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AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT.

BOSCOMBE DOWN.

Messerschmidt 109 Fighter
Brief Handling Trials.

A.&.A.E.E.Ref: S.4487/38 - A.S.66.

A.M.Ref: S.B.5860/R.D.T.4.

SUMMARY.

Reason for tests.

Complete performance trials were carried out in France on a M.E.109 Fighter which fell into Allied hands. It was desired that pilots of this Establishment should handle the aeroplane for comparison with our own fighter aircraft.

Range of investigation.

The aeroplane was flown by several pilots and their behaviour throughout the speed range was noted. Acrobatics were also carried out.

Conclusions.

The aeroplane does not possess any of the vices which it was rumoured were experienced. One objection to it is the lack of space in the cockpit. There is no head room for a large pilot.

In general flying qualities the aeroplane is inferior to both the Spitfire and the Hurricane at all speeds and in all conditions of flight. It is much inferior at speeds in excess of 250 m.p.h. and at 400 m.p.h. recovery from a dive is difficult because of the heaviness of the elevator. This heaviness of the elevator makes all manoeuvres in the looping plane above 250 m.p.h. difficult including steep climbing turns. No difference was experienced between climbing turns to right and left. It does not possess the control which allows of good quality flying and this is particularly noticeable in acrobatics.

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1. Cockpit.

1.1 Ease of entry and comfort. The cockpit is easy to enter but is rather cramped for a large pilot. The rudder pedals are not adjustable by the pilot but can be moved forward or backward by the rigger over a range of about two inches. They can only just be reached by a small pilot. The coupe touches the head of a normal pilot when the seat is in the raised position. A tall pilot has to bend his neck even when the seat is in its lowest position. There is little noise when the hood is closed even when the side panels are open. The cockpit is very warm and the ventilation appears to be adequate.

1.2 View. There is a blind area straight forward and this extends to about 20 degrees to either side of the nose when the aeroplane is on the ground. There is a D.V.panel situated on the left hand side of the sighting panel. This is very easy to operate and allows the pilot a reasonable view to the left forward. There is no draught and little noise when the panel is open. It is of a good size and it is not necessary for the pilot to lean to one side in order to see through it.

1.3 Seat adjustment and straps. The straps are of the usual Continental pattern and are readily adjustable to fit various sized pilots. The seat can be lowered or raised by means of a lever situated on the left hand side of the seat.

1.4 Brakes. The brakes are operated by the toes as were

the brakes on the "Fury". Originally the brakes were difficult to operate, but wooden blocks have been added to raise the pedals and these are better but the braking system is not considered as good as the hand operated system. There is no locking device for parking.

1.5 Controls: All controls work with very little friction on the ground and there is no play. Longitudinal trim is effected by means of a movable tail-plane. The actuating wheel for this is positioned on the left hand side of the cockpit. It is easy to operate, does not slip, and can be moved over the whole range in about 18 seconds. Neither rudder bias nor aileron bias is supplied. The throttle box is not claborate consisting only of the throttle lever and a butterfly nut for preventing slip. There is no mixture control lever. The engine mixture is controlled automatically by an aneroid. The V.D.M. airscrew control is easy to operate and does not slip. The flaps are controlled mechanically by a hand wheel and on the flaps themselves are markings which can be seen by the pilot. They are marked from zero to 40 degrees (fully down) in tens of degrees. On the lower right hand side of the dashboard is the undercarriage control. To the left are indicator lights while on the right is a mechanical indicator. The control is satisfactory and throws out after the operation is completed. The engine has two injector pumps and a control allows the pilot to use either pump or both. The radiator flaps are controlled by an arm on the right hand side of the cockpit. Each radiator flap has an indicator which protrudes through the wing. A further control which is unique inasmuch as it has not been seen before in this country is one which retards the ignition for the express purpose of heating the engine cylinders so as to burn oil off the sparking plugs if they should become oiled up. Photographs of the cockpit layout are attached at the end of this report.

1.6 Instruments. The gauges and instruments are well marked

and easily read. The oil and petrol pressure gauges have maximum and minimum markings. The compass is similar to the P.3. and is situated at the top of the instrument panel. The sole aid to cloud flying consists of an American-type turn-and-bank indicator.

1.7 Illumination. No night flying was carried out so it is not known what the cockpit illumination is like.

1.8 Emergency exits. For exit in the air the coupe hood can be jettisoned by pulling a single lever on the left hand side of the hood. There is no strong-point to support the aeroplane in the event of overturning on the ground and it is considered that a pilot would have great difficulty in extricating himself in that case since the rudder is very small and the hood would be on or very near the ground.

2.0 Handling and flying qualities.

2.1 Ground handling. Except for the poor visibility and the rather unsatisfactory brakes, taxying presents no difficulties. The undercarriage is good and there is no tendency for the tail to lift when the brakes are full on.

2.2. Take-off and initial climb. There is a slight tendency to swing right on take-off and this changes to a tendency to swing left immediately the aeroplane is in the air. Both these tendencies are easily overcome by use of rudder. The tail comes up quickly and the forward view is then satisfactory. The undercarriage can be raised as soon as the aeroplane is off the ground and this operation has no noticeable effect on trim. The undercarriage retracts outwards and upwards and the whole operation takes about 8 seconds. The best speed for raising the flaps is about 125 m.p.h.A.S.I.R.

2.3 Controls in level flight. All controls are light, quick in response, and effective up to a speed of 250 m.p.h. after which they become extremely heavy. This is particularly so in the case of the elevator which is out of harmony with the other controls

to start with, being noticeably heavier, and in the dive it becomes almost immovable. It is to be particularly stressed that the controls of this aeroplane are pleasantly light at all speeds up to about 250 m.p.h. and they then appear to tighten up very suddenly so that, as stated above, at high speeds they are practically immovable. It has been stated by experienced pilots who have flown this aeroplane that, in the event of attack from behind made by the M.E.109, the attack can be easily broken off by the attacked by pulling up fairly quickly from a dive. The pilot of the M.E.109 would never be able to recover quickly enough to follow owing to the heaviness of the controls.

2.4 Stability. The aeroplane is laterally, directionally, and longitudinally stable. The degree of directional and longitudinal stability is considered to be too high at normal speeds for a fighter but at high speeds the aeroplane becomes longitudinally neutrally stable. No tests were made to record phugoids.

2.5 Control and stability at the stall.

The stalling speed with flaps and undercarriage up is 130 KPH (81 m.p.h.) A.S.I.R.

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The aeroplane was not put through all the tests called for in A.D.M.293 but the following remarks apply to the general behaviour of the aeroplane at the stall.

At the approach to the stall the left wing tends to drop and the control column has to be moved to the right. The nose also tends to turn to the left so that some right rudder has to be applied. The stall occurs with the control column just aft of the central position. Warning is given by a fore and aft pitching and a noticeable high rate of descent. If the control column is not moved from the above position the left wing drops followed by the nose. If the control column is pulled right back and rudder is applied to stop the turn, the aeroplane falls into a spin.

2.6 Approach and landing. The best gliding speed has been found to be 95 m.p.h. This is a little fast but is the best because the airspeed indicator is not well marked at the lower end of the scale and it is therefore easier to hold the higher speed constant. The aeroplane is easy to land. The attitude on the ground is steeper than most monoplanes, being comparable to a biplane. The ground run was not measured but did not appear to be unusually long and was estimated to be about the same as the Hurricane and Spitfire. There is no tendency to swing after landing. If the engine is opened up with the flaps and undercarriage set for landing the aeroplane becomes tail-heavy but can be held until retrimmed and climbs away satisfactorily.

3.0. Acrobatics.

3.1 Loops. It is impossible to execute a loop in the normal manner due to the heaviness and ineffectiveness of the elevator. If a normal loop is attempted, the aeroplane flicks over on the top of the loop. The only way in which a loop can be done is by winding the tail trim back. Even then great care must be taken to ensure that the aeroplane does not flick out of the loop on the top.

3.2 Slow-rolls. It is very easy to slow-roll the aeroplane at speeds up to 250 m.p.h. but at higher speeds the controls are so heavy that difficulty is experienced. A great deal of rudder has to be used in the rolls and this is unusual in the modern fighter. Very tight rolls can be executed at speeds up to 190 m.p.h. Slight snatching of the ailerons is noticeable in rolls at speeds of 185 - 220 K.P.H .

3.3 Half roll off a loop. This manoeuvre is difficult for the same reason as given in 3.1 above. When rolling off to the left the aeroplane has to be checked as it tends to flick out in the opposite direction. To the right the difficulty is overcoming a tendency towards a high-speed stall. Provided the control column is eased forward, however, the manoeuvre can be completed successfully.

4.0 Summary of flying qualities.

General reports on the handling of the aeroplane which were received before the arrival of the aeroplane itself led one to believe

that numerous faults existed but these have been found to be untrue. The aeroplane is pleasant to fly at speeds up to 250 m.p.h. the only objection being the lack of space in the cockpit. This objection is a very real one in the case of a large pilot.

At speeds in excess of 250 m.p.h. the controls suddenly become very heavy and at 400 m.p.h. recovery from a dive is difficult because of the heaviness of the elevator. This heaviness of the elevator makes all manoeuvres in the looping plane above 250 m.p.h. difficult, including steep climbing turns. No difference was experienced between climbing turns to right and left.

In general flying qualities the aeroplane is inferior to both the Spitfire and the Hurricane at all speeds and in all conditions of flight. It does not possess the control which allows of good quality flying and this is particularly noticeable in acrobatics.