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A study of dynamic forces in aircraft landing gear struts with relation to the optimum angle of suspension

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St. Paul, Minnesota; University of Minnesota

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A STUDY OF DYNAMIC FORCES
IN AIRCRAFT LANDING GEAR STRUTS
WITH RELATION TO THE OPTIMUM ANGLE
OF SUSPENSION

A THESIS
SUBMITTED TO THE GRADUATE FACULTY
of the
UNIVERSITY OF MINNESOTA
by
HARRY WILD

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
for the
DEGREE OF MASTER OF SCIENCE IN AERONAUTICAL ENGINEERING
July, 1940

THE
IV

ДОВІРІЙ СІЛАНІЙ ТА ІВАНІІ А.
СІЛАНІЙ ВІДНОВЛЯЄ ПРИЧЕРКА СІЛ
ІВАНІЙ СІЛАНІЙ КОМПАНІЇ УКРАЇНСЬКИХ
ІДІОГРАФІВ №2

ІВАНІЙ А.

ІДІОГРАФІЯ СІЛАНІЙ ТА ІВАНІІ СІЛ

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ІДІОГРАФІЯ

PREFACE

In the more recent years the problems in the design of aircraft landing gear have demanded more attention. One of these problems has been the optimum angle for suspending a landing gear strut in such a manner as to gain the most benefit from the spring system incorporated in the landing gear strut. The study of this optimum angle appears to warrant further analytical and experimental work, and, therefore, was chosen as an appropriate subject for this thesis.

The writer wishes to express his appreciation to his adviser, Professor J. A. Wise, whose suggestions, assistance and criticisms have been most valuable. Thanks are also due to Lieutenant Commander B. V. Turner for his able assistance in experimental work, and to others who assisted in the preparation of this thesis.

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ГЛАВА IV

Архитектурные и инженерные сооружения включают в себя:
— здания и сооружения, предназначенные для жилищного, производственного, научно-исследовательского, культурно-бытового, коммунального, коммерческого и транспортного назначения;
— сооружения, связанные с производством, хранением, транспортировкой и реализацией различных видов продукции и материалов;
— сооружения, связанные с проведением научных исследований, разработками и изысканиями;
— сооружения, связанные с организацией и функционированием учреждений здравоохранения, образования, культуры, спорта, социальной защиты населения, а также с организацией и функционированием учреждений, осуществляющих производство, переработку и реализацию пищевой продукции, а также с организацией и функционированием учреждений, осуществляющих производство, переработку и реализацию строительных материалов и конструкций;

— сооружения, связанные с организацией и функционированием учреждений, осуществляющих производство, переработку и реализацию строительных материалов и конструкций;

SUMMARY

This report presents the results of a preliminary investigation of the dynamic forces in a Army Type M1 aircraft landing gear strut with relation to the normal angle of inclination. Tests were limited to low calculated landing velocities due to insufficiency of the tractive force available. The tests were repeated in order due to the self-locking of driving pulley.

The limiting number of cycles indicated indicates the optimum angle of inclination to be approximately one degree. Test data show that the zero position is favorable by preventing the tractive force being caused by the pulley and the blocking forces.

It is recommended that such work be continued to establish the calculable values for the coefficient of friction and gear reflection characteristics of different types during landing impact.

INTRODUCTION

The trend in modern aviation is towards greater weight and faster landing velocities. As these two factors increase the problem of designing a suitable landing gear, yet one which is as light as possible becomes more difficult. One avenue of approach is to suspend the landing gear strut at an angle such that the drag force caused by the initial impact does not have an adverse effect upon the spring properties of the strut and the stresses produced by these drag forces are not greater than those stresses which are induced when the landing strut snaps back after the spin-up of the wheel.

Since very little is known about the optimum angle for suspending a landing gear strut, an investigation of this subject was carried on in the Landing Gear Pit at the University of Minnesota's Rosemount Research Center.

In this investigation the drag forces, axial strut forces, tire deflections, and the relative motion between wheel and the suspension point of the strut were measured. The strut and wheel of a Navy SNJ type aircraft were used in this test work.

This investigation is limited in scope due to the following factors: (1) time available for testing after completion of test equipment; (2) low simulated landing velocities due to output of power plant; (3) insufficient data

theatre setting seems to indicate either an
internal system or one in which certain actions have
been set up by other means without a planned 'in' warden and
an 'out' one. Similarly even though visitors to FOB II in
this form do not seem to have suffered any losses of a disappre-
ciable sort and though I could not find out just how
the forces not so heavily garrisoned will cope with another
sort of attack, the two moral parts about the locality evidently all
have their natural air more or less, one rather naturally would

leave with the troops and partly from
above authority has been given to fight any attack
that is imminent or when the garrison is gathered to
defend and by FOB I and garrison and as in former times the
other garrison thereon is known to
occupy both sides of the valley and will be able to
act like heavy mounted patrols without any considerable risk
as such will increase the force who is being attacked
and thus help to break up the patrols and will be able
not to make way at first to the military staff.

With patrols and soldiers with (L) command against
against the same will (L) command and the soldiers
will be able to bring down the degree of such mobility

on coefficient of friction of rubber under rolling impact loads; (4) insufficient data on sliding friction in case of strut; (5) inability to measure sinking velocity accurately.

10000 million rubles which were to suffice to sustain the war

for six months. But the actual amount was 100000 million

rubles. The plan of the Ministry of Finance was to

raise 100000 million rubles by the end of 1914, but the

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gold which was to be used for the war was 100000 million

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APPARATUS AND INSTRUMENTS

A major part of the time devoted to this thesis was spent in the construction of suitable equipment for drop testing landing gear struts under simulated landing conditions. A ten foot diameter flywheel from a Corliss steam engine was mounted on pedestals in a pit located in Building 717A at Rosemount Research Center. The flywheel was driven by the use of an automobile engine through a reduction gear. This arrangement is shown in Figure 1 below.

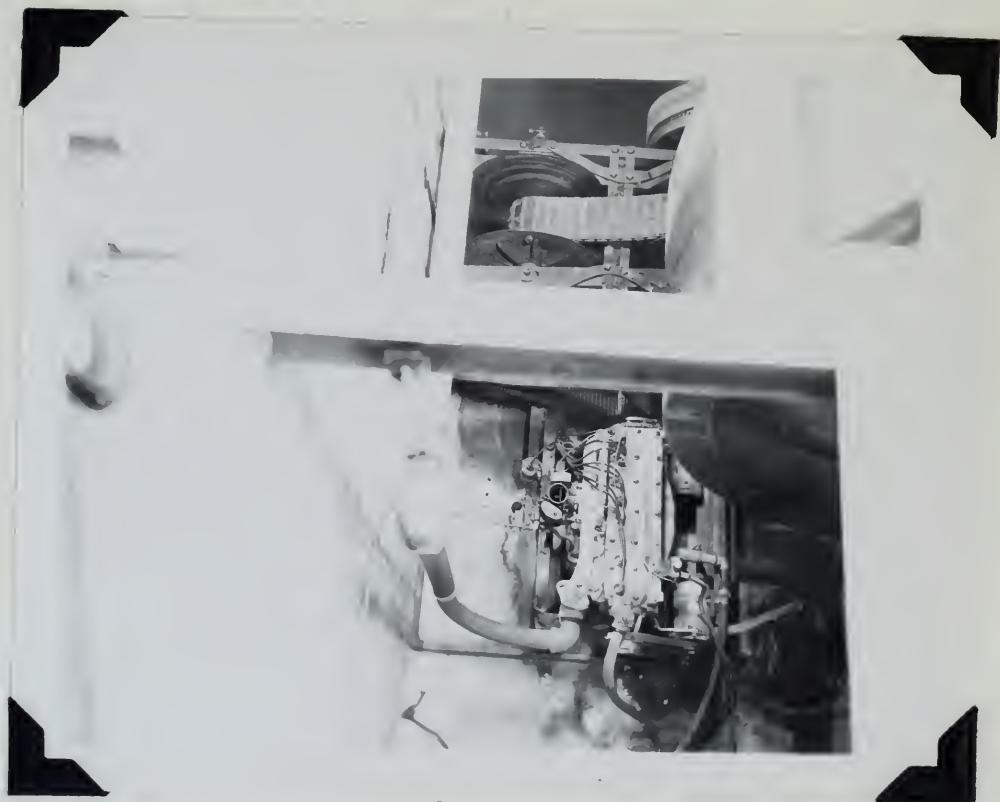


FIGURE 1

СИМВОЛЫ ИХ ПРИЧАСТИЯ

ко звукам или ко звукам смысла, ибо это не звуки в
смысле, они это звуковые манифестиции, то есть звуки, которые
имеют в себе определенные звуковые манифестиции, которые выражают звуковую
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СИМВОЛЫ ИХ ПРИЧАСТИЯ



2. АЗБУКА

A great deal of trouble was encountered in obtaining the desired peripheral velocity on the flywheel due to frictional type pulleys on the reduction gear. The peripheral velocity of the flywheel simulated the ground speed of an aircraft while landing.

A platform mounted upon a pivot arm was used for varying simulated aircraft weights and its free falling velocity was used to simulate aircraft sinking velocities. An adjustable linking arm hung from the platform and into this fitted a linkage box through which the landing gear strut was suspended. This linkage box could be rotated in the plane of simulated landing direction for the purpose of varying the angle of inclination of the landing gear strut. These parts are shown assembled with strut and wheel in Figures 2 and 3 on the following pages.

The strut used in these tests is the standard landing gear strut used on Navy type SNJ aircraft. A standard 27 inch aircraft wheel and tire were mounted on the strut. The strut was serviced and inflated as directed in SNJ maintenance manual. The strut was suspended from the linkage box by means of a standard SNJ strut suspension bracket.

Strain gauges of the C-1 type were mounted at opposite points on the front and rear of the landing gear fork to obtain drag forces. The same type strain gauges were mounted at opposite points on the inside and outside of the landing gear fork to measure the axial forces in the strut.

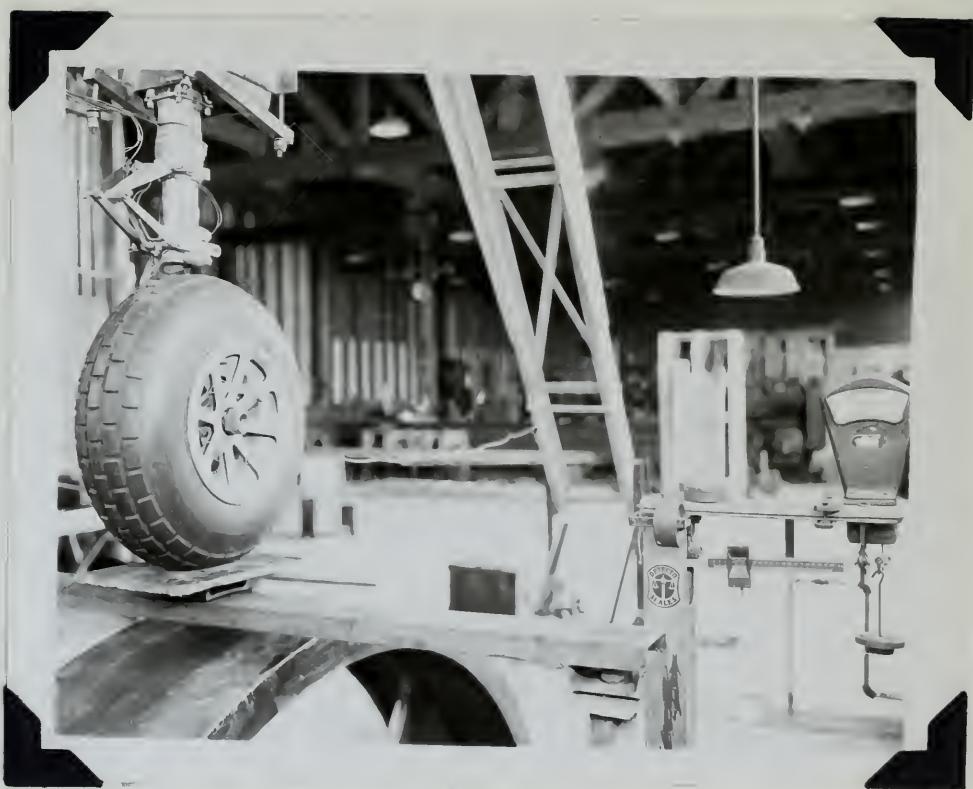


FIGURE 2

and the other two were in the same condition.

The first bird was shot at 1000 feet elevation.

The second bird was shot at 1000 feet elevation.

The third bird was shot at 1000 feet elevation.

The fourth bird was shot at 1000 feet elevation.

The fifth bird was shot at 1000 feet elevation.

The sixth bird was shot at 1000 feet elevation.

The seventh bird was shot at 1000 feet elevation.

The eighth bird was shot at 1000 feet elevation.

The ninth bird was shot at 1000 feet elevation.

The tenth bird was shot at 1000 feet elevation.

The eleventh bird was shot at 1000 feet elevation.

The twelfth bird was shot at 1000 feet elevation.

The thirteenth bird was shot at 1000 feet elevation.

The fourteenth bird was shot at 1000 feet elevation.

The fifteenth bird was shot at 1000 feet elevation.

The sixteenth bird was shot at 1000 feet elevation.

The seventeenth bird was shot at 1000 feet elevation.

The eighteenth bird was shot at 1000 feet elevation.

The nineteenth bird was shot at 1000 feet elevation.

The twentieth bird was shot at 1000 feet elevation.

The twenty-first bird was shot at 1000 feet elevation.

The twenty-second bird was shot at 1000 feet elevation.

The twenty-third bird was shot at 1000 feet elevation.

RESULTS

The results of the experiments are given in Table I. The first column gives the number of the experiment, the second column gives the date of the experiment, the third column gives the time of the experiment, the fourth column gives the elevation of the experiment, the fifth column gives the number of the bird, the sixth column gives the sex of the bird, the seventh column gives the weight of the bird, the eighth column gives the species of the bird, the ninth column gives the condition of the bird, and the tenth column gives the result of the experiment.

The results show that the birds were in good condition throughout the experiments, and that the results were consistent with the results of previous experiments.

The results also show that the birds were in good condition throughout the experiments, and that the results were consistent with the results of previous experiments.

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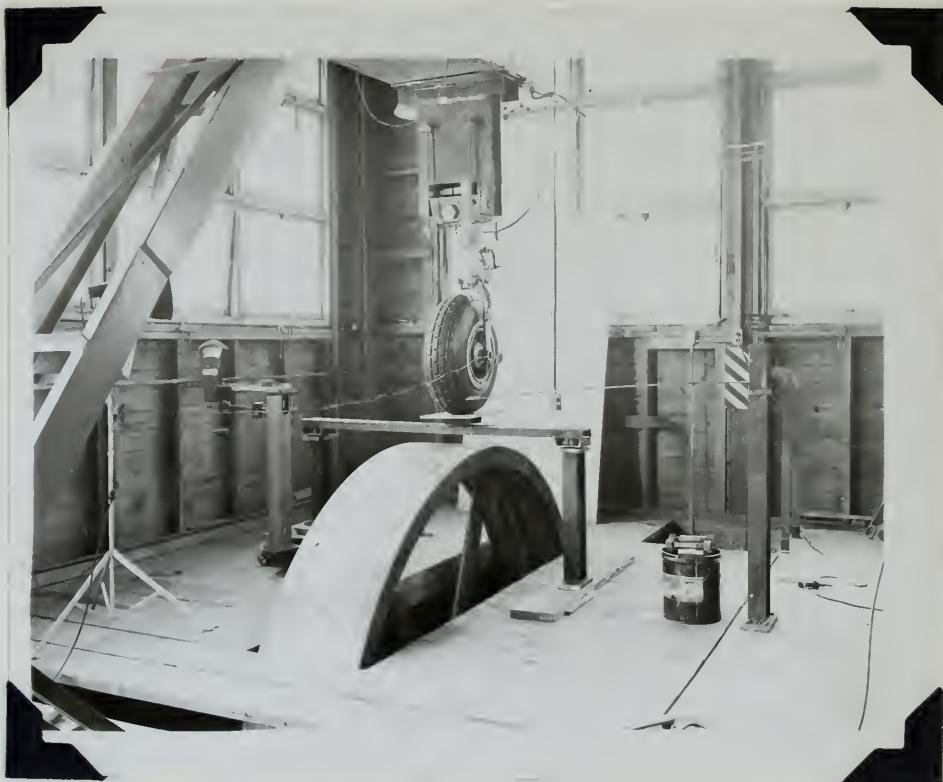


FIGURE 3

S. 140042

Tire deflections were obtained by mounting C-1 type strain gauges on a cantilever beam. The end of the cantilever beam was displaced by the vertical motion of the bottom of the axle, and since the displacement of the axle was due to the tire deflection a reading of tire deflection could be obtained from the cantilever deflection. Cleo deflections were measured by the use of a potentiometer which was rotated by a scissors attachment between the stationary and movable part of the cleo. Mountings of the above instruments are shown in Figure 4 on the following page. Readings from the above instruments were recorded by the use of strain analyzers to which Brush oscilloscopes were attached for recording purposes.

The weighing system was composed of a beam with two knife edges, one of which rested on a fixed upright while the other rested on an upright which in turn was supported by ordinary platform scales. The tire, bearing the simulated aircraft weight, was supported on a third knife edge at a point near the middle of the beam. This lever system is shown in Figure 3 also.

-17-

1944 soll weiteren gründlichen einen vorbereiteten und
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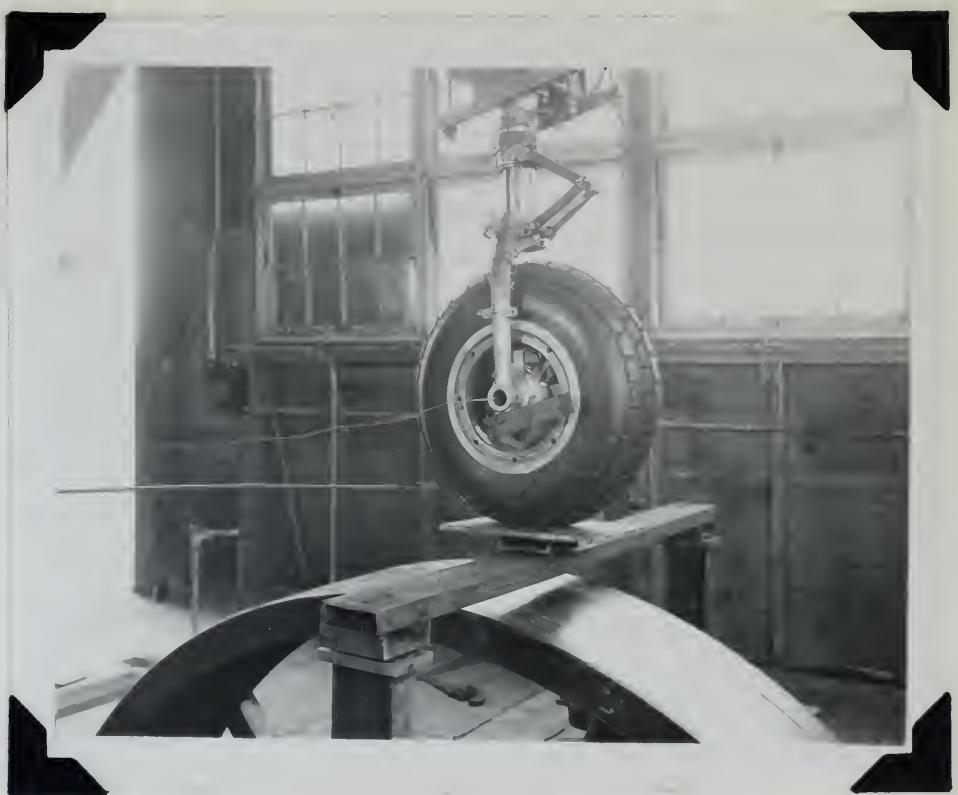


FIGURE 4

and the importance of both the individual and organizational levels in the development of the new paradigm. The authors also argue that the new paradigm can be used to explain the relationship between the individual and organizational levels of leadership. The article concludes by suggesting that the new paradigm can be used to explain the relationship between the individual and organizational levels of leadership.

The article is divided into four main sections. The first section, "The New Paradigm," provides an overview of the new paradigm and its key features. The second section, "Individual Leadership," discusses the individual level of leadership and its relationship to the new paradigm. The third section, "Organizational Leadership," discusses the organizational level of leadership and its relationship to the new paradigm. The fourth section, "Conclusion," summarizes the findings of the article and suggests directions for future research.

TESTING PROCEDURE

The linkage box and pivot arm platform were calibrated first for strut angle inclination and points of suspension from pivot arm platform. These calibration points were taken so that at each test angle of the strut tested the aircraft wheel would rest on top of the large flywheel. These calibrations were made with the oleo fully compressed.

Prior to each day's test work it was necessary to balance the strain analyzers used in recording the strains and deflections of the strain gauges and potentiometer. After balancing the strain analyzers the displacement curves of the Brush oscilloscopes were calibrated.

The displacement due to axial force in the landing gear fork was calibrated first. This was accomplished by turning the strut to a vertical position, allowing the weight of the structure to rest on tire, obtaining this weight from the weighing system and noting the deflection of the Brush oscilloscope. It was possible to make this type calibration due to the fact that the center line of the aircraft wheel was displaced a small amount from the center line of the landing gear fork. This small amount of eccentricity produced a given bending moment for each different vertical force acting on the aircraft wheel. This vertical force acting on the aircraft wheel was the axial force in the landing gear fork.

detachment from materialism was little less real than that of the

materialists; the writing was antithetical to their beliefs and they
acted more freely under interpretation than in actual life. *Confucian* may appear more
philosophical and better suited to actual life than *Confucian* does, but it is
clearly just as *Confucian* as the former is to the latter. Death
and immortality, which are the two main themes of the materialist
and the Confucian, are the two main themes of the latter.

Materialism has no place in the Confucian's scheme of things, and materialism
is the natural outcome of the Confucian's efforts to realize his
ideal of a harmonious society. The Confucian's ideal is to realize
the same harmonious society that he himself planned with the help of

Confucius, whom he considered the author of the *Confucian* *Scriptures*.
The Confucian's view of life is that of the Confucian's view of
things and subjects, and his view of life is that of the Confucian's view of
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The potentiometer for measuring oleo displacements was calibrated at the same time. This calibration was accomplished by plotting oleo displacement in inches versus Brush oscilloscope displacement in millimeters.

The cantilever strain gauges were calibrated by noting the deflection of the Brush oscilloscope in millimeters due to a measured tire deflection in inches.

The drag force strain gauges were calibrated by applying a drag force of known magnitude to the strut and noting the deflection of the Brush oscilloscope in millimeters.

Flywheel revolutions were measured by the use of a stroboscope. The peripheral velocity was computed in feet per second and used as simulated landing velocity. Sinking velocities were attained by dropping the landing gear and pivot arm from a vertical height. These heights were calculated for the velocities which would be attained by a freely falling body. Dropping was made possible by a quick release mechanism attached to the pivot arm.

Having completed these calculations the strut was set at the angle desired for testing. Tests were begun by bringing the flywheel up to the speed required to simulate the desired landing speed. The aircraft wheel was raised by the pivot arm to the height required to attain the sinking velocity desired at the time of contact between tire and

strategische role gehad en voorbereidingen voor

een politieke rol zijn ook niet in de laatste tijd
voortgezet door de Russische regering. De belangrijkste

opgaven die de Russische regering heeft staan
hebben bestaan uit: een negatieve positie van de
republiek en een positieve stand van de sovjetregering.

Deze positie van de Sovjetregering is niet alleen

van belang voor de Russische republiek zelf,

maar ook voor de andere Sovjetrepublieken.

De Russische republiek heeft de Sovjetregering niet alleen
staan te wachten op de verschillende voorstellingen van de Sovjetregering.

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revolving flywheel. The Brush oscilloscopes were turned on and the landing gear dropped on the turning flywheel. The Brush oscilloscopes printed a record of drag force, axial force, tire deflection and oleo deflection versus time. Another test at the same strut angle could be run as soon as the pivot arm and aircraft wheel were raised to the height required to attain desired sinking velocity. The elapsed time between such tests was approximately two minutes.

the limited space available, and the author has chosen to do this in a very simple way. He has, however, tried to make his book as interesting as possible; he has also tried to make it as useful as possible. He has done this by giving a clear account of the basic principles of the theory of relativity, and by showing how these principles can be applied to practical problems. He has also tried to make the book as accessible as possible to those who have no previous knowledge of the subject. The author has done this by using a simple language, and by avoiding technical jargon. He has also tried to make the book as readable as possible by using a clear and logical structure. The author has done this by dividing the book into chapters, and by providing a summary of each chapter at the end. The author has also tried to make the book as informative as possible by providing a bibliography at the end of each chapter. The author has also tried to make the book as useful as possible by providing a list of references at the end of each chapter.

TEST DATA AND RESULTS

The results of these tests are shown in Figures 5A through 30B. Figure 5A is a plot of the spring characteristic of the tire used on the strut during testing, while Figure 5B is a plot of the spring characteristic exhibited by the oleo when under static loads.

Figure 6 is a calibration curve for the purpose of converting the data from the potentiometer, as recorded by the Brush recorder, into oleo deflection in inches.

Test data as recorded by Brush oscilloscopes is shown in Figures 7 through 29. In these figures, the horizontal axis represents time, each five millimeters representing four one-hundredths of a second. The top curve in each figure represents the drag force perpendicular to the strut and is marked drag. The second curve in each figure represents the axial force acting on the strut. The third curve in each figure represents the tire deflection and is labeled cantilever, to correspond with the method used to measure the tire deflections. These curves may be read directly by using the calibration on each figure. The bottom curve in each figure represents the compression of the oleo and is labeled potentiometer. This curve must be read by reference to Figure 6. The sum of the two bottom curves gives the displacement of the mass above the

to request all possible and timely support by, guidance and
informational services and the role of the Mayor, who must
be present at the accident scene, from no later than 10:00 a.m.
on the day of the accident until the time of the final
disposition of the accident.

oleo. Zero time and displacement are indicated by the intersection of the heavy dark line with the curve.

Tests with the strut in a vertical position and at ten degrees inclination show the drag and axial forces and the tire displacements to be approximately straight line variation for a short time.

The presence of friction in the moving part of the oleo is clearly indicated in all figures. This friction is indicated by the change in slope of the potentiometer curve which indicates a slower rate of displacement of the oleo when the curve flattens out. By comparing the curves indicating drag forces with the potentiometer curves indicating oleo compression, it can be seen that the maximum drag forces correspond with a decrease in rate of displacement of the oleo. This indicates that the friction is due to the binding moment forces caused by the drag loads. An angle of inclination of ten degrees shows less pronounced frictional effects on the operation of the oleo than do other angles of suspension.

Figures 7 through 14 indicate quite clearly that drag forces, axial forces, and tire deflections increase with an increase in sinking velocity.

All of the curves indicate that the drag forces, axial forces and tire deflections damp out quite rapidly. The

which took the form of a new, more sophisticated legal model. This model, which could now be applied to conflicts between states, was developed by the Paris Peace Conference in 1919. It was based on the principles of the League of Nations, which had been established at the same conference. The League's purpose was to maintain world peace and security, and to promote international cooperation. The League's members were the United States, Great Britain, France, Italy, Japan, and other countries. The League's members were required to respect the principles of the League, and to work together to achieve its goals. The League's members were also required to respect the principles of the League, and to work together to achieve its goals.

- 14 -

pitch/bank curves indicating that one does not have a constant pitch of the ship, but rather has a pitch with the wind.

Figure 30A shows a plot of drag forces versus angle of inclination of the strait. Curve A is the maximum side way drag forces encountered with a sinking velocity of two feet per second; curve B represents those drag forces when the sinking velocity is five feet per second. Drag forces for sinking velocities of three and four feet per second will fall between curves A and B. Curve C represents the maximum snap back drag forces encountered with a sinking velocity of two feet per second; curve D represents those drag forces for a sinking velocity of five feet per second. The snap back drag forces for sinking velocities of three and four feet per second will fall between curves C and D. The point of intersection of the snap up and snap back curves for the same sinking velocities indicates that these two forces are equal. This indicates the optimum angle of inclination to produce equal bending moments in the strait when the ship is listing and then snaps back. The small number of test points available for plotting these curves indicate this optimum angle to be approximately ten degrees.

Figure 30B is a plot of axial force versus angle of inclination. The minimum points on these curves indicate

the optimum angle of inclination for minimum axial force to be approximately twenty-four degrees.

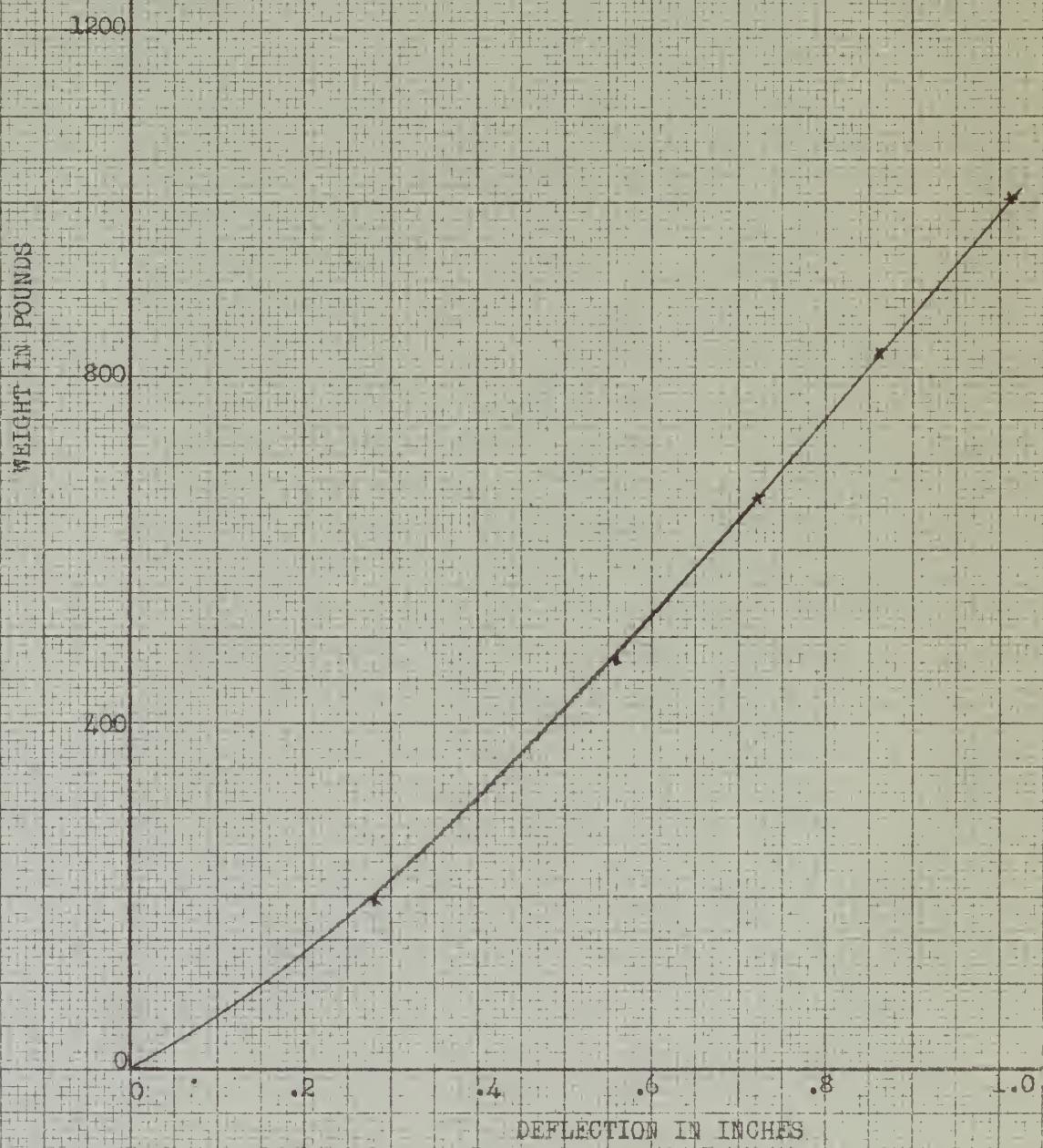
The bending moments due to the drag forces produce quite high stresses in the strut; these stresses are decreased very little by the axial forces since they are small; hence, the optimum angle for producing minimum drag forces is the important angle to consider in design.

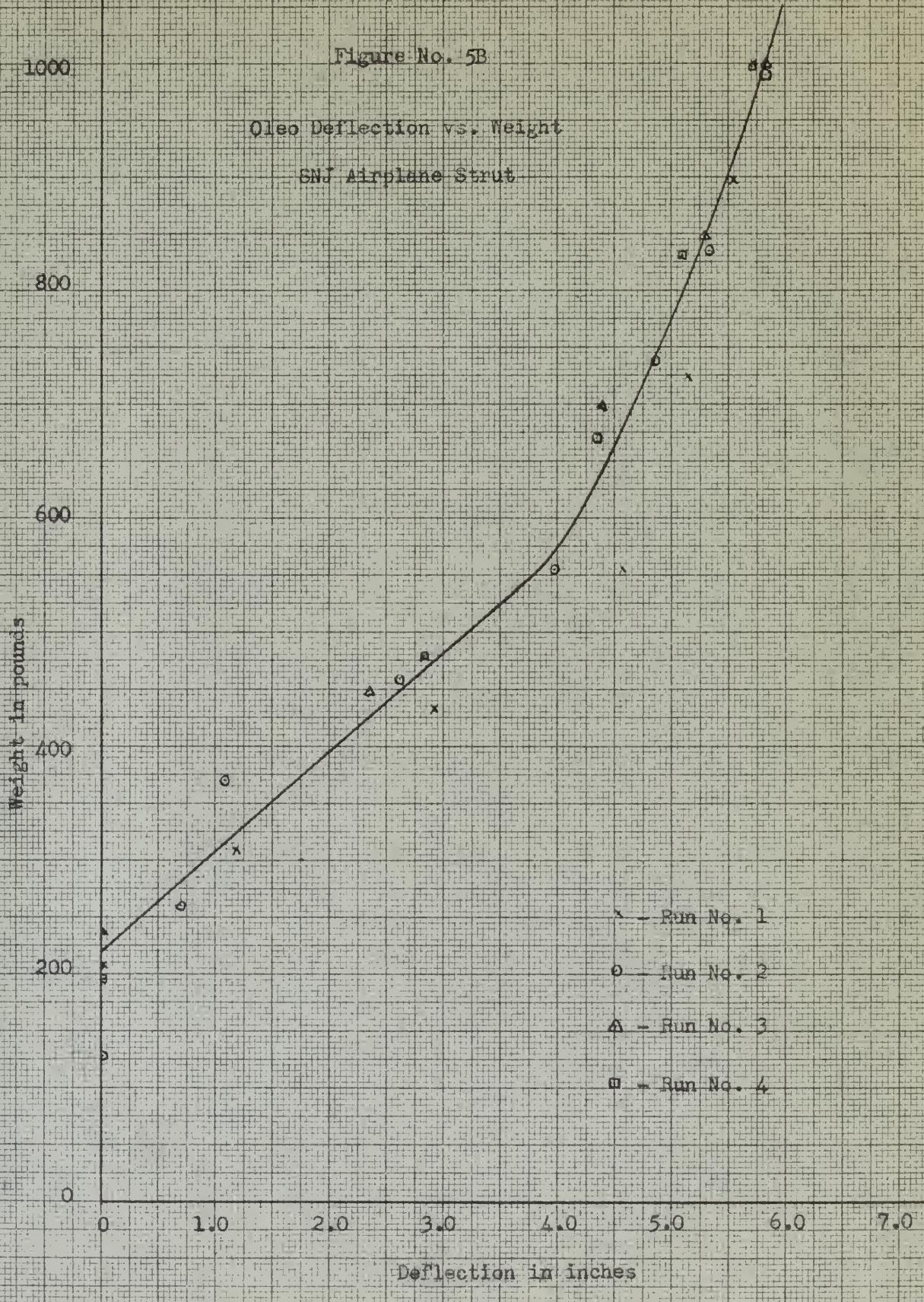
These tests are not conclusive as to optimum angle for suspending a landing gear strut. Other tests should be conducted in which the landing velocity and gross weight of the SNJ type aircraft are more nearly simulated. Tests should also be carried out with the strut suspended at a greater number of angles.

to myself. I also practice non-addiction to other substances and
 -smoking marijuana, tobacco and alcohol and all
 substances and tobacco usage, alcohol and all substances and other substances
 -smoking and smoking and smoke taxes are of little use
 and in most cases provide little income and some studies will
 -demonstrate a lack of significant reduction of illegal substances
 abuse and this is in addition to the other small
 and serious side effects from using tobacco and
 to illegal drugs and tobacco smoking and abuse of substances
 seems better than illegal drugs from my observation being that we
 continue to be encouraged more and more the believe we can
 -improve the health

FIGURE NO. 5A

TIRE DEFLECTION VS WEIGHT
SNJ AIRPLANE STRUT
TIRE PRESSURE 24#





OLEO DILUTION IN INCHES

8

7

6

5

4

3

2

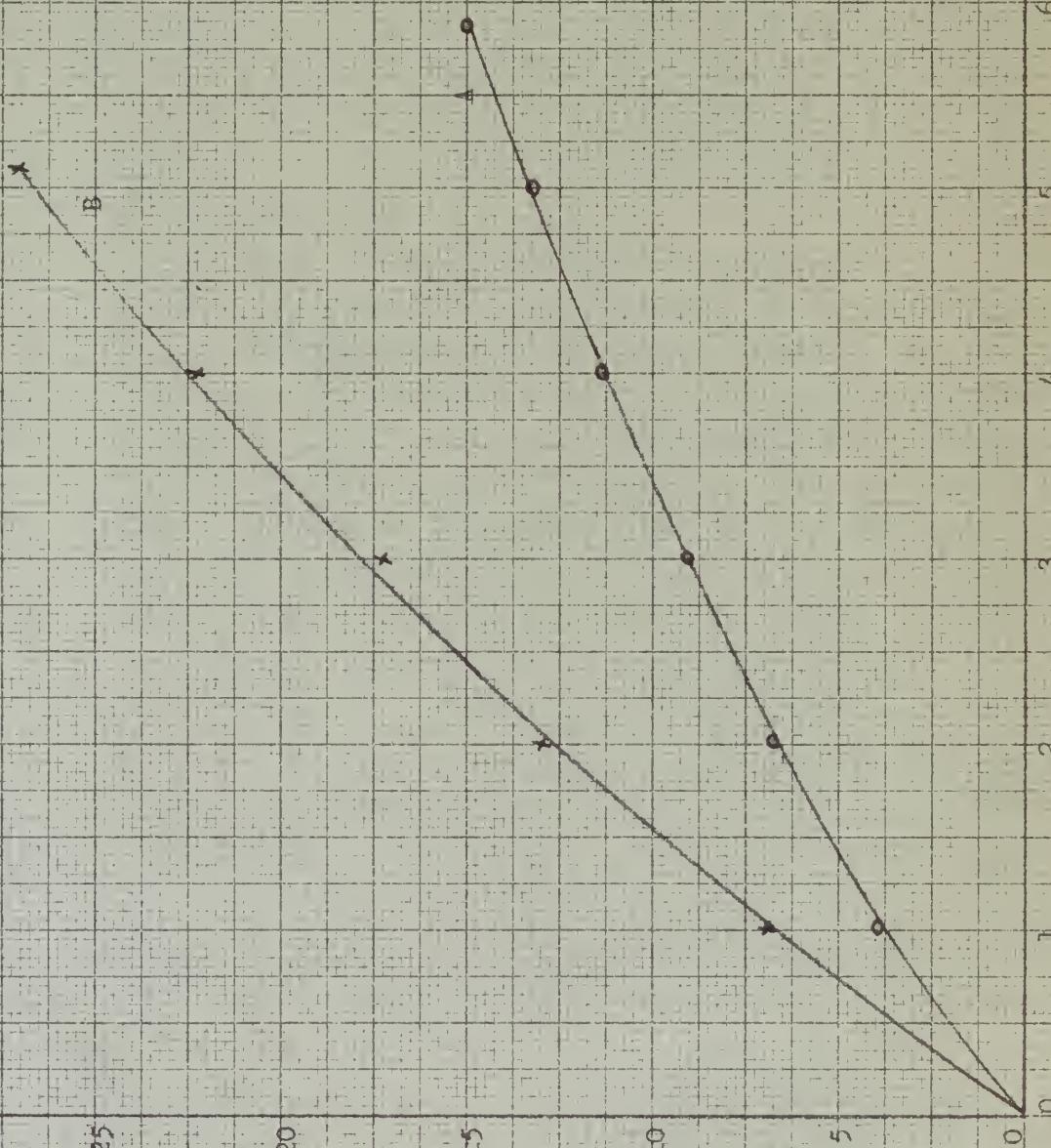
1

0

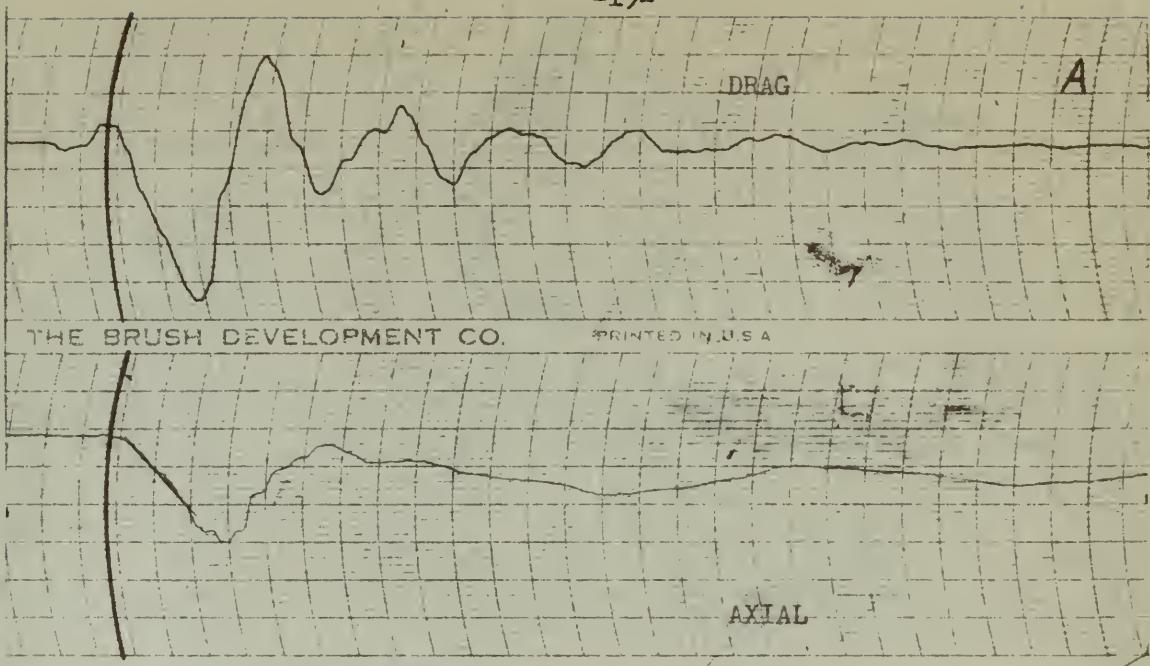
OLEO DILUTION CURVE
FOR PROTEINOMETER

FIGURE NO. 6

BRUSH RECORDING - in mm.



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CALIBRATION:

DRAG - 2 mm. = 128#

AXIAL - 2.5 mm. = 462#

CANTILEVER - 1 mm. = .325 in.

POTENTIOMETER - REFER CURVE "A" FIG. 6

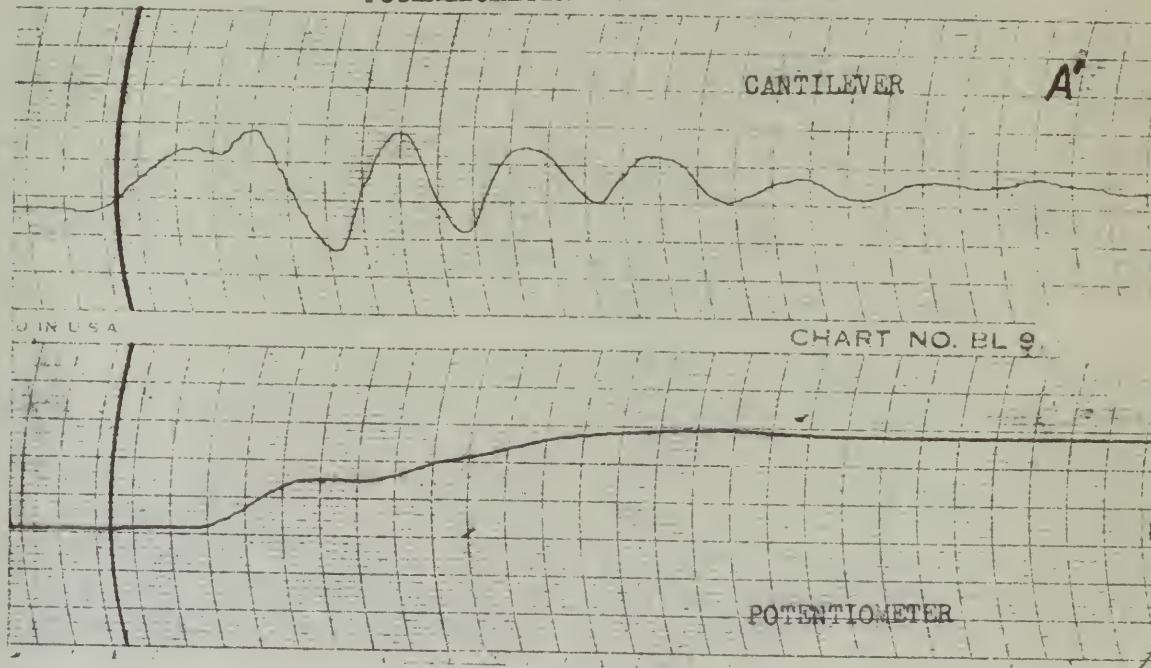
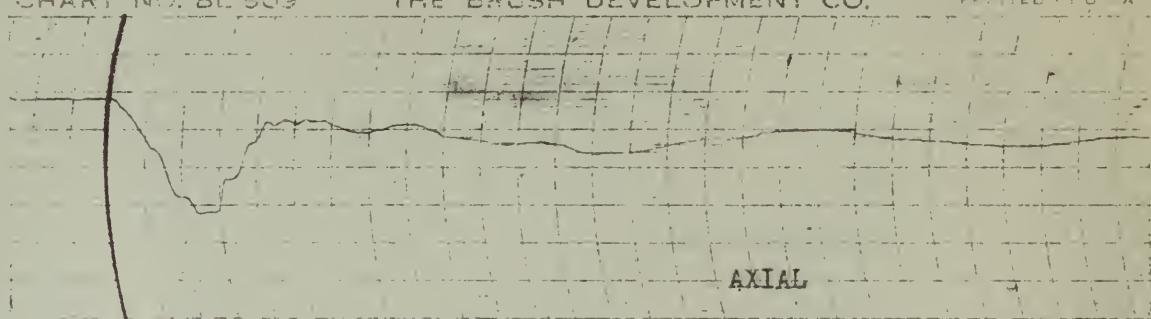
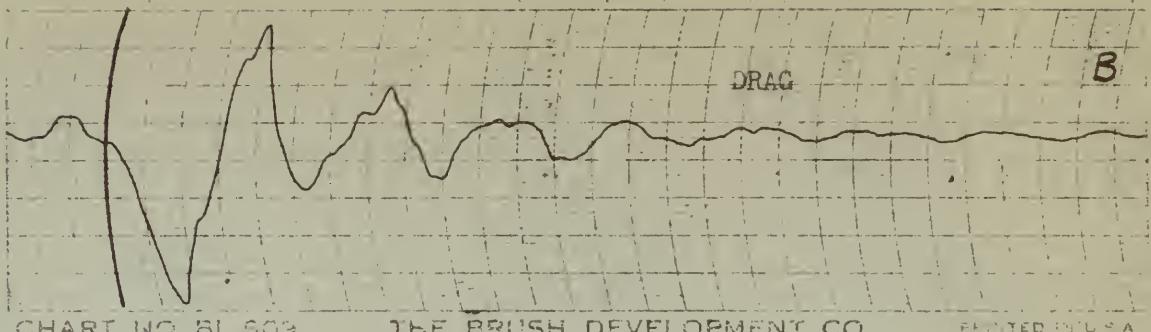


FIG. 7

DATE: 7/9/49
STRUT ANGLE 0°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 52.5 F.P.S.
DROPPING VELOCITY 2 F.P.S.
PAPER SPEED 125 mm./sec.



CALIBRATION:

DRAG - 2 mm. = 128#

AXIAL - 2.5 mm. = 462#

CANTILEVER - 1 mm. = .325 in.

POTENTIOMETER - REFER CURVE "A" FIG. 6

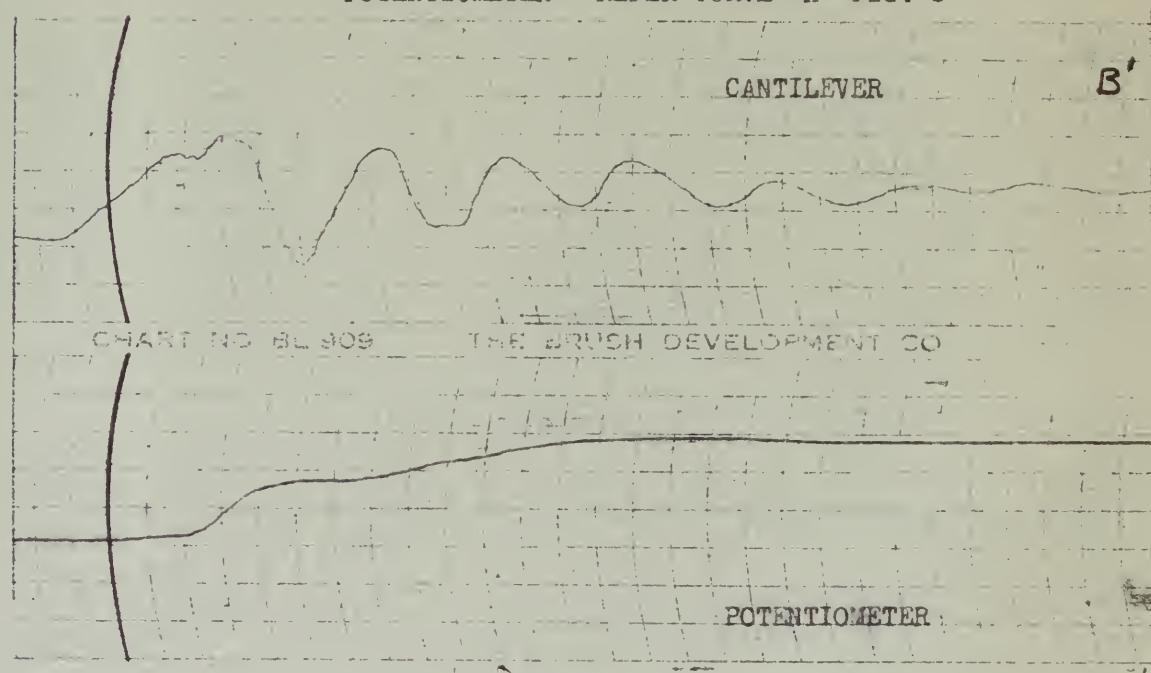
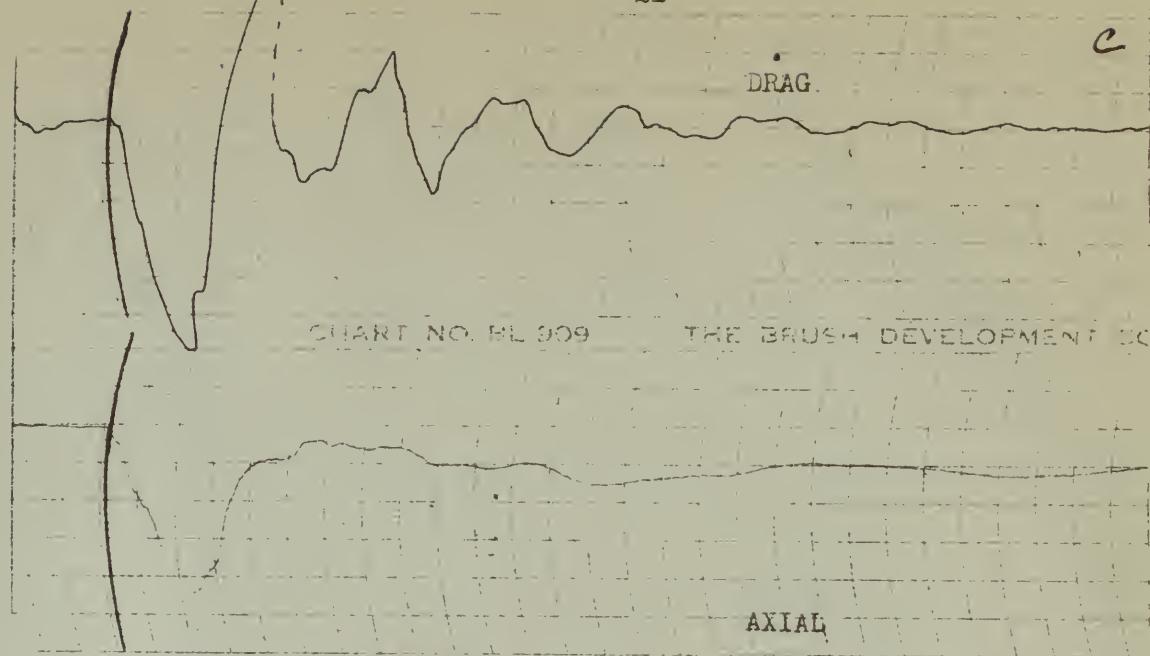


FIG. 8

DATE: 7/9/49
STRUT ANGLE 0°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 52.5 F.P.S.
DROPPING VELOCITY 3 F.P.S.
PAPER SPEED 125 mm./sec.



CALIBRATION:

DRAG - 2 mm. = 128#

AXIAL - 2.5 mm. = 462#

CANTILEVER - 1 mm. = .325 in.

POTENTIOMETER - REFER CURVE "A" FIG. 6

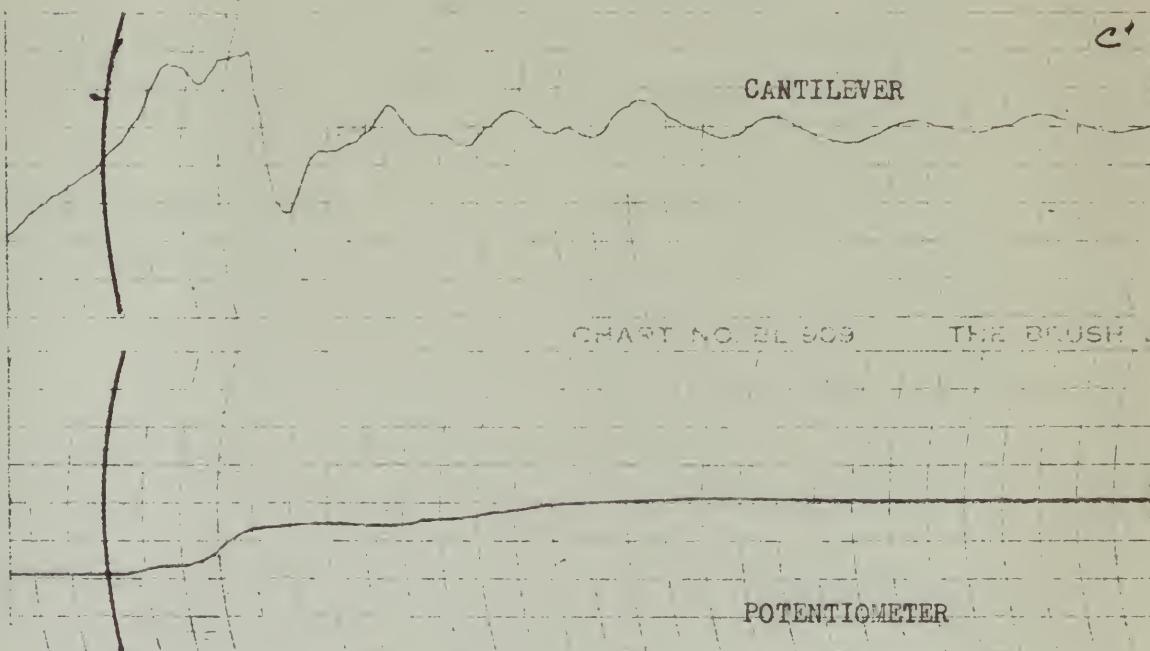


FIG. 9

DATE: 7/9/49
STRUT ANGLE 0°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 52.5 F.P.S.
DROPPING VELOCITY 4 F.P.S.
PAPER SPEED 125 mm./sec.

DRAG

CHART NO BL 909

THE BRUSH DEVELOPMENT C

AXIAL

CALIBRATION:

DRAG - 2 mm.= 128#

AXIAL - 2.5 mm.= 462#

CANTILEVER - 1 mm.= .325 in.

POTENTIOMETER - REFER CURVE "A" FIG. 6

CANTILEVER

CHART NO. E

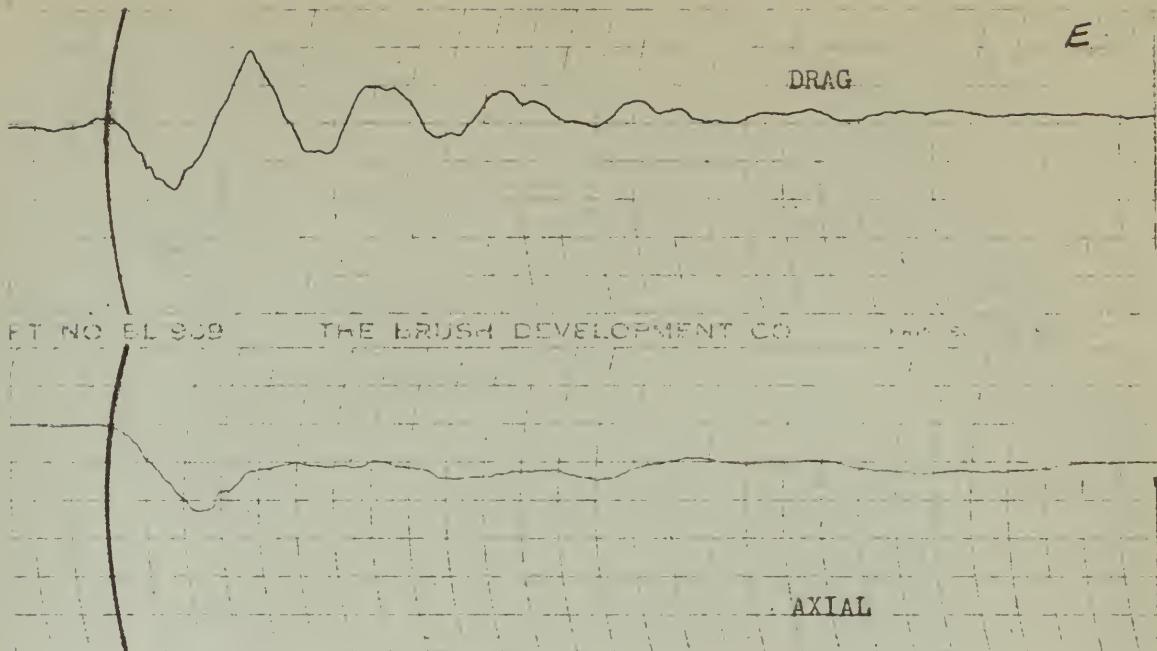
POTENTIOMETER

FIG. 10

DATE: 7/9/49
STRUT ANGLE 0°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 52.5 F.P.S.
DROPPING VELOCITY 5 F.P.S.
PAPER SPEED 125 mm./sec.

E



CALIBRATION:

DRAG - 2 mm. = 220#
AXIAL - 5 mm. = 930#
CANTILEVER - 1 mm. = .375 in.
POTENTIOMETER - REFER CURVE "B" FIG. 6

E'

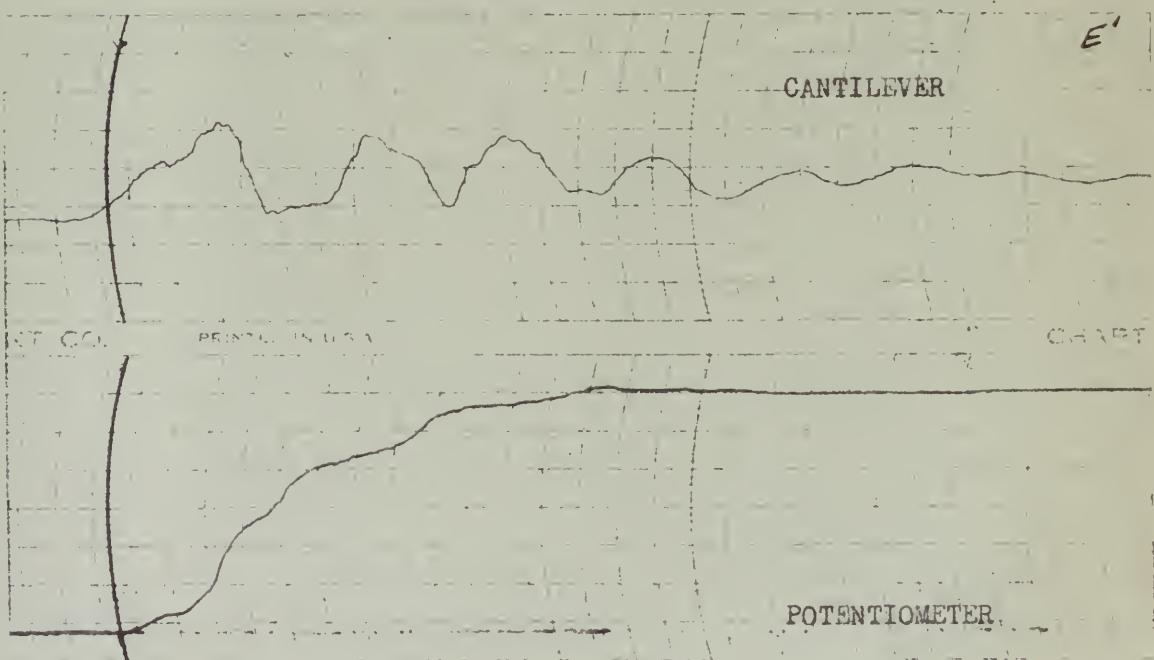
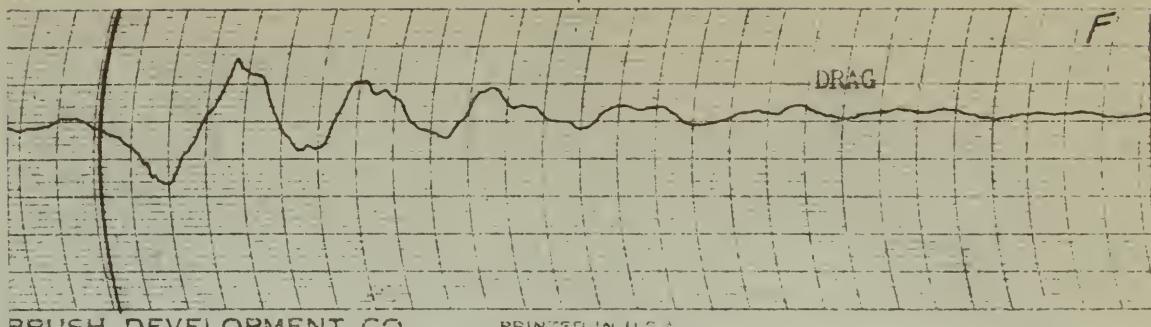


FIG. 11

DATE: 7/10/49
STRUT ANGLE 10°
WEIGHT 1060#

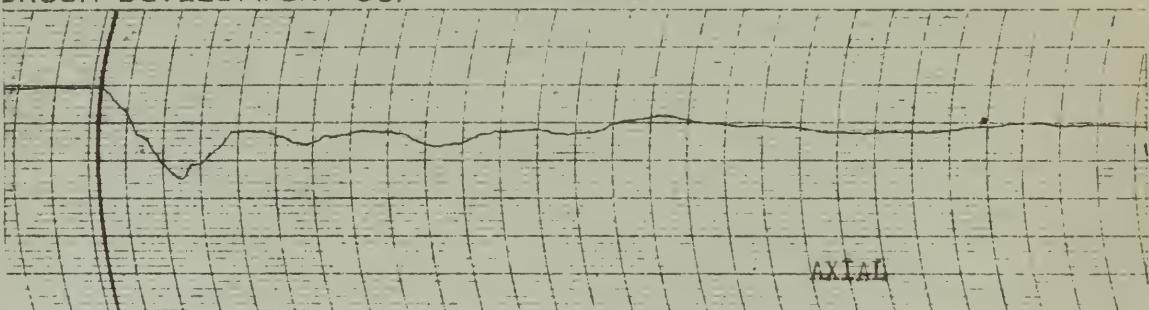
TIRE PRESSURE 24#
LANDING VELOCITY 55 F.P.S.
DROPPING VELOCITY 2 F.P.S.
PAPER SPEED 125 mm./sec.

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CALIBRATION:

DRAG - 2 mm. = 220#

AXIAL - 5 mm. = 930#

CANTILEVER - 1 mm. = .375 in.

POTENTIOMETER - REFER CURVE "B" FIG. 6

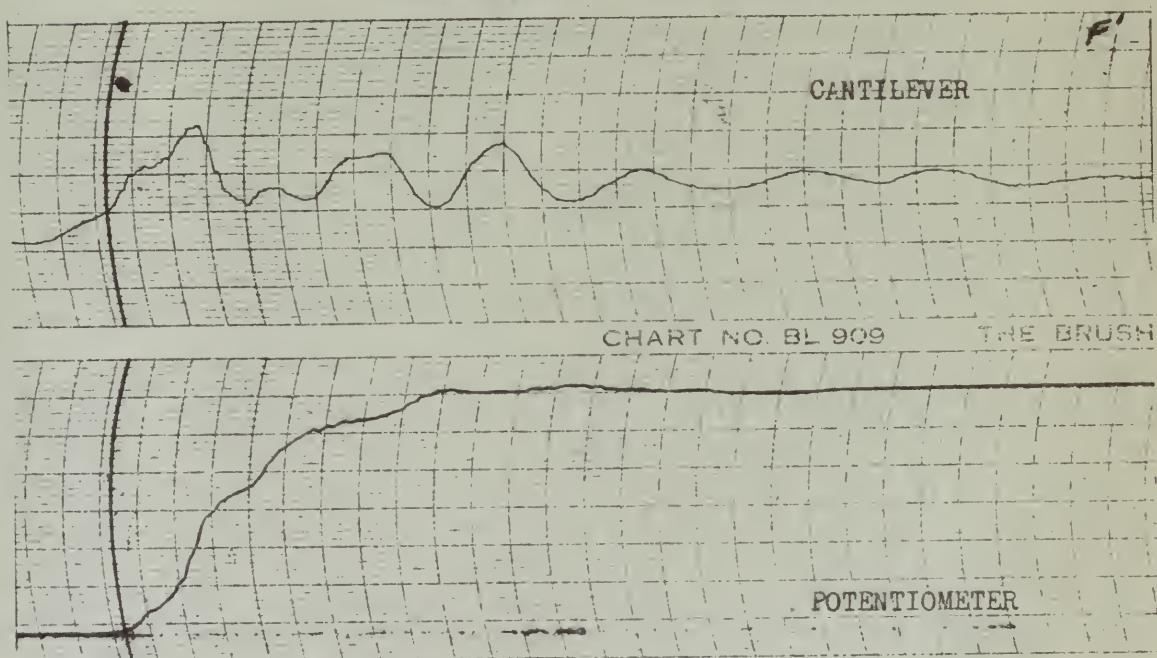
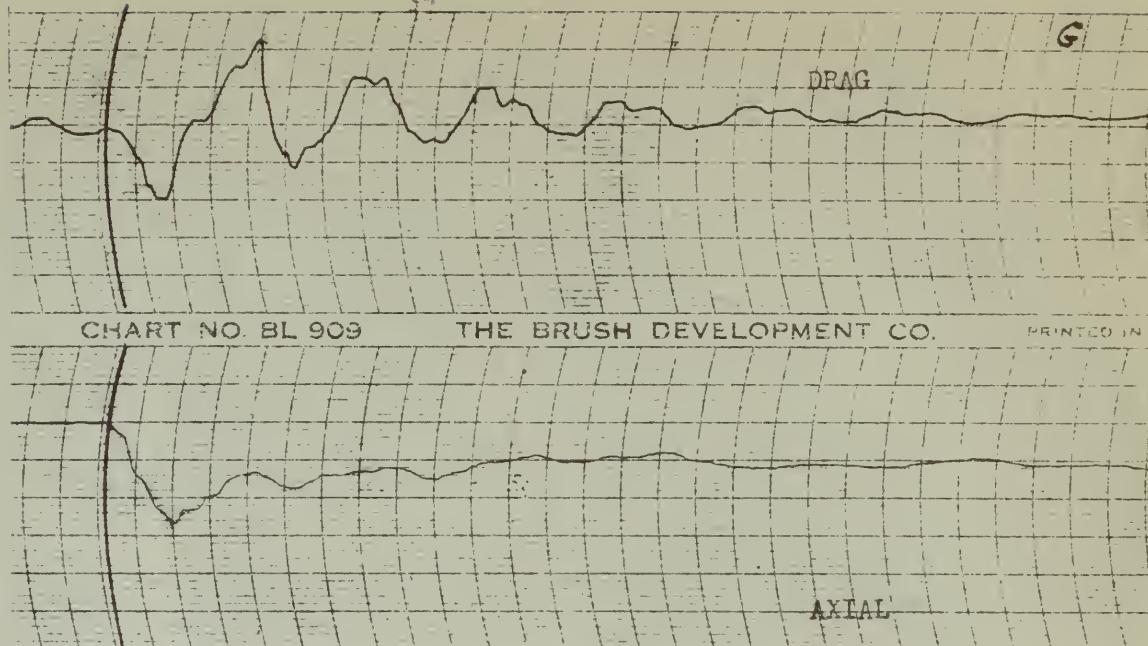


FIG. 12

DATE: 7/10/49
STRUT ANGLE 10°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 55 F.P.S.
DROPPING VELOCITY 3 F.P.S.
PAPER SPEED 125 mm./sec.

-25-



CALIBRATION:

DRAG - 2 mm. = 220#

AXIAL - 5 mm. = 930#

CANTILEVER - 1 mm. = .375 in.

POTENTIOMETER - REFER CURVE "B" FIG. 6

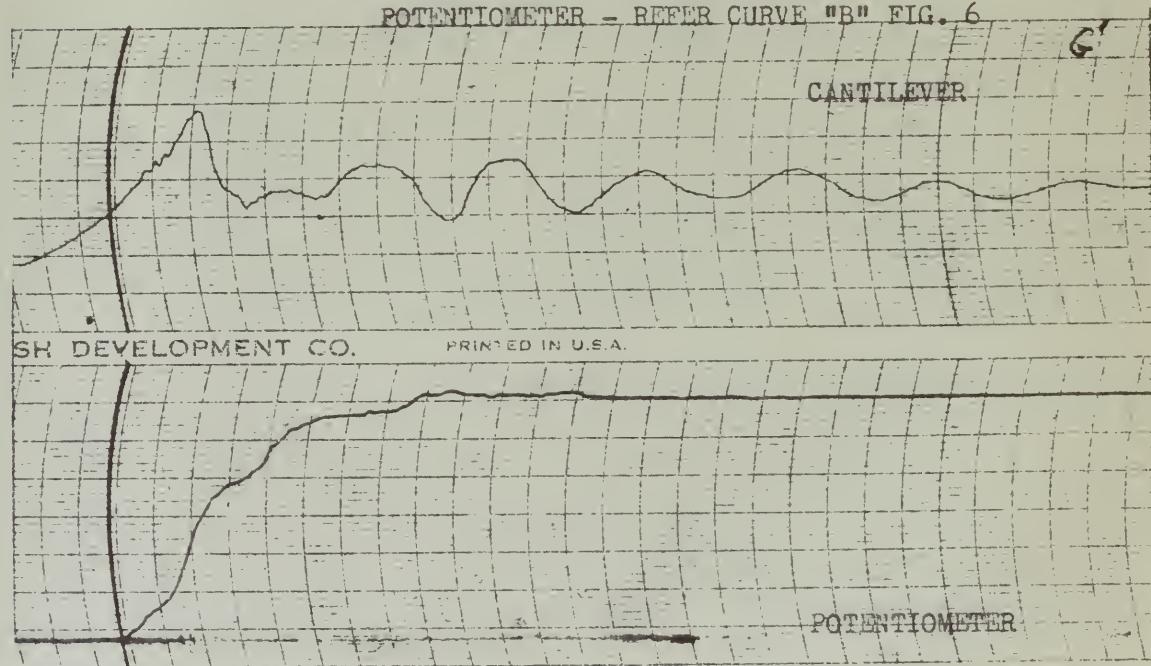
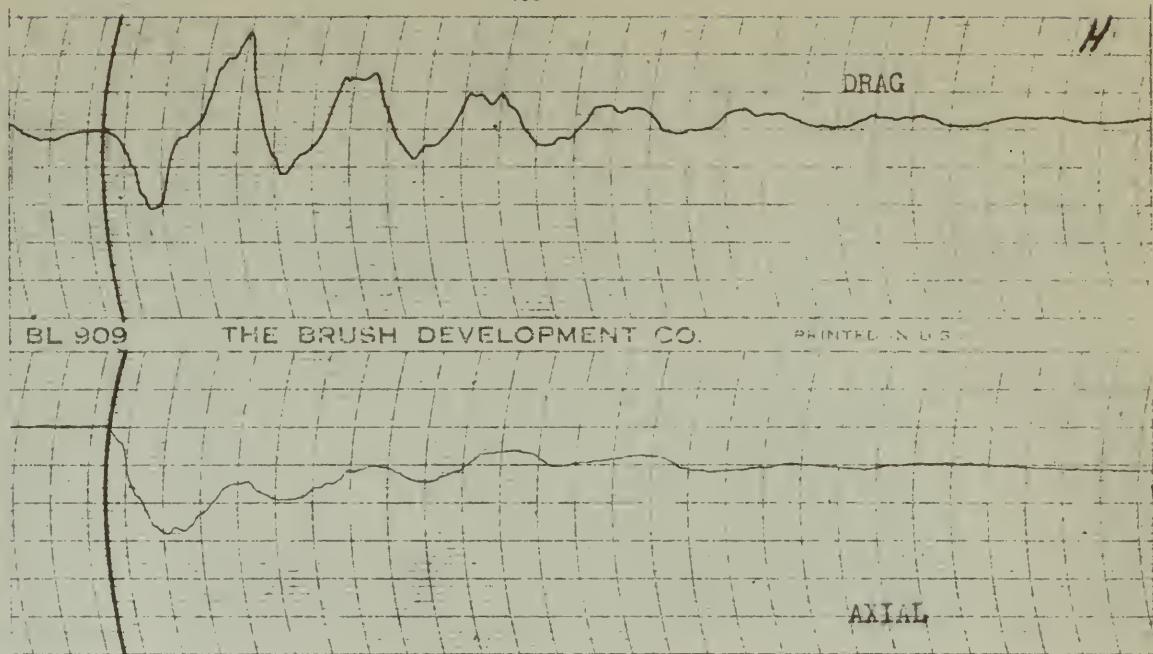


FIG. 13

DATE: 7/10/49
STRUT ANGLE 10°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 55 F.P.S.
DROPPING VELOCITY 4 F.P.S.
PAPER SPEED 125 mm./sec.



CALIBRATION:

DRAG - 2 mm. = 220#

AXIAL - 5 mm. = 930#

CANTILEVER - 1 mm. = .375 in.

POTENTIOMETER - REFER CURVE "B" FIG. 6

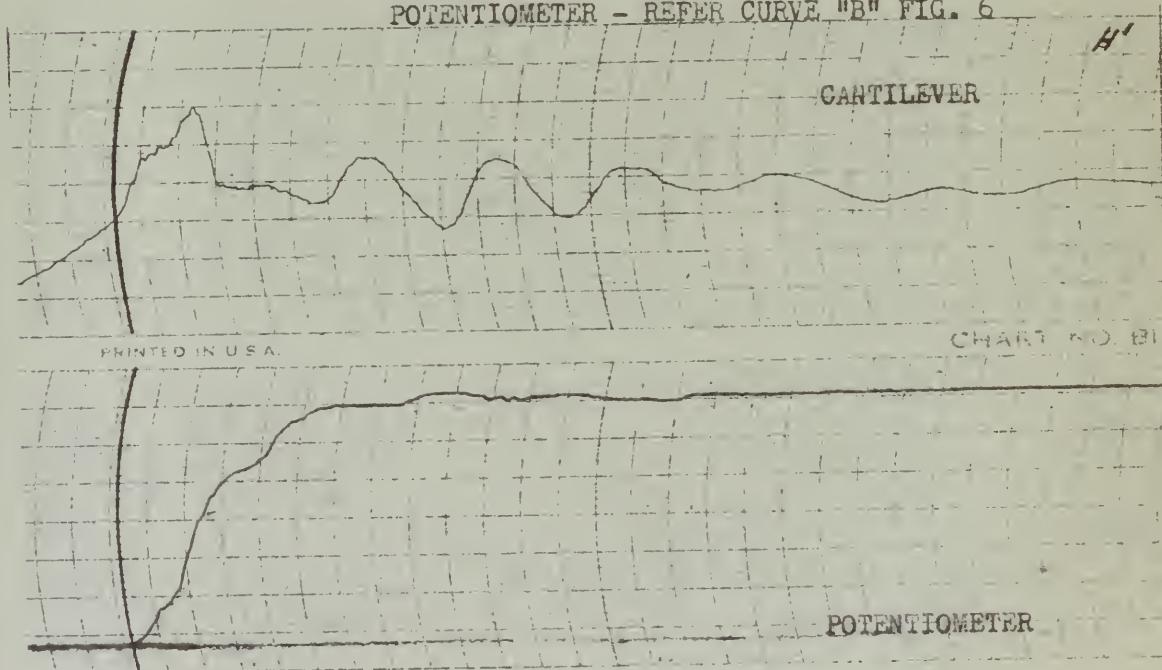
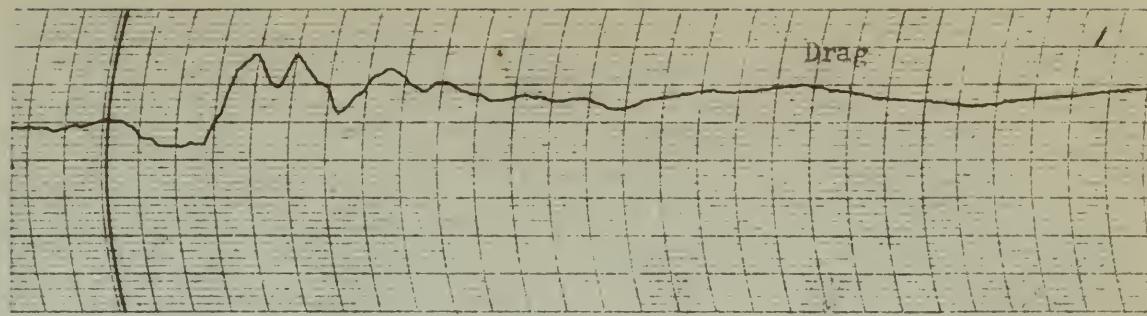


FIG. 14

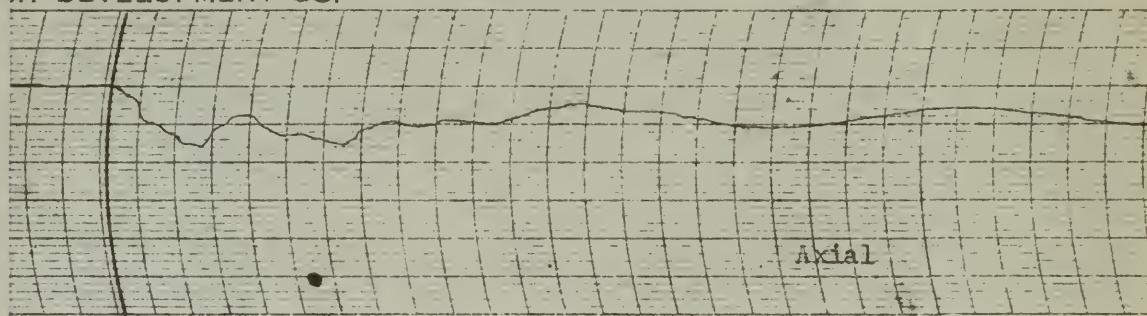
DATE: 7/10/49
STRUT ANGLE 10°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 55 F.P.S.
DROPPING VELOCITY 5 F.P.S.
PAPER SPEED 125 mm./sec.



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Axial

Calibration:

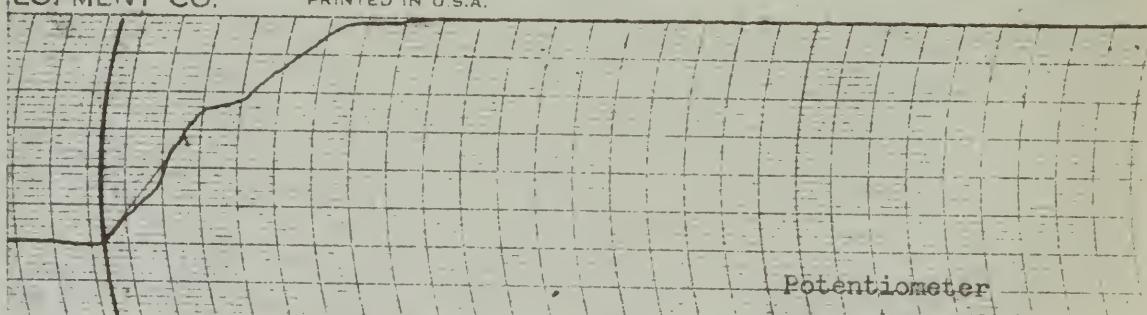
$$\begin{aligned} \text{Drag} & - 1 \text{ mm} = 220\# \\ \text{Axial} & - 5 \text{ mm} = 930\# \end{aligned}$$

Cantilever - 1 mm = .375"
Potentiometer - Refer to Fig. No. 6.
Curve B

Cantilever

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Potentiometer

Fig. No. 15

Date: 7/10/49

Strut Angle - 24°

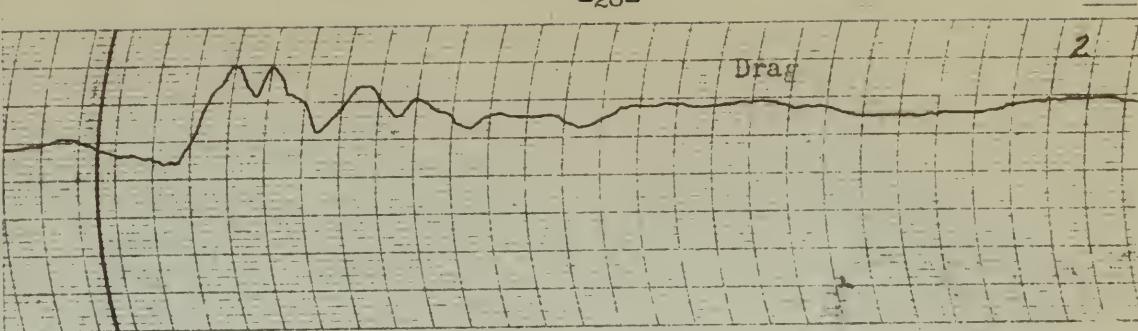
Weight - 1060#

Paper Speed 125 mm/sec

Tire Pressure - 24#

Landing Velocity - 58 FPS

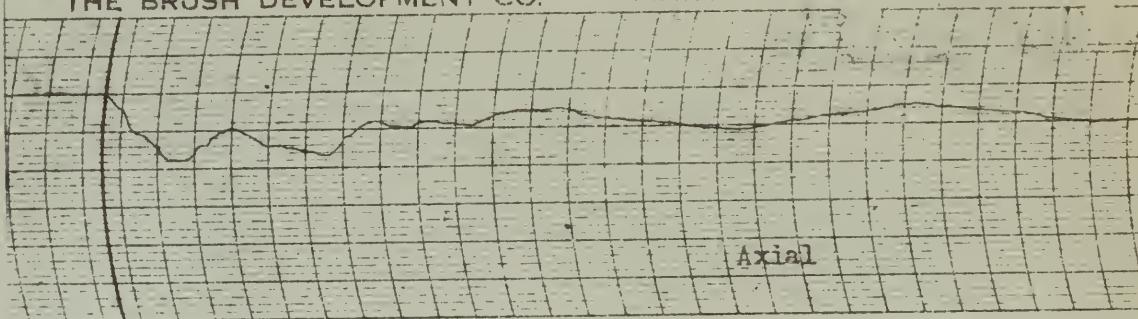
Dropping Velocity - 2 FPS.



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2



Calibration:

Drag - 1 mm = 220#

Cantilever - 1 mm = .375"

Axial - 5 mm = 930#

Potentiometer - Refer to Fig. No. 6.

Curve B

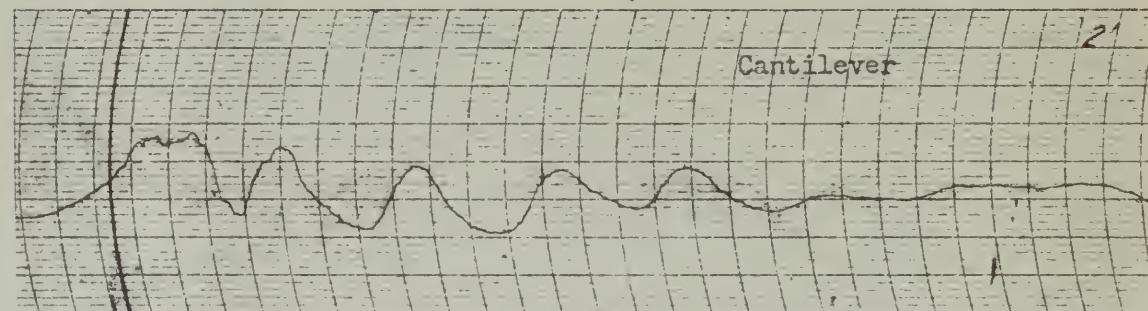
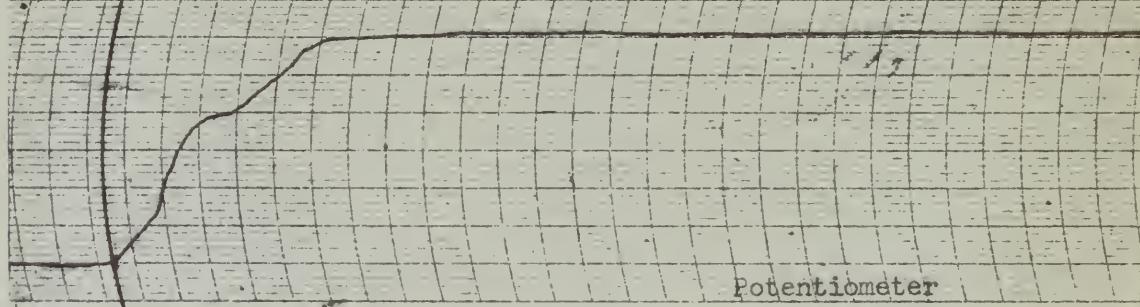


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Date: 7/10/49

Strut Angle - 24°

Weight - 1060#

Paper Speed 125 mm/sec

Fig. No. 16

Tire Pressure - 24#

Landing Velocity - 58 FPS

Dropping Velocity - 3 FPS.

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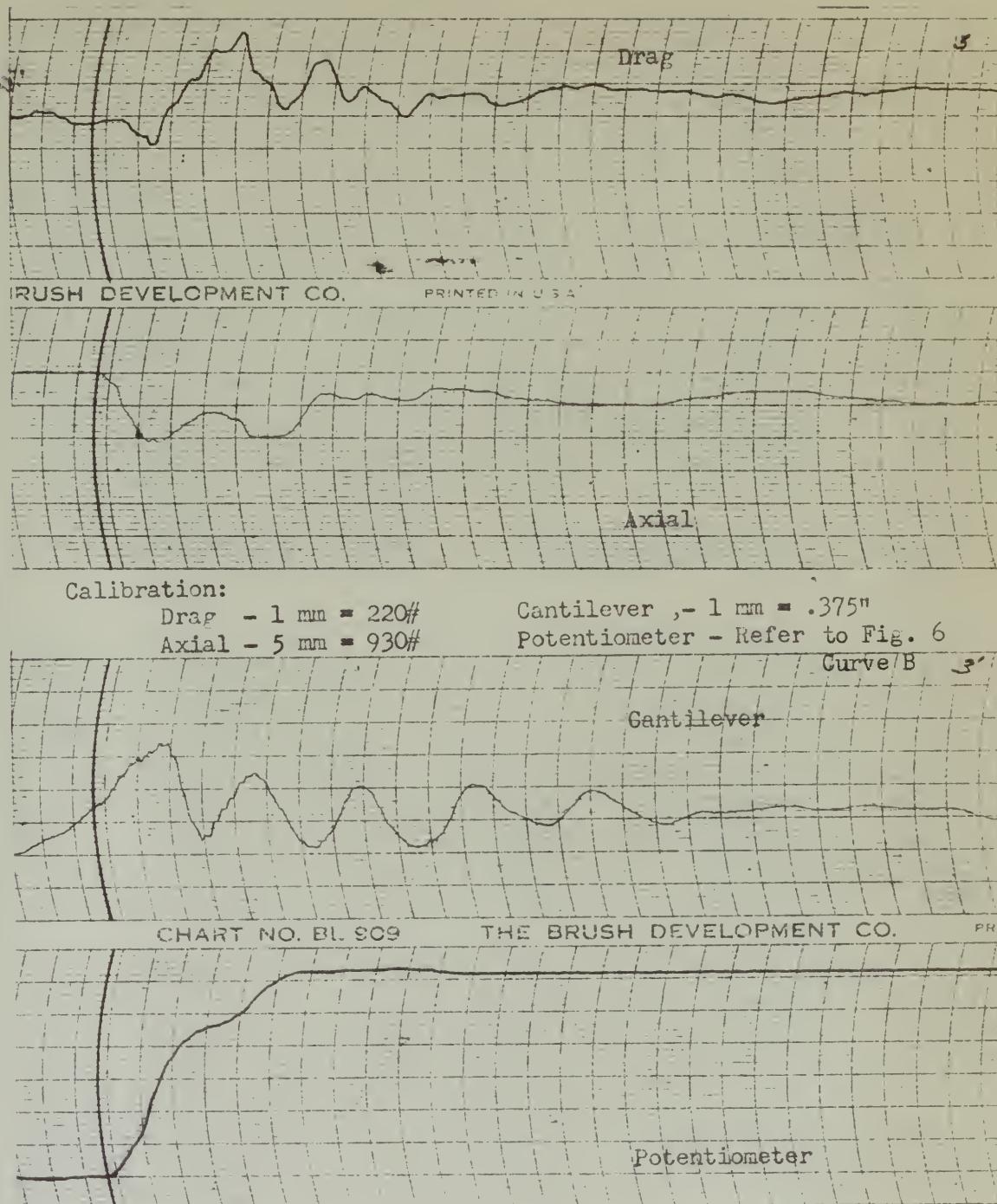


Fig. No. 17

Date: 7/10/49

Strut Angle - 24°

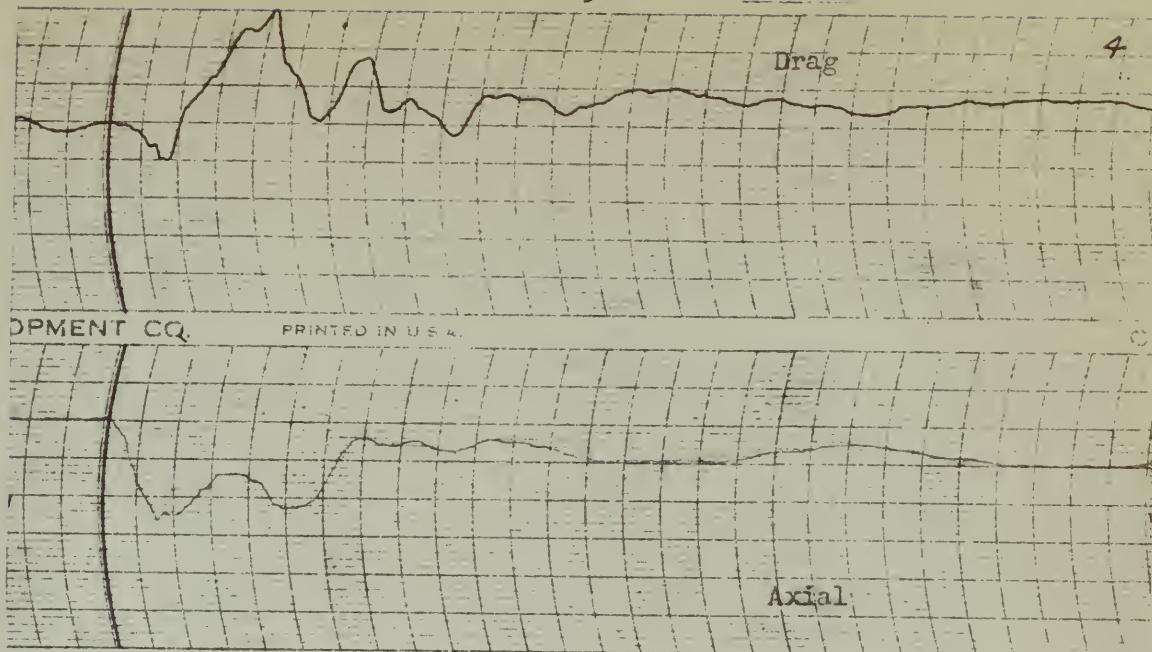
Weight - 1060#

Brush Speed 125 mm/sec

Tire Pressure - 24#

Landing Velocity - 58 FPS

Dropping Velocity - 4 FPS.



Calibration:

Drag - 1 mm = 220#
Axial - 5 mm = 930#

Cantilever - 1 mm = .375"
Potentiometer - Refer to Fig. 6
Curve B

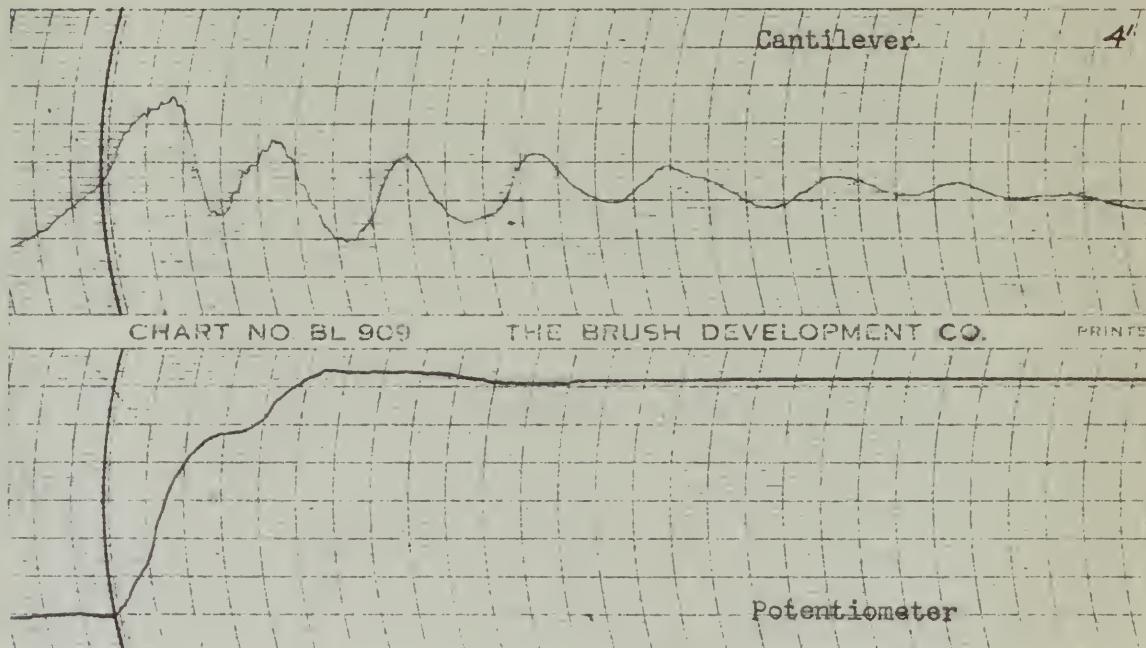


Fig. No. 18

Date: 7/10/49

Strut Angle - 24°

Weight - 1060#

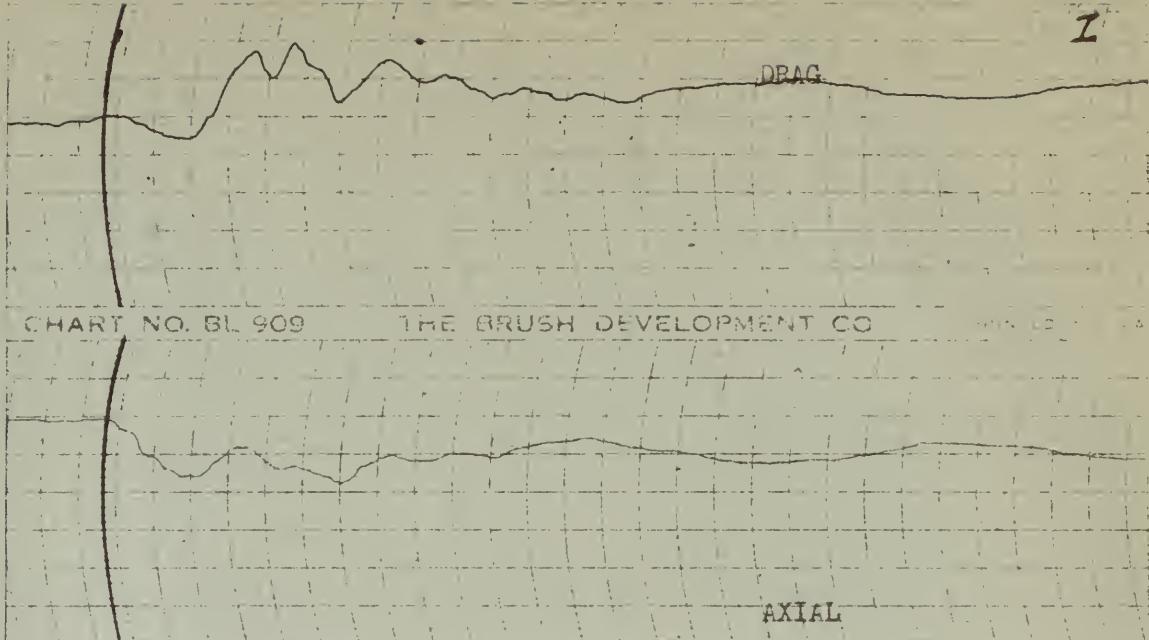
Brush Speed 125 mm/sec.

Tire Pressure - 24#

Landing Velocity - 58 FPS.

Dropping Velocity - 5 FPS.

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CALIBRATION:

| | |
|------------|--------------------|
| DRAG | - 1 mm. = 220# |
| AXIAL | - 5 mm. = 930# |
| CANTILEVER | - 1 mm. = .375 in. |

POTENTIOMETER - REFER 'CURVE "B"' FIG. 6

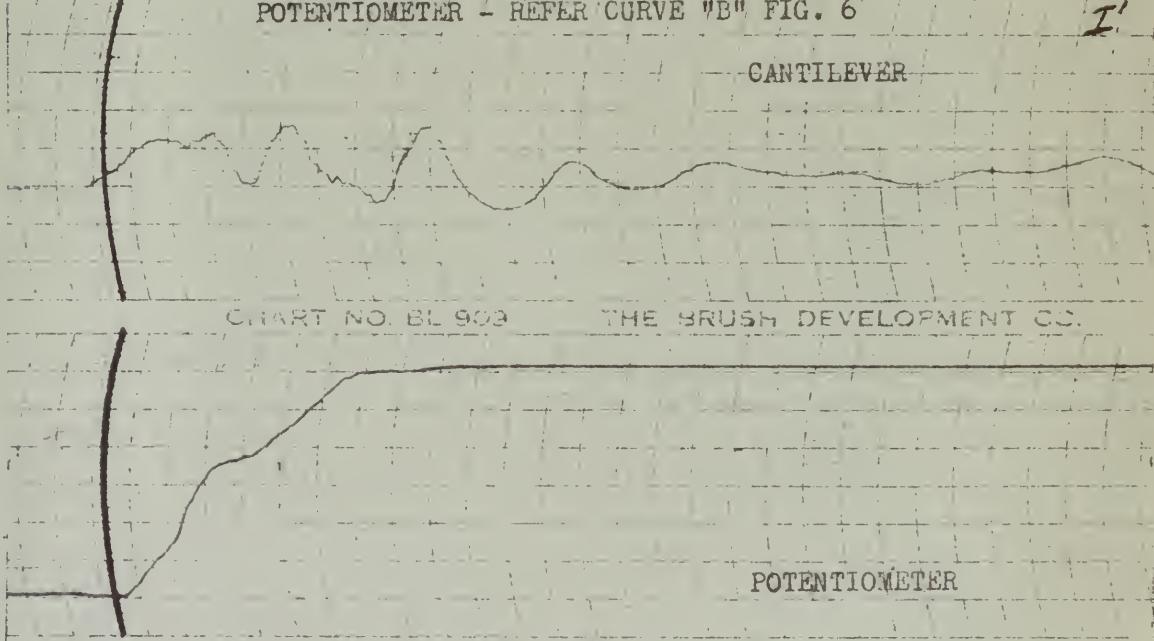


FIG. 19

DATE: 7/10/49
STRUT ANGLE 26°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 60 F.P.S.
DROPPING VELOCITY 2 F.P.S.
PAPER SPEED 125 mm./sec.

-32-

K
DRAG

CHART NO. EL 909

THE BRUSH DEVELOPMENT CO

AXIAL

CALIBRATION:

DRAG - 1 mm. = 220#

AXIAL - 5 mm. = 930#

CANTILEVER - 1 mm. = .375 in.

POTENTIOMETER - REFER CURVE "B" FIG. 6

K
CANTILEVER

THE BRUSH DEVELOPMENT CO

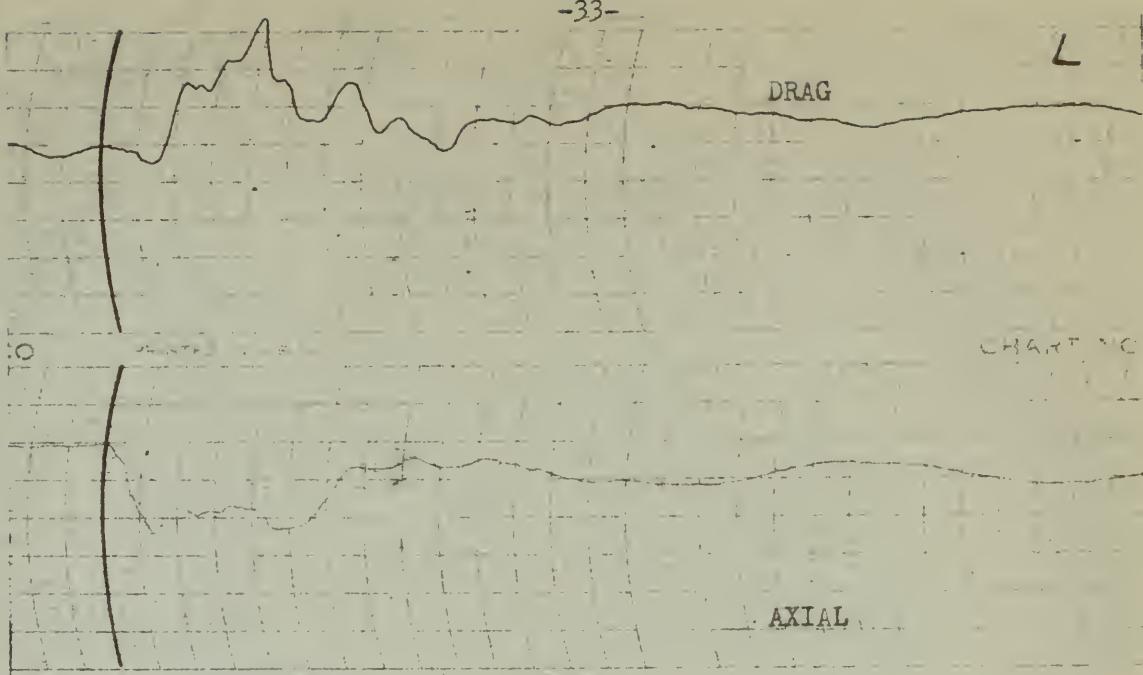
MANUFACTURED IN U.S.A.

POTENTIOMETER

FIG. 20

DATE: 7/10/49
STRUT ANGLE 26°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 60 F.P.S.
DROPPING VELOCITY 4 F.P.S.
PAPER SPEED 125 mm./sec.



CALIBRATION:

| | |
|------------|--------------------|
| DRAG | - 1 mm. = 220# |
| AXIAL | - 5 mm. = 930# |
| CANTILEVER | - 1 mm. = .375 in. |

POTENTIOMETER - REFER CURVE "B" FIG. 6

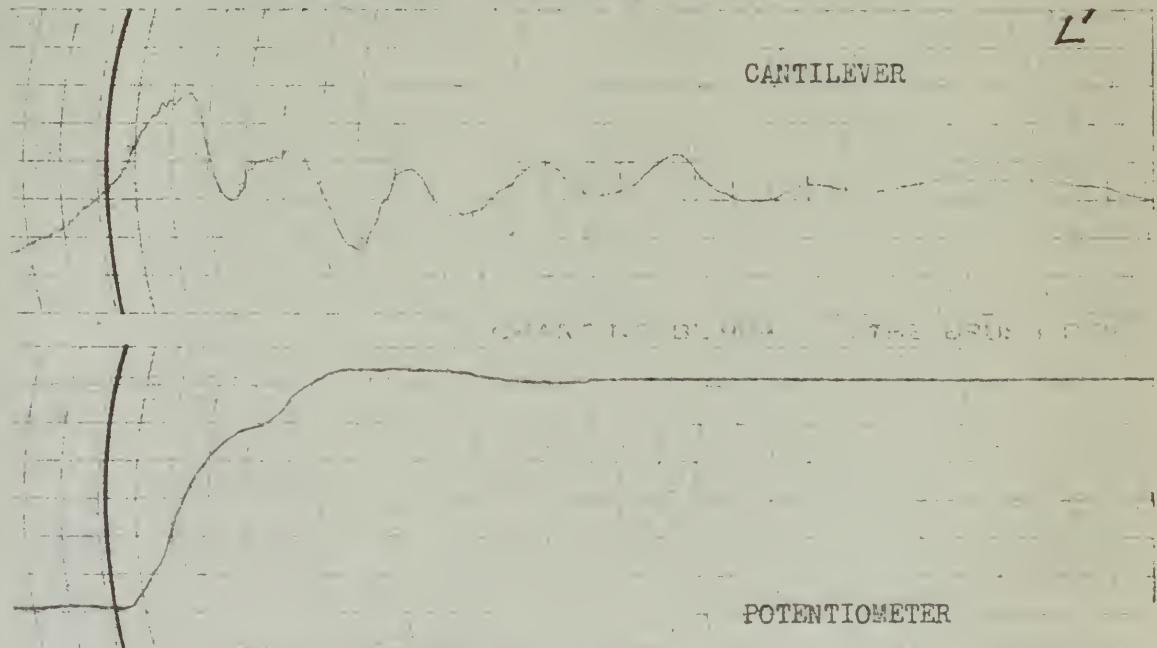


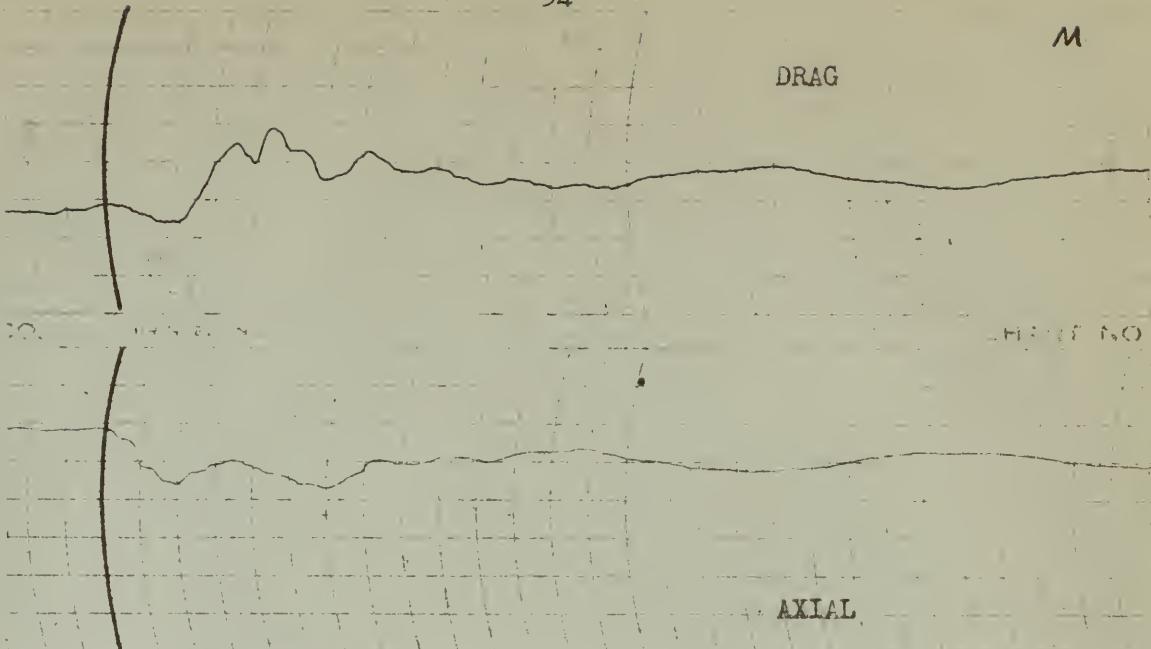
FIG. 21

DATE: 7/10/49
STRUT ANGLE 26°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 60 F.P.S.
DROPPING VELOCITY 5 F.P.S.
PAPER SPEED 125 mm./sec.

DRAG

M



CALIBRATION:

DRAG - 1 mm. = 220#
AXIAL - 5 mm. = 930#
CANTILEVER - 1 mm. = .375 in.
POTENTIOMETER - REFER CURVE "B" FIG. 6

CANTILEVER

M

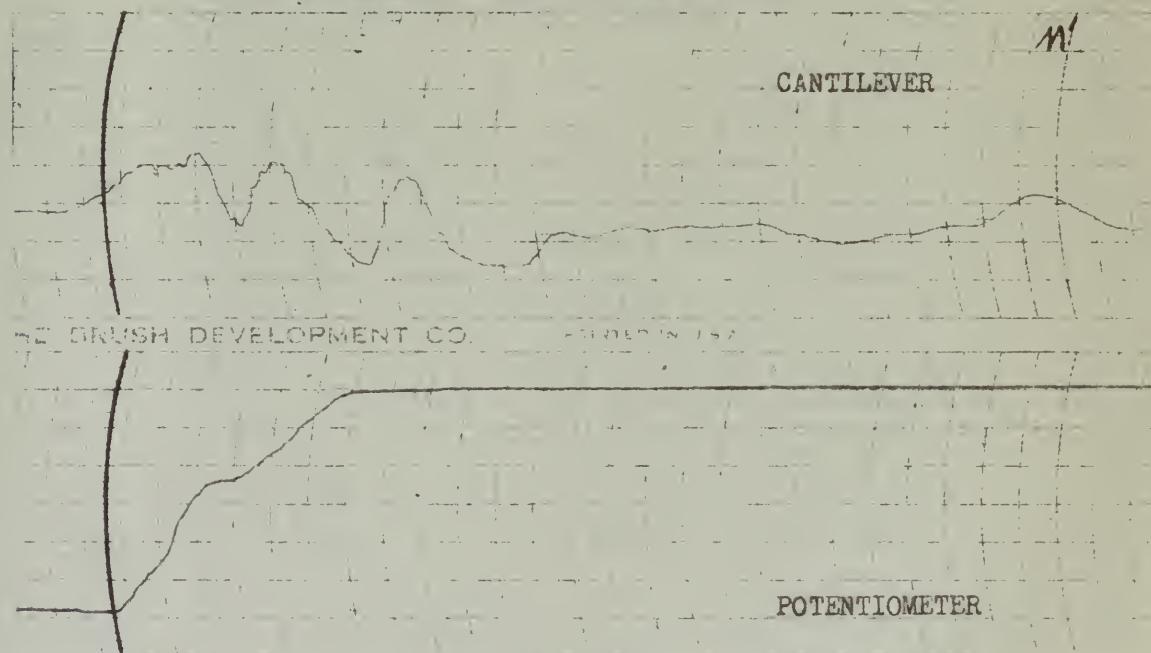


FIG. 22

DATE: 7/10/49
STRUT ANGLE 28°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 59.2 F.P.S.
DROPPING VELOCITY 2 F.P.S.
PAPER SPEED 125 mm./sec.

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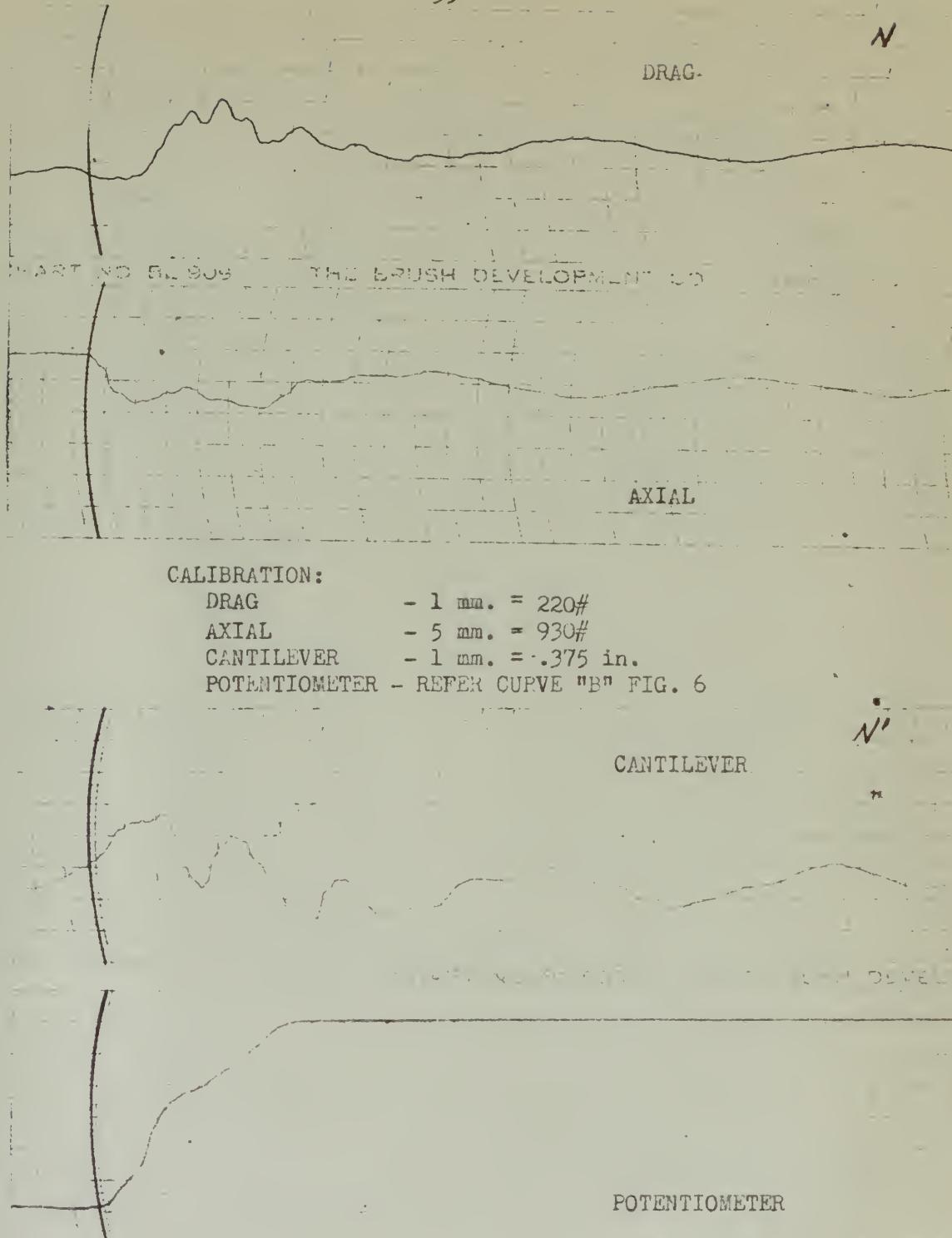


FIG. 23

DATE: 7/10/49
STRUT ANGLE 28°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 59.2 F.P.S.
DROPPING VELOCITY 3 F.P.S.
PAPER SPEED 125 mm./sec.

DRAG

DEVELOPMENT CO.

AXIAL

CALIBRATION:

DRAG - 1 mm. = 220#
AXIAL - 5 mm. = 930#
CANTILEVER - 1 mm. = .375 in.
POTENTIOMETER - REFER CURVE "B" FIG. 6

CANTILEVER

NO. BL 502

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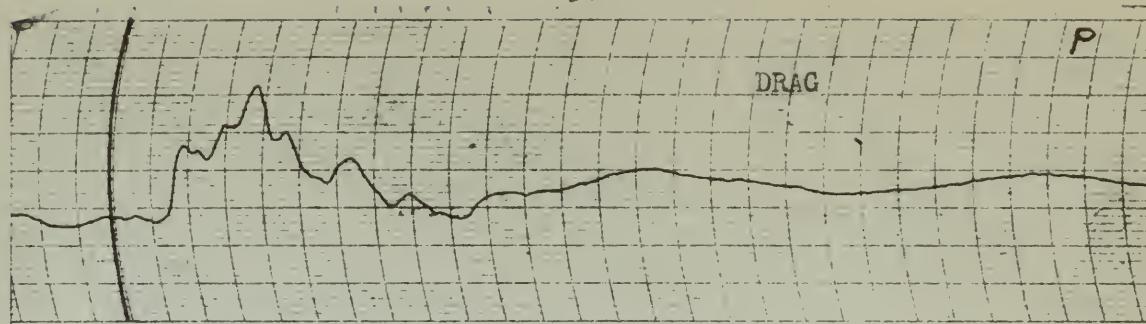
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POTENTIOMETER

FIG. 24

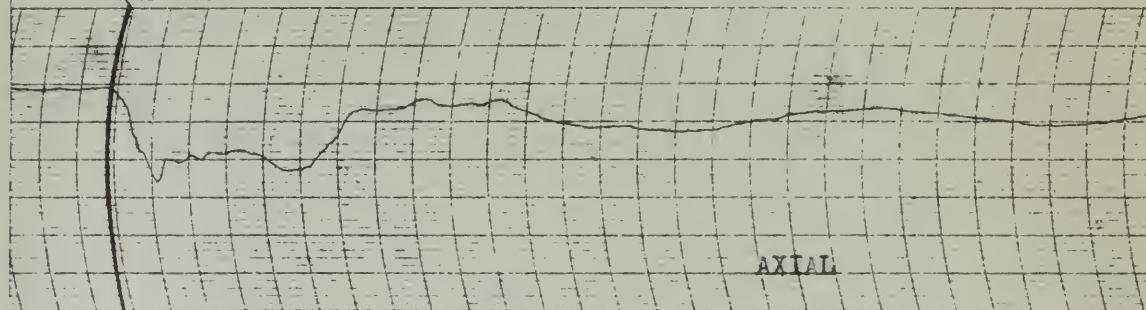
DATE: 7/10/49
STRUT ANGLE 28°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 59.2 F.P.S.
DROPPING VELOCITY 4 F.P.S.
PAPER SPEED 125 mm./sec.



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AXIAL

CALIBRATION:

DRAG - 1 mm. = 220#

AXIAL - 5 mm. = 930#

CANTILEVER - 1 mm. = .375 in.

POTENTIOMETER - REFER CURVE "B" FIG. 6

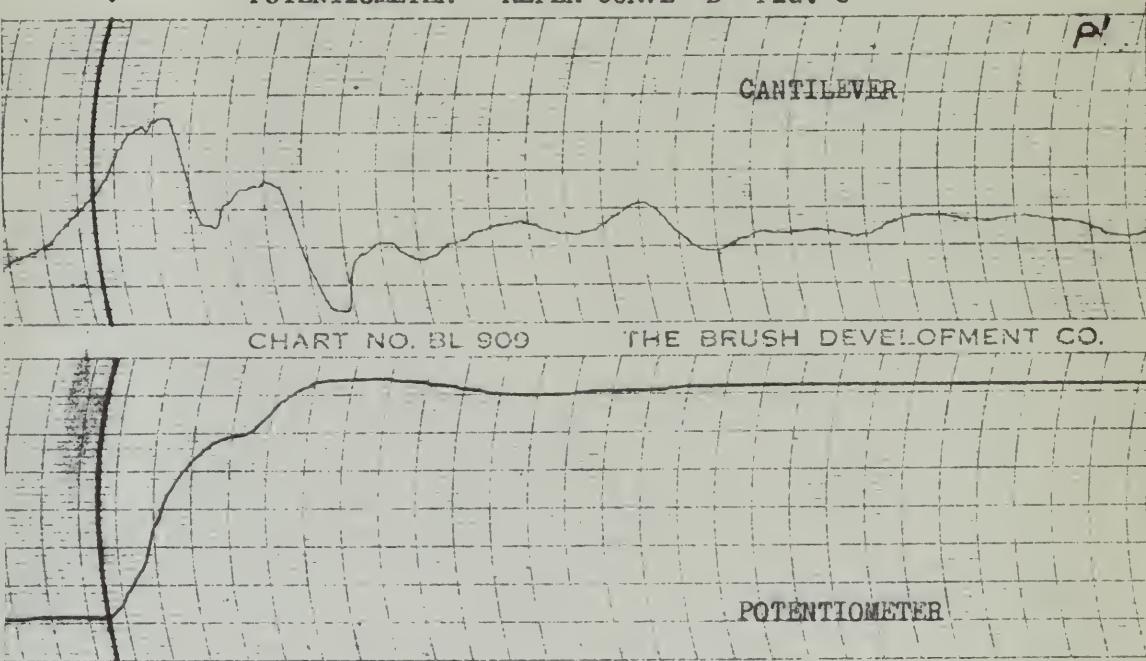


CHART NO. BL 909

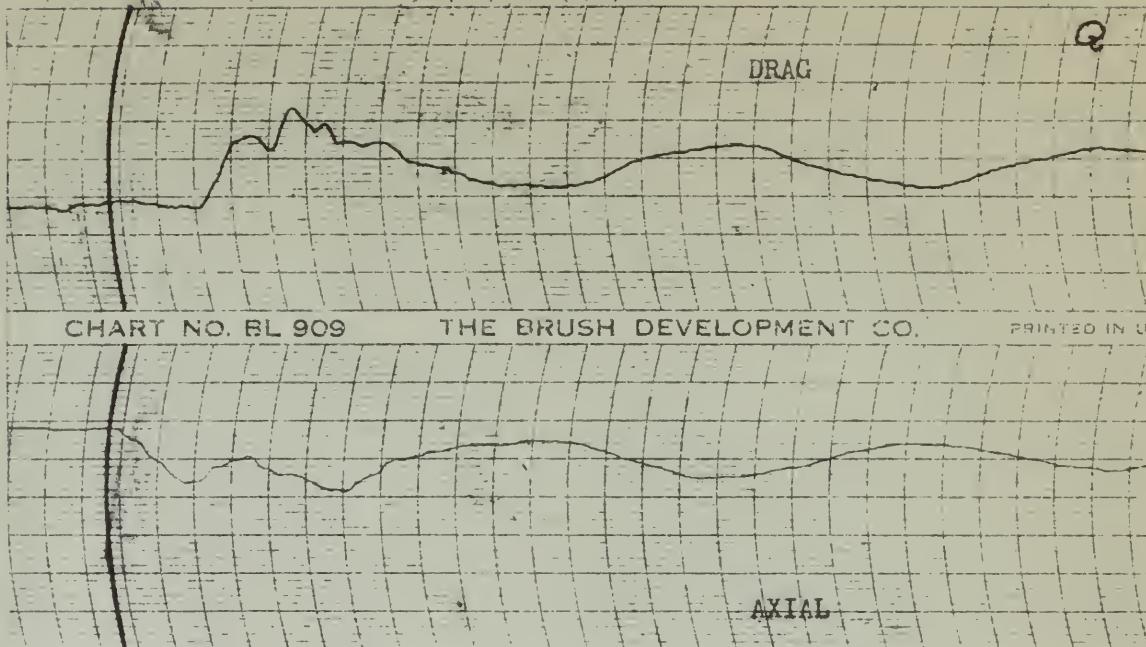
THE BRUSH DEVELOPMENT CO.

POTENTIOMETER

FIG. 25

DATE: 7/10/49
STRUT ANGLE 28°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 59.2 F.P.S.
DROPPING VELOCITY 5 F.P.S.
PAPER SPEED 125 mm./sec.



CALIBRATION:

DRAG - 1 mm. = 220#
AXIAL - 5 mm. = 930#
CANTILEVER - 1 mm. = .375 in.

POTENTIOMETER - REFER CURVE "B" FIG. 6

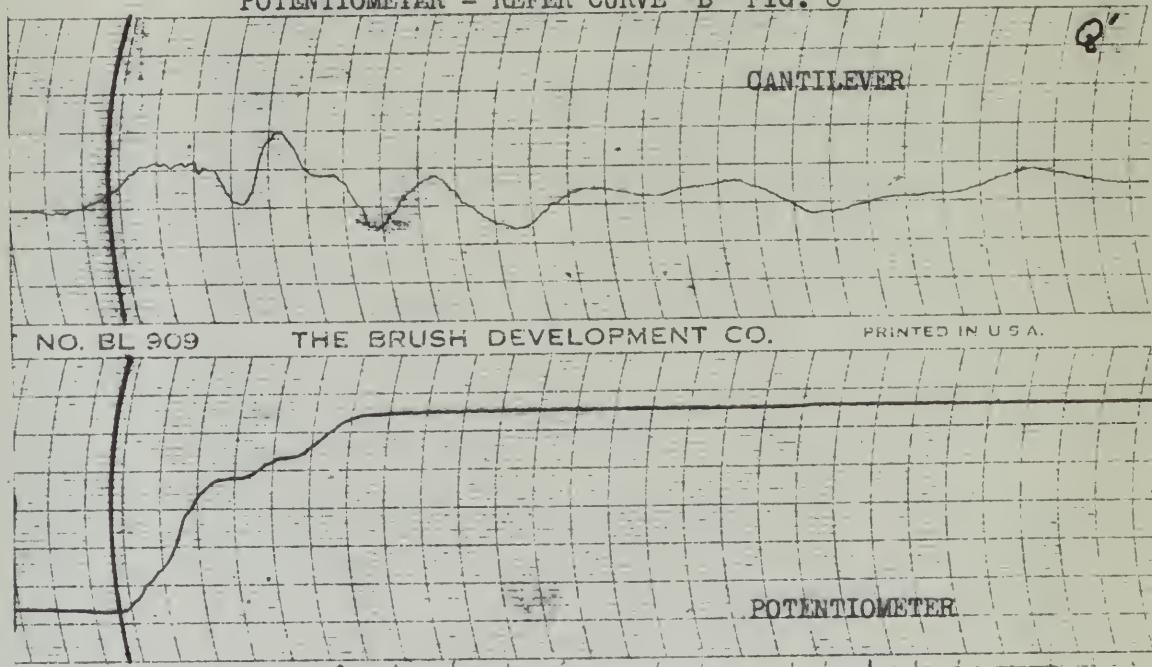
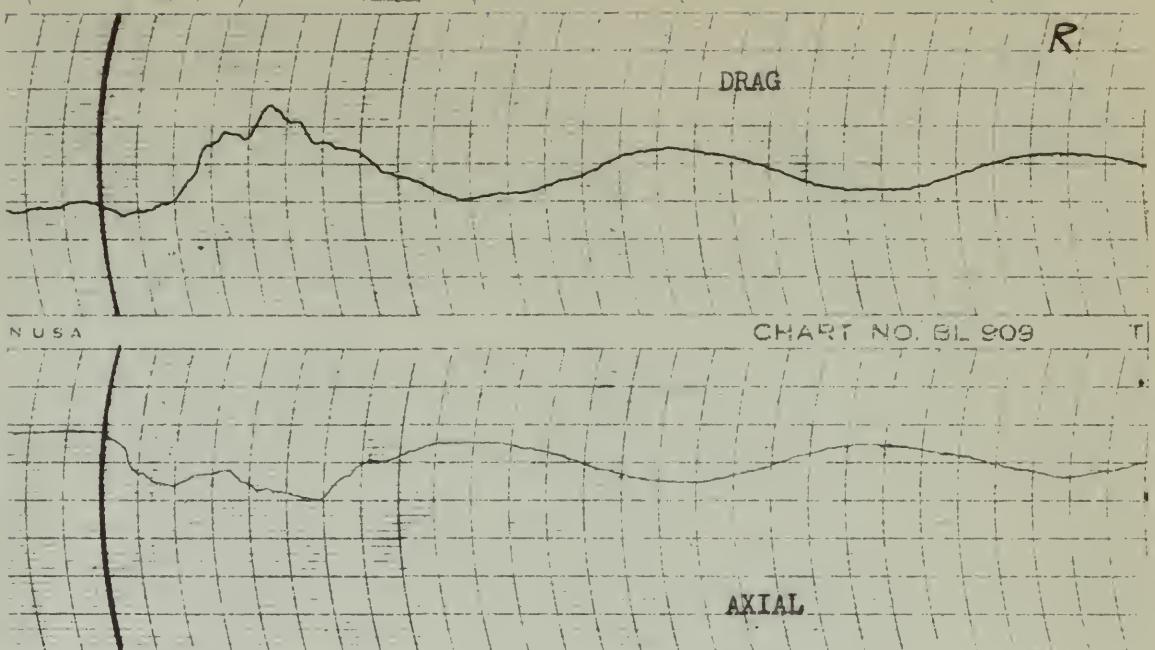


FIG. 26

DATE: 7/10/49
STRUT ANGLE 30°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 57.5 F.P.S.
DROPPING VELOCITY 2 F.P.S.
PAPER SPEED 125 mm./sec.



CALIBRATION:

DRAG - 1 mm. = 220#
AXIAL - 5 mm. = 930#
CANTILEVER - 1 mm. = .375 in.

POTENTIOMETER - REFER CURVE "B" FIG. 6

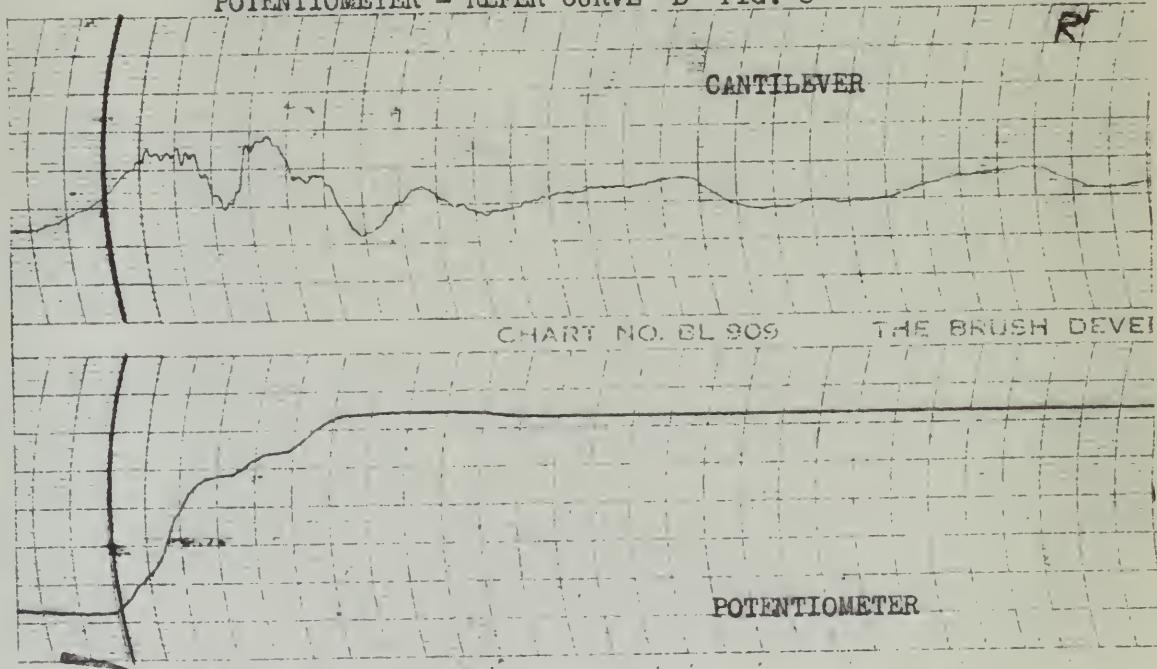
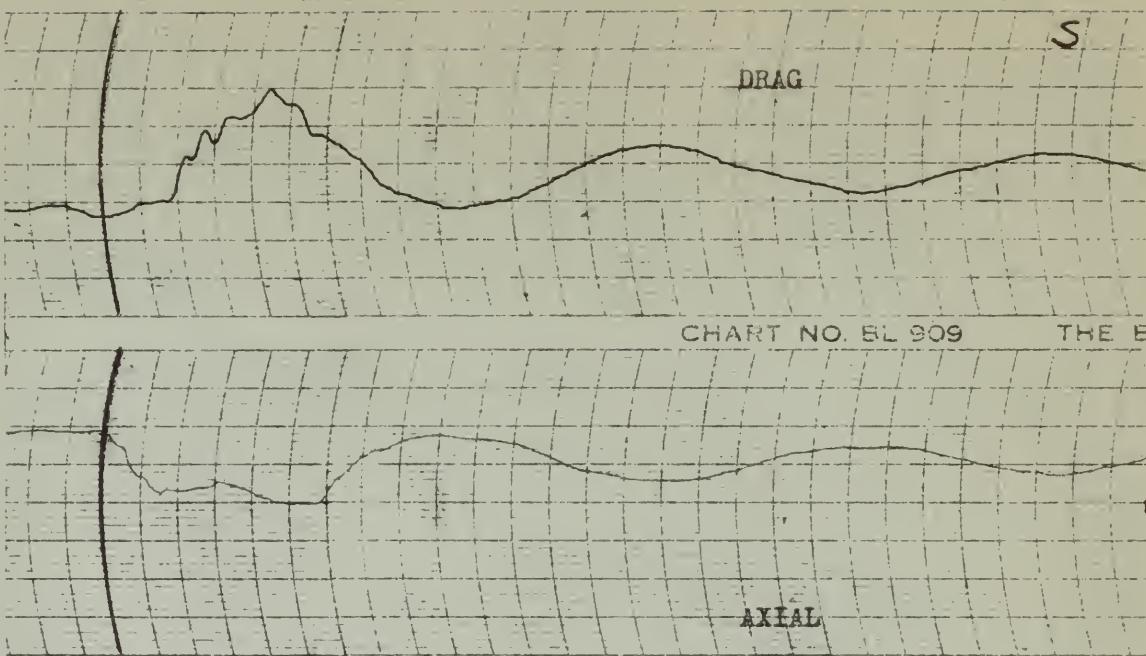


FIG. 27

DATE: 7/10/49
STRUT ANGLE 30°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 57.5 F.P.S.
DROPPING VELOCITY 3 F.P.S.
PAPER SPEED 125 mm./sec.



CALIBRATION:

DRAG - 1 mm. = 220#
AXIAL - 5 mm. = 930#
CANTILEVER - 1 mm. = .375 in.

POTENTIOMETER - REFER CURVE "B" FIG. 6

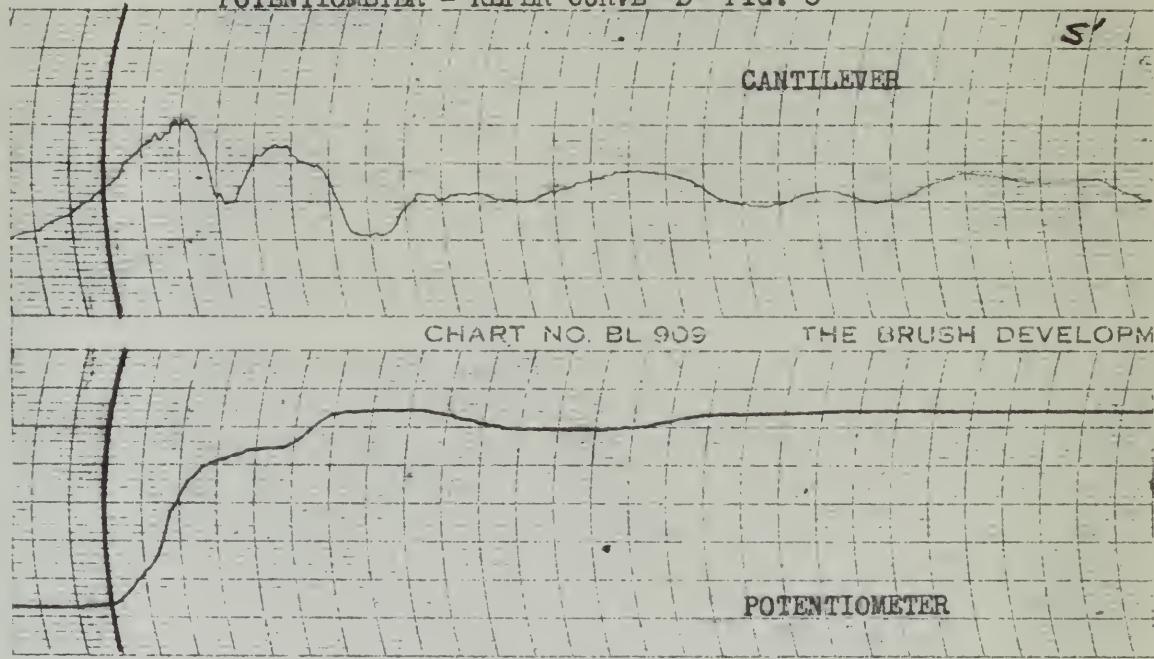
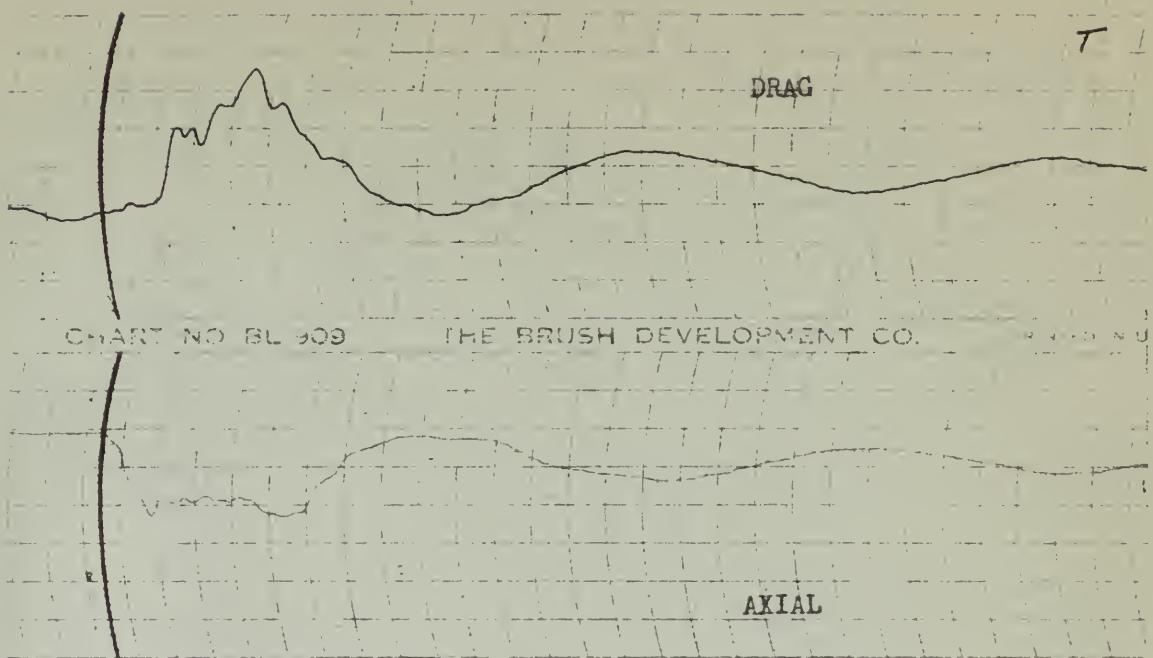


FIG. 28

DATE: 7/10/49
STRUT ANGLE 30°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 57.5 F.P.S.
DROPPING VELOCITY 4 F.P.S.
PAPER SPEED 125 mm./sec.

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CALIBRATION:

DRAG - 1 mm. = 220#
AXIAL - 5 mm. = 930#
CANTILEVER - 1 mm. = .375 in.
POTENTIOMETER - REFER CURVE "B" FIG. 6

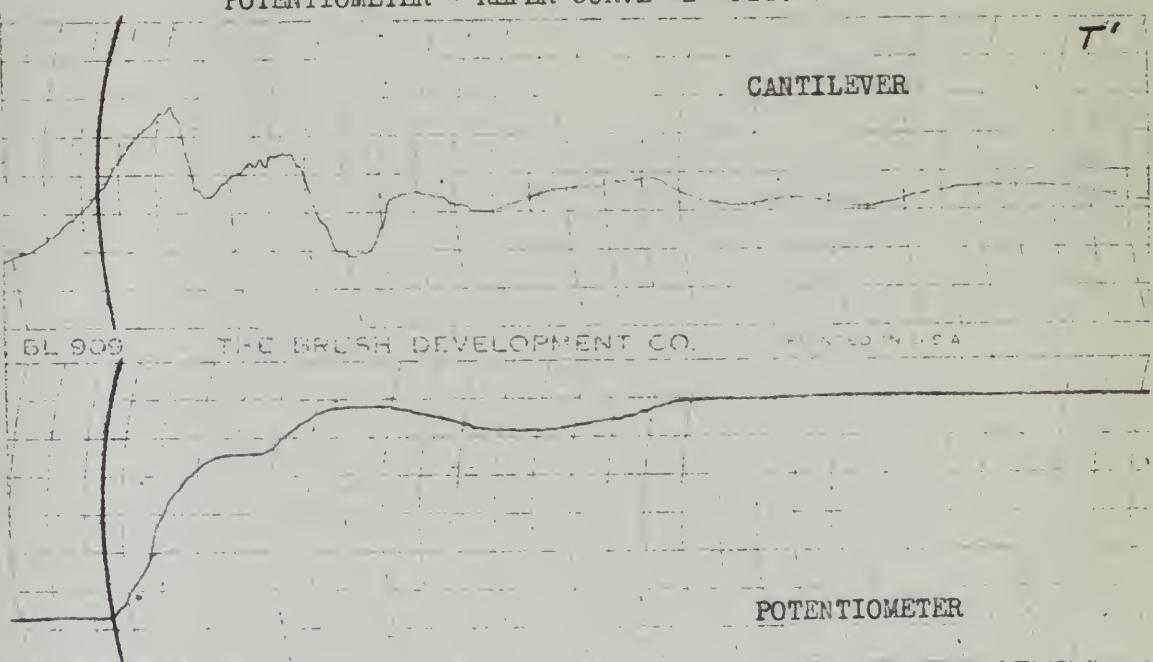
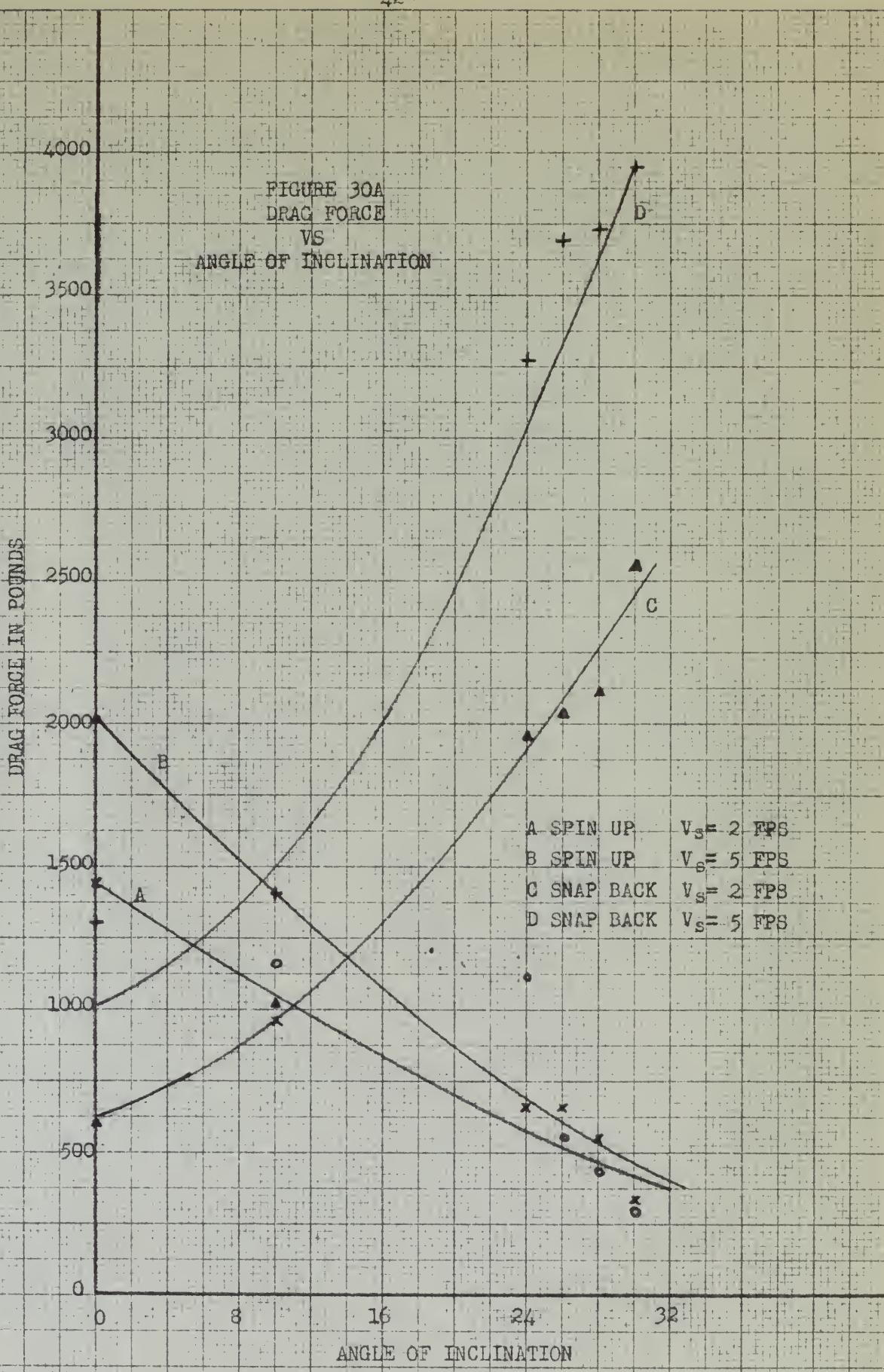
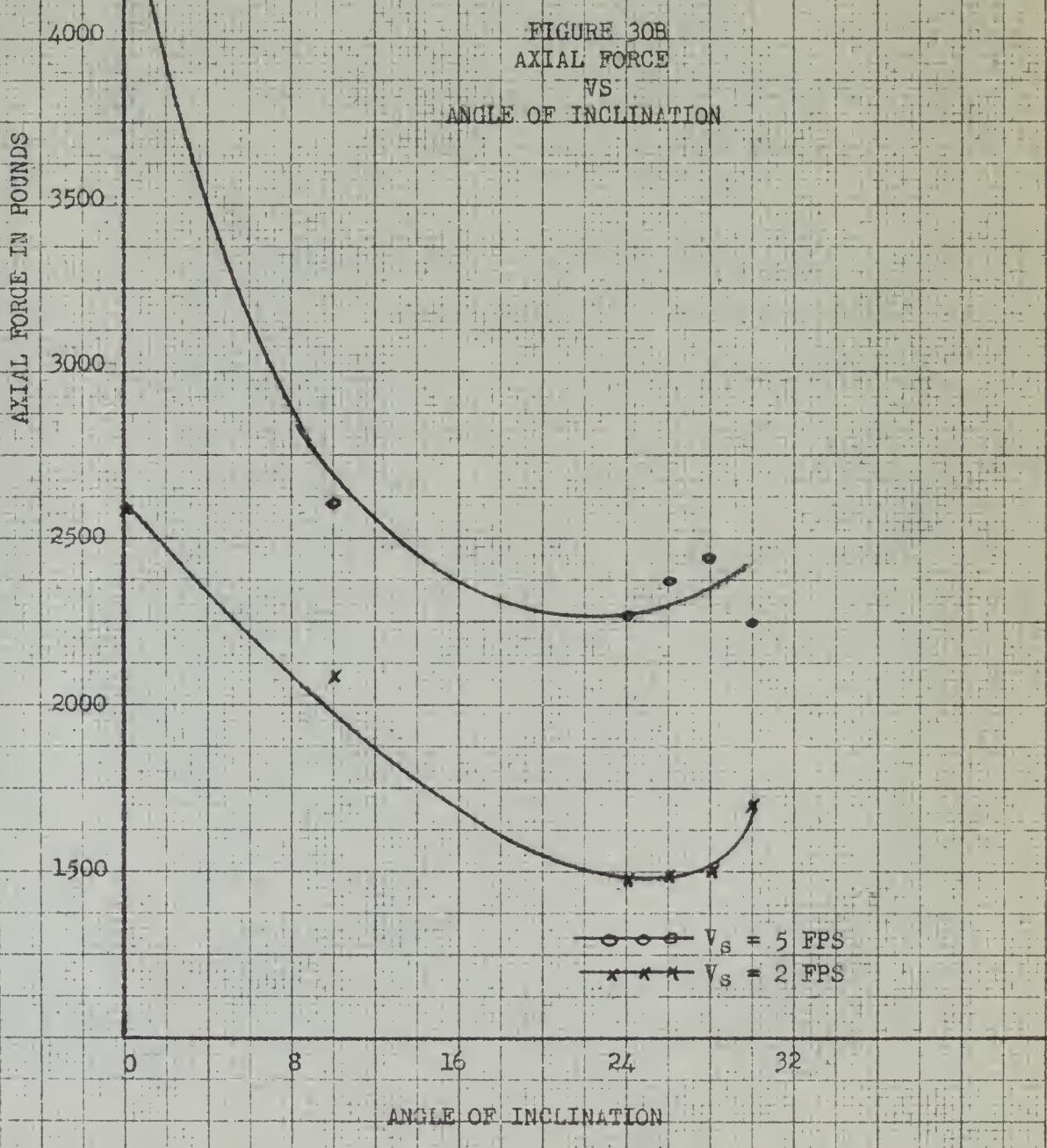


FIG. 29

DATE: 7/10/49
STRUT ANGLE 30°
WEIGHT 1060#

TIRE PRESSURE 24#
LANDING VELOCITY 57.5 F.P.S.
DROPPING VELOCITY 5 F.P.S.
PAPER SPEED 125 mm./sec.





COMPARISON OF TEST AND THEORY

An analytical study of the dynamic forces in landing gear of aircraft is developed in the Appendix. A comparison will be made between the results obtained by test and the results obtained by the analytical approach.

In the example problem developed in the Appendix for an angle of twenty-four degrees and a sinking velocity of three feet per second the displacement equation for wheel, or m_2 is:

$$z_2 = .001137e^{-3.01t} + .001086e^{-158.679t} \\ + e^{-8.155t}(.1368 \sin 16.235t - .1136 \cos 16.235t)$$

The following displacements are obtained:

at $t = .02$ second

$$z_2 = .4472 \text{ inch}$$

at $t = .07$ second

$$z_2 = 2.41 \text{ inches}$$

From test data of Figure 16, the following displacements are obtained:

at $t = .02$ second

$$z_2 = .75 \text{ inch}$$

at $t = .07$ second

$$z_2 = 2.25 \text{ inches}$$

The above values have been evaluated as true tire deflection. The test data shows greater tire deflections

THREE NEW PLATEAU FISHES

problem of marsh fishes and the three families of
congeneric A. carolinensis and A. neogaeus of Florida to New
England and the first of analyses which was started when all three
of the families of landlocked fishes were
and which will be completed probably within a few years.

In addition, probably a few more morphological data will be
available before the time of publication of the present paper.

167

1999-194-200000, 4, 1999-194-200001, 2, 20

(1999-194-200002, 4, 1999-194-200003, 3,

three female and one male with genitalia well

developed; 100, 20, 2, 20

and 100, 20, 2, 20

female 100, 20, 2, 20

adult 100, 20, 2, 20

abdominal gaster very large and thick and well

developed in

female 100, 20, 2, 20

adult 100, 20, 2, 20

female 100, 20, 2, 20

adult 100, 20, 2, 20

and two of females and one male with all

abdominal parts missing were sent from the California

shortly after impact than is obtained by analytical methods, while after a longer period of time the analytical method gives greater tire deflection than is indicated by the test data. This indicates that the spring characteristic of the tire is not a constant as used in the analytical method, but varies with displacement.

The theoretical equation for the displacement of s_1 is:

$$s_1 = -.3534e^{-3.01t} - .0001543e^{-158.679t} + e^{-8.155t}(.04206 \sin 16.235t - .1584 \cos 16.235t)$$

The following displacements are obtained:

at $t = .02$ second

$$s_1 = .762 \text{ inch}$$

at $t = .07$ second

$$s_1 = 3.41 \text{ inches}$$

For the same time periods the test data produces the displacements below:

at $t = .02$ second

$$s_1 = 1.05 \text{ inches}$$

at $t = .07$ second

$$s_1 = 3.95 \text{ inches}$$

The test data shows greater displacements for s_1 than are calculated analytically. This indicates that the spring constant used in the analytical calculation is very small on initial compression and that the damping is somewhat less than calculated. More exact spring and

жестко зафиксирована в виде листа с изображением
одного изображения или серии изображений, а также
имеет форму, соответствующую форме изображения
или группе изображений, и не имеет видимых
изменений вида, способных вызвать опасение о том

Изменение вида

внешности изображения или группы изображений

или

изображения, — изображение в г

(где α — изображение, β — изображение, γ —

изображение, имеющее вид изображения α и

имеющее вид изображения β и

имеющее вид изображения γ

изображение α , β и γ

изображение α , β и γ

изображение α , β и γ

или изображение, имеющее вид изображения α и

имеющее вид изображения β

изображение α , β и γ

изображение α , β и γ

изображение α , β и γ

и т.д. Изображение α может иметь вид изображения

или изображения, имеющего вид изображения α и
имеющего вид изображения β и т.д. Изображение α может
иметь вид изображения α и изображения β и т.д. Изображение α может

damping constants would improve the correlation between test and analytical results.

The maximum drag force and time of maximum drag force for angle of 0 degree are calculated in an example problem in the Appendix. The following results are obtained:

$$t_s = .081 \text{ second}$$

$$P_x \text{ max} = 2140 \text{ pounds}$$

Test data from Figure 7 produce the following results:

$$t_s = .08 \text{ second}$$

$$P_x \text{ max} = 1550 \text{ pounds}$$

The time at which the maximum drag force occurs is the same for analytical and test results. The calculated maximum drag force is much larger than the maximum drag force obtained from test results. This large variation between theoretical and test results may be due to the fact that the coefficient of friction was assumed to be constant and P_{xk} was assumed a constant. The assumption that the coefficient of friction is a constant is erroneous and further investigation should be conducted to determine its value.

The optimum angle of suspension, as calculated in the Appendix, is $23^\circ 31'$, whereas test results indicate the optimum angle of suspension to be approximately ten degrees. This necessitates a revision in the analytical method of calculating the optimum angle of suspension. The analytical

united nations and agreed upon measures, 11 March

UNSCON resolution 678, 1990

which called for the UN to take military action with

all necessary means to end the continued acts of aggression by Iraq against

Iranian soil, which had already been committed against Iran

Resolution 678, 1990

demands that Iraq

immediately cease all hostile actions against Iran

Resolution 678, 1990

demands that Iraq

end all armed attacks against Iranian soil within 15 days of issue

including the withdrawal of personnel from Iranian territory, and return

detained Iranian personnel held captive since the 1980 conflict

including those held without trial or due process of law and those held

incommunicado under conditions of physical and mental torture and other forms of

inhumane treatment and punishment, and release all Iranian personnel held

as detainees and to provide for their rehabilitation and

rehabilitation under medical supervision at Iranian

facilities and hospitals of its choice

and immediately end all acts of aggression against

Iranian soil and personnel, and the withdrawal of all Iranian personnel

from Iranian territory and the restoration of normal relations between

Iran and Iraq, and the resumption of political contacts and negotiations

results were also computed from test data, which requires further verification. The preceding improvement in analytical evaluation accompanied with more test data to definitely establish the optimum angle will no doubt produce better agreement between theoretical and test results.

verschiedenste örtliche Gebräuche kann nicht bestimmen, welche jenseitigen
Gewohnheiten die Ausgangssituation bestimmt, und welche speziellen
Geschäftspraktiken sich dabei ergeben müssen. In Bezug auf die Verhandlungen
während zweier sozialer Phasen an illusorischen Märkten und Verhältnissen
derartiger Märkte ist es ziemlich schwer, einen

III. Die sozialen Phasen

Die sozialen Phasen sind die Phasen der sozialen Entwicklung, die

a) Soziale Phasen

a) Soziale Phasen

die sozialen Phasen sind die Phasen der sozialen Entwicklung,

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die sozialen Phasen sind die Phasen der sozialen Entwicklung, die sozialen Phasen sind die Phasen der sozialen Entwicklung,

CONCLUSIONS

1. To produce equal bending moments during spin up and snap back of the strut, the optimum angle for suspending an SNJ type aircraft strut is approximately ten degrees.
2. Minimum axial forces are produced by suspending the strut at an angle of approximately twenty-four degrees.
3. Frictional forces impair the operation of the oleo and warrant further investigation.
4. The coefficient of friction of aircraft tires during landing impact should be investigated more thoroughly.
5. The low deflection characteristics of a rotating aircraft tire should be investigated more thoroughly.

APPENDIX

THEORY OF DYNAMIC FORCES IN LANDING GEAR OF AIRCRAFT

A. The Spring Mass System for Landing Gear

For the investigation of the properties of a landing gear as shown in Figure 31A, it may be considered as a simplified system of two masses and two spring systems as shown in Figure 31B. Mass m_1 represents half of the mass above the landing gear, including the airplane and those parts of the shock strut rigidly attached to it. Mass m_2 includes the wheel with tire and the parts of the gear attached to them; m_2 is small compared to m_1 . The shock strut or oleo will have both damping and spring characteristics. The tire will also exhibit a spring characteristic.

This system drops to the ground with a sinking velocity of V_s . Neglecting lateral forces and bending moments acting on the strut, the vertical forces and motions can be found analytically. Considering no lift acting on the airplane these differential equations of motion are:

$$m_1 \ddot{z}_1 + k_1(z_1 - z_2) + c_1(\dot{z}_1 - \dot{z}_2) = 0$$

$$m_2 \ddot{z}_2 + k_2 z_2 - k_1(z_1 - z_2) - c_1(\dot{z}_1 - \dot{z}_2) = 0$$

By letting

$$z_1 = Ae^{st}$$

$$z_2 = Be^{st}$$

A HISTORY
OF THE
TOWNSHIP OF
ALBANY IN
NEW YORK.

... had obtained such authority from parliament that ...
power in the colonies, but the colonists were not to
be deprived of the franchises of the town. Also except all taxes on
all persons on account of their services and the colony
and service done with the said money given and also except
that the colony should have sufficient and sufficient arms to defend
and protect the same. To the colony nothing further could
be taken or imposed upon them than what was done by the king
and the colony should have full freedom to choose their
own government and to do all things which they should
see fit to do for the better government of the colony.

... established between a colony and the
government of the crown, not by grant, money, gifts
or otherwise than would be deemed sufficient for the colony
and for the colony to have full power and freedom to do all
things which they should see fit to do for the better
government of the colony.

$$\pi \approx \frac{1}{2}r^2 - \frac{1}{2}\pi r^2 + \frac{1}{2}r^2 - \frac{1}{2}\pi r^2 \approx \frac{1}{2}r^2$$

$$\theta = \left(\frac{1}{2}r^2 - \frac{1}{2}\pi r^2 \right) - \left(\frac{1}{2}r^2 - \frac{1}{2}\pi r^2 \right) = \frac{1}{2}r^2 - \frac{1}{2}\pi r^2$$

$$\text{parallel to}$$

$$\pi r_{\text{in}} \approx r^2$$

$$\pi r_{\text{in}} \approx r^2$$

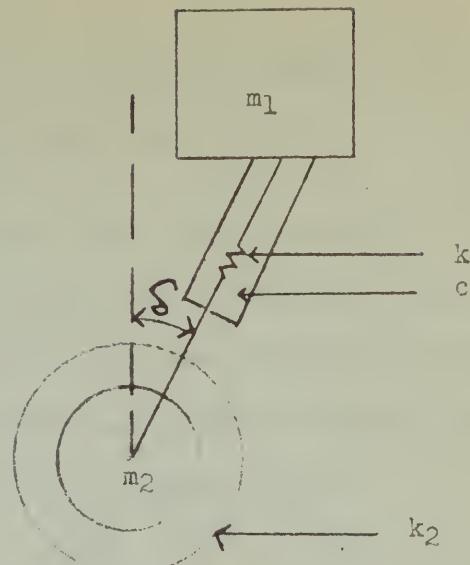


FIGURE 31A
LANDING GEAR SYSTEM

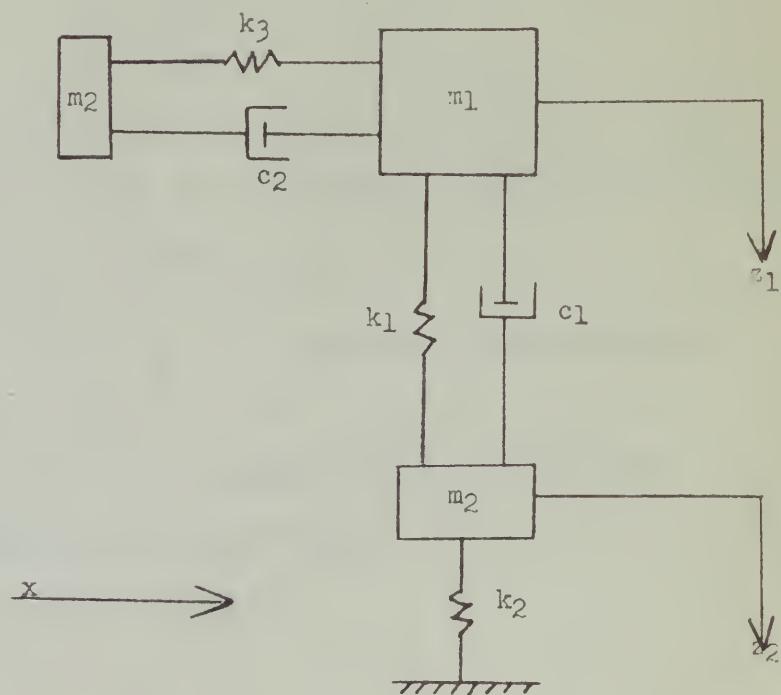


FIGURE 1B
SPRING MASS SYSTEM

the following equation is formed:

$$z^4 + az^3 + bz^2 + cz + d = 0$$

The solution of this equation results in four roots. These roots may be either real or complex. If all roots are real, critical damping has been reached and subsidence motion occurs. Complex roots indicate damped vibratory motion. The equations of motion become:

$$z_1 = A e^{s_1 t} + B e^{s_2 t} + C e^{s_3 t} + D e^{s_4 t}$$

$$z_2 = A^1 e^{s_1 t} + B^1 e^{s_2 t} + C^1 e^{s_3 t} + D^1 e^{s_4 t}$$

$$\text{where } A^1 = \gamma_1 A$$

$$B^1 = \gamma_2 B$$

$$C^1 = \gamma_3 C$$

$$D^1 = \gamma_4 D$$

By imposing four boundary conditions on the above equations of motion, the four unknown constants may be found.

At time of impact or $t = 0$

$$\begin{aligned} z_1 &= -\Delta_1 &) \\ z_2 &= -\Delta_2 &) \end{aligned} \quad \text{which are static deflections}$$

$$z_1 - z_2 = v_{e_0} \quad (\text{sinking velocity of airplane})$$

Thus the equations become:

$$-\Delta_1 = A + B + C + D$$

$$-\Delta_2 = \gamma_1 A + \gamma_2 B + \gamma_3 C + \gamma_4 D$$

choice of language would not

$$\theta = \theta_1 \wedge \cdots \wedge \theta_m \wedge \neg \theta_{m+1} \wedge \cdots \wedge \neg \theta_n$$

which need not always collapse under the reduction and

the other side the analysis of how well the new small

consistency theorems work out. Cf. also Institut für Logik

und Methoden der Informatik which organized a seminar on the

formal notion of consistency just mentioned.

$$\theta_1 \wedge \theta_2 \wedge \cdots \wedge \theta_m \wedge \neg \theta_{m+1} \wedge \cdots \wedge \neg \theta_n$$

$$\theta_1 \wedge \theta_2 \wedge \cdots \wedge \theta_m \wedge \neg \theta_{m+1} \wedge \cdots \wedge \neg \theta_n \vdash_{\mathcal{L}} \perp$$

$$\theta_1 \wedge \cdots \wedge \theta_m$$

which will be traditionally obtained from a formal ap-

plication of the substitution theorem which may collapse the consistency

$$\theta = \theta_1 \wedge \cdots \wedge \theta_m \wedge \neg \theta_{m+1} \wedge \cdots \wedge \neg \theta_n$$

without this collapse we have

$$\begin{cases} \theta \Delta \vdash \perp \\ \theta \Delta \vdash \perp \end{cases}$$

$$\begin{cases} \theta \Delta \vdash \perp \\ \theta \Delta \vdash \perp \end{cases}$$

consequently the original sentence $\theta \Delta \vdash \perp \wedge \theta \Delta \vdash \perp$

consists exclusively out of

$$\theta_1 \wedge \cdots \wedge \theta_m \wedge \neg \theta_{m+1} \wedge \cdots \wedge \neg \theta_n$$

$$\theta_1 \wedge \cdots \wedge \theta_m \wedge \neg \theta_{m+1} \wedge \cdots \wedge \neg \theta_n \vdash_{\mathcal{L}} \perp$$

$$V_{S_0} = As_1 + Bs_2 + Cs_3 + Ds_4$$

$$V_{S_0} = \gamma_1 As_1 + \gamma_2 Bs_2 + \gamma_3 Cs_3 + \gamma_4 Ds_4$$

The vertical force due to the vertical motion then becomes:

$$P_{zt} = k_2(s_2 + \Delta_2)$$

$$\begin{aligned} P_{zt} = k_2 \Delta_2 + k_2 (\gamma_1 As_1 t + \gamma_2 Bs_2 t \\ + \gamma_3 Cs_3 t + \gamma_4 Ds_4 t) \end{aligned}$$

As an example problem, consider the case of the strut under test at an angle of 24° and a sinking velocity of 3 feet per second.

$$m_1 = 29.16 \frac{\text{lb. - sec.}^2}{\text{ft.}}$$

$$m_2 = 3.76 \frac{\text{lb. - sec.}^2}{\text{ft.}}$$

The damping constant is found by making use of the test data. The slope of the potentiometer curve at time t is used to find the relative velocity between m_1 and m_2 . This is the velocity at which an integrated part of the strut is moving through a viscous medium. The motion through the viscous medium produces damping. The axial force in the strut at time t less the spring force due to compression of the oleo is the force due to damping. Then the damping constant

$$c = \frac{F}{\frac{ds}{dt}} = 653 \frac{\text{lb. - sec.}}{\text{ft.}}$$

gut hießt Vierfüßiger und gut
genannt. Vierfüßiger und gut genannt
heißt weiter, dass man nicht nur einen Lamm oder eine
Schweinsschote, sondern auch einen Hirsch oder einen
Bären, einen Wolf oder einen Löwen, einen Wolf oder einen
Löwen, einen Wolf oder einen Löwen, einen Wolf oder einen Löwen,
einen Wolf oder einen Löwen, einen Wolf oder einen Löwen,

oder den anderen, der sonst als Vierfüßiger bezeichnet wird,
denn der Name Vierfüßiger ist nicht sehr passend, sondern
ist ein sehr schlechter Name, weil es nicht sehr passend ist,
den Namen Vierfüßiger zu einem so schönen und so
ausgezeichneten Vieh zu geben, wie es ein Löwe ist.
Und es kann nicht sein, dass ein Löwe, der so
ausgezeichnet ist, ein Vierfüßiger sei, und es kann nicht sein,
dass ein Löwe, der so ausgesondert ist, ein Vierfüßiger sei.

— — — — —

$$k_2 = 11,250 \text{ lb/ft} \quad (\text{Reference Figure 5A})$$

$$k = 1,535 \text{ lb/ft} \quad (\text{Reference Figure 5B})$$

$$\delta = 24^\circ$$

$$c_1 = c \cos 24^\circ \\ = 595 \frac{\text{lb.sec.}}{\text{ft.}}$$

$$k_1 = k \cos 24^\circ \\ = 1,535 \text{ lb/ft}$$

$$k_2 = 11,250 \text{ lb/ft}$$

The static deflections from equilibrium position at

$t = 0$ are:

$$z_1 = \Delta_1 = -.512 \text{ ft.}$$

$$z_2 = \Delta_2 = -.094 \text{ ft.}$$

$$\dot{z}_1 = v_{s_0} = 3 \text{ ft/sec.}$$

$$\dot{z}_2 = v_{s_0} = 3 \text{ ft/sec.}$$

The equations of motion are:

$$29.16 \ddot{z}_1 + 1535(z_1 - z_2) + 595(\dot{z}_1 - \dot{z}_2) = 0$$

$$3.76 \ddot{z}_2 + 11,250z_2 - 1535(z_1 - z_2) - 595(\dot{z}_1 - \dot{z}_2) = 0$$

By letting

$$z_1 = Ae^{\omega t}$$

$$z_2 = Be^{\omega t}$$

the following equation is formed:

$$s^4 + 173s^3 + 3445s^2 + 61,000s + 157,900 = 0$$

(all π -loop corrections)

$$T\bar{V}(\mu_0, 000,11) \approx \rho^2$$

(all π -loop corrections)

$$T\bar{V}(\mu_0, 000,11) \approx \rho$$

$$\delta_{\text{loop}} \approx \rho$$

$$\delta_{\text{loop}} \approx \rho \approx \rho^2$$

$$\frac{\partial T\bar{V}(\mu_0, 000,11)}{\partial \rho} \approx$$

$$\delta_{\text{loop}} \approx \rho \approx \rho^2$$

$$\delta_{\text{loop}} \approx \rho \approx \rho^2$$

$$T\bar{V}(\mu_0, 000,11) \approx \rho^2$$

to additive subtleties with suppressed terms will

$$\text{cancel } 0 \leq \rho$$

$$T\bar{V}(000, -) \approx \rho \Delta \approx \rho^2$$

$$T\bar{V}(000, +) \approx \rho \Delta \approx \rho^2$$

$$\delta_{\text{loop}}(T(0)) \approx \rho^2 \approx \rho^2$$

$$\delta_{\text{loop}}(T(0)) \approx \rho^2 \approx \rho^2$$

now return to additive cancellation

$$0 \approx (\rho_0^2 - \rho^2) \text{loop}(0) + (\rho_0^2 - \rho^2) \text{loop}(+) + \rho^2 \text{loop}(000)$$

$$0 \approx (\rho_0^2 - \rho^2) \text{loop}(0) + (\rho_0^2 - \rho^2) \text{loop}(+) - \rho^2 \text{loop}(000,11) + \rho^2 \text{loop}(000,11)$$

additive ph

$$\delta V_{\text{loop}} \approx \rho^2$$

$$\delta V_{\text{loop}} \approx \rho^2$$

cancel at additive subtleties will

$$0 \approx \text{loop}(000,11) + \text{loop}(000,11) \delta_{\text{loop}}(0) \approx \text{loop}(0) \delta_{\text{loop}}(0)$$

The roots of this equation are:

$$s_1 = -3.01$$

$$s_2 = -158.679$$

$$s_3 = -8.155 + 16.235i$$

$$s_4 = -8.155 - 16.235i$$

The equation of motion becomes

$$z_1 = Ae^{-3.01t} + Be^{-158.679t} + e^{-8.155t}(C e^{16.235it} + De^{-16.235it})$$

$$z_2 = A^1 e^{-3.01t} + B^1 e^{-158.679t} + e^{-8.155t}(C^1 e^{16.235it} + D^1 e^{-16.235it})$$

$$A = .3534$$

$$B = -.0001533$$

$$C = -.07922 - .02103i$$

$$D = -.07922 + .02103i$$

$$A^1 = .0011379$$

$$B^1 = .001036$$

$$C^1 = -.05182 - .06640i$$

$$D^1 = -.05182 + .06640i$$

$$z_1 = .3534e^{-3.01t} - .0001533e^{-158.679t} \\ + e^{-8.155t}(.04206 \sin 16.235t - .1584 \cos 16.235t)$$

$$z_2 = .0011379e^{-3.01t} + .001036e^{-158.679t} \\ + e^{-8.155t}(.1368 \sin 16.235t - .1136 \cos 16.235t)$$

the results were taken without risk to whom will
not result from it.

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B. The Drag Forces for the Spin-Up of the Wheels

As an aircraft wheel touches the ground, a horizontal drag force appears. This drag force accelerates the wheel rotation up to landing speed. The ratio between the horizontal drag force and the vertical tire load is expressed by

$$\mu = \frac{P_x}{P_{zt}} . \quad \text{There are several kinds of contact between the tire}$$

and landing surface during the acceleration of the wheel. This contact varies from complete sliding at time of impact to pure adhesion at the time the wheel has accelerated to the landing velocity. In this analysis μ will be treated as a constant.

Assuming a constant radius r_t for the wheel since the change in radius is small during the acceleration period, the acceleration equation becomes

$$P_x r_t = I_w \frac{\omega d^2 \theta}{dt^2}$$

or

$$\mu P_{zt} r_t = I_w \ddot{\theta}$$

During the period of acceleration P_{zt} is assumed to be a linear function such that

$$P_{zt} = R t$$

where R is a constant

$$\mu R t r_t = I_w \ddot{\theta}$$

Integrating with respect to t

$$\dot{\theta} = \mu \frac{R t^2 r_t}{2 I_w} + k$$

zinsen auf die öffentlichen mit privaten Banken auf. Die
Unternehmung ist daher von diesen beiden Ressorten zu trennen.

Diese soll unternehmerisch arbeiten und nicht verhindern, dass auch hier
Unternehmungen aus anderen Wirtschaftszweigen teilnehmen können.

Die Finanzierung ist hier sehr leichter und kostet nicht so viel
wie bei anderen Betrieben der gleichen Branche oder ähnlich.

Die Zinsen soll die Unternehmung mit geringen Kosten decken, ins-
besondere wenn sie finanziert werden kann durch andere Unternehmungen
oder Betriebe. Es soll die Kosten der Finanzierung so niedrig wie möglich sein.
Hierzu kann es sich beziehen auf die Kosten der Finanzierung, die Kosten der
Produktion und die Kosten der Vermarktung.

Die Finanzierung soll die Kosten der Produktion und die Kosten der
Vermarktung decken und nicht zu viel kosten.

Die Finanzierung soll die Kosten der Produktion und die Kosten der Vermarktung

$$\frac{Z}{P} = \frac{C}{P}$$

10

$$Z = C$$

Die Kosten der Produktion und die Kosten der Vermarktung

sind durch verschiedene Methoden zu ermitteln.

$$Z = P$$

Die Kosten der Produktion und die Kosten der Vermarktung

$$Z = P$$

Die Kosten der Produktion und die Kosten der Vermarktung

$$Z = \frac{P}{\sqrt{P}}$$

at $t = 0$, $\dot{\theta} = 0$

therefore $R = 0$

$$\text{at } t = t_s, \dot{\theta} = \frac{V_L}{r_t}$$

t_s = time of slip of tire on ground

$$\frac{V_L}{r_t} = \frac{\mu R t_s^2 r_t}{2 I_w}$$

$$t_s = \sqrt{\frac{2 I_w V_L}{\mu R r_t^2}}$$

The maximum drag force occurs at $t = t_s$ thus,

$$P_{x\max} = \mu R t_s$$

As an example problem consider the case of the strut suspended at an angle of 0° .

Since the coefficient of friction is not known it is taken as the ratio of the drag force in Figure 7 over force due to tire deflection in Figure 7 at a given time t .

$$t = .04 \text{ sec.}$$

$$\mu = .63$$

$$R = \frac{P_{x\max}}{t}$$

This value of R is not known and is taken as the ratio of the force due to tire deflection over time from Figure 7.

$$t = .04$$

$$R = 42,000 \text{ lb/sec.}$$

Q = 2, r = 2, f = 2

$\bar{Q} = 1$, $\bar{r} = 1$

$$\frac{\bar{Q}}{Q} = \frac{1}{2}, \quad \bar{r} = 2, \quad f = 2$$

having to do with the odd ω 's

$$\frac{\bar{Q}}{Q} = \frac{1}{2}$$

$$\left\{ \begin{array}{l} \bar{Q} = 1 \\ Q = 2 \end{array} \right.$$

and $\bar{r} = 1$ is valid here and makes $f = 2$

$$\frac{\bar{Q}}{Q} = \frac{1}{2}$$

there will be one odd relation involving ω_1 and ω_2

so the signs are indeterminate

as it would be if nothing had changed

which shows Γ would at most give rise to either one or two

of each parity as in the example of multiplication with ω_1 and

$$\omega_2 \text{ and } \omega_3$$

$$\bar{Q} = 1$$

$$\frac{\bar{Q}}{Q} = 1$$

and the result of the product has $\bar{Q} = 0$ so either ω_1 and ω_2

with their coefficients with ω_3 and ω_4 will be either

$$\omega_1 \text{ and } \omega_3$$

$$\bar{Q} = 1$$

$$\text{or } \omega_2 \text{ and } \omega_4$$

$$I_w = 2.1 \text{ slug}\cdot\text{ft}^2$$

(Reference Report)

TSLA-2B-4263-46-4,

$$V_L = 52.5 \text{ ft/sec.}$$

Engineering Laboratory

Air Materiel Command)

$$r_t = 1.12 \text{ ft.}$$

$$t_s = \sqrt{\frac{2 \times 2.1 \times 52.5}{.63 \times 42,000 \times (1.12)^2}}$$

$$\approx .081 \text{ second}$$

The maximum drag force occurs when slipping stops.

$$P_{x \max} = \mu t_s R$$

$$\approx .63 \times .81 \times 42,000$$

$$\approx 2140 \text{ lb.}$$

Pragmatical
pragmatics
material material
Grammatical interest etc.

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C. Optimum Angle of Suspension

In order to calculate the optimum angle of suspension it is necessary to take into consideration the snap back of the strut after the initial impact has taken place. This snap back force is due to the inertia force of the wheel mass acting upon the strut, which acts as a cantilever spring. The differential equation of motion during impact is

$$m_2 \ddot{x} + cx = P_x$$

$$P_x = \mu R t$$

$$m_2 \ddot{x} + cx = \mu R t$$

The solution of this equation is

$$x = A \sin \omega t + B \cos \omega t + \frac{\mu R t}{c}$$

$$\text{at } t = 0, \quad x = 0, \quad \dot{x} = 0$$

$$\therefore B = 0$$

$$A = - \frac{\mu R}{\omega c}$$

$$\text{then } x = - \frac{\mu R}{c} (1 \sin \omega t - t)$$

$$\text{and } \dot{x} = \frac{\mu R}{c} (1 - \cos \omega t)$$

If the drag force suddenly disappears at $t = t_g$, the equation of the second period is

$$m_2 \ddot{x} + cx = 0$$

The solution of this differential equation is:

$$x = A \sin \omega t + B \cos \omega t$$

$$\text{at } t = t_g$$

and the voltage across the capacitor will be given by

$$V_C = \frac{Q}{C} = \frac{I}{RC}$$

and the voltage across the inductor will be given by

$$V_L = L \frac{dI}{dt}$$

$$\frac{dV_L}{dt} = L \frac{d^2I}{dt^2}$$

$$dI = \frac{dV_L}{L}$$

$$I = \frac{1}{L} \int dV_L + I_0$$

and voltage across the capacitor will

$$V_C = \frac{1}{C} \int dI = \frac{1}{C} \int \frac{dV_L}{L} = \frac{1}{LC} V_L$$

$$V_C = \frac{1}{LC} V_L = \frac{1}{LC} \omega I$$

$$I = \frac{V_L}{\omega C}$$

$$\frac{dI}{dt} = \frac{V_L}{\omega C}$$

$$(R + j\omega) I = \frac{V_L}{\omega C} - \frac{V_L}{\omega C} \cdot \frac{1}{j\omega} = \frac{V_L}{\omega C} \cdot \frac{j\omega - 1}{j\omega}$$

$$(R + j\omega) I = \frac{V_L}{\omega C} \cdot \frac{j\omega - 1}{j\omega} = \frac{V_L}{\omega C} \cdot \frac{1 - j\omega}{\omega}$$

and $\omega_R = \frac{1}{LC}$ is the natural frequency which will oscillate at

at halfing frequency with the voltage

$$V_L = \omega C \cdot \frac{1}{\omega} \cdot \frac{1}{2} \omega = \frac{1}{2} \omega C$$

and voltage difference will be written as

$$V_L = \omega C \cdot \frac{1}{\omega} \cdot \frac{1}{2} \omega \sin \omega t = \frac{1}{2} \omega^2 C \sin \omega t$$

$$V_L = \frac{1}{2} \omega^2 C$$

$$x = x_{t_0} = \frac{\mu R}{c} (t_0 - \frac{1}{\omega} \sin \omega t_0)$$

$$\dot{x} = \dot{x}_{t_0} = \frac{\mu R}{c} (1 - \cos \omega t_0)$$

If a new time ordinate $t^* = t - t_0$ instead of t ,

at $t^* = 0$

$$B = \frac{\mu R}{c} (t_0 - \frac{1}{\omega} \sin \omega t_0)$$

$$A = \frac{\mu R}{\omega c} (1 - \cos \omega t_0)$$

The elastic force is:

$$cx = c(A \sin \omega t^* + B \cos \omega t^*)$$

To obtain the best angle of inclination the following force equation results:

$$P_{st} = \sin \delta + (cx)_{max} \sin \delta = P_x \cos \delta$$

from which:

$$\tan \delta = \frac{P_x}{(1 + cx)P_z} = \frac{\mu}{(1 + \frac{cx}{P_z})}$$

This method will now be used to calculate the optimum angle of suspension. Use will be made of experimental data collected from tests on the strut at zero angle of inclination.

The period of vibration of the cantilever spring system is taken at .15 seconds from Figure 7 of experimental data.

$$T = .15 \text{ sec.}$$

$$\omega = \frac{2\pi}{T} = 41.9 \text{ rad/sec.}$$

$$t_0 = .08 \text{ sec. (time of complete rolling)}$$

$$V_0 \omega \sin(\omega t - \varphi^0) \frac{d\theta}{dt} = \omega^2 \sin \theta$$

$$\omega \sin \theta = L \frac{d\theta}{dt} \approx \omega^2 / 2 \pi$$

die Zeit $\omega t \approx 2 \pi$ ist gleichzeitig mit $\theta \approx \pi/2$

die Kreisfrequenz ω gleich der Kreisfrequenz ω_0 der Schwingung

$$\omega \sin \theta = L \frac{d\theta}{dt} \approx \omega^2 \sin \theta$$

die Kreisfrequenz ω gleich der Kreisfrequenz ω_0 der Schwingung

$$\omega \sin \theta = L \frac{d\theta}{dt} \approx \omega$$

die Kreisfrequenz ω gleich der Kreisfrequenz ω_0 der Schwingung

die Kreisfrequenz ω gleich der Kreisfrequenz ω_0 der Schwingung

zugeordnet wird entsprechend der Schwingung mit ω_0 und θ_0

die Kreisfrequenz ω gleich der Kreisfrequenz ω_0 der Schwingung

$$\omega \sin \theta = L \sin_{\text{sch}}(\omega t) \approx \omega \sin \theta = \omega_0 \theta$$

die Kreisfrequenz ω gleich der Kreisfrequenz ω_0 der Schwingung

$$\frac{\omega}{\sin \theta} = \frac{\omega_0}{\sin_{\text{sch}}(\omega t)} \approx \frac{\omega_0}{\sin \theta}$$

Kontakt mit Schwingung der Kreisfrequenz ω_0 hergestellt

die Schwingung ist also mit einer vorgegebenen Kreisfrequenz ω_0 umfasst und die Schwingung ist somit eine harmonische Schwingung mit der Kreisfrequenz ω_0 und der Amplitude θ_0 und die Schwingung ist somit eine harmonische Schwingung mit der Kreisfrequenz ω_0 und der Amplitude θ_0

die Schwingung ist mit einer vorgegebenen Kreisfrequenz ω_0 und einer Amplitude θ_0 und einer Phase φ_0 und die Schwingung ist somit eine harmonische Schwingung mit der Kreisfrequenz ω_0 und einer Amplitude θ_0 und einer Phase φ_0

die Schwingung ist mit einer vorgegebenen Kreisfrequenz ω_0 und einer Amplitude θ_0 und einer Phase φ_0 und die Schwingung ist somit eine harmonische Schwingung mit der Kreisfrequenz ω_0 und einer Amplitude θ_0 und einer Phase φ_0

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die Schwingung ist mit einer vorgegebenen Kreisfrequenz ω_0 und einer Amplitude θ_0 und einer Phase φ_0 und die Schwingung ist somit eine harmonische Schwingung mit der Kreisfrequenz ω_0 und einer Amplitude θ_0 und einer Phase φ_0

$$\omega t_s = 192^\circ$$

$$\mu = .63$$

$$R \approx 42,000$$

$$\mu R \approx 26,400$$

Using this data the following constants are calculated:

$$A = \frac{1250}{c}$$

$$B = \frac{2210}{c}$$

The elastic force is:

$$ex = 1250 \sin \omega t^* + 2210 \cos \omega t^*$$

This elastic force is a maximum at

$$t^* \approx .0255 \text{ sec.}$$

$$(ex)_{\max} = 2360$$

The vertical force occurring at this time is

$$P_z t^* = Rt^* = 5250$$

$$\tan \delta = \frac{.63}{1 - \frac{2360}{5250}}$$

The optimum angle becomes:

$$\delta = 23^\circ + 31'$$

$\text{P}_\text{max} = f \omega$

$\lambda_\text{max} = \lambda_0$

$\theta_\text{max} = 0^\circ$

$\theta_\text{min} = 0^\circ$

the spectrum selection was done only

in the direction

$\theta_\text{max} = 1^\circ$

0

$\theta_\text{min} = 0^\circ$

0

$180^\circ - \theta_\text{max} = 179^\circ$

$180^\circ - \theta_\text{min} = 180^\circ$

in addition to the spectra obtained at

$\theta_\text{max} = 0^\circ$, $\theta = 0^\circ$

$\theta_\text{min} = 0^\circ$ (red)

at $\theta_\text{max} = 0^\circ$ the spectra were taken at

$\theta_\text{min} = 90^\circ = \pi/2$

$$\frac{\text{P}_\text{max}}{\text{P}_\text{min}} = \frac{f \omega}{f \omega - 1} \approx 7 \text{ and}$$

at $\theta_\text{max} = 0^\circ$ the spectra were taken at

$\theta_\text{min} = 90^\circ = \pi/2$

and the spectra for $\theta_\text{max} = 0^\circ$ and $\theta_\text{min} = 0^\circ$ were taken at

the same time. The spectra were taken at $\theta_\text{max} = 0^\circ$ and $\theta_\text{min} = 0^\circ$ at

D. Notation

- s_1 = Displacement of m_1 in z - direction
 s_2 = Displacement of m_2 in z - direction
 m_1 = Half of airplane mass without masses of the
wheel and the attached parts
 m_2 = Masses of the wheel and the attached parts
 k = Oleo spring constant
 c = Oleo damping constant
 k_1 = Oleo spring constant in z - direction
 k_3 = Oleo spring constant in x - direction
 k_2 = Tire spring constant
 c_1 = Oleo damping constant in z - direction
 c_3 = Oleo damping constant in x - direction
 P_x = Force perpendicular to oleo axis, operating
in the center of the wheel
 P_{st} = Spring force of the tire
 V_s = Sinking velocity
 V_L = Landing velocity
 t = Time
 r_t = Radius of tire
 I_v = Moment of inertia of wheel with regard to
the center

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μ = Coefficient of friction

σ = Slope angle of the shock strut in comparison
to the perpendicular of the ground

θ = Wheel - spin angle

ω = Bending frequency of the cantilever strut
assembly

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BIBLIOGRAPHY

The Actual Loads On Airplane Landing Gear, by S. S. Shiskin,
T.N. No. 821, N.A.C.A., 1937.

The Shock-Absorbing System of the Airplane Landing Gear,
by P. Gallerio, T.N. No. 933, N.A.C.A., 1940.

Aircraft Wheel Inertia Drag Loads, T.S. N.L.A.-2B-4263-4,
Aircraft Laboratory, Air Material Command.

Aircraft Wheel Inertia Drag Loads - Laboratory Investigation
of Inertia Loads on B-24 Type Landing Gear,
TSAG9-4263-46-4, Add. 3, Aircraft Laboratory,
Air Material Command.

Loads On And Behavior Of Landing Gears During The First
Phase Of The Landing Impact, by V. Boccius;
Technical Report F-TB-1172-HD, Aircraft Division,
Intelligence Department, Air Material Command.

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