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ARMY AIR FORCES
MATERIEL ~~CENTER~~ COMMAND

MEMORANDUM REPORT ON
Japanese Zero Fighter

MLS/hbs/47

Date 24 November 1943

SUBJECT: Pilots Comments on Handling Characteristics of Japanese Zero Fighter.

SECTION Flight

SERIAL No. ENG-47-1673-A

Contract No.
Expenditure Order No.
Purchase Order No.

A. Purpose

1. To forward pilots comments on Japanese Zero Fighter Model II.

B. Factual Data

1. Introduction:

a. A Mitsubishi Zero Model II Fighter plane returned from an active combat zone was flown approximately ten hours including 900 miles of cross country flying and 5 hours of general air work consisting of all types of acrobatic maneuvers, stalls, spins, landings, and take-offs. The plane was powered by a Japanese Sake Model 12 Engine equipped with a Hamilton Standard Hydromatic Propeller. Less than the rated 1,000 H.P. was available due to unknown power plant difficulties.

2. Weight and C.G. Information:

a. The plane weighed 5400 lbs. and the C.G. location was 24%. There was no ammunition in the plane but American radio and oxygen systems had been installed.

3. Flight Characteristics:

a. Cockpit Layout - The layout is fair and the rudders are mounted on an adjustable bar and the stick is located too far forward, it is possible to strike the instrument panel by pushing the stick full forward. The instruments are well grouped and easy to read. The compass and Gyro indicator are at the top center of the panel, the landing gear and flap levers are located on the right side of the pilots seat and are very unhandy to operate. The seat adjustment handle is also on the pilots right side and was found to be much too long, at certain positions it interferes with the flap and wheel levers.

b. Taxiing and Ground Handling - The plane is very difficult to handle on the ground. The full application of brakes and rudder will cause only a slight change in direction at slow speeds. The brakes were found to be extremely erratic at all times and great effort was made to improve the system without apparent results. The tailwheel is of the non-steerable non-locking type and offers little help in taxiing the airplane. It is necessary to have a man at each wing tip throughout all taxiing maneuvers.

c. Take-off and Climb- At a speed of 25 M.P.H. the rudder becomes effective in directional control. Torque is not dangerous but great care is necessary to keep the plane rolling straight until sufficient speed is attained to provide full rudder control. In one take-off run a severe swing to the left was experienced, recovery was made by using a full blast of throttle and full right rudder. The plane responded rapidly and became air-borne as soon as directional control was regained. Take-off R.P.M. was the maximum obtainable; 2150. The speed at take-off was 75 M.P.H. indicated. The best climbing speed was 80 to 85 M.P.H. indicated. Without flaps the plane was stable in the climbs and the indicated rate of climb was 2300 ft. per minute at these speeds with 2150 R.P.M. and 33"Hg. The wheels retract in about 10 seconds and to lock them it is necessary to move the wheel lever back to neutral with a swift smooth stroke.

d. Climb - Due to the fact that full power was impossible to obtain the actual rate of climb was not determined. The angle of climb is very steep and the zoom rate of climb is excellent and perhaps is one of the Zeros best fighter characteristics.

e. Handling and Control At Various Speeds - The Zero handles well at all speeds up to 300 M.P.H. Both stick and rudder are sensitive to touch and the plane responds readily to changes of controls; however, as the speed is increased the aileron control becomes progressively difficult and at speeds of 300M.P.H. or more it is necessary to use both hands on the stick to perform slow rolls.

f. Trim And Stability - Good trim is easy to maintain up to speeds of 210 M.P.H. There is no aileron or rudder trim control in the cockpit so it is necessary to ride the controls to maintain stabilized flight. This plane was found to be much less stable in flight than heavier fighter types. From a standpoint of flyability, however, any lack of stability it may have is nullified by its ease of handling.

g. Stalls and Stall Warnings - The clean stall occurs at about 65 M.P.H. and the plane shows a tendency to fall off sharply on one wing, control is easily regained and there is only a slight inclination toward secondary stalls. Stalling speed with wheels and flaps extended is 58 M.P.H. In this stall the plane falls straight through and recovery is even more rapid than from a clean stall. Ample warning before the stall occurs is given by slight buffeting of the elevators and by vibrations in the fuselage. Good control is possible right up to the actual stall point.

h. Maneuverability and Acrobatics - At speeds up to 300 M.P.H. the Zero is easy to maneuver and performs all acrobatics with a natural grace, characteristic of good fighting planes. It is especially good at loops and immelmans. An indicated speed of 160 M.P.H. was found to be sufficient to complete loops and immelmans. With cruising throttle in level flight it is possible to perform consecutive loops without losing altitude. The radius of turn is very short and the rate of roll at speeds under 250 M.P.H. is quite rapid. It is difficult to stall the ailerons in a fast roll. Above 300 M.P.H. all maneuvers become increasing difficult to perform. This characteristic may account for the reports from combat experiences that the zero is not a maneuverable plane at high speeds.

i. Control On Reduced Number Of Engines - This plane has only one engine.

j. Changes in Trim When Operating Landing Gear and Flaps- When operating the gear and flaps prompt attention to the elevator is necessary. There is ample range of trim control to restabilize the controls in any altitude.

k. Noise and Vibration - There are no unusual noises in the Zero, but excessive vibration is evident in the wings and fuselage during pull-outs. Inspection plates were torn from the cowling in a normal turn of 4 Gs, DZUS. Fasteners in the cowling were also found in a loosened condition.

l. Comfort - It is evident that in the cockpit design much thought was given to the comfort of the pilot. Entry to the cockpit is very easy due to an ingenious system of pop-out handles and steps. When the pilot is seated he will find a large comfortable safety belt easy to adjust, ample shoulder and head room and sufficient knee room for the average man. The rudder bar is adjustable 8" fore and aft, A cockpit heater and ventilator is provided and seemed sufficient at low altitudes in fall weather.

m. Vision - The canopy and wind screen provide ample all round vision to the pilot and there is little distortion noticeable. The pilots position in the cockpit enables him to see downward over the nose well enough to accomplish good full deflection shooting while the plane is in a turn or dive. Landing and take-off vision is good, and it is thought that vision for night flying would be excellent due to the lack of curves in the canopy glass and the location of exhaust outlets under the fuselage.

n. Approach and Landing - Approach speeds of 80 to 85 M.P.H. feel best, and with gear and flaps down and a slight amount of power the plane becomes quite stable and easy to control at a speed of 70 M.P.H. The landing is normal and there is no tendency for the plane to bounce due to high pressure tires and a stiff gear strut. The landing run is short and directional control is easy to maintain. It is recommended that no brakes be used to control the landing run.

4. General Functioning:

a. Power Plant and Associated Equipment - Due to unknown causes the engine would not turn the specified maximum R.P.M. of 2550, only 2150 R.P.M. was possible. The cowl flaps and oil shutters are operated by mechanical cranks in the cockpit. They are easy to adjust and provide adequate cooling for the engine. The propeller operates much like any other Hamilton Standard Hydromatic Propeller.

b. Hydraulic, Pneumatic, and Electric Systems - The wheels and flaps are operated by the main hydraulic system. Pressure is maintained by an engine driven pump. The system was faulty due to leaking connections and worn valves. One to two quarts of fluid would leak from the system on every flight. A pneumatic gun charging system is installed in the plane but no test was made of this device. The electric system gave satisfactory performance.

c. Emergency Systems - A one shot fire extinguishing system is installed in the Zero, the pull handle is on the left cockpit wall behind and to the rear of the throttle quadrant. An emergency hydraulic hand pump is mounted on the cockpit floor to be used in case of pump failure. Should both systems fail the wheels may be lowered by putting the wheel lever in the down position and yawing the airplane.

5. Performance:

a. No performance tests were made.

C. Conclusions

1. The Zero is a light weight fighter with excellent flying characteristics, and great acrobatic ability. It is thought that the lack of armour plate and leak-proof fuel tanks would decrease its tactical efficiency.

D. Recommendations

None.

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