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CENTRAL FIGHTER ESTABLISHMENT

REPORT No. 259

FIXED GUN-SIGHT INSTALLATION
IN HUNTER AIRCRAFT

DECEMBER 1954

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Central Fighter Establishment Report No. 259

Trial No. 210

Fixed Gun-Sight Installation in Hunter Aircraft

Introduction

1. Production Hunter aircraft are fitted at present with a Mark 5 Gyro Gunsight mounted on a retractable mounting, similar to the installation in the Meteor. The purpose of the retractable mounting is to meet the requirements that, in the extended position, the distance from eye to sight should be approximately 9 $\frac{1}{4}$ inches, and, in the retracted position there should be no crash or ejection hazard to the pilot.

2. The retractable mounting, with its mechanism and wiring, has the following disadvantages, however:-

- (a) Marked harmonisation changes due to looseness of the mounting slide stops, and to the heavy impact dealt at the limit of its erection.
- (b) Poor serviceability, and the added servicing load required for its maintenance.
- (c) Reduced forward visibility when the sight is extended, due to the bulky mechanism.
- (d) Weight penalty by the installation.

3. With these undesirable characteristics in mind, the Sighting Division of the Royal Aircraft Establishment have designed a fixed gunsight installation, which appears to offer many advantages over the retractable mounting.

4. The installation was fitted to Hunter Mark 1, WT 599 which was put at the disposal of R.A.E. by the Ministry of Supply. The Central Fighter Establishment and A. & A.E.E. BOSCOMBE DOWN, were asked to evaluate the sight, and to report upon its suitability as soon as possible.

5. During the trial, the aircraft was based at DUNSFOLD, and was maintained by the Hawker Aircraft Co.

Authority for the Trial

6. Authority for the trial, which was allotted Priority 'A', was contained in Air Ministry D.D.Ops.(AD) letter BF 460/8366 dated 29th October, 1954.

Description of Installation

7. The fixed mounting was a machined solid light alloy forging, attached to existing strong-points in the lower part of the windscreen framework. The upper surface of the mounting was a machined horizontal plane, parallel to the line of sight. Provision was made for fore and aft adjustment of the sight (for use during the trial only) by the single-point attachment hole in the mounting being repeated four times, at one-inch intervals. These were provided to enable the trials pilots to evaluate the installation in each of the four sight positions.

8. The Mk.5 G.G.S. was attached to the mounting by a single attachment bolt. The sight was fitted with a taller reflector glass, to enable more graticule movement to be seen, and was further modified to allow a deflection of ten degrees to be attained before toppling.

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9. The cleaner installation allowed the complete "decking-in" of the sight body to the level of the bottom windscreen coaming. This prevented reflections reaching the windscreen from the back of the instrument panel, and, as only the reflector glass interrupted forward vision over the aircraft's nose, left the windscreen completely free from extraneous obstructions.

10. The sight was also fitted for the attachment of a Mk. 3 Recorder Camera, and for the attachment of a wooden mock-up of the Mk. 4 Recorder. With the Mk. 3 Recorder fitted, the taller reflector glass allows more forward vision than is allowed by the present standard G.G.S./Recorder combination. The recorder, however, still blocks vision to an unacceptable degree.

11. The Mk. 4 Recorders attaches to the starboard side of the G.G.S., and employs a horizontal periscope which projects some two inches inwards from the side of the reflector glass. This proved to be a vast improvement on the Mk. 3 Recorder installation; it was felt however, that the recorder could be further improved by making it taller, and having the periscope above the reflector glass, to look down into the moving graticule.

Conduct of the Trial.

12. The aircraft was flown by five pilots of Air Fighting Development Squadron, whose height ranged from 5'9" to 6'0". Trials were carried out with the sight in each of the four positions available on the mounting, and the following results were observed:-

(a) In No. 4 position, i.e. the sight furthest from the pilot, the sight obscured some of the forward field of view. Also, the relatively large distance from the pilot's eye made the full deflection use of the sight impossible.

(b) In No. 3 position, i.e., the sight one inch nearer the pilot, some of the forward view was still obscured, and the full deflection capability of the sight could still not be employed.

(c) In No. 1 position, i.e., with the sight nearest the pilot's eye, the sight was too close to the pilot's face, and did not permit the minimum clearance laid down by the Institute of Aviation Medicine in respect of crash hazard. Furthermore, instruments on the blind flying panel were obscured with the sight in this position.

(d) The optimum position was found to be No. 2. This left the instrument panel and the forward field of view completely unobscured, and with one qualification, allowed the pilots to use the full deflection capabilities of the sight. This position also allowed sufficient body clearance for seat ejection and crash hazard.

13. The qualification to the use of the sight in the No. 2 position is described as follows: With the seat in normal flying position, it was found early in the trial that the pilot had to bend his head slightly forward to see the graticule in its undeflected (neutral) position. He was then loath to assume a more upright position when 'G' was applied during manoeuvre, to follow the movement of the graticule. If the original slightly crouching posture was maintained, it was possible to see about 6° deflection before the graticule disappeared. By raising the head when applying 'G' the full deflection of 10° could be followed, until in fact, the sight toppled. The trials pilots found no difficulty in adopting this procedure once they had become accustomed to it.

Conclusions

14. (a) No. 2 sight position provided the best natural aiming attitude for the pilot.

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(b) The sight, in No.2 position, is a preferable installation to the present retractable mounting.

(c) The following features are satisfactory:-

- (i) View over the nose.
- (ii) View of the instrument panel.
- (iii) Clearance for seat ejection.
- (iv) Clearance for crash hazard.

(d) There is a slight but acceptable limitation in the use of the sight during attacks which involve large lead-angles, in that the pilot must raise his head slightly when applying "G", to keep the graticule in view to the limit of its deflection.

(e) The modified sight installation satisfies the recommendations made in C.F.E. Report No. 236 dated 31st December, 1953.

15. With the Mark 3 Recorder Fitted:-

(a) The view over the nose in flight and when landing is obstructed to a slightly less degree, than occurs with the present standard G.G.S./Recorder installation. The installation is considered acceptable for training conditions, but would block forward vision to an unacceptable degree in combat.

(b) To attach the Mk.3 Recorder in flight requires considerably more time and patience than to detach and stow it, and may lead to damage to the reflector glass, or disturbance of harmonisation.

16. With the Mk.4 Recorder (mock-up) fitted:-

(a) The view over the nose is greatly superior to that permitted by the Mk. 3 Recorder, there being no obstruction to forward vision in flight.

(b) The periscope of the recorder does not noticeably interfere with view of the graticule under any flight conditions.

(c) When landing, the body of the recorder presents a minor obstruction to view out of the starboard side of the windscreen, but this is considered acceptable.

(d) In all respects, the Mk. 4 Recorder appears to be a vast improvement on the existing Mk.3.

Recommendations

17. It is recommended:-

(a) That the fixed gun sight installation in the Hunter aircraft, as evaluated by this Establishment, be accepted for introduction into the Service.

/(b)

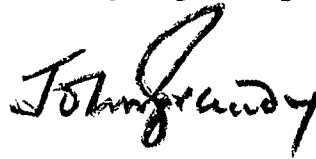
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(b) That the Mk.4 Recorder be further improved, by the incorporation of a taller periscope, to look down into the moving graticule lens.


for. (J.L.W. HILLACOMBE)
Wing Commander, Commanding,
Air Fighting Development Squadron



(J. GRANDY)
Air Commodore, Commandant,
Central Fighter Establishment.

WEST RAYNHAM
31st December, 1954.

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