

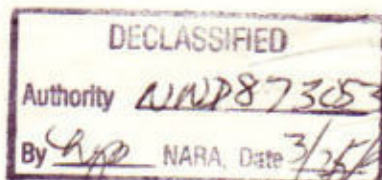
In reply refer to:

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NA83
VF4U-1
PTR 0415
(FT) (44127)

U. S. NAVAL AIR STATION
PATUXENT RIVER, MARYLAND

WWB/vba



JUN 27 1944

R-3

R-4

JUN 27 1944

Index and File

To: The Chief of the Bureau of Aeronautics

Subj: TED No. PTR 0415 - Model F4U-1 Airplane - Evaluation of Maximum Practicable Combat Rating - Performance at Carburetor Impact Pressure of 32.8" Hg. - Preliminary report on.

Ref: (a) BuAer rest. ltr. Aer-E-41-QCS (37707) dated 22 Feb. 1944.
(b) BuAer rest. ltr. Aer-E-211-JMC (162013) dated 21 Oct. 1943.
(c) NAS, Patuxent River conf. ltr. NA83 VF4U-1 PTR 2105 (FT) (44078) dated 28 April 1944.
(d) NAS, Patuxent River rest. Report NA83, VF4U-1 PTR 0415 (FT) (564) dated 2 June 1944.

1. Tests are currently being conducted by Flight Test in accordance with reference (a) which supersedes reference (b) to determine through a series of performance and endurance tests the maximum practicable power available for combat emergency use in the model F4U-1 airplane. This preliminary report covers the performance phase of the model F4U-1 airplane tests at a combat power rating corresponding to a carburetor impact pressure setting of 32.8" Hg. with water on, as performed on model F4U-1 airplane No. 50030.

2. Performance data on the model F4U-1 airplane at combat power corresponding to a carburetor impact pressure setting of 31.5" Hg. was previously obtained on F4U-1 No. 17930 and reported in reference (c). Reference (d) is the preliminary report on the endurance phase at a carburetor impact pressure of 31.5" Hg.



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3. The airplane was loaded to a gross weight corresponding to an overload fighter for all tests. This loading may be summarized as follows:

Gross weight-lbs.....	12164
Center of gravity location-% MAC:	
Gear extended.....	31.3
Gear retracted.....	32.5
Fuel-gallons.....	237
Oil-gallons.....	20
Injection fluid (right wing tank)...	46
Armament-.50 caliber machine guns...	6
Ammunition-rounds.....	1383

Photographs forming enclosure 1 show the airplane as flown during the test.

4. The airplane was equipped with a Pratt and Whitney model R2800-8W engine and a 3-bladed Hamilton Hydromatic (F6F-3) propeller of 13'-1" diameter blade design No. 6501A-0. Externally the airplane was a typical production model F4U-1 airplane. All radio antennae were installed and gun blast tubes faired over with tape. Fairing was placed over the instrument and torquemeter lines where they extended along the outside of the fuselage as shown in the photographs. An outside air temperature bulb was suspended from a bracket under the right wing.

5. The reliability of the R2800-8W engine at combat power corresponding to 32.8" Hg. carburetor impact pressure seems to be reasonably good based on performance determination flights and a few endurance tests. Difficulty reported in reference (d) has again been encountered in attempting to maintain constant carburetor impact pressures due to erratic and sometimes sluggish action of the auxiliary supercharger regulator. Difficulty has also been encountered in obtaining adequate cooling in climbing flight

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particularly below climbing critical altitudes and is being further investigated. Carburetor air temperatures in excess of 60°C and cylinder head temperatures above 260°C have developed during climbing and level flight tests in high blower at altitudes below critical during endurance flights conducted as outlined in reference (a). The problem of high carburetor air temperatures will become more acute as higher carburetor impact pressures, with correspondingly lower critical altitudes, are tested.

6. During performance calibration flights engine operation was within limits specified in reference (a) employing a number 25 water jet, and water and fuel pressures set at 13 pounds per square inch, except that during the combat power climb in high and low blowers it was necessary to increase cowl flap opening from one-third to three-quarters and indicated airspeed from 150 to 175 MPH to hold head temperature on number two cylinder ("Hottest") to below 270°C (uncorrected).

7. Charts contained in enclosure 2 are plots of the performance obtained during the test. Engine power was measured by means of a torquemeter. The data obtained are summarized as follows:

Maximum Speed

Combat Power (32.8" Hg. carburetor impact pressure setting)

Blower.....	Low	High
RPM.....	2700	2700
BHP.....	2176	2030
Airplane crit. alt.-ft.....	13,200	13,800
Maximum speed-MPH.....	406	421.8
Manifold pressure-inches Hg...	61.5	61.5

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Climb

Blower.....	Low	High
RPM.....	2700	2700
BHP.....	2160	2012
Climb crit. alt.-ft.....	10,200	14,500
Maximum rate of climb-FPM.....	3300	2890
Manifold pressure-inches Hg.....	61.5	61.5

8. Several test flights were made to investigate the possibility of increased propeller efficiency at 2600 and 2500 RPM. The data obtained are summarized as follows: (All runs were made in high blower.)

Altitude.....	18,360	18,360	18,360	23,480	23,480	23,500
RPM.....	2700	2600	2500	2700	2600	2500
Manifold Press.....	60.9	60.5	59.3	51.1	49.9	48.9
Carb. Impact Press..	32.7	33.2	33.3	26.2	26.6	26.8
Carb. Air Temp.°C..	50.1	46.0	40.0	35.5	31.5	28.5
BHP.....	1985	2005	1994	1632	1642	1650
TAS.....	419	421	420.5	412	413	417
BMEP (cal.) lbs/sq.-in.....	207.5	218	225.5	171	179	187
Fuel flow-recorded lbs/hr (AR).....	1510	1485	1440	1280	1210	1150
Specific fuel consumption.....	.762	.74	.723	.784	.737	.698
Water flow (includes vent drainage)...	----	----	----	625	610	585

The above data when plotted on the brake horsepower required curve indicates that the propeller efficiency remained essentially constant between 2700 and 2500 RPM. However, higher values of BMEP and brake horsepower were obtained at the lower RPM's, giving a slight increase in true airspeed and lower fuel flows. The carburetor impact pressures increased at the lower altitude apparently due to sluggish action of the auxiliary supercharger regulator.

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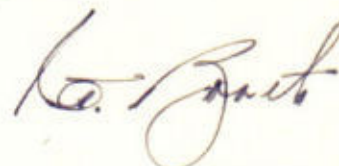
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At the higher altitude, the gate valve is assumed to have been wide open. The increase in carburetor impact pressure would indicate higher combat power criticals (at constant carburetor impact pressure) at 2600 and 2500 RPM and may be due to the decrease in air flow through the engine at the lower RPM's.

9. Performance tests are currently scheduled on model F4U-1 No. 55937 at a higher combat rating corresponding to a carburetor impact pressure of 33.9" Hg.

By direction of the Commanding Officer:



Copy to:

C. T. BOOTH
Comdr., U.S.N.
Flight Test Officer

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Comdg. Gen., AAF Proving Ground, Eglin Field, Fla.

Development Engrg. Sec., Materiel Div., MM&D, AAF

HQ, Washington, D. C.

NACA (2)

Office of Scientific Research & Development

Joint Electronics Information Agency

BAC, via CNO (ONI)

Senior Naval Representative, BAC, in BuAer,
via CNO (ONI)

Encl: (HW)

1. Three (3) photographs, Photo PTR Nos. 7917, 7918 and 8066.
2. Three (3) performance curves, Photo PTR Nos. 8074, 8075, and 8076.



P4U-1 - #50030
3/4 Right Front View

Photo PER 7917
6-1-44

RESTRICTED
OFFICIAL NAVY PHOTOGRAPH
NOT TO BE USED FOR PUBLICATION

MODEL F4U-1 AIRPLANE No. 50030
 PERFORMANCE CHARACTERISTICS
 AT COMBAT POWER
 CARBURETOR IMPACT PRESSURE REGULATOR SET 32.8 IN. HG
 OVERLOAD FIGHTER GROSS WEIGHT 12,162 LBS

PHOTO PTR 8074
 6-5-44
 FIG. 1

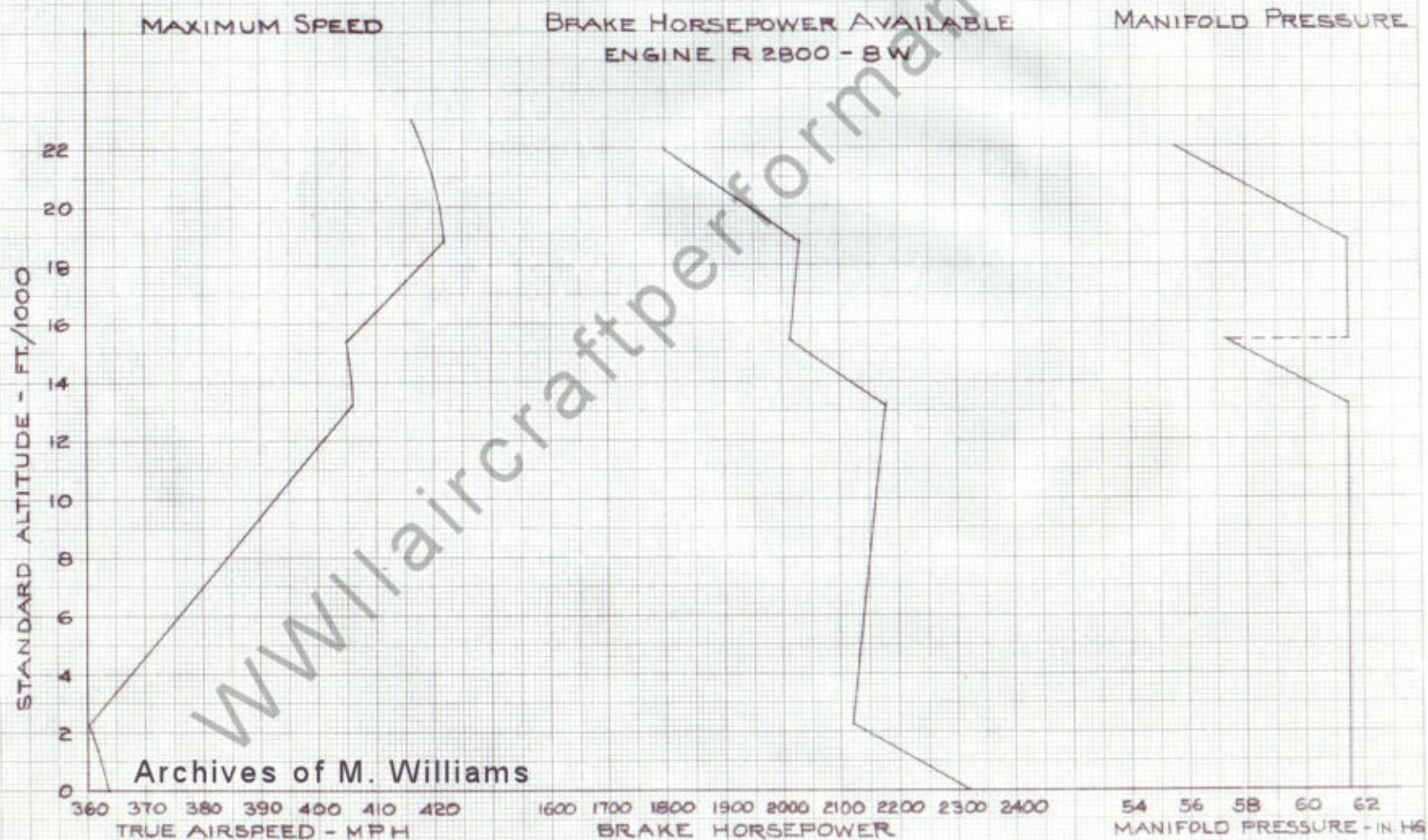


PHOTO PTR NO. 8075
6-5-44

MODEL F4U-1 AIRPLANE No. 50030
PERFORMANCE CHARACTERISTICS AT
COMBAT POWER
CARBURETOR IMPACT PRESSURE REGULATOR
SET AT 32.8 IN. Hg
OVERLOAD FIGHTER GROSS WEIGHT = 12,162 LBS

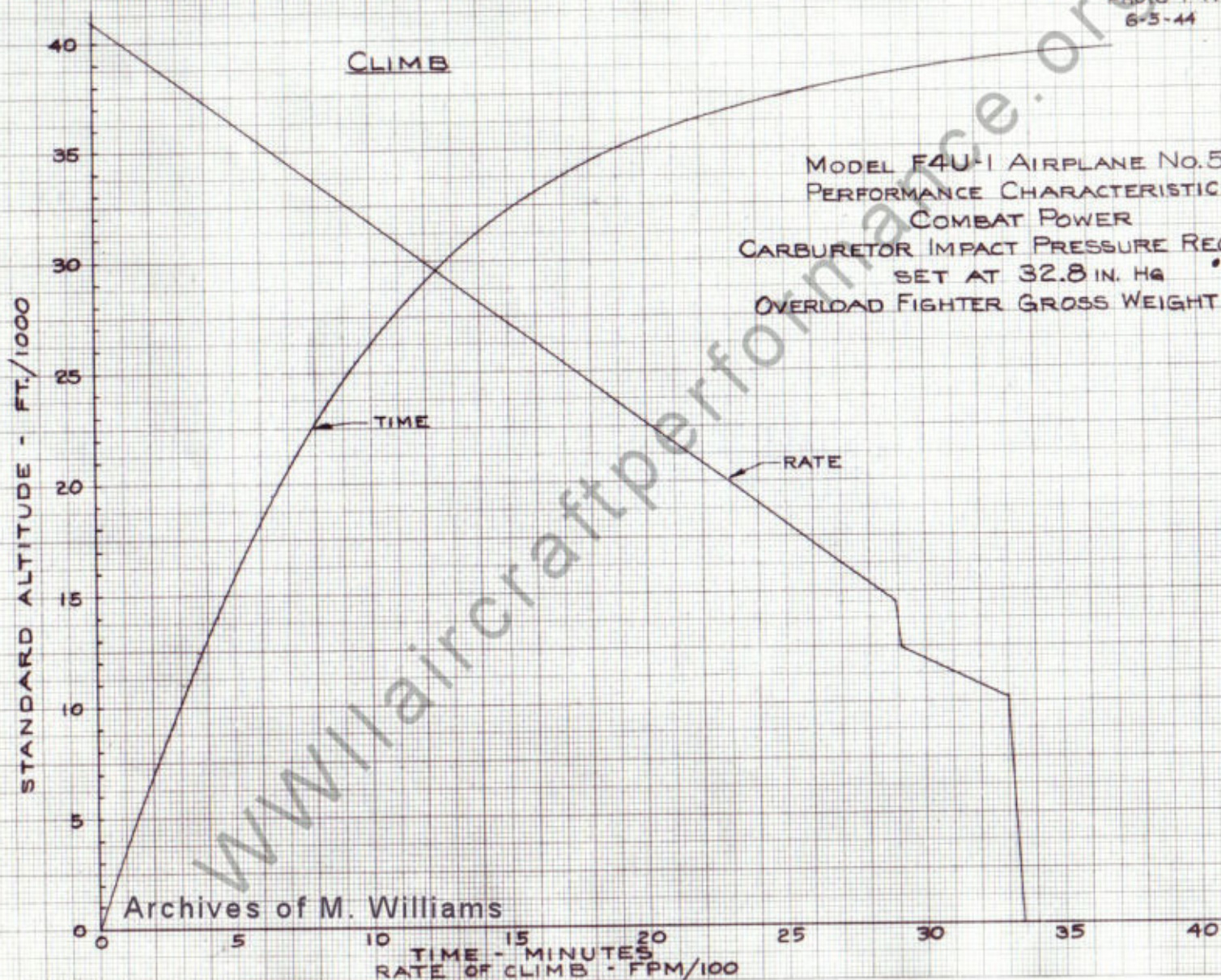


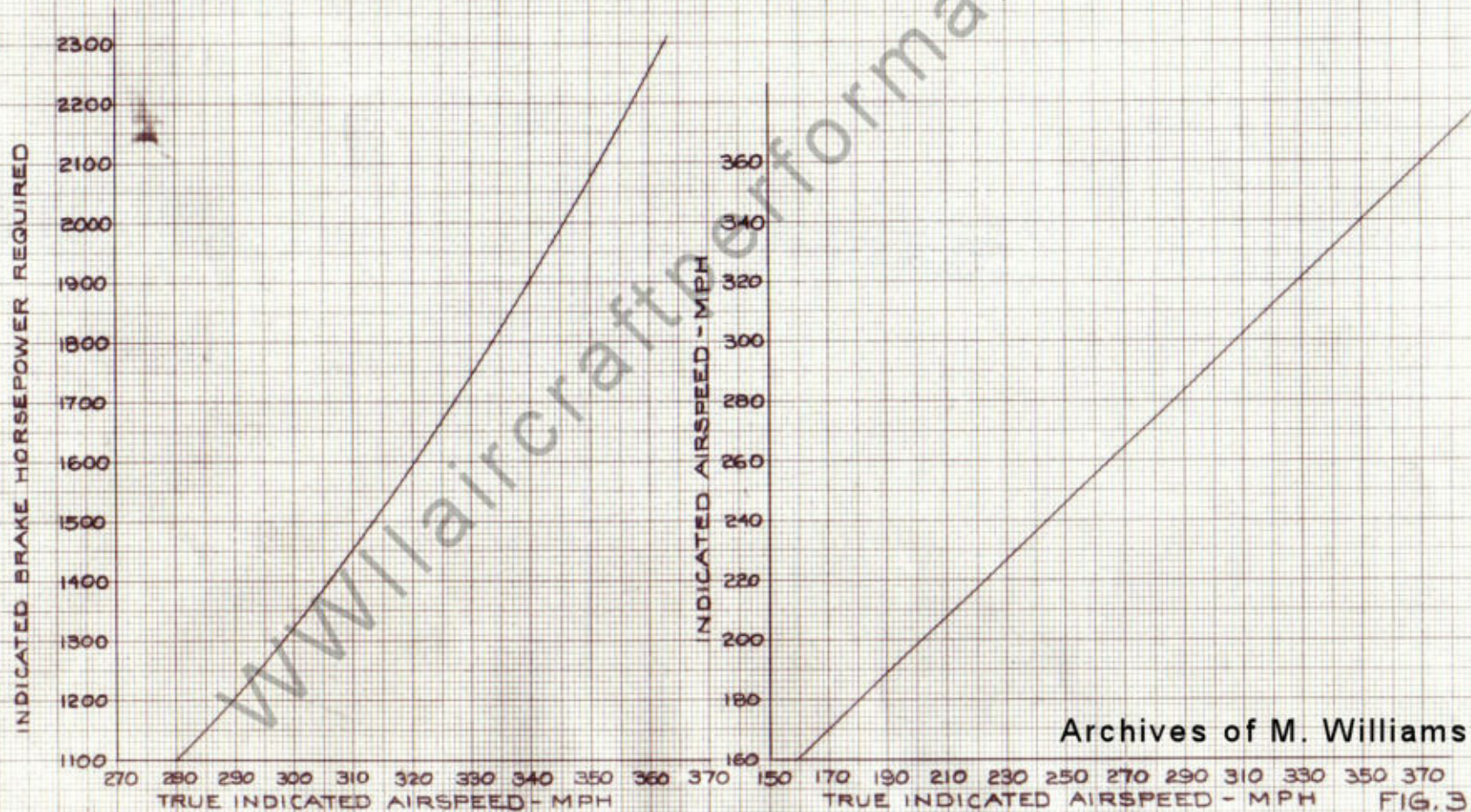
FIG. 2

MODEL F4U-1 AIRPLANE NO. 50030
PERFORMANCE CHARACTERISTICS
AT COMBAT POWER
OVERLOAD FIGHTER GROSS WEIGHT 12,162 LBS

PHOTO PTR NO. 8076
6-5-44

INDICATED BRAKE HORSEPOWER
REQUIRED VS MAXIMUM TRUE
INDICATED AIRSPEED

AIRSPEED INDICATOR CALIBRATION



Archives of M. Williams

FIG. 3