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ARMY AIR FORCES
MATERIEL CENTER COMMAND

MEMORANDUM REPORT ON

HJB/mac/47

B-17G Airplane, AAF No. 42-97656

Date 29 March 1944

SUBJECT: Speed Tests with Various
Finish Configurations.

SECTION Flight

Contract No.

Expenditure Order No. 146-21

SERIAL No. Eng-47-1722-A

Purchase Order No.

A. Purpose

1. To report results of flight tests on B-17G airplane, AAF No. 42-97656, to determine the effect of various finishes on speed. The types of finishes tested were as follows:

- a. Unpainted
- b. Painted with standard camouflage paint.
- c. Camouflage paint, sanded, waxed and polished.

B. Factual Data

1. Airplane equipped with R-1820-97 engines and three bladed, constant speed, full feathering, hydromatic propellers, blade design No. 6477A-0. Torquemeters were installed on all engines.

2. Armament included two 50 caliber guns in chin turret, two 50 caliber guns in top turret, two 50 caliber guns in ball turret and two 50 caliber guns in tail position. Waste gun window openings were fitted with plywood covers. Standard cheek guns were not installed on this airplane.

3. Gross weight at take-off was 49,265 pounds with c.g. at 25.52% m.a.c., wheels down and 24.9% m.a.c., wheels up.

4. The results of level flight power calibrations run at 5100 ft. and at 24,900 ft. under three finish configurations are given in the following table. Curves showing test points are given on page A-1.

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Cowl flaps closed, intercooler flaps wide open, throttles wide open and turbo on to give desired manifold pressure.

Altitude	TRUE SPEED - MPH					
	5100 Ft.			24,900 Ft.		
Condition	(a)	(b)	(c)	(a)	(b)	(c)
Military Power 1200 Torque H.P.	248.5	250.5	250.5	297.5	300	300
Normal Power 1000 Torque H.P.	232.5	234.5	234.5	277.5	280	280
800 Torque H.P.	213	215	215	251.5	255	255
700 Torque H.P.	200.5	203	203	234	-	238.5

(a) Natural finish (unpainted except for necessary anti-glare surfaces on inboard side of engine nacelles and on top of fuselage ahead of pilot). A surface roughness measurement of 14 to 15 micro inches was obtained for this natural finish condition.

(b) Camouflage finish, which consisted of one coat of zinc chromate primer with one coat of olive drab lacquer as a finish coat. Neutral gray lacquer was used on under side of wings and fuselage. A surface roughness measurement of 50 micro inches was obtained on this finish. Airplane was weighed before and after painting. Painting increased weight 75 lbs.

(c) Camouflage finish as in (b) sanded with #400 water sandpaper, pumiced with FFF pumice, waxed with Simoniz Car Polish, and buffed.

Surface roughness could not be measured on the polished finish because the tracer of the profilometer cut through the wax coating.

An attempt was made to fill the rough joints and cover the rivets with glazing putty; however, difficulty was encountered in sanding the putty around the rivets. Practically all skin rivets on the B-17 wings and fuselage have crown heads and any sanding around these rivets tended to cut down the crown heads along with the putty. It was found necessary to remove all the putty and repaint before sanding, pumicing and polishing.

5. Surface roughness measurements were made using a Physicist Research Co. electrical profilometer. This profilometer measures the root mean square value of the peak and valley depth in the surface. These measurements are given as a comparison of the different surface finishes obtained.

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C. Conclusions

1. Camouflage paint increases the speed over the unpainted condition by approximately 2 to 2.5 MPH at 5100 ft. and 2.5 to 4.5 MPH at 24,900 ft. This increase in speed was probably due to the paint filling in and fairing surface seams, joints and rivet heads.

2. Sanding, pumicing, and polishing of the camouflaged surface gives no increase in speed on the -17G airplane; the exposed rivets spoiling any improvement in performance which might be gained by smoothing the paint.

3. Application of camouflage paint increased the gross weight by approximately 75 pounds, which has no appreciable effect on the performance.

D. Recommendations

None

Appendix 1 attached

Prepared by HOMER J. BATES

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APPENDIX I

A. Curves

1. Speed power curve, Page A-1

B. Photographs

- | | | |
|--------------------------------------|---------|----------|
| 1. Front view, unpainted | #135829 | Page A-2 |
| 2. 3/4 front view, unpainted | #135830 | Page A-3 |
| 3. Side view, unpainted | #135831 | Page A-4 |
| 4. 3/4 rear view, unpainted | #135832 | Page A-5 |
| 5. 3/4 rear close up view, unpainted | #135833 | Page A-6 |
| 6. 3/4 front view, painted | #136750 | Page A-7 |
| 7. 3/4 rear close up view, painted | #136753 | Page A-8 |

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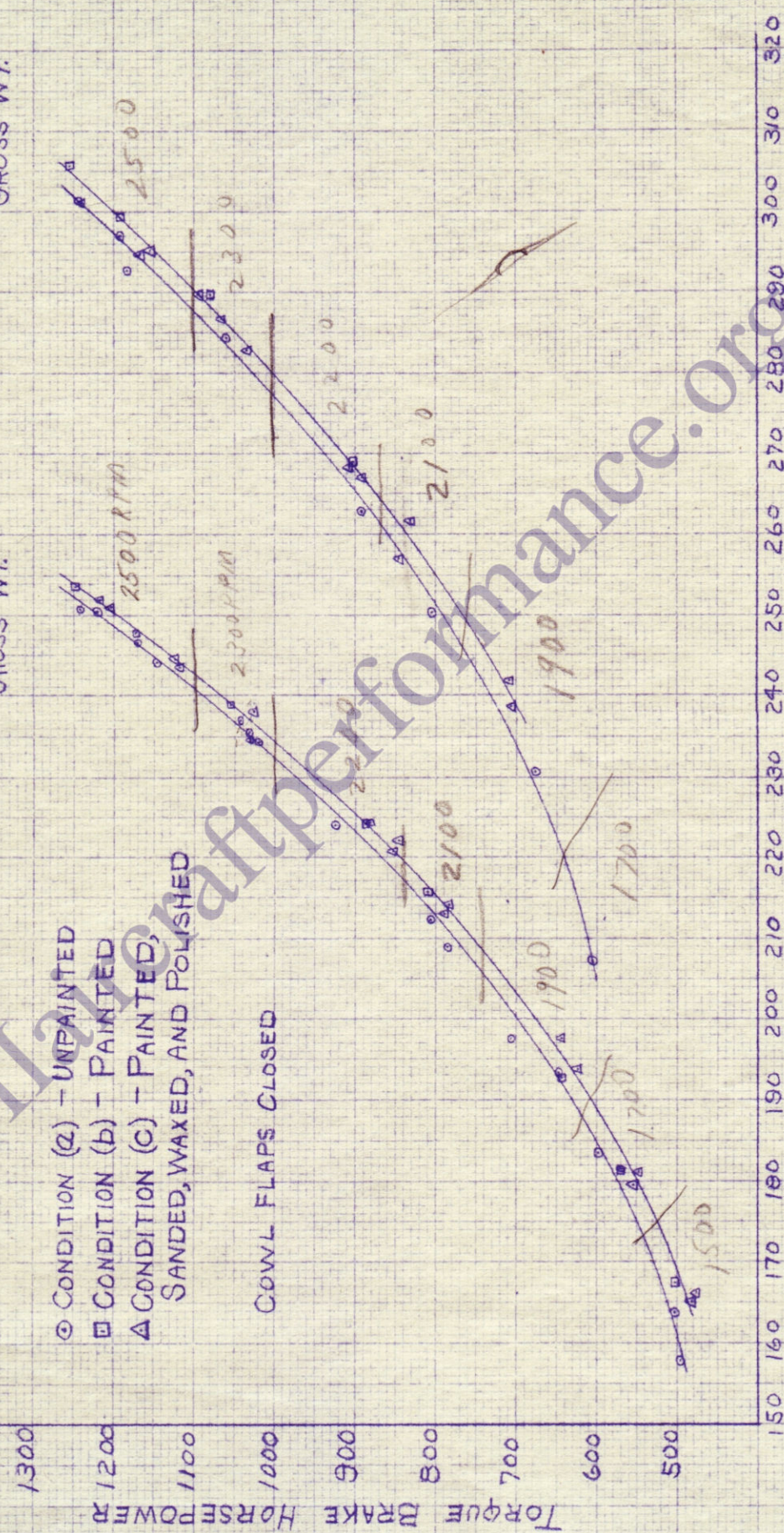
SPEED VS POWER CALIBRATION
FOR THREE TYPES OF FINISH
B-17G AAF No. 42-97656

24900' ALTITUDE
45,360 LBS.
GROSS WT.

5100' ALTITUDE
47700 LBS.
GROSS WT.

- CONDITION (a) - UNPAINTED
- CONDITION (b) - PAINTED
- △ CONDITION (c) - PAINTED,
SANDED, WAXED, AND POLISHED

COWL FLAPS CLOSED

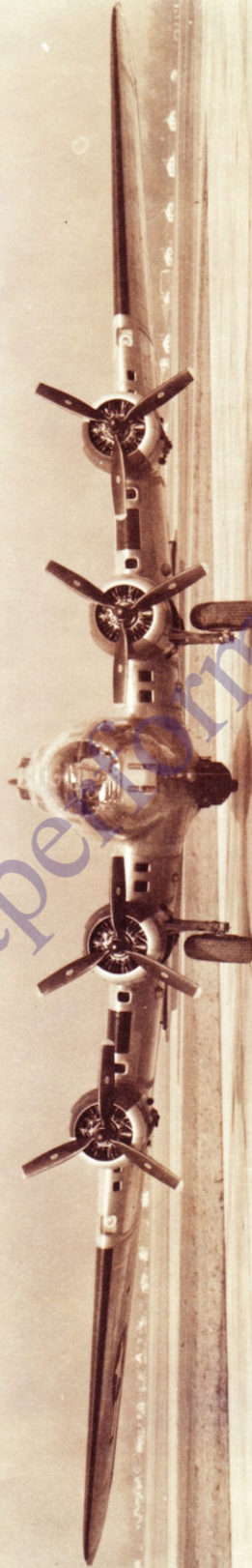


TRUE SPEED - M.P.H.

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B-17G

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2. B-17G, AAF No. 42-97656 3/4 Front View, Unpainted

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4. B-17G, AAF No. 42-97656 3/4 Rear View, Unpainted.

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5. B-17G, AAF No. 42-97656 3/4 Rear Close Up View, Unpainted.

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6. B-17G, AAF No. 42-97656 3/4 Front View, Painted.

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7. B-17G, AAF No. 42-97656 3/4 Rear Close Up View, Painted.