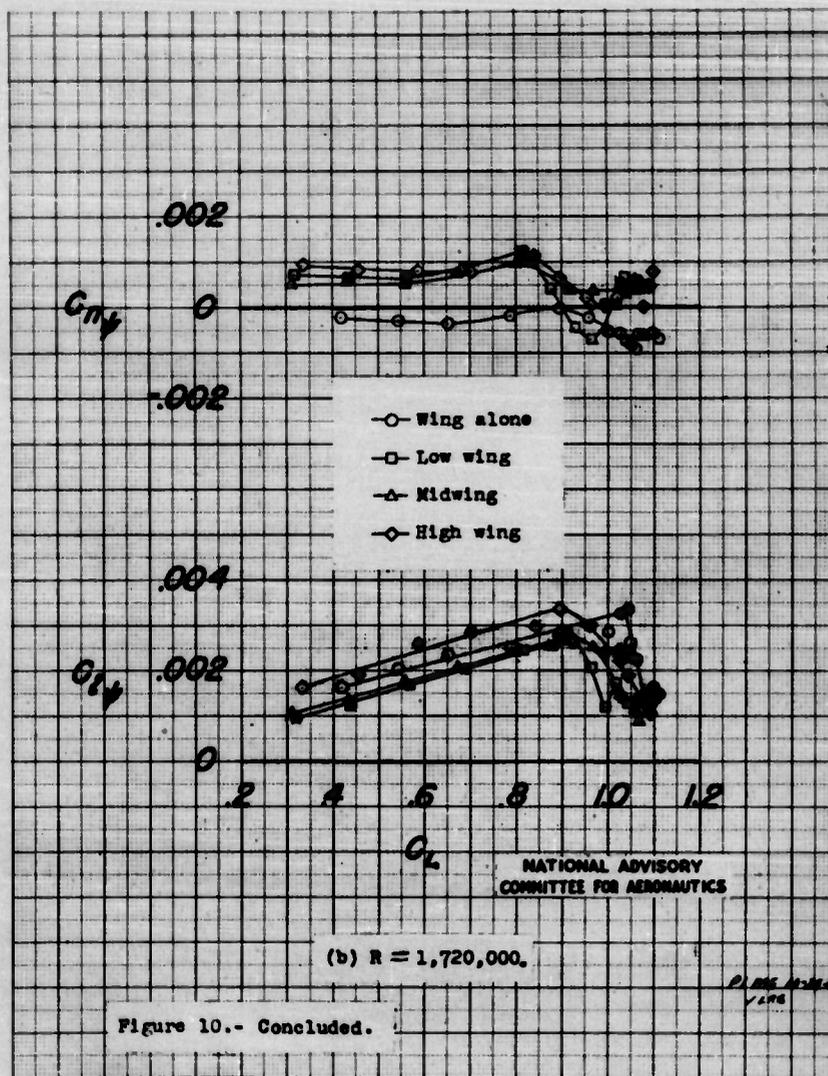


Figure 10.- Concluded.

9  
 0  
 0  
 4  
 7  
 4

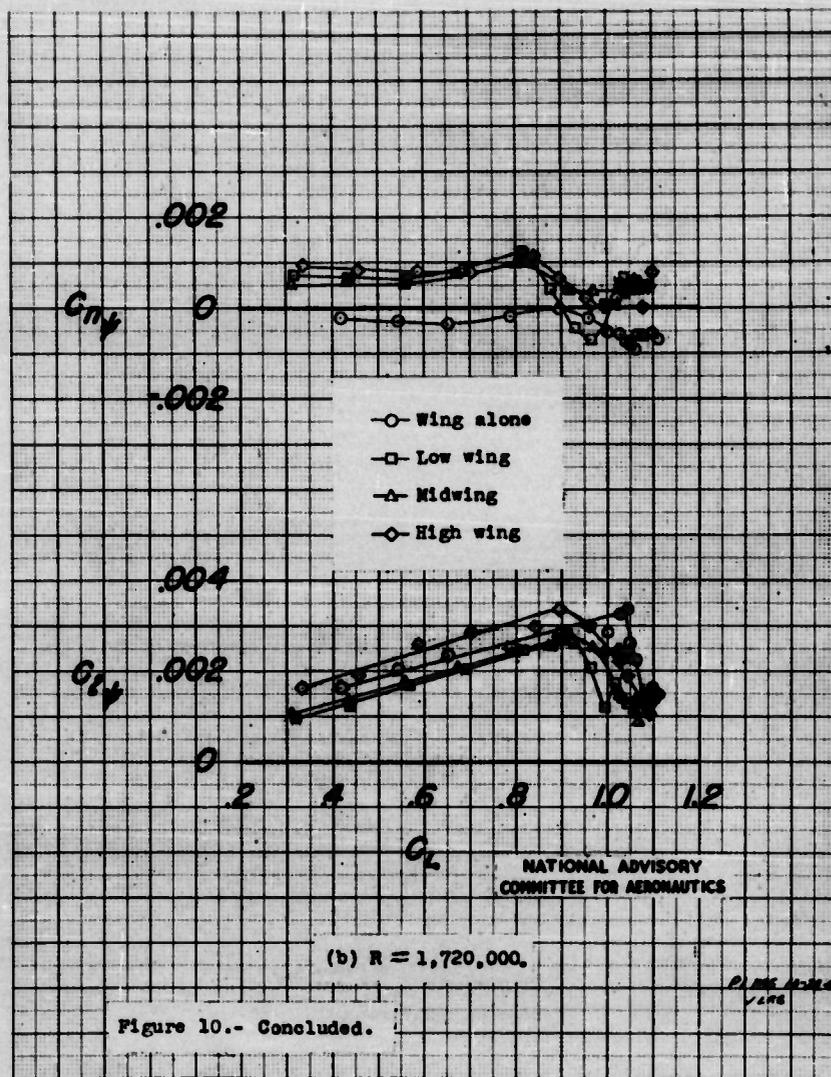
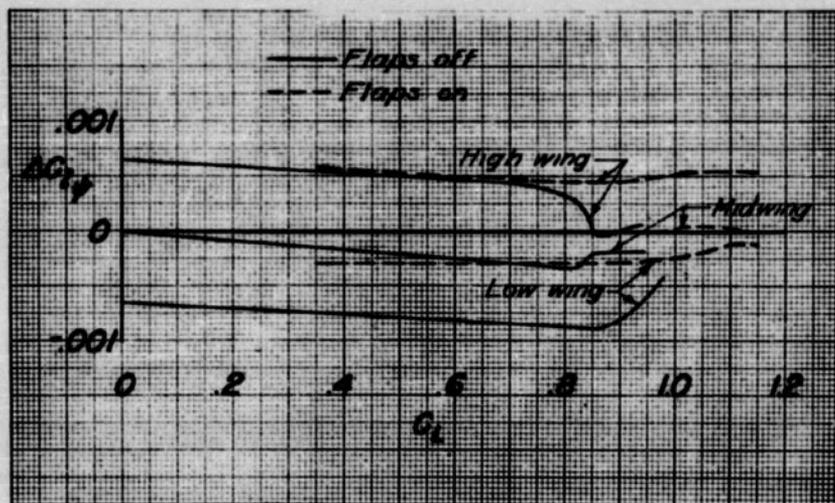
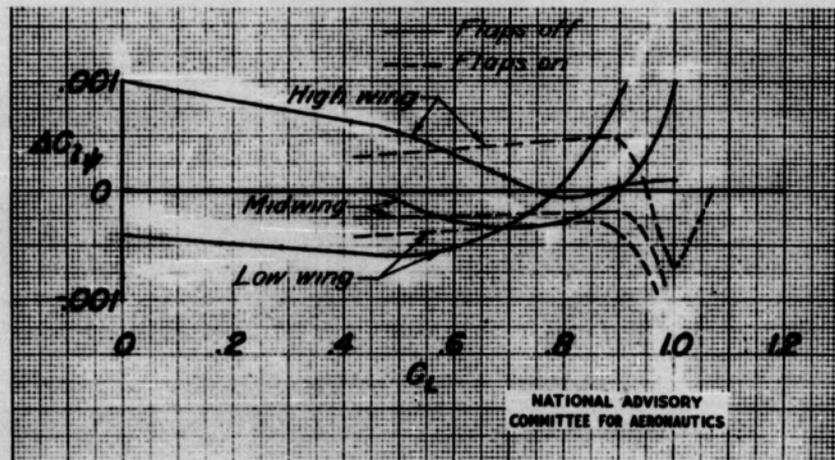


Figure 10.- Concluded.



(a)  $R = 5,300,000$ .

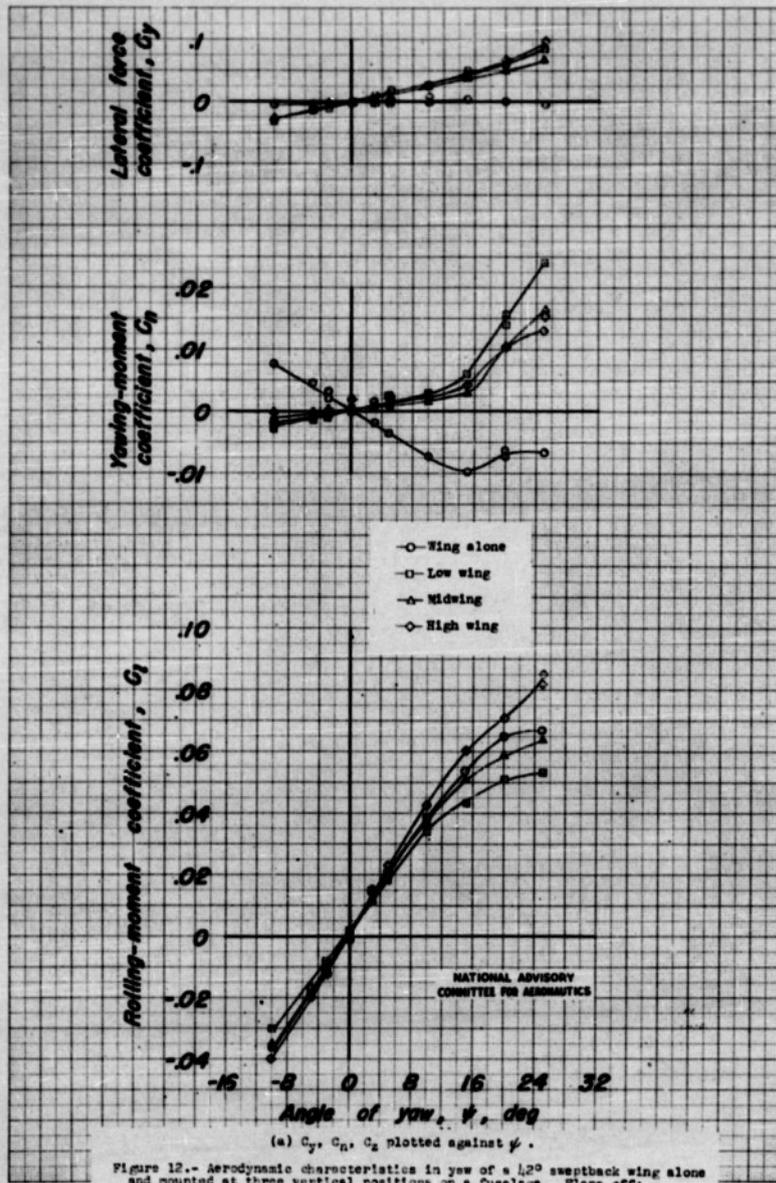


(b)  $R = 1,720,000$ .

Figure 11.- Effects of a fuselage on  $C_{L\psi}$  of a  $42^\circ$  sweptback wing for three vertical positions of the wing.

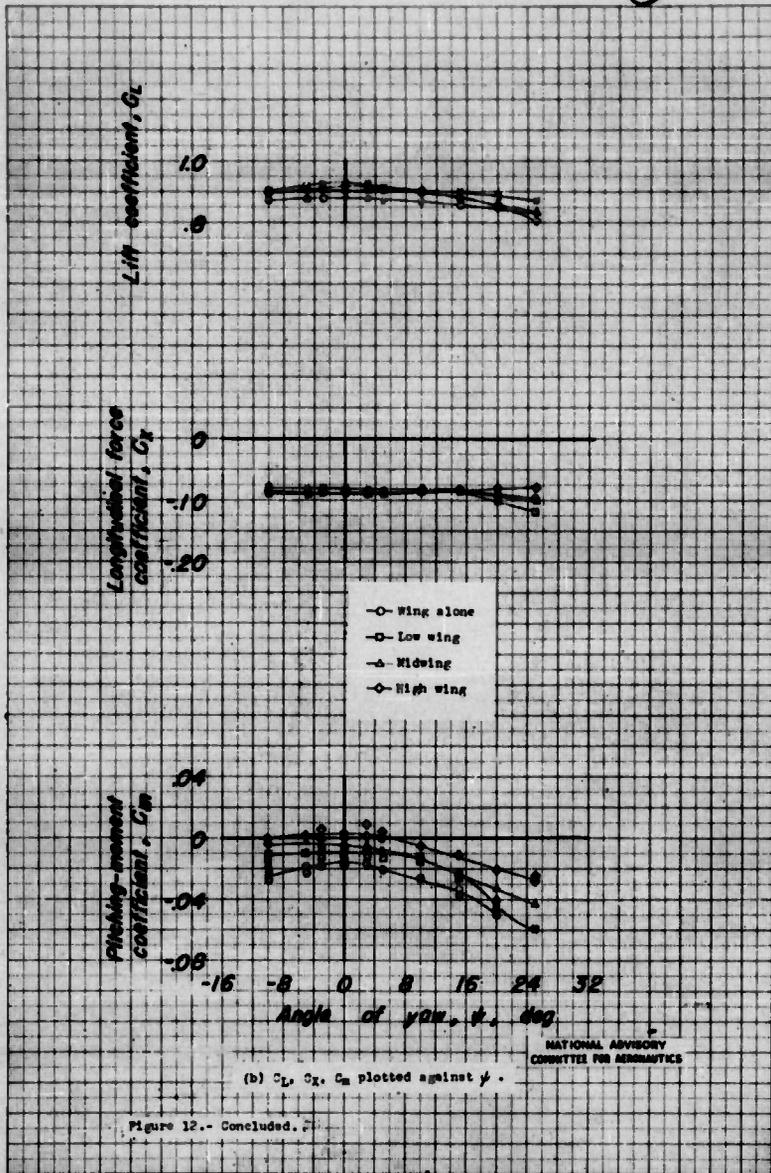
NATIONAL ADVISORY  
COMMITTEE FOR AERONAUTICS

2  
4  
5  
2  
4  
2

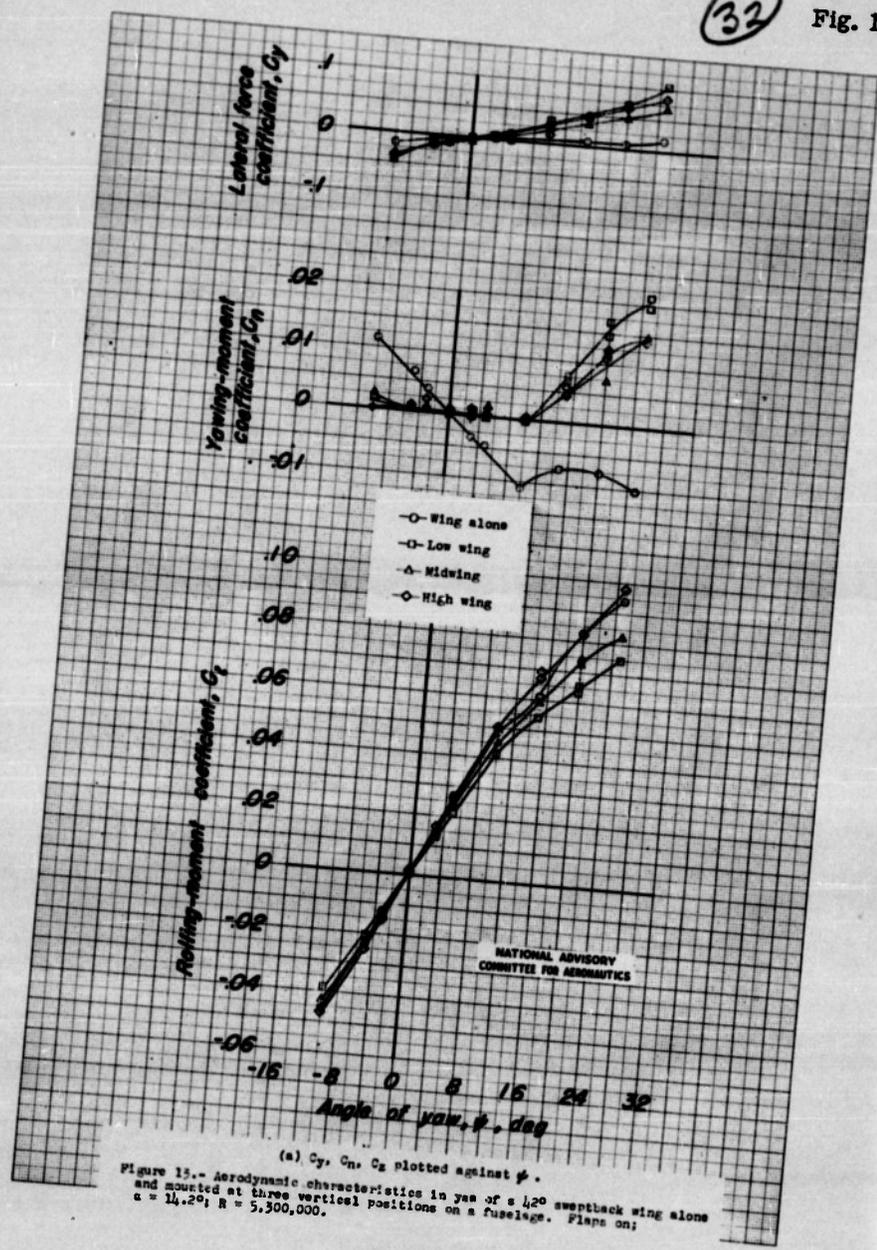


(a)  $C_y$ ,  $C_n$ ,  $C_l$  plotted against  $\psi$ .  
 Figure 12.- Aerodynamic characteristics in yaw of a  $12^\circ$  sweptback wing alone and mounted at three vertical positions on a fuselage. Flaps off;  $\alpha = 15.0^\circ$ ;  $R = 5,300,000$ .

21

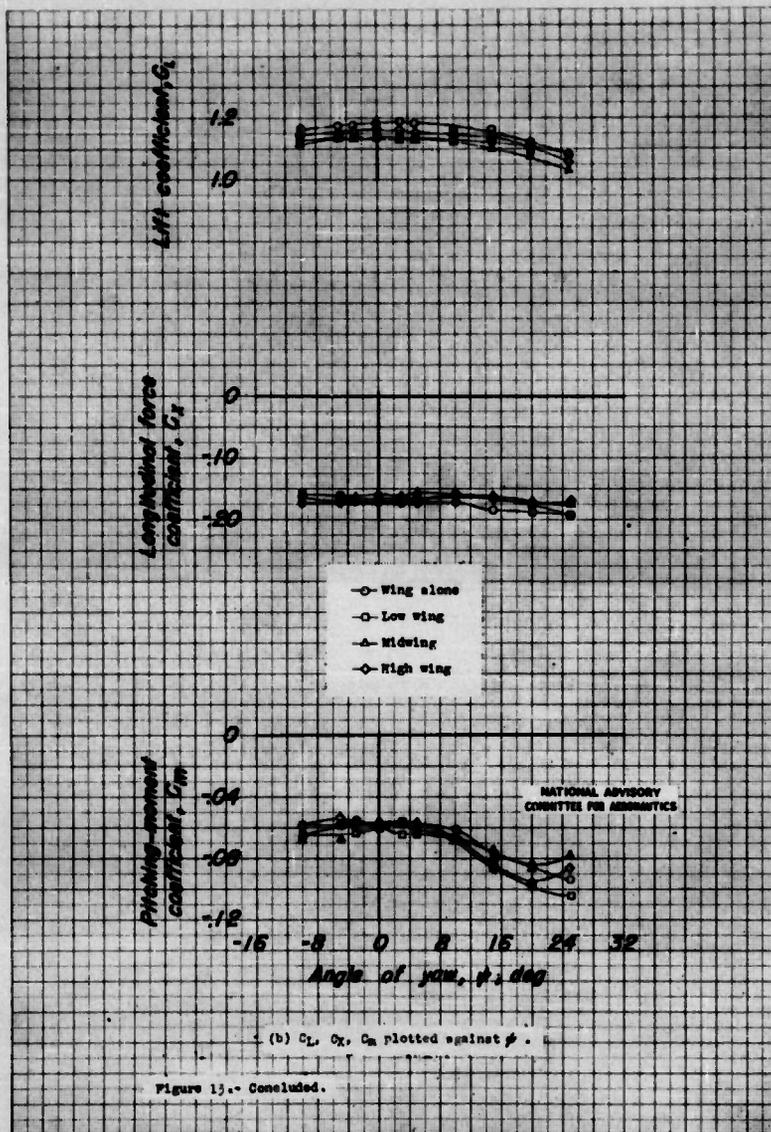


32503



(a)  $C_y$ ,  $C_n$ ,  $C_l$  plotted against  $\psi$ .  
 Figure 13.- Aerodynamic characteristics in yaw of a  $42^\circ$  sweptback wing alone and mounted at three vertical positions on a fuselage. Flaps on;  
 $\alpha = 14.2^\circ$ ;  $R = 5,300,000$ .

32573



REEL - C

3 4 0

A.T.I.

1 0 1 7 8

~~RESTRICTED~~

ATI- 10178

TITLE: Effects of a Fuselage on the Aerodynamic Characteristics of a 42 Degree Swept-Back Wing at Reynolds Numbers to 8,000,000

REVISION (None)

AUTHOR(S): Salmi, Reino J.; Conner, D. W.

ORIG. AGENCY NO.  
RM-L7E13

ORIGINATING AGENCY: National Advisory Committee for Aeronautics, Washington, D. C.

PUBLISHING AGENCY NO.

PUBLISHED BY: (Same)

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
(None)	<del>RESTRICTED</del>	U.S.	Eng.	33	photos, graphs, drwgs

ABSTRACT:

Wind-tunnel investigations were made in pitch and yaw with and without split flaps. Presence of the fuselage had negligible effect on values of maximum lift coefficient and slope of lift curve, but caused a destabilizing shift in the rate of change of pitching moment with lift. Effects of fuselage position on drag characteristics were small for wings without flaps, but were appreciable when split flaps were on.

DISTRIBUTION: Request copies of this report only from Originating Agency

DIVISION: Aerodynamics (2)  
SECTION: Parasitic Components and Interference (7)

SUBJECT HEADINGS: Interference effects - Aerodynamics (52501)

ATI SHEET NO.: R-2-7-11

Air Documents Division, Intelligence Department  
Air Materiel Command

AIR TECHNICAL INDEX

Wright-Patterson Air Force Base  
Dayton, Ohio

~~RESTRICTED~~

TITLE: Effects of a Fuselage on the Aerodynamic Characteristics of a 42 Degree Swept-Back Wing at Reynolds Numbers to 8,000,000  
AUTHOR(S): Salmi, Reino J.; Conner, D. W.  
ORIGINATING AGENCY: National Advisory Committee for Aeronautics, Washington, D. C.  
PUBLISHED BY: (Same)

ATI- 10178

REVISION (None)

ORIG. AGENCY NO.  
RM-L7E13

PUBLISHING AGENCY

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
(None)		U.S.	Eng.	33	photos, graphs, drwgs

ABSTRACT:

Wind-tunnel investigations were made in pitch and yaw with and without split flaps. Presence of the fuselage had negligible effect on values of maximum lift coefficient and slope of lift curve, but caused a destabilizing shift in the rate of change of pitching moment with lift. Effects of fuselage position on drag characteristics were small for wings without flaps, but were appreciable when split flaps were on.

DISTRIBUTION: Request copies of this report only from Originating Agency

DIVISION: Aerodynamics (2)  
SECTION: Parasitic Components and Interference (7)

SUBJECT HEADINGS: Interference effects - Aerodynamics (52501)

ATI SHEET NO.: R-2-7-11

**U**auth: Na & a Res. Abstracts no. 57, 29 Jan 58