**WAR DEPARTMENT**
**AIR CORPS, MATERIEL DIVISION**

**MEMORANDUM REPORT ON**

SUBJECT: Pilot's Observations on Supermarine Spitfire Powered with Merlin Mark III. Date May 20, 1940



SECTION Flying Branch Contract No.

SERIAL No. PHQ-M-19-1092-A Expenditure Order No.

Capt. USAF. Purchase Order No.

1. Purpose: To report on the handling, flying, maneuverability, and general characteristics of the British Supermarine Spitfire airplane powered with Merlin Mark III.

2. Factual Statement:

a. Flying Characteristics:

(1) Speed.- The Supermarine Spitfire airplane is about 8 MPH slower than the XP-40 at military power at 2300 feet. Inasmuch as the Spitfire is equipped with a two-position propeller which is set for limiting RPM at about 15,000 feet, it is probable that the Spitfire would show to better advantage at higher altitudes. It should be borne in mind, however, that the Spitfire was operating at military power manifold pressure during this test and was handicapped only by operating at about 300 RPM less than rated RPM. With the Spitfire wide open at military power the XP-40 stayed with it with 36.5" manifold pressure out of 42.5" available and 2500 RPM out of 2950 available, which reduces to 886 HP out of 1090 available. The true speed was approximately 286 MPH.

(2) Maneuverability.- The maneuverability was the same as the XP-40.

(3) Take-off.- Long take-off run due to two-position propeller. No noticeable torque.

(4) Landing.- The airplane is under-flapped by USAC standards with resultant flat glide and tendency to float if brought in too fast. A 90-MPH glide is a very safe gliding speed. The plane glides and lands almost exactly like the PB-2.

(5) Control Forces.- The controls are very light and sensitive, particularly the rudder and elevators. This is not considered a great advantage by the undersigned.

(6) Aerobatic Handling.- Due to poor weather conditions no aerobatics were attempted except slow rolls. The airplane handled nicely, engine stopped when inverted.

(7) General Handling.- Very good with one exception, when pulled around in a steep bank (60° - 80°) there was a very noticeable tendency for the ailerons to get very light as though they were stalling. Cause unknown, but a very disconcerting condition.

(8) Stalls.- In all conditions - very good. The stall is slow, there is aileron control up to and during the stall and the plane stalls straight ahead. Slight buffet of the canopy when stalled. Indicated 65 MPH wheels down; 58 MPH wheels and flaps down.

(9) Spins.- None attempted. RAF pilot stated that the plane was not to be spun intentionally; that it had a tendency to spin out of steep climbing turns; that the plane recovered nicely from spins; that it took a dive of such distance to regain control after recovering from the spin that a spin started under 5000 feet was a sure crash.

b. Cooling:

(1) Air.- Excellent. With all shutters closed and a free air temperature of plus 7 deg. C. the maximum temperatures encountered during combat at full power were 65 degrees for oil and 90 degrees for prestone.

(2) Ground.- Very poor. It is necessary to take off immediately after starting to prevent excessive prestone temperatures. It was noted on one flight that the prestone was 102 degrees at the end of the landing roll and after two minutes of taxiing and one of idling, the temperature had reached 137 degrees. (Free air about 10 deg. C.).

c. Cockpit and Controls:

(1) Cockpit is quite small and face of instrument board close to pilot's head.

(2) Rudder pedals are adjustable on a screw arrangement that is slow and judged inferior to USAC standard pedals.

(3) Stick is hinged some ten inches from the top to provide aileron control and to eliminate the need for excess room for lateral stick movement. Not noticeable in flying plane and judged superior to USAC.

(4) Automatic manifold pressure control permits wide open operation at military power at any altitude. Equipped with manual cut-out. Superior to USAC.

(5) Compass.- Large navigator's compass, believed unnecessary.

(6) Flight Instruments:

Directional gyro
Horizon. (No caging control but understood to be on later models.)
Bank and Turn. (Bank indicator is a pointer rather than a skid ball and seemed very awkward.)
Free-air thermometer (None)
Map Case (None).

(7) Landing Gear Indicators.- Horn plus pressure against pump movement plus positive mechanical indicators in the wings are excellent for day operation only.

(8) Landing Gear.- Manually operated. Very easy to operate and as fast or faster than the electric-hydraulic system on the XP-40.

(9) Flap Indicators.- Pointers for EACH flap which would indicate that failure of one flap has been experienced.

(10) Flaps.- Air operated and very fast. No intermediate positions with resultant hazard when raising flaps after an attempted landing. Flaps are not interconnected.

(11) Brakes.- Air brakes operated by one trigger on the stick. The brakes are very effective but, operating differentially, are very awkward for a USAC pilot trained on toe brakes.

(12) Belt.- Chest and shoulder straps very easily adjusted and quickly releasable. Would be effective in preventing head injuries caused by pilot's head hitting instrument panel. This type belt seems very restricting when an attempt it made to look to the rear. It is also a positive restriction when the pilot wants to duck his head in case of nose-over. A better combination would seem to be a standard USAC belt plus another similar belt around the pilot's chest. This chest belt could then be worn loosely enough to permit free turning in the seat for rear vision and for head ducking, tightly enough to keep the head off the instrument board.

MEMO REPORT - Serial No. PHQ-M-19-1092-A CONFIDENTIAL
May 20, 1940

-4-

(13) Turnover Protection.- None noted. There are no provisions made for exit through a removable side panel.

d. Vision.- The windshield is of a poor grade of plexiglass and is small, giving the pilot a limited and distorted view forward. This was further complicated by oil from the propeller covering the windshield and reducing the forward vision to zero. One RAF pilot stated that this oil throwing was normal; another that it was normal only for twenty hours after repacking the propeller with grease. Repacking interval unknown. Due to the glass of the cabin extending such a short distance behind the pilot, the vision to the rear is quite limited. Both RAF pilots wh flew the XP-40 commented upon its excellent vision.

Prepared by GEORGE E. PRICE
(Name) Captain, Air Corps

Approved by STANLEY M. UMSTEAD, Major, A.C.
(Chief.) Flying Branch

Concurrence:

Approved by H. C. BOGERT, Major, A.C.
Act.Ch. Expt. Engr. Sect.

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