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TITLE

Evaluation and Comparison Trials of P-51B
and P4U-1 Aircraft - Report on.

DATE

REFERENCES

- (a) FT Report of Trouble of 21 January 1944
on P-51C.
- (b) FT Report of Trouble of 17 February 1944
on P4U-1.

Test made and reported on by Flight Test,
U. S. Naval Air Station, Patuxent River,
Maryland

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REMI Evaluation and Comparison Trials of P-51B
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INTRODUCTION

1. This report summarizes the results of the comparison between the P-51B airplane and the F4U-1 and F4U-1A airplanes recently completed by Flight Test, together with an evaluation of the P-51B. The tests were carried out under a verbal directive of BuAer, for the purposes of evaluating the merits of each type, determining the possible uses of the P-51B type in Naval or Marine employment, and reporting design features of the Army airplane of general interest to the Navy.

METHODS

(a) Military evaluation of the P-51B airplane and comparison between the P-51B and F4U airplanes was accomplished by flying them together in high speed level flight, climbs at various speeds, dives, simulated combat and simulated gunnery approaches. The aircraft were flown at various times by seven pilots with combat experience.

(b) Stability, control, and performance elements of the P-51B were determined by the standard methods of Flight Test.

(c) Qualitative performance comparison between the P-51B and F4U-1 types was determined by simultaneous air trials.

DISCUSSION

(a) Description of Airplanes:

1. In all, four airplanes were compared during the trials. P-51C airplane (identical with P-51B except for place of manufacture) AAF serial 42-102987 was

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employed briefly at the outset of trials, but because of numerous material deficiencies and malfunctions was shortly replaced by P-51B AAF serial 37050, which completed the trials. F4U-1 airplane serial 02390 and F4U-1A airplane serial 17930 were used for comparison.

2. The P-51B is a single-seat, single-engine, low-wing fighter powered by a Packard-built, Rolls Royce V-1650-3 engine, using an 11'2" four-blade Hamilton Standard propeller. It employs a laminar-flow wing section, and is of unusual overall aerodynamic cleanliness. The F4U's, with war emergency power equipment, were production airplanes, except for the differences discussed below. Photographs of the three airplanes form enclosure 1.

(b) Comparison Loadings:

1. The airplanes were compared at two general load conditions. In the first condition, the planes were ballasted to give: (1) Fuel for equal duration, with half of the fuel expended at maximum range cruise and half at military power, taking into account the varying specific consumptions of the two engines; (2) Total armament weight proportional to the military rated horsepower; and (3) All other items of useful load as specified for the normal fighter loading. The F4U's were employed as the datum airplanes, and loaded to full internal protected fuel and full armament, at a gross weight of 12,162 lbs. The corresponding gross weight for the P-51B was 9,423 lbs. In the second condition, each plane was loaded to its own specified full load fighter weight, 9,100 lbs. for the P-51B and again 12,162 lbs. for the F4U's. At this latter loading the endurance of the two planes by coincidence is nearly the same, but the F4U has $(6/4 \times \frac{391}{315}) = 86\%$ greater firepower.

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for P-51B

results/gun
for F4U-1

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(c) Drag Condition:

1. The P-51B, as flown, was in a drag condition slightly improved over that of a standard production airplane, by reason of minor changes in the external radio installation and smooth sanding of the wing. F4U-1 No. 02390 was a standard low-cabin production airplane, in a drag condition representative of that to be expected in the P4U-4 airplane as a Marine land-based fighter. A propeller of 13'1" diameter, blade design No. 6501A-0, was installed in lieu of the usual propeller of 13'4" diameter, blade design No. 6525A-21. The principal changes in drag included sealing and fairing the wing fold hinge line, removal of the tail hook, carefully fitted cowling, and a faired and smoothed, but not polished, skin. The total speed gain, as a result of drag reduction alone, in this airplane is estimated to be 8 MPH at the airplane upper critical altitude.

2. F4U-1A No. 17930 was a standard production raised cabin airplane, with a surface finish in rather poor condition, but with the tail hook removed. It is considered to have been in a drag condition representative of production airplanes after moderate service. The same type propeller as that on No. 02390 was installed.

(d) Power Ratings:

1. The P-51B was flown at its war emergency power rating of 67" manifold pressure at 3000 RPM. (See power ratings, enclosure 2.)

2. F4U-1 No. 02390 was flown at a special war emergency power rating of 65" manifold pressure and 2700 RPM, with water injection at an increased water flow rate.

3. F4U-1A No. 17930 was flown at the standard war emergency rating of 60" Hg at 2700 RPM, with water injection. (See power ratings, enclosure 2.)

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RESULTS

(a) Performance Comparison:

1. V_{MAX}

The relative speed performance of the airplanes compared is indicated on the speed-altitude chart (enclosure 3). In summary, F4U-1 No. 02390 appeared to be superior from sea level to 13,600 feet, slightly inferior from 13,600 feet to 16,000 feet, markedly superior from 16,000 feet to 24,200 feet, and markedly inferior everywhere above 24,200 feet, at either comparison loading. Up to this latter altitude, there is nowhere more than 15 MPH speed difference between the two airplanes. F4U-1A No. 17930 is, as shown, slightly slower than either of the other airplanes, except in the region of sea level to 2,000 feet and from 18,600 feet to 24,000 feet where it is superior to the model P-51B airplane.

2. Climb

(a) At the first comparison loading, the F4U's are everywhere superior in climb, having an estimated margin of from 750 feet to 1,000 feet per minute at various altitude levels.

(b) At the second comparison loading, the F4U's are superior in climb to 20,000 feet, and the P-51B superior above that altitude to ceiling.

3. Other Conditions

The F4U's appear to be superior to the P-51B under all conditions in level flight acceleration, in maneuverability, and in response. The P-51B has markedly superior diving acceleration. The F4U's are decidedly superior in take-off and have a lower stalling speed at comparable loads.

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(b) Flight Characteristics - P-51B:

1. Stability and Control

The P-51B has good stability and control characteristics except for the weak directional stability, which permits heavy yaw even at rather high speeds (450 MPH ind.), and which results in inadvertent yawing in flight unless constant attention is paid to the rudder. Longitudinal stability, in most flight conditions, is weak but positive. Control is adequate throughout, except that lateral control at low speeds is marginal, and would not be sufficient for carrier operation.

2. Ground Handling

Taxying, parking, take-off and landing run are good, except for the extremely poor vision in the ground attitude. Taxying is greatly facilitated by the tail wheel lock, which is operated on the ground by movement of the control stick. This arrangement, however, would not be satisfactory for carrier operation.

3. Vision

Vision in the P-51B is notably poor forward, because of the low pilot position and heavy framing. Vision aft also is poor, because of the limited head travel allowed by the narrow cockpit.

4. Cockpit, Controls, etc.

The cockpit is cramped for space, but the arrangement of controls is generally good. Operation of the fuel system is unusual in that choice of supply from the right or left internal tank is made by selective operation of the right or left auxiliary fuel pump, rather than by shifting a fuel selector valve. This arrangement has advantages in minimizing the danger of a loss of fuel suction in an embarrassing position, but is dependent

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on an electric power source for proper operation. However, with electric booster pumps inoperative, the engine pump will continue to supply fuel to the engine from one or the other of the tanks, the pilot having no control over the distribution of fuel between the two tanks.

CONCLUSIONS

1. It is concluded that, in general:
 - (a) There is little to choose between the P-51B and F4U-1 airplanes in speed between sea level and 25,000 feet, and that above 25,000 feet, the P-51B is superior.
 - (b) That the F4U-1 is everywhere considerably superior in climb, at any comparable loading, and superior in all other performance elements except diving speed.
 - (c) The F4U-1 is everywhere superior in maneuverability and response.
 - (d) With equal endurance, the F4U carries about 86% greater armament, and that it is a better gun platform.
2. In summary, the F4U-1 airplane appears to be the superior fighter for Naval or Marine employment, either land or ship-based, except in the single case where substantially all fighting occurs above 25,000 feet.

F. E. ELLIS
Lieut. Comdr., USNR

(Detached)
H. A. M. GAYLER
Lieut. Comdr., USN

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1. Two (2) Fighter Comparison Curves
 2. Eight (8) Photographs on the P-51B
 3. Eight (8) Photographs on the F4U-1

PAUL H. RAINSEY
Comdr., USN

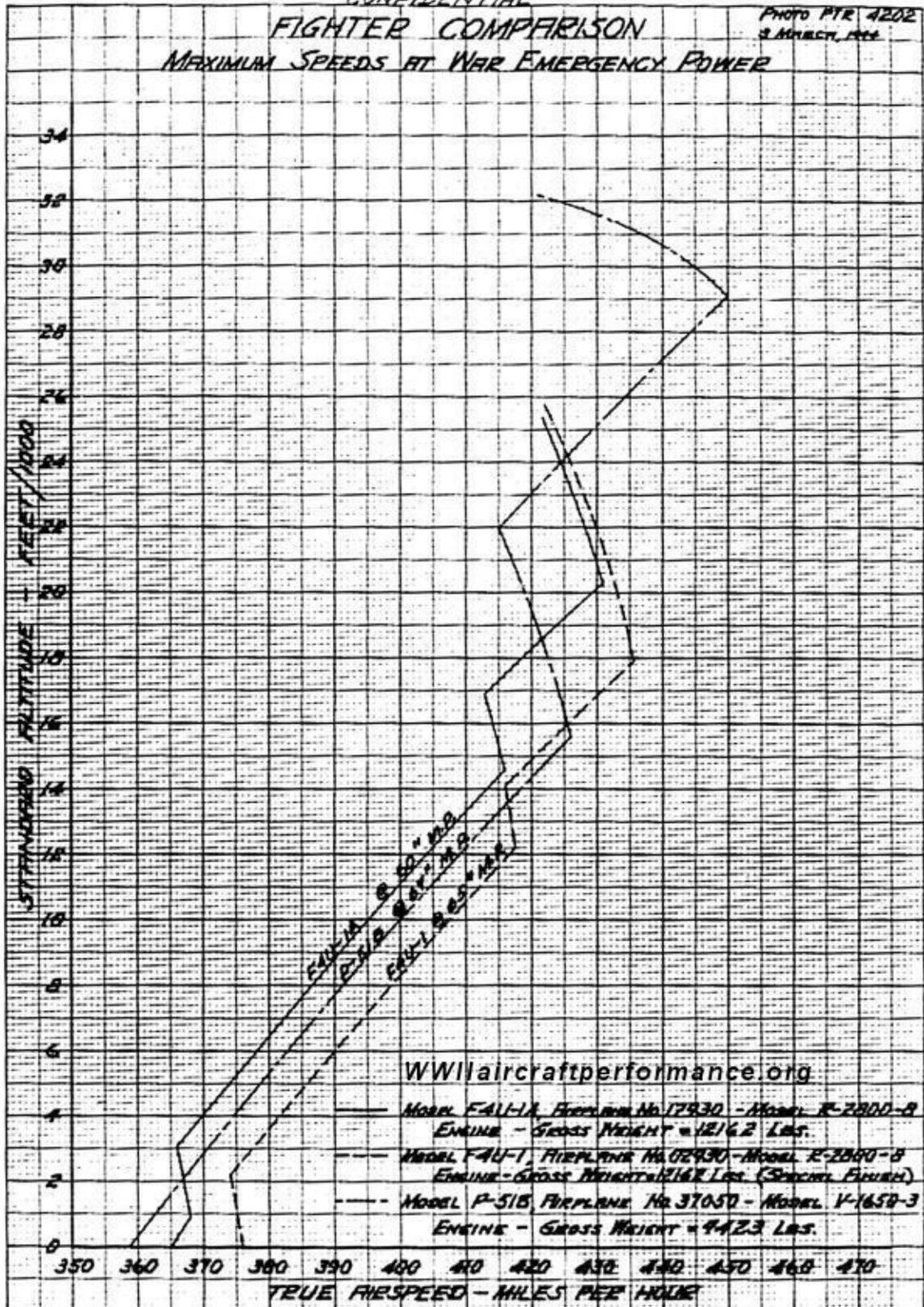
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PHOTO PFR 4202
3 AUGUST, 1944

FIGHTER COMPARISON

MAXIMUM SPEEDS AT WAR EMERGENCY POWER



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34 BRAKE HORSEPOWER AVAILABLE AT WAR EMERGENCY POWER
IN MAXIMUM SPEED FLIGHT

