SECRET

A.F.C. 154

AIR FIGHTING DEVELOPMENT UNIT,
R.A.F.STATION,WITTERING.

REPORT No.74
on
TACTICAL TRIALS - MOSQUITO VI

## INTRODUCTION

1. Trials have been carried out at this Unit to determine the value of the Mosquito as a day-fighter, in accordance with Headquarters, Fighter Command Exercise Instruction No.4/1943 (FC/S.31511/Ops.1 dated 29th January 1943) and Air Ministry letter S.18668/D.A.T. dated 14th March 1943. The following roles were considered:-

(i) Intruder
(ii) Fighter/Bomber
(iii) Long Range Fighter (with and without bombs)
(iv) Escort Fighter.

In addition, at the end of the above trials, the aircraft was flown as a single-seater with about 1,500 lbs. removed to consider the possibilities of a single-seater small twin-engined fighter of similar design.

2. Mosquito VI No.HJ.666 was delivered on 8th March 1943, but was returned to the manufacturers for fitting multiple ejector exhausts and trials commenced on 17th March 1943. The trials were delayed by the move of the Unit from Duxford to Wittering and by the changing of the starboard engine, which became necessary on 27th March 1943. This aircraft was fitted with Merlin 23 engines and a second aircraft was to have been loaned by Fighter Command having Merlin 25 engines, giving an improvement in speed. This aircraft has not yet been made available and it has therefore been decided to issue this report on the aircraft fitted with the earlier engines without further delay and to give details of the increased performance in an addendum as soon as possible.

## DESCRIPTION

3. The Mosquito VI is fitted with Merlin 23 engines allowing +14 lb.boost for combat. As in the ordinary night-fighter version, four 20 mm. cannon with 600 rounds and four ·303 Browning guns with 2000 rounds are fitted. The ammunition can be increased to 700 and 2800 rounds respectively. Normal fuel is 403 gallons. Provision is made for carrying the following additional alternative loads:-

| | |
|---|---|
| (i) As Intruder or Fighter/Bomber | 2 x 250 lb. bombs internally and, either 2 x 250 lb. bombs on wings (total weight 20,114 lb) or 2 x 315 lb. S.C.I. containers (20,244 lb). |
| (ii) As Long Range Fighter | 113 gallons of fuel extra carried in bomb bay (total 516 gallons) (Total weight 19,941 lb). |
| (iii) Overload Long Range Fighter | As for (ii) but 80 gallons extra fuel can be carried in jettisonable tanks fitted to wing bomb racks, thus making total fuel 596 galls.(Weight 20,611 lb). |
| (iv) As Escort Fighter | 113 gallons of fuel extra (total 516 gallons) 2 x 250 lb. bombs on wings. (Total weight 20,487 lb). |

4. The crew consists of a pilot and navigator (W) seated side by side. Both face forwards so that for keeping a look-out the navigator has to turn right round and kneel for a good all-round view to the rear. Unless he does this, or sits sideways, it is impossible for them to divide the area for searching satisfactorily.

/5.

Courtesy of Neil Stirling

5. The aircraft was fitted with a 9 lb. inertia weight on the elevator control, which improves stability but restricts the amount of acceleration force which the pilot can impose. With the manufacturers agreement the inertia weight was removed when the aircraft was flown as a single seater.

6. During the trials, which included flying with and without external bomb racks, and with and without bombs, the fuel tanks were full save for sufficient fuel to allow for take-off and at least 30 minutes flying before going into combat. Fuselage blast tubes and ejector chutes were unsealed, full ammunition and war load were carried. Multiple ejector exhausts were fitted and the aircraft flew without snow guards.

## TACTICAL

### General

7. The trials were framed to show the advantages and disadvantages of the Mosquito in comparison with single engine fighters and to determine its fighting characteristics generally. It was flown against a Typhoon and various Marks of Spitfire, and a number of comparative speed and climb measurements made.

### Manoeuvrability

8. The Mosquito is very pleasant to fly in all the above-mentioned conditions. The controls are light and well harmonised, the aileron being particularly effective, while the elevators are good, but the presence of the inertia weight means that forces over 3G are very difficult to impose and detract from the aircraft's general manoeuvrability as a fighter. The presence of bombs on the wings is felt slightly in the lateral control. The aircraft is very stable. When diving it needs trimming into the dive at about 300 mph I.A.S., as it becomes very tail heavy.

### Performance

9. The aircraft fitted with Merlin 23 engines was capable of about 317 mph at sea level when flying as Intruder or Fighter/Bomber with bombs on. With bombs gone the speed is about 322 mph and as a fighter without bomb racks about 327 mph. (+14 lb. boost in all cases). Full throttle heights at 14 lb. boost are about 9,000 and 17,000 feet for M.S. and F.S. gear respectively. At these heights the following approximate speeds are obtainable for the fighter without external racks:-

| | |
|---|---|
| 9,000 feet | 368 mph |
| 17,000 feet | 380 mph |

The Intruder with bombs on is about 10 mph less than these figures and with "bombs gone" about 5 mph less. By comparison with latest obtainable figures, the FW.190 and Me.109G2 are more or less the same speed at sea level, the Mosquito is faster than both at 9,000 feet but slower than the Me.109 at 17,000 feet, and only a little faster than the FW.190. (The figures for this and the subsequent paragraph can only be taken as approximate. A. & A.E.E. have not yet issued performance data for this type of Mosquito).

### Climb

10. The climb of the Mosquito is about 700 feet per minute slower than the FW.190 near the ground and over 1,000 feet less than the Me.109G; with altitude both enemy fighters become considerably superior, the rate of climb of the Mosquito dropping to 1,000 feet per minute at about 25,000 feet.

/Dive

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Dive

11. The Mosquito accelerates well in a dive and the limiting speed of 450 mph I.A.S. can be quickly obtained in a fairly shallow dive of about 20°. At this speed the elevator becomes very heavy but the aileron control is still quite light and allows very slight weaving. The aircraft definitely needs trimming into the dive by about 300 mph I.A.S.

Trials against Spitfire and Typhoon

12. The Mosquito was flown in combat against Mark V, IX and XII Spitfires and Typhoon IB.

13. Low Altitude - The Mosquito was outpaced by all the above types except by the Spitfire V, and was out-climbed by all of them. In manoeuvrability all the single engine fighters were able to throw the Mosquito off their tails and get on to the Mosquito themselves, while the Mosquito was unable to disengage whenever a fighter got into position astern. The evasive tactics it could take, however, were particularly good and it provided the majority of fighters with very difficult shooting. The only exception to being out-turned and generally out-manoeuvred was in the case of the Typhoon flown by a comparatively inexperienced pilot. When the Typhoon, which has a turning circle similar to the FW.190, was well flown, it could make matters almost as difficult for the Mosquito as the Spitfires.

14. Medium Altitude - At medium altitude the results in manoeuvrability were much the same as near the ground. The Mosquito accelerates well when opened up to full throttle, taking just under two minutes to reach top speed from fast cruising and long stern chases resulted when it observed the hostile aircraft some way away, and in many cases combat was avoided. In a slight dive the acceleration is naturally much better and if the fighter happens to be spotted below, this allows the Mosquito to draw away. As in all types of Mosquito, however, the view down to the rear is extremely blind and it was frequently found that a fighter could get in position there at medium and high altitudes and remain for some time without being spotted by either of the crew.

15. High Altitude - At altitude the manoeuvrability of the Mosquito drops off considerably, its climb above 25,000 feet is not good and the aileron control feels comparatively mushy.

As Intruder

16. The Mosquito is considered excellent as an intruder as has in fact been shown already in operations. Its low flying characteristics are good and while kept near the ground it cannot be surprised from below and behind, but at height this is a vulnerable area. With Merlin 23 engines it is about as fast as enemy fighters at ground level and when weaving and corkscrewing evasive action is undertaken it can provide very difficult shots for a pursuing fighter. Owing to its good positive control these types of evasion are easily carried out. With Merlin 25 engines the speed near the ground is believed to be superior to enemy fighters at present. The areas for search must be divided between pilot and navigator to prevent being "jumped" and in this connection it is considered that to have the navigator facing forwards is not satisfactory. The observer can sit sideways facing to port by putting his feet through into the gun bay below and so divide the area for search far more effectively. By this means his ability to maintain a watch dead astern is considered to be improved without creating any difficulties in navigation. If facing forwards he can only watch over his shoulders and so may easily be taken by surprise. If there is more than one fighter in the engagement or a single fighter which changes from side to side, it is extremely difficult for him to keep them in view.

17. If contact is made with single engine enemy fighters, the Mosquito is unable to get on the offensive and must content itself with defensive tactics of

/turning

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turning sharply into attacks and weaving generally. Where height permits, a diving turn into the attack is best as it creates a more difficult shot for the attacking fighter.

18. The range available naturally alters with a number of variable conditions, but allowing for example 100 miles of sea crossing (giving a total of 200 for the whole journey), 10 minutes combat and the balance at fast cruising, the maximum radius of action is about 300 miles (Example 1, Appendix 'A', shows details). If taking off from a base near enemy territory the radius is reduced to 280 miles (Example 2, Appendix 'A').

As Fighter/Bomber

19. In this role the Mosquito appears best operated at low level against similar targets to those now engaged by Typhoon and Whirlwind bombers, or in the same manner as the Bomber Mosquitos when operating low down. It cannot, however, be expected to behave as a fighter offensively when engaged by enemy single engined fighters but must rely again on speed and manoeuvrability. The front armament, however, can be used effectively against such targets as training aircraft, gliders or any aircraft taken by surprise as if an intruder, or against ground targets.

20. The range available will be similar to that of the Intruder (para.18).

As Long Range Fighter

21. Again in this role the Mosquito is only able to be offensive against enemy bomber type aircraft discovered either by deep penetration into occupied territory or by operating on sweeps over long sea crossings against enemy reconnaissance aircraft or those affording protection to 'U' boats and convoys. It cannot take on enemy single seater fighters effectively but is an excellent offensive weapon against larger enemy aircraft, and is certainly the best available aircraft of this type.

22. With bombs it can be effective against shipping or in ground attack in which it becomes in effect a long range intruder.

23. Its radius of action can be a maximum of 400 miles, if 200 miles of unopposed sea crossing is included (Example 3, Appendix 'A'), or 370 miles when operating from bases near the enemy (Example 4, Appendix 'A').

24. In the overload case (carrying an extra 80 gallons on the wing racks in jettisonable tanks, making a total of 596 gallons) its maximum radius could be 470 miles, giving a total range of 940 miles to a distant base, or 440 miles radius in less favourable conditions. (Examples 5 & 6, Appendix 'A').

As Escort Fighter

25. The Mosquito is not considered effective as an escort to bombers. Its powers of being on the offensive against enemy fighters are too limited, as has been described previously. It is therefore considered that the Mosquitos would themselves be a liability to the bomber force as they would have difficulty in engaging the enemy fighters effectively, and if attacked by enemy fighters they would be fully employed in taking care of themselves.

As Single Seater

26. 1,500 lbs. of equipment were removed to turn the aircraft into a single-seater, making the take-off weight about 18,800 lbs. The inertia weight was removed from the elevator control system.

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27. The rate of climb improved considerably, being well over 3,000 feet per minute for the first few thousand feet and all manoeuvrability was improved. It was still unable to be really effective against a Spitfire, but showed that in slow turns a lighter, smaller version could probably out-turn the Typhoon and certainly out-climb it.

## CONCLUSIONS

28. The Mosquito has very good controls but the presence of the inertia weight detracts from the aircraft's general manoeuvrability as a fighter.

29. With Merlin 23 engines it is about the same speed as the FW.190 and Me.109G2 at sea level, faster at 9,000 feet, but slower than the Me.109 at 17,000 feet.

30. The climb of the Mosquito is considerably slower than that of enemy fighters.

31. The acceleration to the dive is good and the limiting speed (450 mph) quickly obtained.

32. Against single seater fighters the Mosquito could hardly ever get on to the offensive and was unable to disengage when the fighters were in position astern.

33. The Mosquito is an excellent intruder but limited by the difficulty of searching aft satisfactorily to prevent being jumped.

34. As Fighter/Bomber the Mosquito can be used effectively against similar targets to those now engaged by the Typhoon and Whirlwind.

35. As long range fighter the Mosquito is considered the best available aircraft of the type and can be very effective against enemy bomber or reconnaissance aircraft.

36. As escort fighter the Mosquito is not considered effective owing to its limited powers of offence. It would probably be a liability to a bomber force.

37. As single seater all powers of manoeuvrability were considerably improved but it was still unable to be really effective against the Spitfire. A smaller lighter version could probably deal well with the Typhoon or FW.190 classes of fighter, especially by out-climbing them.

Wing Commander,
Commanding, A.F.D.U.

AFDU/3/20/46
26th May 1943

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Ex. 1

Radius of Action 300 miles at sea level with 340 galls. of fuel (after allowing 70 for reserve) determined as follows:-

| Condition | R.P.M. | Boost lb/sq.in. | Airspeed True | Airspeed A.S.I. | Consumption Galls/hr. | Consumption Total | Range Miles |
|---|---|---|---|---|---|---|---|
| 5 mins.full throttle (to cover running up,taxying & take-off) | 3000 | +12 | - | - | - | 20 | - |
| 200 miles sea crossing at economical cruising | 2300 | + 4 | 260 | 262 | 105 | 81 | 200 |
| 5 mins. combat | 2850 | +14 | 330 | 332 | 240 | 20 | 28 |
| 5 mins. normal full throttle | 2850 | + 9 | 310 | 312 | 190 | 16 | 26 |
| Balance at max. cruising | 2650 | + 7 | 283 | 285 | 160 | 203 | 359 |
| Total Combat Range | | | | | | | 613 |

Ex. 2

Radius of Action 280 miles at sea level with 340 galls. of fuel (after allowing 70 for reserve) determined as follows:-

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 mins.full throttle (to cover running up,taxying & take-off) | 3000 | +12 | - | - | - | 20 | - |
| 5 mins. combat | 2850 | +14 | 330 | 332 | 240 | 20 | 28 |
| 5 mins. normal full throttle | 2850 | + 9 | 310 | 312 | 190 | 16 | 26 |
| Balance at Max. cruising | 2650 | + 7 | 283 | 285 | 160 | 284 | 502 |
| Total Combat Range | | | | | | | 556 |

Ex. 3

Radius of Action 400 miles at sea level with 446 galls. of fuel (after allowing 70 for reserve) determined as follows:-

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 mins.full throttle (to cover running up,taxying & take-off) | 3000 | +12 | - | - | - | 20 | - |
| 200 miles sea crossing at economical cruising | 2300 | + 4 | 260 | 262 | 105 | 81 | 200 |
| 5 mins. combat | 2850 | +14 | 330 | 332 | 240 | 20 | 28 |
| 5 mins. normal full throttle | 2850 | + 9 | 310 | 312 | 190 | 16 | 26 |
| Balance at max. cruising | 2650 | + 7 | 283 | 285 | 160 | 309 | 546 |
| Total Combat Range | | | | | | | 800 |

Ex. 4

Radius of Action 370 miles at sea level with 446 galls. of fuel (after allowing 70 for reserve) determined as follows:-

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 mins.full throttle (to cover running up,taxying & take-off) | 3000 | +12 | - | - | - | 20 | - |
| 5 mins. combat | 2850 | +14 | 330 | 332 | 240 | 20 | 28 |
| 5 mins. normal full throttle | 2850 | + 9 | 310 | 312 | 190 | 16 | 26 |
| Balance at max. cruising | 2650 | + 7 | 283 | 285 | 160 | 390 | 690 |
| Total Combat Range | | | | | | | 744 |

/Ex.5.

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Ex. 5

Radius of Action . 470 miles at sea level with 526 galls. of fuel (after allowing 70 for reserve) determined as follows:-

| Condition | R.P.M. | Boost lb/sq.in. | Airspeed True | Airspeed A.S.I. | Consumption Galls/hr. | Consumption Total | Range Miles |
|---|---|---|---|---|---|---|---|
| 5 mins.full throttle (to cover running up,taxying & take-off) | 3000 | +12 | - | - | - | 20 | - |
| 200 miles sea crossing | 2300 | + 4 | 260 | 262 | 105 | 81 | 200 |
| 5 mins. combat | 2850 | +14 | 330 | 332 | 240 | 20 | 28 |
| 5 mins. normal full throttle | 2850 | + 9 | 310 | 312 | 190 | 16 | 26 |
| Balance at max. cruising | 2650 | + 7 | 283 | 285 | 160 | 389 | 688 |
| Total Combat Range | | | | | | | 942 |

Ex. 6

Radius of Action 440 miles at sea level with 526 galls. of fuel (after allowing 70 for reserve) determined as follows:-

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 mins.full throttle (to cover running up,taxying & take-off) | 3000 | +12 | - | - | - | 20 | - |
| 5 mins. combat | 2850 | +14 | 330 | 332 | 240 | 20 | 28 |
| 5 mins. full throttle | 2850 | + 9 | 310 | 312 | 190 | 16 | 26 |
| Balance at max. cruising | 2650 | + 7 | 283 | 285 | 160 | 470 | 831 |
| Total Combat Range | | | | | | | 885 |

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SECRET ADDENDUM TO A.F.C.154

AIR FIGHTING DEVELOPMENT UNIT,
R.A.F. STATION, WITTERING

ADDENDUM
to
REPORT NO. 74
on
TACTICAL TRIALS - MOSQUITO VI

## INTRODUCTION

A Mosquito VI, No. HJ.821, has now been made available by No. 418 Squadron by arrangement with Headquarters, Fighter Command. This aircraft differed from the one used for the earlier trial only in having Merlin 25 engines instead of Merlin 23 and was flown in the same condition. The relative performance with fighters near the ground was investigated.

## TACTICAL.

### Performance.

2. The aircraft was flown both with and without the long range external jettison tanks. It is thought that only about 5 m.p.h. is lost by fitting the tanks when operating at low levels.

3. Full throttle heights are about 5,000 ft. in M.S. gear and 12,000 ft. in F.S. gear. No actual speed measurements can be quoted as the position error for this aircraft was unknown.

4. When cruising fairly fast (2300 r.p.m. + 4 boost) near the ground, the Mosquito was "jumped" by a Spitfire XII (Griffon IV) which is the fastest mark of Spitfire at low altitude in use at present. It was found that provided a good watch was kept, it was possible to pull away from it before it could close range to shoot effectively. This of course depended considerably upon the height from which the Spitfire was attacking and the range at which it was first observed, but at the Mosquito's fast cruising speed the Spitfire usually had difficulty in positioning itself to attack and was seen in time. Even if not seen till 800 yds. and about 1,000 ft. above, it was possible to accelerate and pull away if the Mosquito was opened up to full power (3000 r.p.m. + 18 lb. boost) immediately. The indicated airspeeds were 250 m.p.h. for cruising and 340 m.p.h. at full power.

/5.

Courtesy of Neil Stirling

5. The Mosquito accelerates from 250 m.p.h. to full speed in 1½ minutes. If height allows, the acceleration can be helped by a slight dive through at least 500 - 600 ft., in which case this speed can be reached in one minute from fast cruising. The height must, however, be lost slowly.

6. The climb has also improved considerably at full power so that the Mosquito can pull up from low level into cloud 2,000 ft. above it in less than 30 seconds from fast cruising. Near the ground the rate was approximately 3,800 ft. per minute in a steady climb.

## CONCLUSIONS.

7. The Mosquito VI with Merlin 25 engines is slightly faster than the Spitfire XII at low level. On intruder work with good search it should accelerate away from the majority of enemy attacks.

8. The good climb at full power allows the Mosquito an excellent chance of reaching cloud cover quickly.

AFDU/3/20/46
4th August, 1943

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