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C.A.D. 3/44
COPY

FINAL REPORT
OF
PRODUCTION INSPECTION TRIALS
ON
MODEL F4F-4 AIRPLANE NO. 4058
(Contract NOs-75736)
HELD
DECEMBER 6, 1941 TO FEBRUARY 28, 1942
BY
BOARD OF INSPECTION AND SURVEY
AT
U. S. NAVAL AIR STATION, ANACOSTIA, D. C.
AND
NAVAL AIRCRAFT FACTORY, PHILADELPHIA, PENNSYLVANIA

Original to: Department (Judge Advocate General)
Via: Chief of the Bureau of Aeronautics
Copies to: Chief of Naval Operations 1
Bureau of Aeronautics 18 (1)✓
(1 copy with 53 additional photographs)
Naval Air Station, Anacostia, D.C. 4
Naval Aircraft Factory, Philadelphia, Pa. ... 1

NAVY DEPARTMENT
BOARD OF INSPECTION AND SURVEY
WASHINGTON

AWM

VF4F-4/F8-2(988-S)
Serial 04821
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March 24, 1942.

From: Board of Inspection and Survey.
To : Secretary of the Navy (Judge Advocate General).
Via : Chief of the Bureau of Aeronautics.

Subject: Contract 75736 - Model F4F-4 Airplane -
Production Inspection Trials - Final Report on.

Reference: (a) JAG ltr VF4F-4/F8-2(411118)P JDM; hk of
November 19, 1941. (Copy appended, Marked
"A")
(b) BuAer. conf. ltr Aer-B-211-EM, C-75736
C 5902 of November 17, 1941. (Copy appended,
marked "B")
(c) BuS&A restr. ltr NOS-75736 SPM6 of July 18,
1941.
(d) Insurv conf. report MGH VF4F-3/F8-2(158-S)
Serial 1321 of January 23, 1941.
(e) BuS&A restr. ltr NOS-75736 SPM of April 11,
1941.
(f) BuS&A restr. ltr NOS-75736 SPM6 of February
7, 1942.
(g) NAS, Anacostia, conf. ltr VXF4F-6/NA6 Serial
41064 of March 6, 1941.
(h) Grumman Aircraft Eng. Corp. Report No. 1439A
dated November 22, 1941.
(i) NAS, Anacostia, conf. ltr VF4F-4/NA6 Serial
41270 (FT)(201) of December 18, 1941.
(j) SD-235-4-2, Detail Specification for Model
F4F-4 Airplane, dated January, 1942.
(k) Grumman Aircraft Eng. Corp., Report No. 1448U -
Actual Weight and Balance Report, Model F4F-4
Airplane No. 4058 - forwarded by INA, Bethpage,
1st end. C-75736/F1-2(3116-42) of November
27, 1941.
(l) BuS&A conf. ltr NOS-75736 SPM6 of February 18,
1942.
(m) NAS, Anacostia, restr. ltr VF4F-4/NA6 (FT)(47)
of February 13, 1942.
(n) Insurv conf. ltr VF4F-4/F8-2(327-S) Serial
01621 of January 31, 1942.

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- (o) Conf. Report on SEU Test No. 41-26 forwarded by NAF conf. ltr VF4F-4/F8(1627) of March 5, 1942.
- (p) NAS Anacostia (RTO) conf. ltr VF4F-4/F42-1/F36-1/NA6(150) Serial #42042 of February 4, 1942.
- (q) Insurv conf. ltr VF4F-4/F8-2(501-S) Serial 02521 of February 13, 1942.

Enclosure: (C) Set of six (6) photographs of Model F4F-4 airplane.
(D) Summary of Weight and Balance Data for Model F4F-4 Airplane.
(E) Performance Chart covering Model F4F-4 Airplane.
(F) Report of Results of Armament Tests of Model F4F-4 Airplane.
(G) List of Recommended Changes in Model F4F-4 Airplane.

1. In accordance with the references the Board of Inspection and Survey has conducted production inspection trials on Model F4F-4 airplane No. 4058. These trials having been completed except for the vibration survey which will be reported separately, this final report is submitted. Photographs forming enclosure (C) show the airplane as flown during the trials.

2. The first 202 airplanes manufactured under the terms of contract N0s-75736, dated August 5, 1940, were designated as models F4F-3 and F4F-3A. The 203rd airplane and the remainder on this contract are model F4F-4 airplanes, so designated in reference (c), which provides for folding wings and the six .50 caliber wing gun installation. Since the models F4F-3 and F4F-3A airplanes delivered under this contract were substantially identical with those secured by contract N0s-68219 and reported on by reference (d), reference (e) eliminated trials on the F4F-3 model and specified demonstration and trials on the first F4F-4 model, referred to in reference (f) as the 203rd airplane on the contract. The model XF4F-6 airplane, reported on in reference (g), served as the prototype for the model F4F-3A airplane.

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3. Preliminary demonstration of the model F4F-4 airplane No. 4058 was carried out before the Inspector of Naval Aircraft, Bethpage, Long Island. Report of this demonstration was made by reference (h).

4. Contract N0s-75736, dated August 5, 1940, provided for delivery of the last eighty airplanes, of the original number on the contract, within 18 months from the date of contract. Reference (c) stated a delay not exceeding two weeks would be satisfactory for the airplanes delivered as F4F-4 models. Airplane No. 4058, included in the above group of eighty, was delivered to the Naval Air Station, Anacostia, D.C., by contractor's pilot on November 24, 1941.

5. Final demonstration of the model F4F-4 airplane No. 4058 was carried out at the Naval Air Station, Anacostia, and Naval Proving Ground, Dahlgren, from November 27 to December 6, 1941. Report of this demonstration was made in reference (i), which stated that the demonstration was satisfactory in all respects.

6. The Board met at the Naval Air Station, Anacostia, D.C., on December 6, 1941.

Present: Commander R. E. Jennings, U.S.N.

7. The Board was assisted during the trials by personnel of the Naval Air Station, Anacostia, D. C., and the Naval Aircraft Factory, Philadelphia.

8. The model F4F-4 airplane, as a carrier airplane under all load conditions specified in reference (j) and in all other respects was found to be satisfactory for service use as a fighter, except as covered by recommendations in paragraph 26 of this report.

9. The model F4F-4 airplane, under all load conditions specified in reference (j), was found to be in correct flying balance, controllable and positively stable in the air about each of the three major axes, with free and locked longitudinal, lateral, and directional controls, except longitudinally with free controls as follows:

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- (a) In all load conditions, statically unstable in high power climb, both in normal flight and landing conditions, and barely stable dynamically in power off glide in normal flight condition.
- (b) As a bomber, dynamically neutral in carrier approach condition and in power off glide in landing condition.
- (c) As an overload fighter, statically unstable at high speed and cruising speed in normal flight condition, and dynamically neutral to unstable in carrier approach condition and glide with power off in landing condition.

10. The model F4F-4 airplane, under all load conditions specified in reference (j), was found to be controllable and stable on the ground.

11. The model F4F-4 airplane, under all load conditions specified in reference (j), was found to be satisfactory for service use in taking off from and landing on a carrier, except as covered by recommendations in paragraph 26.

12. The weight empty of the model F4F-4 airplane, as defined in reference (j), paragraph 105a, was reported in reference (k) to be 5758.5 pounds. The comparable guaranteed empty weight was stated to be 5833.4 pounds, making the airplane 75 pounds under weight.

13. Gross weights and useful load data applying to the model F4F-4 airplane as flown are contained in enclosure (D).

14. Performance data obtained during the trials are shown by the curves plotted in enclosure (E). The performance of model F4F-4 airplane No. 4058, as a fighter in the combat condition with the useful load specified in paragraph 104a of reference (j), is compared below with the guarantees as revised by reference (1), as follows:

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	<u>Actual</u>	<u>Guaranteed</u>
Maximum speed at airplane critical altitude* (mph).....	319	Not less than 328.5
Minimum speed without power at sea level (mph).....	76	Not more than 77.3
Service ceiling, starting with normal load (feet)	35,000	Not less than 30,100
Take-off distance in a 25-knot wind (feet)	246	Not more than 296

*19,400 feet.

15. The performance guarantees were made with the understanding that the government furnished engines (R-1830-86) would deliver 1000 BHP at 2550 RPM at 19,000 feet altitude and at sea level and 1200 BHP at 2700 RPM for take-off purposes, using 3-blade, constant speed controllable pitch propeller described in reference (j), and that the engines would be operated with domestic aviation gasoline of 100 octane number in accordance with Specification AN-9531.

16. Take-off tests as a normal 4-gun fighter resulted in a distance of 698 feet for a no wind condition. Take-offs were also measured with the airplane carrying the useful load of paragraph 104c of reference (j). This load included six .50 cal. wing guns and maximum fuel of 144 gallons. At a gross weight of 7921 pounds the measured take-offs resulted in 297 feet for a 25-knot wind and 686 feet for a calm.

17. Stalling speeds of the airplane as a normal fighter were measured with the following results:

Landing condition, no power	76 MPH
Landing condition, with power	70 MPH
Normal flight condition, no power	87 MPH
Normal flight condition, with power	81 MPH

18. Maneuvers expected of the type were performed during the course of the trials. Measurements to determine the effect of the gun installations on the rate of roll gave the following results:

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<u>Condition of Airplane</u>	<u>Gross Wt.</u>	<u>Time</u>
6-gun fighter	7237 lbs.	6.0 sec.
4-gun fighter	7237 "	5.9 "
No Guns	7237 "	5.7 "

19. Excessive concentrations of carbon monoxide gas were measured at various locations in the cockpit during various conditions of flight. The maximum was .032% at pilot's face during high speed in low blower.

20. Part of the rubber came off the tail wheel after about ten landings during the tests at Anacostia. During catapult tests at Philadelphia the rubber was stripped from the wheel on the thirteenth launching.

21. Power plant temperature survey showed No. 1 cylinder head temperature to be excessive. Results of this survey were forwarded to the Bureau of Aeronautics by reference (m).

22. Results of the armament tests and a general list of recommended changes to the model F4F-4 airplane were forwarded to the Bureau of Aeronautics as enclosures (A) and (B), respectively, to reference (n). Copies of these enclosures are attached to this report as enclosures (F) and (G).

23. Arresting and catapulting tests were conducted at the Naval Aircraft Factory, Philadelphia. Report of these tests was made by reference (o), which states that the F4F-4 type airplane is satisfactory for catapult launchings as a normal fighter, normal bomber or overload fighter, and that subject to improved functioning of the wing locking mechanism, it is satisfactory for carrier operations, including arrested landings, at gross weights of 7400 pounds.

24. Inspections and tests of the radio and electrical installations in model F4F-4 airplane, No. 4058, were reported on in reference (p), copies of which were forwarded to the Bureau of Aeronautics by reference (q).

25. The model F4F-4 airplane bettered all contract guarantees of weight empty and performance, with the exception of maximum speed which was 9.5 miles below the guarantee.

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26. It is recommended that modifications be incorporated in the model F4F-4 airplane to improve the longitudinal stability, and to correct the defects covered in enclosure (g) and in references (o) and (p) of this report.

27. With appropriate action taken on the recommendations referred to in paragraph 26 above, the Board recommends that the model F4F-4 airplane be considered suitable for service use.

VF4F-4/F6-2(4111118)P
JDM:hk

DEPARTMENT OF THE NAVY
OFFICE OF THE JUDGE ADVOCATE GENERAL
WASHINGTON, D.C.

November 19, 1941

From: Judge Advocate General of the Navy.
To : President, Board of Inspection and Survey,
Navy Department, Washington, D.C.
SUBJECT: Model F4F-4 Airplane, Contract 75736
Production Inspection Trials.

1. The Board of Inspection and Survey, or such members and assistants thereof as may be designated by you, will assemble at the Naval Air Station, Anacostia, D.C., on or about November 22, 1941, to conduct and report upon the Production Inspection Trials of the model F4F-4 airplane in accordance with the contract and specifications for her construction and with Articles 405 to 420, U.S. Navy Regulations 1920.

2. The Board of Inspection and Survey is authorized to obtain such further assistance of Government personnel as may be necessary for the performance of its duties hereunder.

By direction of the Secretary of the Navy.

W. B. WOODSON

A

NAVY DEPARTMENT
BUREAU OF AERONAUTICS
Washington

Aer-E-211-EM
C-75736
C 5902

November 17, 1941

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From: Chief of the Bureau of Aeronautics.
To : President, Board of Inspection and Survey.

Subject: Contract 75736 - Model F4F-4 Airplane -
Production Inspection Trials.

Reference:
(a) SD-235-3-1B, Detail Specification for F4F-3,
dated 12 August 1941.
(b) BuAer. conf. ltr. Aer-E-211-GF, EF13-1/F41,
EF13-1/L4, A5-1, C-1790, dated 23 April 1941.

Enclosure: (herewith)
(A) Revised Useful Load for Combat Condition.

1. It is requested that the board arrange to conduct production inspection trials on F4F-4 airplane No. 4058, which will be delivered to the Naval Air Station, Anacostia, in the near future, including the following in the program for the trials:

- (a) Standard performance test as a combat fighter (110 gals.)
- (b) Take-off data for the normal and maximum gross weights, including pertinent comment on the method used to obtain test take-off.
- (c) Stability and balance tests.
- (d) Routine arresting and catapulting tests. Limiting gross weights will be furnished in separate correspondence.
- (e) Comprehensive armament installation tests as outlined below:
 - (1) All armament items, except the bomb installation, in accordance with the A-N-B "Standardization Form for Gunnery Trials", and covering

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Aer-E-211-EM

C-75736

C 5902

November 17, 1941

Subject: Contract 75736 - Model F4F-4 Airplane - Production
Inspection Trials.

accelerations of -2 g to +5 g. The A-N-E
Form was forwarded with reference (b).

(2) Bombs (Ground Test)

- (A) Trial installation of both the Mk. XLI-2 and Mk. XLIII bomb racks. What are the required times for installation? Removal?
- (B) Trial installation of all types of bombs specified for the airplane.
- (C) Check of location of bomb release handle. Can it be reached readily with eye to gun sight?
- (D) Check of arming and release cable installations for proper alignment, sufficient adjustment and absence of excess friction.
- (E) Check of loading of bombs with wings folded, and respread of wings with bombs in place.

(3) Bombs (Flight Test)

- (A) Release singly of L.H. and R.H. 100 lb. bomb at low temperature in horizontal flight and in dives. Check for evidence of damage to wing by tail vanes.
- (B) Release of two 100 lb. bombs in salvo.
- (C) Repeat with miniature bombs.
- (f) Night flying test.
- (g) Maneuvers specified under Demonstration in the contract.
- (h) Routine vibration survey.

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Aer-E-211-EM
C-75736
C 5902

November 17, 1941

Subject: Contract 75736 - Model F4F-4 Airplane -
Production Inspection Trials.

2. Revised performance guarantees, based on the combat condition and all contract changes, will be furnished in separate correspondence.

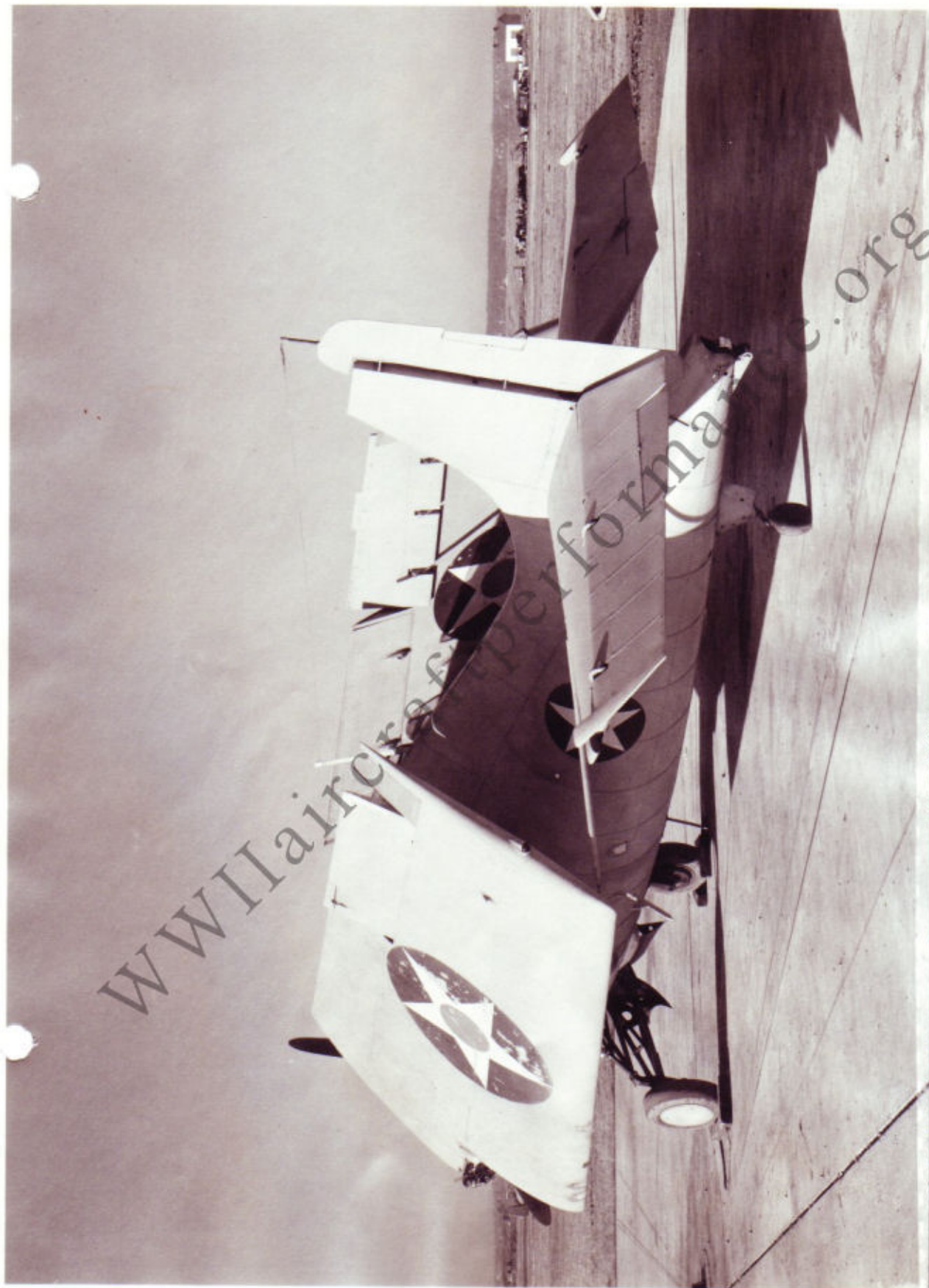
3. Revised useful load data are given in enclosure (A). Three (3) copies of reference (a), detail specification for Model F4F-3 airplane, are being furnished with separate correspondence for information and use in connection with the subject trials. It will be noted that the specification only includes contract changes prior to "N", which covers the Model F4F-4 modification.

4. S.E.U. Test No. 41-26 is assigned to the arresting, catapulting and night flying tests at the Naval Aircraft Factory.

5. The desired priority of these trials is assigned in the monthly precedence list.

J.H. TOWERS
Rear Admiral U.S.N.
Chief of the Bureau of Aeronautics

Copy to:
NAS, Anacostia
NAF, Philadelphia
INA, Bethpage



Model T4F-4,
No. 4058

AN-5922/
1-26-42

OFFICIAL NAVY PHOTOGRAPH
NOT TO BE USED FOR PUBLICATION

Model F4F-4 Airplane #4058

Weight and Balance Summary as Flown During Trials

(Pilot Armor and Tank Protection Included)

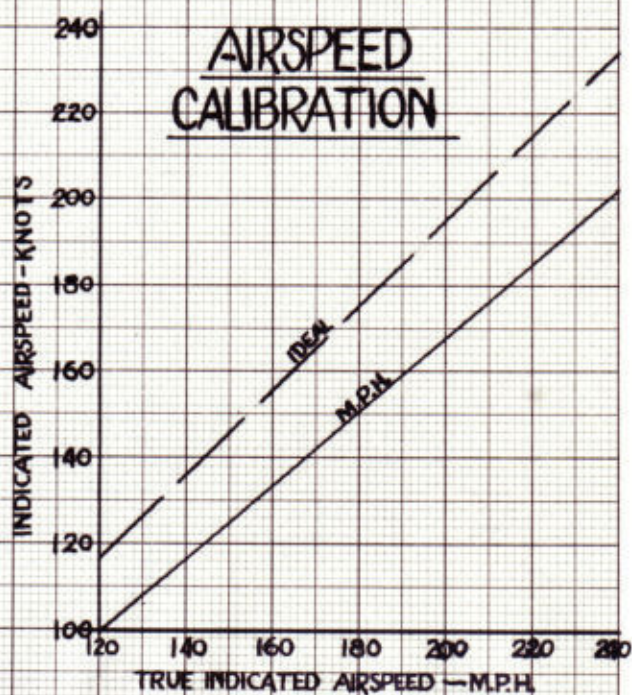
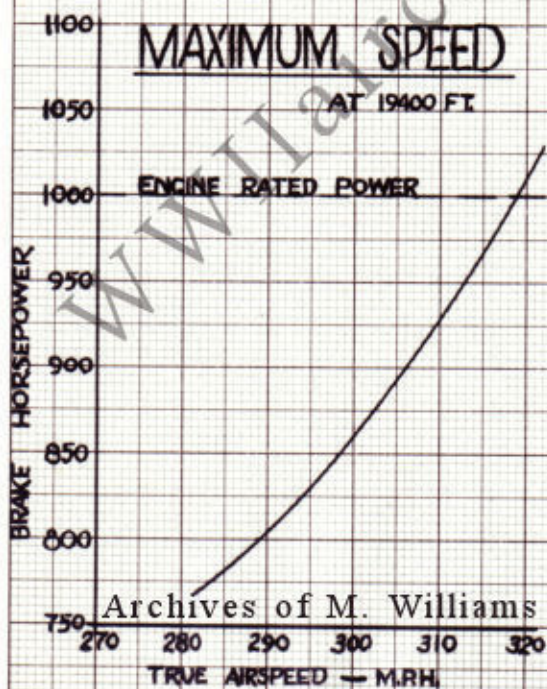
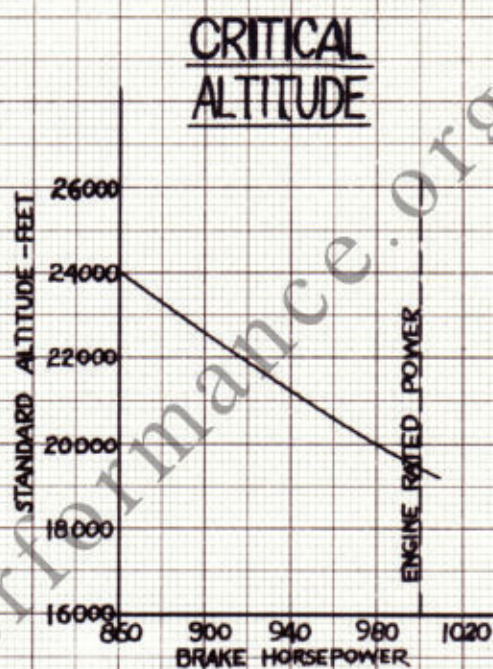
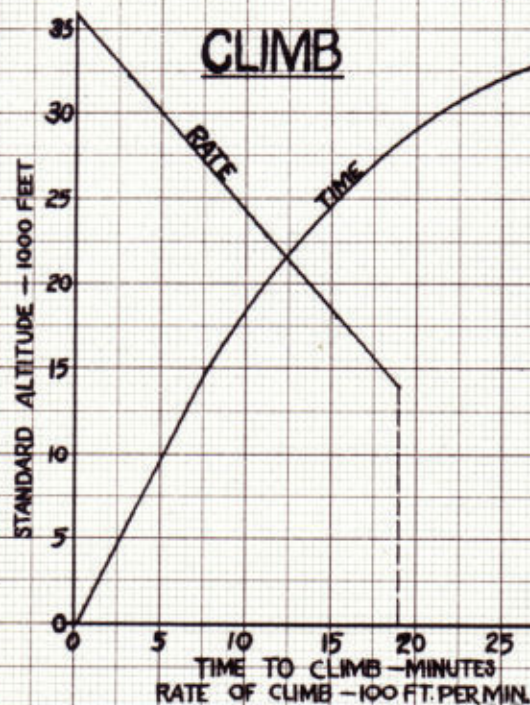
<u>Loading</u>	<u>NORMAL 4 gun VF</u>	<u>NORMAL Bomber</u>	<u>OVERLOAD 6 gun VF</u>
Par. from Det. Spec. No. SD-235-4-2	104a	104b	104c
Gross Wt. -- lbs.	7370	7363	7921
C.G. Position- $\frac{1}{2}$ MAC wheels up	28.00	28.31	29.9
wheels down	27.70	28.06	29.6
Useful Load -- lbs.	1554.1	1542.4	2103.0
Crew (1) -- lbs.	200	200	200
Fuel main tank - gals at 6#/gal	77.4	77.4	111.5
Fuel emergency tank - gals at 6#/gal	29.1	29.1	29.1
Oil -- gals. at 9#/gal	9	9	11
Guns & equipment - lbs.	248.7	128.7	388.6
Ammunition - rnds.	800	400	1440
Bombs & racks - lbs.	---	250.3	---
Pyrotechnics - lbs.	3.5	3.5	3.5
Camera gun - lbs.	14.0	14.0	14.0
Radio - lbs.	60.0	60.0	60.0
Navigating equipment - lbs.	3.5	3.5	3.5
Misc. equip. - lbs.	55.8	55.8	55.8
Test. equip. - lbs.	42.4	42.4	42.4

MODEL F4F-4 AIRPLANE No.4058

FOUR GUN FIGHTER

WEIGHT = 7370 POUNDS

AN-59490



Archives of M. Williams