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5th Part of Report No. AAEE/861/10

MINISTRY OF AVIATION

**AEROPLANE AND ARMAMENT
EXPERIMENTAL ESTABLISHMENT**

BOSCOMBE DOWN

CANBERRA B MK. 15

CLEARANCE IN 1,650 LB. AND 2,000 LB. TRAINING ROLES
USING 25 LB. PRACTICE BOMBS

PRESENTED BY

FLYING OFFICER R. BENN, R.A.F.
ARMAMENT DIVISION

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5th Part of Report No. A.A.E.E./861/10

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT
BOSCOMBE DOWN

27 MAY 1963

Canberra B Mk. 15

Clearance in 1,650 lb and 2,000 lb Training Roles
Using 25 lb Practice Bombs

Presented by

Flying Officer R. Benn, R.A.F.
Armament Division.

A. & A.E.E. Ref: Arm 3G/5
M.O.A. Ref: AV/198/017/36 AV/198/011/37
Period of Trial: Part 1 25 May 1961, 20 September 1961.
Part 2 2 February 1962, 9 February 1962.

Trials Aircraft: Part 1 Canberra B Mk. 15 WH.967
Part 2 Canberra B Mk. 16 WF.302

Summary

This Report covers the trial to clear the Canberra B Mk. 15 aircraft for the carriage and release of 25 lb Practice Bombs in the 1,650 lb Loft Bombing training role and the 2,000 lb Ballistic and Loft bombing training roles. During the trials 25 lb Practice Bombs were carried on and released from both aircraft bomb-bay and wing pylon installations.

Resulting from the trials it is recommended that the installations be cleared for Service use and that the clearance be extended by analogy to include suitably modified Canberra B (I)6, B (I)8 and B16 aircraft.

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1. Introduction

Trials to clear the Canberra B Mk. 15 Aircraft for the carriage and release of 25 lb. Practice Bombs in the 1,650 lb. and 2,000 lb. Training Roles have been completed in accordance with Ministry of Aviation Trials Proformas AV/498/047/36 dated 30th May, 1960 and AV/498/041/37 dated 18th August, 1960 respectively.

2. Object of Trial

The object of the trial was to determine that the Canberra B Mk. 15 aircraft is suitable for Service for the carriage and release of the following stores under the conditions given below:-

2.1 Stores

Bombs, Practice 25 lb. S. & F. No. 1 Mk. 1
Bombs, Practice 25 lb. S. & F. No. 2 Mk. 1
Bombs, Practice 25 lb. S. & F. No. 1 Mk. 2
Bombs, Practice 25 lb. S. & F. No. 2 Mk. 2

2.2 Conditions

(a) 2,000 lb. Ballistic Role

- (i) Release Heights: 25,000 ft. to 40,000 ft.
- (ii) Speeds: Up to 0.75 Indicated Mach Number
- (iii) Aircraft Attitude: Straight and level.

(b) 1650 lb. and 2,000 lb. Loft Bombing Role

- (i) Approach heights: 500 ft. \pm 250 ft.
- (ii) Entry Speed: 434 knots true airspeed with full power applied 3 seconds before pull-up.
- (iii) 'G' Conditions: 3.4 'g' to be applied linearly in first two seconds after pull-up and maintained until roll-out.
- (iv) Release Angles: Flight path angles of 45° and 60° in the L.A.B.S. 'NORMAL' (Forward Toss) manoeuvre and gyro angles of up to 125° in the L.A.B.S. 'ALTERNATE' (Over the Shoulder) manoeuvre.

(c) Emergency Release

- Heights: Up to 40,000 ft.
- Speeds: Up to 370 knots or 0.78 Indicated Mach Number whichever is less.
- Aircraft attitude: Straight and level.

3. Description of Installation

3.1 1650 lb. Role - Internal Carriage

Four 25 lb. Practice Bombs are carried on a Light Series Bomb Carrier, (L.S.B.C.) Mk. 3 bolted to an Adaptor, Light Series, 1650 lb. Bomb Carrier

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(Stores Reference 11A/5040) attached to the Aero X.61B Bomb Release Unit of the Carrier Bomb 1650 lb. Mk. I (Stores Reference 11A/4472). A Simulator Type 101 Mk. 1 or Mk. 2 is also attached to the 1650 lb. Bomb Carrier, forward of the Adaptor, by means of a triple pip-pin suspension and screw crutching system. This installation is illustrated at Figures 1, 2 and 3.

The 1650 lb. Bomb Carrier 7 pin 'Cannon' Connector for the Aero X.61B Bomb Release Unit and the Light Series Bomb Carrier standard plug are connected respectively to a 'Cannon' 7 pin Connector and a Type 'A' socket located on the top of the Simulator. Three 'flush fitting' sockets on the top of the Simulator accommodate the 1650 lb. Bomb Carrier Weapon Harness plugs. A moveable arm at the rear of the Simulator, holds the "Store gone" plunger in the 'up' or 'bomb loaded' position by the insertion of a pip-pin (Figure 3).

3.2 2000 lb. Role - Internal Carriage

Four 25 lb. Practice Bombs are carried on a Light Series Bomb Carrier Mk. 3 secured to the aircraft bomb bay by either of the following methods:-

(a) The Light Series Bomb Carrier is fitted to Practice Bomb Station No. 4 or 5 on the forward section of Auxiliary Bomb Beam Mk. I (Stores Reference 11A/3680) using Transverse Adaptor Beams Forward, (Stores Reference 11A/3688 and 11A/3689). This installation is illustrated at Figures 4 and 5.

(b) The Light Series Bomb Carrier, Mk. 3 is fitted to an Adaptor Single, Mk. 3 modified by the fitment of 'V' Adaptor Blocks. This assembly is loaded and crutched to the lower station of an Avro Triple Bomb Carrier Mk. 2 (Stores Reference 11A/4228) located at Station 3 of the Forward Auxiliary Bomb Beam. This installation is illustrated at Figures 6 and 7.

3.3 Carriers Bomb Light Series Mk. 3

The Light Series Bomb Carrier Mk. 3 (Stores Reference 11A/572) used for the internal carriage of 25 lb. Practice Bombs on both the 1650 lb and 2000 lb Training Roles is the standard item described in A.P. 1664A, Volume 1, Book 1, Section 1, Chapter 6 except that the following Release Unit variants were fitted during the trial:-

(a) Release Unit Type 'A' Mk. 3 - Standard

(b) Release Unit Type 'A' Mk. 3 - incorporating Mod. E.L.1225.

(c) Release Unit Type 'A' Mk. 3 - incorporating Mod. Arm.3106. Illustrated at Figure 10.

Note:-

A Type 'F' Auto Selector Switch, being developed by R.A.E. Farnborough in conjunction with Messrs. M. L. Aviation Ltd., was fitted to the Light Series Bomb Carrier Mk. 3 for one sortie only. The switch, a modern electronic device having no moving parts, is inertia proof. Switching is performed by the orientation of three small Ferrite cores. Signals are amplified by transistors.

3.4 1650 lb. and 2000 lb. Roles - External Carriage

Two 25 lb. Practice Bombs are carried by a Practice Bomb Carrier, External Mk. 2 (Stores Reference 11A/4723) attached to a Carriers, Bomb, Pylon, Type 'B' Mk. 3, (Stores Reference 11A/5825 Port and 11A/5826 Starboard) on each aircraft mainplane. This installation is illustrated at Figures 8 and 9. The Bomb Carriers are described at A.P. 1664A, Volume 1, Book 1, Section 1,

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Chapters 14 and 18.

4. Description of Stores

4.1 Bombs, Practice, 25 lb. S. & F. No. 1 Mk. 1

The store features in Installation illustrations at Figures 1 to 9. The "original" design bomb tail has a solid steel plug inserted in the small diameter of the tail cone to which the tail drum is attached. Drawing A.I.D. (Arm.) 344 (5 sheets) introduced a tail unit with design concessions by which the solid steel plug is replaced by a sheet metal sleeve, fitted externally to the small diameter of the tail cone. The "original" and "concession" design tail units are illustrated at Figure 11.

4.2 Bombs, Practice, 25 lb. S. & F. No. 2 Mk. 1

All No. 2 Mk. 1 Bombs have improved safety devices. Tail units for this type of bomb are of identical design, but some are manufactured by Messrs. Hobbies Limited and others by Messrs. Bulpitt. The two makes of tail unit may be recognised by the manufacturers' monograms HOB or BAS respectively.

4.3 Bombs, Practice, 25 lb., S. & F. No. 1, Mk. 2

This store is the No. 1 Mk. 1 Bomb fitted with a specially strengthened tail and improved tail locking (see Figures 12 and 13). The new tail incorporates the following improvements.

- (a) Annular grooves are cut in the solid plugs at the large and small diameters of the tail cone into which are pressed strips of "resin core" solder. The sheet steel tail cone is then secured to the solid plugs by spinning material into the annular grooves. Finally the assembly is induction heated to ensure sound soldered joints.
- (b) The number of tail drum vanes is increased from four to six.
- (c) Each vane is secured to the tail drum and to the central tube by multiple spot welding at each joint. (See Figure 13.)
- (d) A large shakeproof washer 0.30 ins. thick, is interposed between the nose and tail sections of the bomb to facilitate tail locking.
- (e) Two radial holes are drilled in the steel plug at the large diameter of the tail cone to accept a 'C'-spanner used for tail locking. (See Figure 12.)

4.4 Bombs, Practice, 25 lb., S. & F., No. 2, Mk. 2

This store is a No. 2 Mk. 1 Practice Bomb fitted with a specially strengthened tail for use on high speed aircraft. The new tail unit, illustrated at Figures 12 and 13, incorporates the improvements detailed at paragraphs 4.3(a) and 4.3(c).

Note:-

Further information on the above stores can be found in A.P. 1661B, Volume 1 (2nd Edition) Section 9, Chapter 7.

5. Method of Trial

5.1 Ground Examination

The ground examination consisted of:-

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- (a) Examination of 1650 lb. Internal Carriage Installations.
- (b) Examination of 2000 lb. Internal Carriage Installations.
- (c) Examination of 1650 lb./2000 lb. External Carriage Installations.
- (d) Introduction of a Dummy Load Resistor.
- (e) Preparation of 25 lb. Practice Bombs.
- (f) Loading 25 lb. Practice Bombs.

5.2 Flight Tests

The flight tests consisted of:-

- (a) Carriage flights to compare No. 1 Mk. 1 and No. 1 Mk. 2 Practice Bomb Tails.
- (b) Carriage flights to compare No. 2 Mk. 1 and No. 2 Mk. 2 Practice Bomb Tails.
- (c) Carriage flights to test No. 1 Mk. 1 Practice Bomb Tails.
- (d) Release flights in 1650 lb. Role-internal carriage.
- (e) Release flights in 2,000 lb. Role-internal carriage on Bomb-beam.
- (f) Release flights in 2,000 lb. Role-internal carriage using Triple Bomb Carrier.
- (g) Release flights in 1650 lb./2000 lb. Roles external carriage on Wing Pylons.

6. Results of Trial

6.1 Ground Examination

(a) 1650 lb. Role - Internal Carriage

During ground examination of the installations the L.S.B.C. was satisfactorily functioned through the medium of the Simulators Type 101 Mk. 1 and 2 and all the responses catered for in the individual simulator designs took place correctly. The following two methods of loading the equipment to the aircraft were also investigated and found equally satisfactory:-

- (i) Carrier, Bomb, 1650 lb. Mk. 1 without accessories loaded manually by four men. Simulator, Adaptor, L.S.B.C. and Practice Bombs were loaded afterwards.
- (ii) The complete assembly illustrated at Figure 1, loaded complete as one unit, using Beams, Hoisting, Set No. 1 Mk. 1 (Stores Ref. 26FZ/95529) and two Hoists, Bomb, Type C, Mk. 2 (Stores Ref. 4GC/5910).

(b) 2000 lb. Role - Internal Carriage

The release supply is taken from the L.A.B. System to the Auxiliary Do. b. via a Practice Bomb Facility Control Box (P.B.F.C.B.) introduced by Modification Canberra 2199. Initial examination of the aircraft revealed that the supply facilities did

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not extend to all Practice Bomb Stations on the Auxiliary Bomb Beam and a modification now covered by Modification Canberra 3743 was introduced to remedy this omission. Ground examinations and functioning checks of the installations illustrated at Figure 4, 5, 6 and 7 proved that both were satisfactory after embodiment of the above mentioned modification.

(c) 1650 lb. and 2000 lb. Roles - External Carriage

No provision had been made in the aircraft wiring to operate the external bomb carrier installation illustrated at Figures 8 and 9 through the L.A.B. System. A modification, described at Appendix 'I', originally designated A.A.E.E. Mod/Canberra/7 and now referred to as Modification Canberra 3914 was therefore introduced and incorporated locally. During the ground examination and functioning checks it was necessary to set the Port and Starboard External Bomb Carrier Auto Selector Switches Type 'C' (Stores Reference 5D/1769) to '2' and '1' respectively before a satisfactory release sequence could be obtained.

(d) Dummy Load Resistor

Whilst the Trials Aircraft was undertaking the 1650 lb. and 2000 lb. Training Role External Carriage Release Flights, the aircraft bomb bay was maintained in the 1650 lb. Training Role - Internal Carriage configuration described at paragraph 3.1 above, except that the Light Series Bomb Carrier Mk. 3 was not electrically connected to the Simulator. In order to obtain full responses from the Simulator Type 101 Mk. 1 or Mk. 2 it was necessary to apply a representative resistance load at the Type 'A' Socket on the top of the Simulator body. This item, known as the Dummy Load Resistor is described and illustrated at Appendix 'II'.

(e) Preparation of 25 lb. Practice Bombs

The bombs were prepared as described in A.P. 1661B, Volume 1, (2nd Edition), Section 9, Chapter 1, Appendix 1, except that Detonators, Burster, No. 28 were fitted only when Bombs were to be released. The following points were noted:-

- (i) Bomb, Practice, 25 lb. No. 1 Mk. 1 does not have an effective tail locking device but see Appendices 'III' and 'IV'.
- (ii) Bomb, Practice, 25 lb. No. 1 Mk. 2 incorporates an effective tail locking device but the technique of application involving holding the bomb nose in a vice and tightening the tail with a 'C' spanner is considered laborious.

(f) Loading of 25 lb. Practice Bombs

Loading the stores to either type of Practice Bomb Carrier was straightforward. It was noted that the 'Safety Devices' of the No.1 Bomb are unsatisfactory since there is a risk that the bomb could function if it sustains a blow on the protruding striker once the safety pin is removed.

6.2 Flight Tests

(a) Carriage Flights to Compare No.1 Mk.1 and No.1 Mk.2 Practice Bomb Tails

Two No.1 Mk.1 Practice Bombs with "original" design tails and two No.1 Mk.2 Practice Bombs were loaded to the L.S.B.C. Mk.2 fitted

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in the 1650 lb. Role Internal Carriage configuration described at paragraph 3.1. After each flight the bombs were examined and before the next flight their positions were exchanged and the bombs carefully re-crutched. Improved tail locking was not initially applied to the No. 1 Mk. 1 Practice Bombs and this resulted in the loss of one tail due to it becoming unscrewed during the second carriage flight. This practice bomb was replaced and, before the third carriage flight, improved tail locking as described at Appendices 'III' and 'IV', was incorporated. No further troubles were encountered with tail locking during the remainder of the trial. Three of the practice bombs each successfully sustained 30 L.A.B.S. manoeuvres and the fourth withstood 20 L.A.B.S. manoeuvres during the series of carriage flights which are listed at Appendix 'VIII'. It is particularly significant that the No. 1 Mk. 1 Practice Bombs used on this trial were also used for the carriage flights described at sub-paragraph 6.2(c). Three No. 1 Mk. 1 "original" design practice bombs therefore successfully withstood 64, 54 and 40 L.A.B.S. manoeuvres while a fourth withstood 34. The No. 1 Mk. 2 Practice Bombs each withstood 30 L.A.B.S. manoeuvres without defect.

(b) Carriage Flights to Compare No. 2 Mk. 1 and No. 2 Mk. 2 Practice Bomb Tails

The carriage method and procedure employed for these carriage flights, detailed at Appendix 'IX', were similar to those described at paragraph 6.2(a) above. Quantity two, Messrs. Hobbies Ltd., and quantity two, Messrs. Bullpit Ltd., No. 2 Mk. 1 Practice Bombs were loaded for the first flight. During this flight the tail of a bomb manufactured by Messrs. Hobbies Ltd., failed at the large diameter soldered joint of the inert filled tail cone. (See Figure 14.) The complete tail cone and drum struck and damaged the Bomb Bay Deflector which is illustrated at Figures 15 and 16. For the remainder of the carriage flights, two "Bullpit" No. 2 Mk. 1 Practice Bombs were compared with two No. 2 Mk. 2 Practice Bombs. During these flights which were successful, these bombs were subjected to 20 and 16 L.A.B.S. manoeuvres respectively. The No. 2 Mk. 2 Practice Bombs however, had been supplied by R.A.E., Farnborough, after having been subjected to extensive high speed, high 'g' loading carriage flights, including L.A.B.S. manoeuvres, by a Scimitar aircraft.

(c) Carriage Flights to Test No. 1 Mk. 1 Practice Bomb Tails

Examination of the two types of No. 1 Mk. 1 Practice Bombs, described at paragraph 4.1, suggested that the 'original' design bomb tails were suitable for use on the L.A.B.S. manoeuvre. Four of these bombs were therefore obtained from a Bomber Command station, emptied of explosive and refilled with a representative inert filling. During External Carriage Release Flights described at Appendix 'XIII' these four Practice Bombs were loaded to the Light Series Bomb Carrier Mk. 3 associated with the 1650 lb. Role Internal Carriage configuration, described at paragraph 3.1 in which the bomb bay was maintained. The Type 'A' plug of the Light Series Bomb Carrier remained disconnected, while the Simulator Type 104 was fitted with a Dummy Load Resistor (See Appendix 'II'). During the course of the External Carriage Release Flights, these Practice Bombs successfully withstood over 30 L.A.B.S. manoeuvres. The following observations were made:-

- (i) Bomb tails tend to become loose during flight and highlight the need for improved tail locking.
- (ii) Bomb crutching failed. This was due to the Crutch Adaptors (Stores Reference 11A/685) working loose due to vibration,

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and the effect of 'g' forces during the L.A.B.S. manoeuvre forcing the crutches upwards into the housings where these were retained by the friction imposed by the wing nuts and bolts.

(d) Release Flights in 1650 lb. Role Internal Carriage

Details of 13 Release Flights in the configuration described at paragraph 3.1 are given at Appendices 'XI', 'XII' and 'XIV'. The following incidents were recorded:-

- (i) One No.1 Mk.1 Practice Bomb Tail of "concession" design failed after only two manoeuvres. (See Figures 17 and 18). Unlike the failure of the No.2 Mk.1 tail, the detached tail drum was carried clear of the aircraft bomb bay without causing damage.
- (ii) The standard design type 'A' Release Units Mk.3 gave release delay of the order of $\frac{1}{2}$ second. This was evidenced by the 'Hussenot' recorder traces which recorded the time intervals between application of the release pulse and physical separation of the store.
- (iii) Release Units Type A Mk.3 incorporating Mod. E.L.1225 were prone to hang-ups. The sharp corner of the release hook tended to bite into the chamfered trigger introduced by the modification.
- (iv) Release Units Type A Mk.3 incorporating Mod. Arm.3106 were satisfactory.
- (v) Two hang-ups, attributed to the 'step on' characteristic of the Auto Selector Switch Type 'C' subsequently investigated by R.A.E. Farnborough. (See para. 8.5(b)(i).
- (vi) The Auto-Selector Switch Type 'F' fitted for one release flight gave a double release. This was due to its very high sensitivity. (See Appendix 'XIV' - Flight 25).

(e) Release Flights in 2,000 lb. Role - Internal Carriage on Bomb Beam

Although this installation, described at Paragraph 3.2 (a), had been tested successfully during an earlier L.A.B.S. trial, two Release Flights involving Ballistic bombing were carried out. See Appendix 'X'. These were unsatisfactory since the bombs behaved erratically and a number struck the bomb bay doors. It was evident from the excessive 'trail' of the unstable bombs that bomb accuracy would be of a low order.

(f) Release Flights in 2,000 lb. Role - Internal Carriage using Triple Bomb Carriers

One Ballistic and Three L.A.B.S. releases were made in the configuration described at sub-paragraph 3.2(b). All releases were successful and noticeably smooth. Details are given at Appendices 'X' and 'I'. By means of cine record extracts, Figure 21 illustrates bomb release characteristics of this installation compared with that referred to at paragraph 6.2(e) above.

(g) Release Flights in the 1650 lb./2,000 lb. Roles External Carriage on Wing Pylons

Seven release flights detailed at Appendix 'XIII' were carried out in the configuration described at paragraph 3.4. Apart from

/a double release ...

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a double release attributed to a failure of the Type 'C' Auto Selector Switch, these flights were successful. The Type 101 Simulator fitted with Dummy Load Resistor in lieu of the Light Series Bomb Carrier Type 'A' plug gave full responses and the Flight Carriage trials of the No.1 Mk.1 Practice Bomb Tails were also satisfactorily concluded. (See paragraph 6.2(c)).

Note:-

The Release Flight at Wainfleet Range (Appendices 'XIII' and 'XIV' were assessed for accuracy from "Quadrant Sight" readings. Results are summarised at Appendix 'XV'.

7. Conclusions

7.1 As a result of the trials described above it is concluded that certain types of 25 lb. Practice Bombs are not suitable for internal carriage and release from the Canberra B Mk.15 installations investigated during this trial.

(a) Bombs, Practice, 25 lb. S. & F. No.1 Mk.1

These bombs are satisfactory for carriage on and release from the Canberra B Mk.15 aircraft provided that:-

- (i) Bomb tails are positively locked to bomb bodies as described at Appendices 'III' and 'IV'.
- (ii) Bombs fitted with 'concession' design tails (See paragraph 4.1 above) are carried externally or on a Light Series Bomb Carrier Mk.3 fitted to the lower station of the Avro Triple Carrier Installation.

(b) Bombs, Practice 25 lb. S. & F. No.2 Mk.1

Bombs manufactured by Messrs. Bullpit Ltd., are satisfactory for carriage on and release from the Canberra B Mk.15 aircraft provided that:-

- (i) Carriage is limited to external carriers and Light Series Bomb Carrier Mk.3 fitted to the lower station of the Avro Triple Carrier Installation and, if No.1 Mk.2 and/or No.2 Mk.2 Practice Bombs are not available, to the Light Series Bomb Carrier Mk.3, of the 1650 lb. Training Role Internal Installation.

(c) Bombs, Practice, 25 lb. S. & F. No.1 Mk.2 and No.2 Mk.2

These are satisfactory for carriage on and release from the Canberra B Mk.15 aircraft without restriction.

7.2 It is further concluded that:-

(a) 1650 lb. Role - Internal Carriage

The installation described at paragraph 3.1 above is suitable for Service use for the carriage and release of 25 lb. Practice Bombs defined at paragraph 7.1 in the Loft Bombing Role.

(b) 2000 lb. Role - Internal Carriage

- (i) The installation described at paragraph 3.2(a) is suitable for Service use for the carriage and release of 25 lb. Practice Bombs defined at paragraph 7.1 in the Loft Bombing role only.

/(ii) ...

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- (ii) The installation described at paragraph 3.2(b) above, is suitable for Service use for the release of 25 lb. Practice Bombs defined at paragraph 7.1 in both the Loft and Ballistic Bombing roles.

(c) 1650 lb. and 2000 lb. Roles - External Carriage

The installation described at paragraph 3.4 is suitable for the carriage and release of 25 lb. Practice Bombs defined at paragraph 7.1 provided Modification Canberra 3914 (detailed at Appendix 'I') is incorporated.

7.3 Finally it is concluded that:-

- (a) The Auto Selector Switch Type 'C' fitted to both internal and external Light Series Bomb Carriers is unsatisfactory in that it is prone to malfunction which results in double releases and 'hang-ups' and that modification action is essential.
- (b) Of the Release Unit Type 'A' Mk.3 variants employed during this trial, only that incorporating Mod/Arm/3106 is satisfactory for the L.A.B.S. manoeuvre.
- (c) The crutch Adaptor fitted to the Light Series Bomb Carrier Mk.3 is inadequate for the L.A.B.S. manoeuvre in that due to the combined effect of vibration and 'g' forces, this item progressively unscrews and permits loss of crutching. This defect directly contributes to the failure of 25 lb. Practice Bomb Tails. Pending the introduction of an improved Crutch Adaptor, the condition may be ameliorated by adjusting the Crutch Adaptors "finger tight" and not unscrewing them one half turn.
- (d) The Auto-Selector Switch Type 'F' used on one release flight requires further development, as it is too sensitive for use with the Canberra aircraft.

8. Recommendations

Clearance is recommended for the carriage on and release from the Canberra B Mk. 15 aircraft of the quoted Practice Bomb variants, in the role configurations stipulated, subject to the conditions and essential modifications listed below.

8.1 Stores and Types of Installation

| <u>Store</u> | <u>Installation</u> |
|---|---|
| (a) Bombs, Practice, 25 lb., S. & F. No.1 Mk.1 (Fitted with "original" design tails). Bombs should incorporate improved tail locking described at Appendices 'III' and 'IV'. | 1650 lb. and 2000 lb. Training Roles - External and Internal Carriage. |
| (b) Bombs, Practice, 25 lb. S. & F. No.1 Mk.1 (Fitted with "concession" design tails). Bombs should incorporate improved tail locking described at Appendices 'III' and 'IV'. | (i) 1650 lb. and 2000 lb. Training Roles - External Carriage. (ii) 2000 lb. Training Role - provided L.S.B.C. is mounted on the lower station of the Avro Triple Carrier Installation. |

(c) ...

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- | | |
|--|--|
| (c) Bombs, Practice, 25 lb. S. & F. No.2 Mk.1 (Manufactured by Messrs Bullpit. | (i) 1650 lb. and 2000 lb. Training Roles - External Carriage. (ii) 2000 lb. Training Role - Internal Carriage-provided L.S.B.C. is mounted on lower station of the Avro Triple Carrier Installation. (iii) 1650 lb. Training Role Internal Carriage until strengthened tails are available. |
| (d) Bombs, Practice, 25 lb. S. & F. No.1 Mk.2 | 1650 lb. and 2000 lb. Training Roles - External and Internal Carriage. |
| (e) Bombs, Practice 25 lb. S. & F. No.2 Mk.2. | 1650 lb. and 2000 lb. Training Roles - External and Internal Carriage. |

8.2 Method of Carriage

(a) 1650 lb. Role - Internal Carriage

The installation described at paragraph 3.1 for Loft Bombing.

(b) 2000 lb. Role - Internal Carriage

The installation described at paragraph 3.2(b) and further defined at paragraph 6.1(b) for both Ballistic and Loft Bombing. This installation locates the practice bombs in a region of reduced airflow disturbance, improves condition of separation, obviates the risk of bombs striking the bomb doors, permits a wide range of 25 lb. Practice Bomb variants to be used and results in an acceptable level of bombing errors. Details of the modification associated with this installation have been submitted as A. & A.E.E./Mod/Canberra/11.

(c) 1650 lb. and 2000 lb. Roles - External Carriage

The installation described at paragraph 3.4 with Modification Canberra 3914 (See Appendix 'I') incorporated when releases are to be made in the L.A.B.S. mode.

8.3 Carriage

(a) Bomb Doors Closed

To maximum height, speed and 'g' conditions for the aircraft.

(b) Bomb Doors Open

To maximum height, speed and 'g' conditions defined in the current C.A. Release to Service, provided bomb door opening is restricted to the period required for the release of the store and confined to authorised range areas.

8.4 Release

(a) 2000 lb. Ballistic Role

/(i) ...

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- (i) Release height:- 25,000 to 40,000 ft.
- (ii) Speeds:- Not exceeding 0.75 Indicated Mach Number.
- (iii) Aircraft Altitude:- Straight and level $\pm 5^\circ$ in pitch and roll.
- (b) 1650 lb. and 2000 lb. Loft Bombing Role
 - (i) Approach heights:- 500 ft. ± 250 ft.
 - (ii) Entry Speed:- 434 kts. true airspeed with full power applied 3 seconds before pull-up.
 - (iii) 'G' Conditions:- Linear 'g' increase from 1 to 3.4 in first 2 seconds after pull-up and maintained until roll-out.
 - (iv) Release angles:- Flight path angles of 45° and 60° in the L.A.B.S. 'NORMAL' (forward toss) manoeuvre and gyro angles of between 115° and 125° in the L.A.B.S. 'ALTERNATE' (over the shoulder) manoeuvre.
 - (v) L.A.B.S. Calibrator settings:- The following L.A.B.S. Calibrator settings should be employed.

| <u>'G' Calibration</u> | <u>Yaw Ratio</u> | <u>Roll Ratio</u> | <u>'G' Sensitivity</u> | <u>Y/R Sensitivity</u> |
|------------------------|------------------|-------------------|------------------------|------------------------|
| 3.40 | 5.25 | 6.50 | 6.50 | 6.50 |

- (vi) 'G' Calibration should be adjusted to 3.4 using Calibration Tester Mk. 2 (Stores Ref. 9/4864). On completion of L.A.B.S. calibration settings the Calibrator should be sealed using "3M Sealer C-1126" (Stores Ref. 33H/2202111).
- (vii) Limitations: It should be noted that an indicated airspeed of 450 kts. can be exceeded easily during the escape manoeuvre, therefore dive angles in Instrument Meteorological Conditions should be limited to 20° . In the event of an artificial horizon failure the dive angles should be further limited to 10° .

(c) Emergency Release

Practice Bombs may be released in an emergency at speeds not exceeding 370 knots indicated airspeed or 0.78 Indicated Mach Number, whichever is less. The Pilots' or Bomb Aimers' "Push Switch" must be operated four times.

8.5 Essential Modifications

The modification state of the aircraft and its equipment should be as follows:-

(a) Aircraft

Modifications essential to the role should be incorporated including the following:-

3154, 3743, 3914, 3917, 3918 and 3920.

/(b) ...

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(b) Bomb Carriers

- (i) In order to obviate malfunctions which result in double releases and hang-ups, the Type 'C' Auto Selector Switch (Stores Reference 5D/632) fitted to Carrier Bomb, Light Series Mk. 3 (Stores Reference 11A/572) and a similar switch (Stores Reference 5D/2156) fitted Practice Bomb Carrier (External) Mk. 2 (Stores Reference 11A/4723) which form part of the installations referred to above, should be modified by fitting two 200 ohm., $1\frac{1}{2}$ watt resistors in parallel across the interruptor contacts.
- (ii) Release Units Type 'A' Mk. 3 incorporating Mod/Arm/3106 should be fitted to Light Series Bomb Carriers Mk. 3.
- (iii) Pending the introduction of a replacement for the Crutch Adaptor (Stores Reference 11A/685), this item should be adjusted 'finger tight' only when crutching 25 lb. Practice Bombs.

9. Further Recommendations

It is further recommended that consideration be given to:-

(a) Practice Bomb Facility Control Box

Repositioning the Practice Bomb Facility Control Box introduced by Mod/Canberra 2199 so as to be more accessible to the aircraft Navigator.

(b) Light Series Bomb Carrier Mk. 3

Developing a new design Crutch Adaptor capable of finger pressure adjustment and incorporating a vibration proof self-locking device.

(c) Bombs Practice 25 lb. S. A. F. No. 1 Mk. 1

Introducing modifications on the lines suggested at Appendices 'V', 'VI' and 'VII' to improve the safety aspects of this store.

10. Extensions to the Clearance

It is further recommended that this clearance be extended by analogy to include suitably modified Canberra B(I)6, B(I)8 and B Mk. 16 aircraft. Modifications essential to the role should be incorporated, including the following:-

| | |
|---------------------|---|
| Canberra B(I)6 | 3154, 3742, 3908, 3917, 3918, 3920. |
| Canberra B(I)8 | 3154, 3742, 3915, 3916, 3917, 3918, 3920. |
| Canberra B(I)8 N.I. | 3154, 3742, 3915, 3916, 3917, 3919. |
| Canberra B 16 | 3154, 3743, 3917, 3918, 3920, 3928. |

/Circulation List ...

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Circulation List

| | | |
|-------------------------|-----------|-----------------------------|
| D.A. Arm. | 8 Copies | 1 for Action |
| A.D.(R.A.F.)C. | 2 " | (for information of D.P.O.) |
| A.D.A.D.R. | 1 Copy | |
| A.D.S. & G. | 1 " | |
| A.D.P.An. | 1 " | |
| R.D.T.3 | 1 " | |
| T.I.L. | 50 Copies | |
| R.A.E. Farnborough | 6 " | |
| R.A.E. Bedford | 2 " | |
| R.T.O. English Electric | 2 " | |

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Appendix I

Canberra B.15 and B.16 Aircraft

Modification to Permit the Release of
Practice Bombs from the Wing Pylons in the L.A.B.S. Manoeuvre
A. & A.E.E./Mod/Canberra/7

1. Introduction

This modification is introduced to permit carriage on and release of Bombs Practice 25 lb. S. & F. from the Wing Pylon Installation in the L.A.B.S. manoeuvre.

- (1) This modification does not cancel, supersede or render unnecessary the work called for by any approved modification S.T.I. or S.I.
- (2) This modification is essentially connected with Mod. No. Canberra/2199.

2. Embodiment

This modification is to be embodied by:-

2nd Line Servicing Units: As soon as possible.

3rd and 4th Line Servicing Units: Before Issue.

Aircraft Storage Units: Before Issue.

3. Approximate Time Required for Embodiment

(1) B.15 Aircraft

The work will take approximately 4 man hours.

(2) B.16 Aircraft

The work will take approximately 5 man hours.

4. Drawings Required

- | | |
|-----------------------|--|
| (1) Circuit diagram | A.P.4326F, Vol.1, Sect.5, Chap.1, Groups A & B, Figure 3. |
| (2) Drawing SK.B.1197 | Mod. to Practice Bomb Facility Control Box. |
| (3) Drawing SK.B.1200 | Mod. to L.A.B.S. Distribution Box. |
| (4) Sketch | Illustrating Relay No.5 |

5. Parts and Special Tools Required

(1) Parts and Materials

The following parts are required and are to be provided under Unit arrangements.

/Ref. No. ...

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty.</u> | <u>Class of Equipment</u> |
|--------------------------|-----------------|--|----------------|---------------------------|
| A. Canberra B15 and B16. | | | | |
| 5X/792 | E & I 10424 | Plug, Type 'M' | 1 | 'B' |
| 5X/802 | E & I 10425 | Socket, Type M, No.2 | 1 | 'B' |
| 5X/846 | E & I 9711/1 | Inserts, socket | 1 | 'C' |
| 5X/2784 | | Grommet, Helsyn | 1 | 'C' |
| 28S/15150 | | Screws, M.S., 4BA x 9/16 in. | 4 | 'C' |
| 28M/10287 | | Nuts, stiff, M.S., 4BA. | 4 | 'C' |
| 28M/9419465 | | Washers, steel, plain | 4 | 'C' |
| 30B/1608 | | Solder, resin core (to specification BS.441) | | 'C' |
| B. Canberra B15 only. | | | | |
| 5L/3894 | | Cable, Unifersil-20 | 1 yd (approx) | 'C' |
| C. Canberra B16 only. | | | | |
| 5E/3894 | | Cable, Unifersil-20 | 3 yds (approx) | 'C' |

(2) Special Tools and Test Equipment

The following tool is required and is to be provided under Unit arrangements.

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty.</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|-----------------------|-------------|---------------------------|
| 5X/6701 | - | Tool, cable threading | 1 | 'B' |

6. Spares Affected

There are no spares affected by this modification.

7. Change of Reference, Part and Assembly Numbers

This modification does not give rise to any changes in reference, part or assembly numbers.

8. Sequence of Operations

The following is the sequence of operations:-

Note: Before any electrical circuit is disturbed, all electrical power supplies in, to or from the aircraft are to be disconnected.

(1) Disconnect all sources of electrical supply.

(2) Disconnect the two sockets from the underside of the Practice Bomb Facility Control Box (P.B.F.C.B.) introduced by Mod. No. Canberra/2199.

(3) Unscrew the four 4.B.A. bolts securing the P.B.F.C.B. to its mounting and remove the P.B.F.C.B. from the aircraft.

/(4) ...

- (4) Remove the 12 4.B.A. screws and lift the lid from the P.B.F.C.B. Mark out, drill four No.26 holes and mount the Type 'M' Plug on the underside of the P.B.F.C.B. as shown in drawing S.K.B.1197 using four 4.B.A. screws, stiffnuts and plain washers.
- (5) Re-assemble the lid and replace the P.B.F.C.B. on its mounting in the aircraft.
- (6) Reconnect the supply socket to the underside of the P.B.F.C.B. and stow the existing Type 'M' socket at the new stowage.
- (7) Open the L.A.B.S. Distribution Box (L.D.B.). Form a hole 0.75 in. dia. the L.D.B. as shown on drawing attached, and fit the Helsyn tension grommet.
- (8) Using the cable threading tool pass one end of the Uniterail-20 cable through the Helsyn tension grommet.
- (9) Remove Relay No.5 from its mounting bracket to expose the terminal connections and solder the end of the Tersil-20 cable to the spare terminal as shown in the illustration of Relay No.5.
- (10) Re-mount No.5 Relay on its bracket, loom up the cable and close the lid of the L.D.B.
- (11) Lead the Tersil-20 cable via recognised cable routes from the L.D.B. to P.B.F.C.B. securing the cable as necessary.
- (12) Trim the Uniterail-20 cable to length and solder to the socket insert.
- (13) Assemble the Socket Type 'M' with the socket insert in position 3 and connect the socket to the Type M Plug at the P.B.F.C.B.

9. Testing after Embodiment

After embodiment of the modification the installation is to be tested as follows:-

- (1) Fit Practice Bomb Carriers 25 lb. External Mk.2 (Stores Ref. 11A/4723) to each Wing Pylon Bomb Carrier and crutch to 30 lb. ft. - AP.1664A (2nd Edn) Vol. 1, Book 1, Sect. 1, Chap. 14, para. 20.
- (2) Set the Auto-selector of the Stbd carrier to No.1 and that of the Port carrier to No.2.
- (3) Ensure that all switches are off.
- (4) Connect an external 28 volt D.C. power supply.
- (5) Set Bombs/R.P. switch to Bombs.
- (6) Sight Selector (L.A.B.S./NORMAL) switch to NORMAL.
- (7) Wing Fuzing switch to TAIL or NOSE AND TAIL
- (8) Port and Starboard Wing Selector switches ON.
- (9) 4-way selector on P.B.F.C.S. to position '2'.
- (10) Practice Bomb Selector switch at P.B.F.C.B. 'ON'.
- (11) Press the Pilot's Bomb Release switch four times and ensure that the carriers fire in the order Ft., Stbd., Pt., Stbd.
- (12) Recoek the release units and re-set the Auto-selector boxes of both bomb carriers.

Appendix I (Cont'd)

- (13) Switch on the No.6 Invertor.
- (14) Set the Sight Selector (L.A.B.S./NORMAL) switch to L.A.B.S.
- (15) After 3 minutes set L.A.B.S. START switch to START.
- (16) Press the gun trigger (pickle button) and keep it pressed.
- (17) Rotate the NORMAL Sector through Zero.
- (18) Ensure that a release unit on the port Practice Bomb Carrier has fired and that the white gunsight lamp is on.
- (19) Release the gun trigger (pickle button).
- (20) Re-set the NORMAL Sector as briefed.
- (21) Switch L.A.B.S. START switch to 'OFF'.
- (22) Switch Sight Selector (L.A.B.S./NORMAL) switch to NORMAL.
- (23) Switch OFF No.6 Invertor.
- (24) Return all bombing switches to the 'OFF' position.
- (25) Disconnect the external power supply.

10. Recording Action

Record on Form 700.

11. Disposal of Redundant Parts

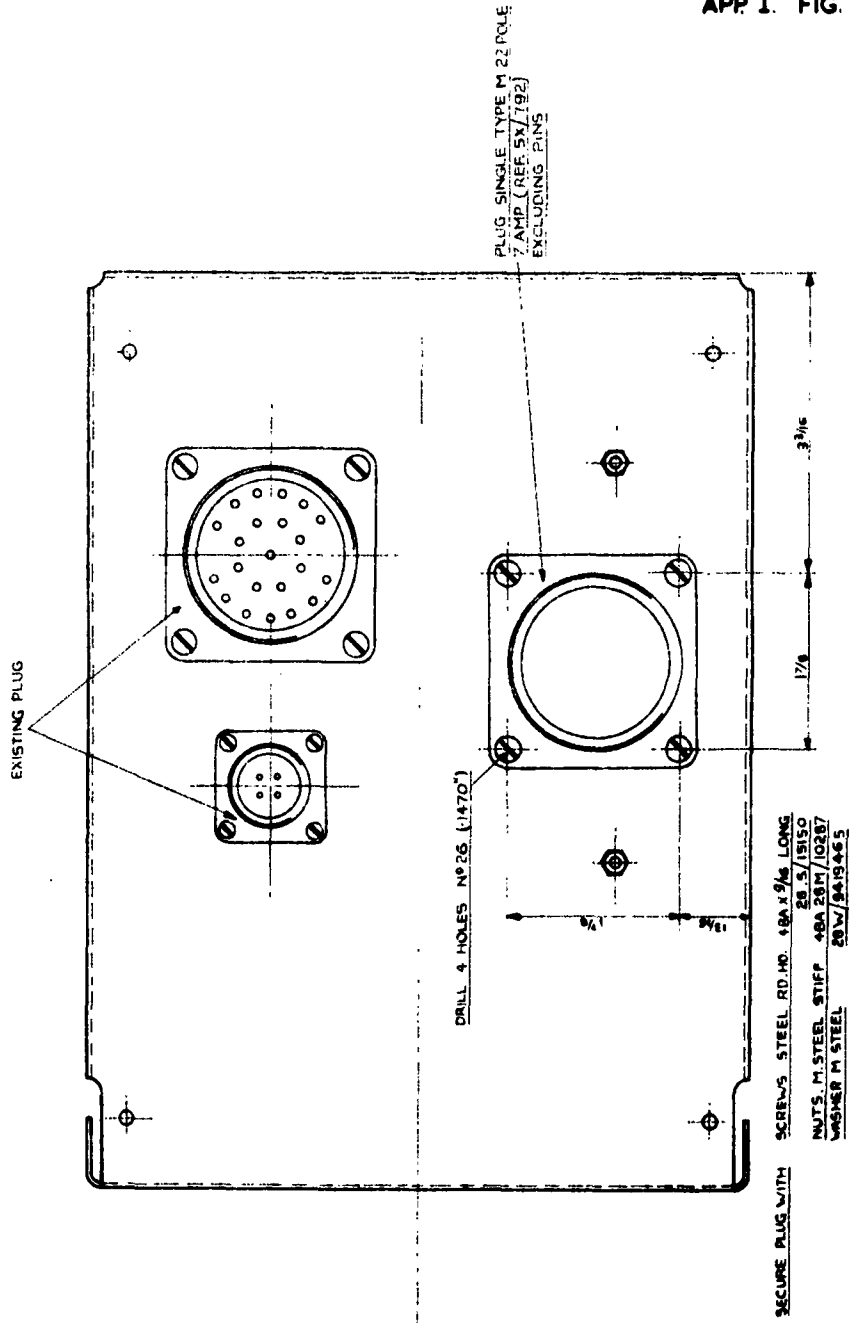
No components are rendered redundant by incorporation of this modification.

12. Effect on Weight, C. of G. and Servicing Schedule

- (1) The modification results in a negligible increase in weight.
- (2) This modification will affect the servicing schedule.

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APP I. FIG. I.

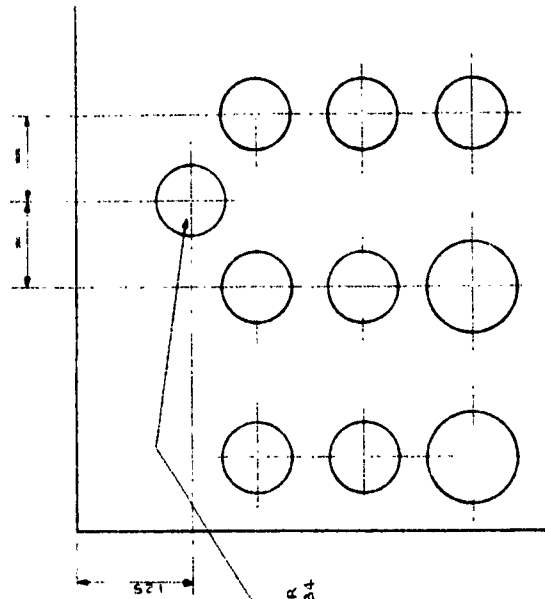


APP I. FIG. I.

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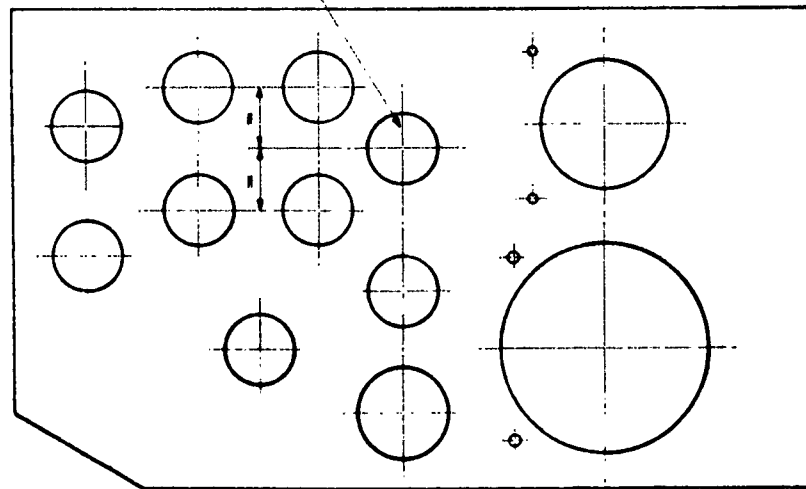
MODIFICATION TO—PRACTICE FACILITY CONTROL BOX.

APP I. FIG. 2.



LABS. DIST. BOX EG. 5. 28-115 (E86-81-3863)
SLS.A/C. VIEW ON LOWER FACE.

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LABS. DIST. BOX EG. 4-81-203 (E86-81-3227)
SLS.A/C. VIEW ON FWD FACE.

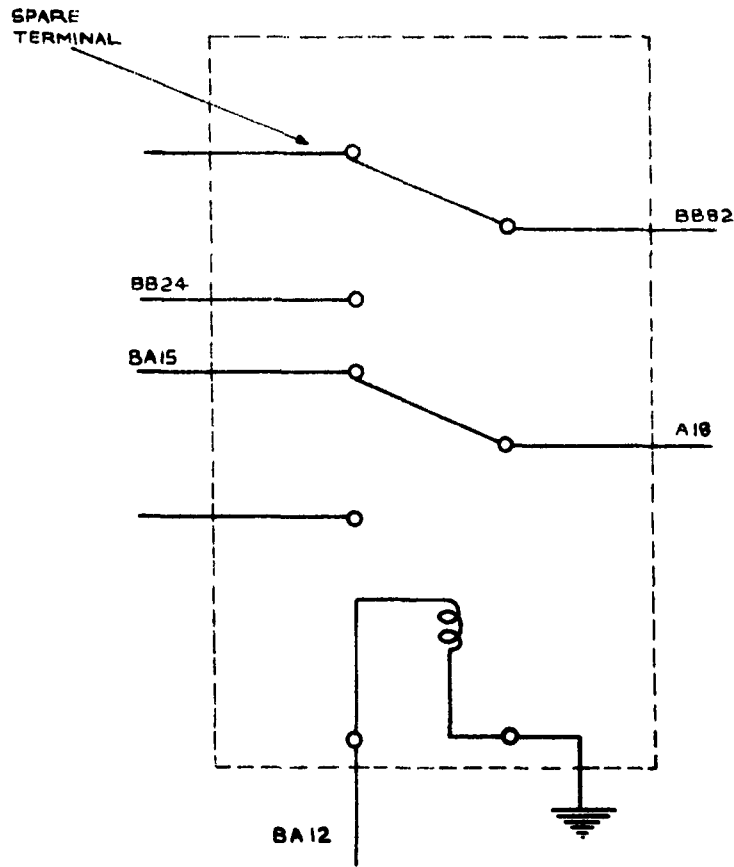
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APP I. FIG. 2.

SK N°B 1492 5 PART OF REPORT N°A&A EE / 861/10 CANBERRA BIS WH 967 TR.S.J.H CH.F/O BENN APP. done for S of A 26 3 63

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APP.I. FIG.3.



PART N° S.T.C. 4190 H.D.
STORES REF. : 104 / Z 330473.

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RELAY N°5 AT L.A.B.S. DISTRIBUTION BOX

Canberra B(I)6, B(I)8, B.15 and B.16 AircraftIntroduction of a Load Resistor for Simulator
Type 101 Mk.2 for use when Practice Bombs are
Released from Wing Pylons in the L.A.B.S. Manoeuvre1. Introduction

This modification is introduced to enable full responses to be obtained from the Simulator Type 101 Mk.2, when practice bombs are released in the L.A.B.S. manoeuvre from wing pylons of the Canberra aircraft, without the use of a Light Series Bomb Carrier in the aircraft bomb bay.

(1) This modification does not cancel, supersede or render unnecessary the work called for by any approved modification, S.T.I. or S.I.

(2) This modification is essentially connected with:-

- | | | |
|-----|-------|------------------|
| (a) | B(I)6 | 3908, 3917 |
| (b) | B(I)8 | 3915, 3916, 3917 |
| (c) | B.15 | 3914, 3917 |
| (d) | B.16 | 3928, 3917 |

2. Embodiment

This modification is to be embodied as soon as possible by Units employing Simulators Type 101 Mk.2 in connection with the L.A.B.S. release of practice bombs from Wing Pylons.

3. Approximate Time required for Embodiment

The work will take approximately one man hour.

4. Drawings Required

Drawings are not required to incorporate the modification but details can be seen at Figure 1 of this Appendix.

5. Parts and Special Tools Required(1) Parts and Materials

The following parts are required and are to be provided under Unit arrangements.

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty.</u> | <u>Class of Equipment</u> |
|-----------------------------------|-----------------|--|-------------|---------------------------|
| 101/Z113369 (old ref. Z243082) | R.W.V. 4-L | Resistor, fixed, wire wound 68 ohm/6 watts | 1 | 'C' |
| 5D/512 | - | Plug brass, two-pole unscreened | 1 | 'B' |
| 5CX/1069 | - | Lamps, warning Type 'A' | 1 | 'B' |
| 33H/90 | - | Compound, polyester resin, Marco. | as required | 'C' |

(2) Special Tools and Test Equipment

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Appendix II (Cont'd)

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The use of a Laboratory Balance is needed to measure the ingredients of the encapsulating compound.

6. Spares Affected

There are no spares affected by this modification.

7. Change of Reference, Part and Assembly Numbers

This modification does not give rise to any changes in reference, part or assembly numbers.

8. Sequence of Operations

The following is the sequence of operations:-

- (1) Remove the components of the Type 'A' Warning Lamp.
- (2) Bend up the tags of the threaded lampholder and push this component out of the body of the Warning Lamp.
- (3) Check the fit of the Wire Wound Resistor in the body of the Warning Lamp. If necessary file the internal shoulder to increase the small diameter of the Warning Lamp to clear the resistor.
- (4) Dismantle the Type 'A' Plug.
- (5) Bend the wires of 68 ohm. Resistor as required, and solder the resistor to the pins of the plug so that their diametrical axes coincide (see Figure 1).
- (6) Re-assemble the Type 'A' Plug, except for knurled nut and ferrule, taking care to see that wire connections of the resistor are well separated and clear of the plug body.
- (7) Engage the internal threads at the small diameter of the Warning Lamp with those of the Type 'A' Plug and screw home.
- (8) Make up the polyester resin to the instructions for encapsulation contained in the leaflet supplied with the Kit.
- (9) Seal off the two lead holes of the Warning Lamp with Sellotape and pour in the polyester resin from the top of the Warning Lamp.

NOTE: If mica flour is not available a small quantity of fibre glass may be either mixed with the resin or inserted in the barrel of the Warning Lamp.

9. Testing after Embodiment

- (1) When the resin has set, remove the Sellotape and check the completed load resistor for correct fitting and locking by assembling to the Type 'A' socket of the Simulator.
- (2) Check the insulation and resistance values of the complete load resistor. The insulation value should be not less than 10 megohms and the resistance value 68 ohms $\pm 5\%$.

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Appendix II (Cont'd)

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- (3) Carry out complete functioning checks of the Simulator Type 101 Mk.2, with the Load Resistor fitted in place of the Light Series Bomb Carrier.

10. Recording Action

Record incorporation of this modification in the appropriate servicing documents.

11. Disposal of Redundant Parts

The various small components removed from the Warning Lamp and Type 'A' Plug are to be disposed of as salvage under Unit arrangements.

12. Effect on Weight and C. of G. and Servicing Schedule

- (1) The modification causes a negligible increase in the weight of the Simulator.
- (2) This modification will affect the servicing schedule.

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FIG. 1.

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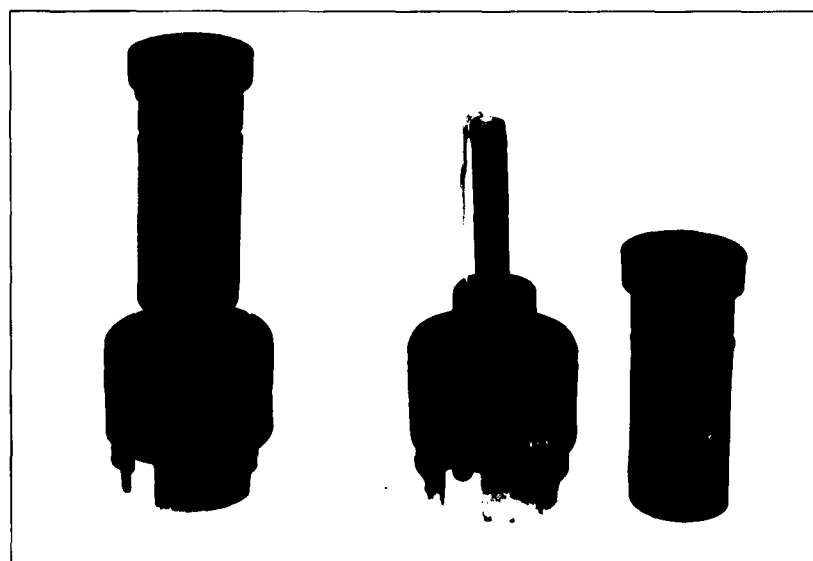


FIG. 1. LOAD RESISTOR FOR SIMULATOR TYPE 101.

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Appendix III

Bomb, Practice, 25 lb., S. & F., No.1 -
Improved Tail Locking

1. Introduction

This modification introduces a positive system of tail locking for the No.1 Mk.1 Practice Bomb.

2. Embodiment

This modification is to be embodied by:-

2nd Line Servicing Units:- As soon as possible.

3rd and 4th Line Servicing Units:- Before Issue.

Equipment Depots:- Before Issue.

3. Approximate Time Required for Embodiment

The work will take approximately 0.1 man hours.

4. Drawings Required

Drawing SK.B./1173 is incorporated in this issue.

5. Parts and Special Tools Required

(a) Parts and/or Materials

The following items are required and are to be demanded under Unit arrangements:-

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|---|------------|---------------------------|
| 28S/15906 | A56/E6 | Screw, grub, S.S., $\frac{1}{4}$ in. B.S.F. x $\frac{3}{8}$ in. long. | 1 | 'C' |
| 33B/9433454 | - | Varnish, Electrical, insulation. | - | 'C' |

(b) Special Tools and/or Test Equipment

6. Spares Affected

7. Changes of Reference Part and Assembly Numbers

8. Sequence of Operations

The following is the sequence of operations:-

(a) Unscrew and remove the $\frac{1}{2}$ in. B.S.F. socket screw from the bomb nose (Stores Ref. 12B/597).

(b) Examine the screw threads and contact surfaces on the nose and tail sections for cleanliness and freedom from damage. Rectify as necessary.

/(c) ...

- 2 -

(c) Engage the screw threads of the nose and tail sections and screw up as securely as possible using firm hand pressure.

(d) Form a register in the screwthreads of the tail section, as shown in the attached drawing using a No.8 drill applied through the tapped hole in the nose section.

(e) Using a small chisel, cut matching index marks across the junction of the nose and tail sections, as shown in the drawing attached.

(f) Separate the two sections of the store, remove swarf and any burrs that may have formed on the threads.

(g) Re-assemble the two sections of the store, and continue screwing until the index marks line-up.

(h) Lock the assembled store using the $\frac{1}{4}$ in. B.S.F. S.S. grub screw, and fill up the index recesses with red paint.

NOTE: The $\frac{1}{4}$ in. B.S.F. S.S. grub screw is to be locked when missile preparation is completed by filling the grub screw hole with varnish.

9. Testing After Embodiment

The modification is to be inspected in accordance with current procedure.

10. Recording Action

Record the incorporation of this modification in the appropriate servicing documents.

11. Disposal of Redundant Parts

The following component is rendered redundant by incorporation of this modification and is to be disposed of as salvage under Unit arrangements.

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Store</u> |
|-----------------|-----------------|--|------------|-----------------------|
| - | - | Screw, socket, $\frac{1}{4}$ in. B.S.F. | 1 | 'C' |

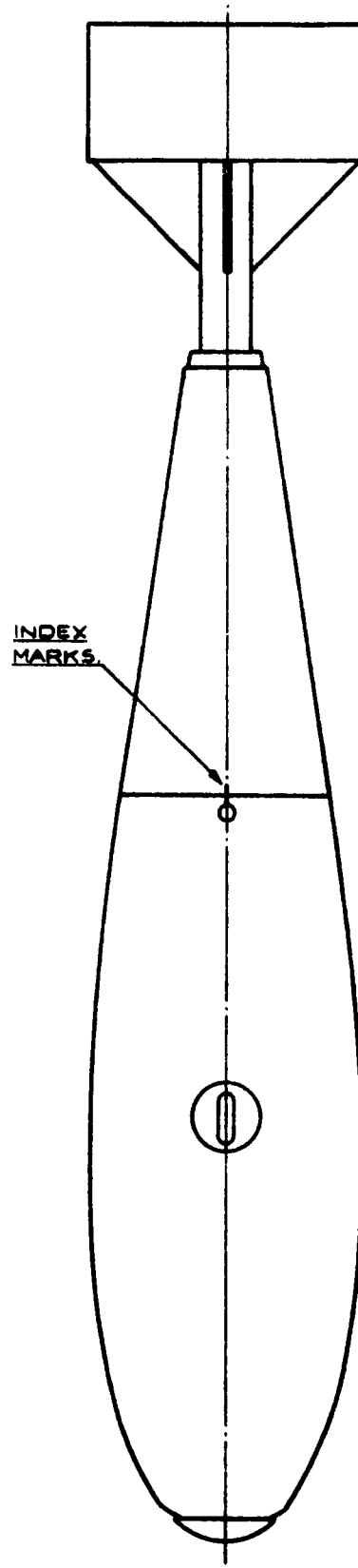
12. Effect on Weight

This modification has virtually no effect on the weight of the store.

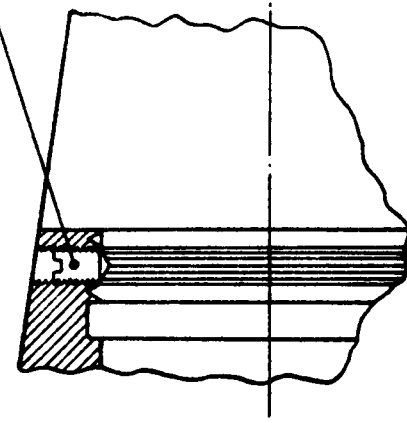
SKN° 8 1173 5TH PART OF REPORT N° A & A E E / 861/10 CANBERRA B 15 WH 967 TR SPT CH. F/O BENN APP. 6th for S of A 26 3 63

SECRET

APP III. FIG. I.



GRUB SCREW, 1/4" B.S.F. 3/8" LONG,
STAINLESS STEEL. SPEC. B.S. A86,
REF. 285/15906.



REMOVE EXISTING SOCKET SCREW
DRILL THROUGH TAPPED HOLE
WITH DRILL N° 8 (.1990 DIA)
TO FORM DIMPLE BELOW ROOT OF
MAIN THREAD FOR NEW GRUB SCREW.
ENGRAVE INDEX MARKS & FILL IN
WITH RED PAINT.

NOTE:-

THE GRUB SCREW IS TO BE
LOCKED WITH VARNISH
ELECTRICAL INSULATION
(REF. N° 228/2432454)
AFTER MISSILE PREPARATION.

SECRET

BOMB, PRACTICE, 25 LB. S. & F., N° 1, MK. I.
MODIFICATION TO TAIL LOCKING.

RESTRICTED

Appendix IV

Bomb. Practice, 25 lb., S. & F., No.1
Improved Tail Locking Using Jig

1. Introduction

This modification introduces a positive system of tail locking for the No.1 Mk.1 Practice Bomb.

2. Embodiment

This modification is to be embodied by:-

2nd Line Servicing Units:- As soon as possible.

3rd and 4th Line Servicing Units:- Before Issue.

Equipment Depots:- Before Issue.

3. Approximate Time Required for Embodiment

The work will take approximately 0.1 man hours.

4. Drawings Required

Drawing SK/B1181 is incorporated in this issue.

5. Parts and Special Tools Required

(a) Parts and/or Materials

The following items are required:-

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|---|------------|---------------------------|
| 28S/15906 | A56/E6 | Screw, grub S.S. $\frac{1}{4}$ in. B.S.F. x $\frac{3}{8}$ in. long. | 1 | 'C' |
| 33B/9433454 | - | Varnish, electrical, insulation. | - | 'C' |

(b) Special Tools and/or Test Equipment

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|---------------------|------------|---------------------------|
| - | - | Jig, Drilling | - | - |

6. Spares Affected

7. Changes in Reference, Part and Assembly Numbers

8. Sequence of Operations

The following is the sequence of operations:-

(a) Unscrew and remove the $\frac{1}{2}$ in. B.S.F. socket screw from the bomb nose.

/(b) ...

- (b) Examine the screw threads and contact surfaces on the nose and tail sections for cleanliness and freedom from damage. Rectify as necessary.
- (c) Engage the screw threads of the nose and tail sections and screw up as securely as possible using firm hand pressure.
- (d) Screw the drilling jig into the $\frac{1}{4}$ in. B.S.F. locking screw hole in the bomb nose, and form a register in the tail threads using a $\frac{1}{8}$ in. drill.
- (e) Remove the drilling jig. Should the jig stick a $\frac{3}{16}$ in. Whitworth spanner may be employed to remove it.
- (f) Using a small chisel cut matching index marks across the junction of the nose and tail sections, as shown in the drawing attached.
- (g) Separate the two sections of the store and open out the drilling in the tail threads using a $\frac{1}{4}$ in. drill to form a grub screw register as shown in the drawing.
- (h) Remove swarf and burrs and re-assemble the two sections of the store. Continue to apply pressure until the index marks line-up.
- (j) Lock the assembled store using the $\frac{1}{4}$ in. B.S.F. S.S. grub screw and fill up the index recesses using red paint.

NOTE. The $\frac{1}{4}$ in. B.S.F. S.S. grub screw is to be locked, when missile preparation is completed, by applying varnish to the recess containing the grub screw.

9. Testing After Embodiment

The modification is to be inspected in accordance with current procedure.

10. Recording Action

Record the incorporation of this modification in the appropriate servicing documents.

11. Disposal of Redundant Parts

The following component is rendered redundant by incorporation of this modification and is to be disposed of as salvage under Unit arrangements.

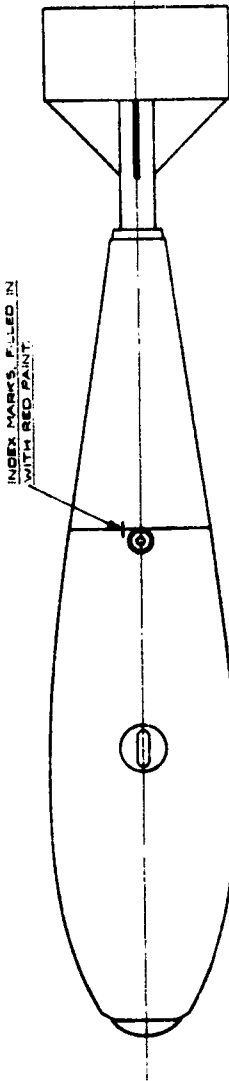
| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Store</u> |
|-----------------|-----------------|---|------------|-----------------------|
| - | - | Screw, socket $\frac{1}{4}$ in. B.S.F. | 1 | 'C' |

12. Effect on Weight

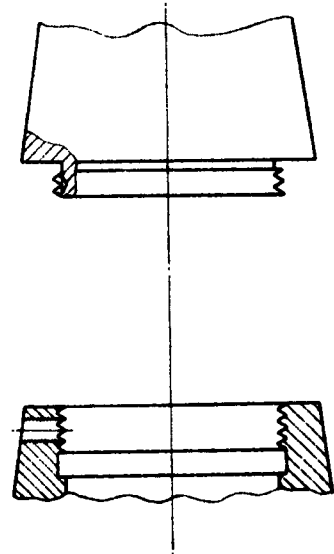
This modification has virtually no effect on the weight of the store.

SECRET

DRILLING JIG. MAT'L-STEEL SPEC 0515 REF. 30c/3292
SCALE - 3/4 FINISH:- CASE HARDEN ALL OVER



SCALE: - V2



SCALE: - 1/1

SECRET.

**BOMB, PRACTICE, 25 LB., S.&F. NO. 1, MK. I.
DRILLING JIG FOR IMPROVED TAIL LOCKING.**

APP. IV FIG. 1.

RESTRICTED

Appendix V

Bomb, Practice, 25 lb. S. & F. No.1 - Improved
Striker Mechanism

Stage One Modification

1. Introduction

This modification improves safety and reliability of the No.1 Mk.1 Practice Bomb.

2. Embodiment

(a) This modification is to be embodied by:-

2nd Line Servicing Units:- As soon as possible.
3rd and 4th Line Servicing Units:- Before issue.
Equipment Depots:- Before issue.

(b) Special Instructions. N/A.

3. Approximate Time Required for Embodiment

The work will take approximately 1 man hour.

4. Drawings Required

Drawing SK.B.1130 is incorporated in this issue.

5. Parts and Special Tools Required

(a) Parts and/or Materials

The following parts and materials are required and are to be provided under Unit arrangements. A modification kit will not be assembled.

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|---|------------|---------------------------|
| | | Nose cap, frangible, plastic, white. | One | 'C' |
| | | Corks | Two | 'C' |
| | | Wire, brass hard | 1.25 in. | 'C' |
| | | No.18 S.W.G. | | |
| | | Cement, Araldite | - | 'C' |

(b) Special Tools and/or Test Equipment

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Store</u> |
|-----------------|-----------------|--------------------------------|------------|-----------------------|
| 27L/706 | A/MBEU/5826 | Tool, cartridge, extraction | One | 'C' |

6. Spares Affected

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Class of Store</u> |
|-----------------|-----------------|---------------------|-----------------------|
| | | Striker No.1 | |

7. Changes of Reference Part and Assembly Numbers

8. Sequence of Operations

The following is the sequence of operations:-

- (a) Remove the shear wire.
- (b) Remove the transit safety pin, safety wire, safety plunger and spring.
- (c) Remove the striker, taking care not to damage the point.
- (d) Mount the striker in the 3-jaw chuck, part off nose of striker with hacksaw, leaving a diaphragm of steel approx. $\frac{1}{8}$ " thick and machine to the dimensions of the attached drawing.
- (e) Coat the corks (or rubber/plastic plugs) with "Araldite" cement and insert in the transit safety pin and safety plunger housings.
- (f) Examine the axial striker way and ensure that it is not fouled by the plugs and clean as necessary.
- (g) Trim the corks to the bombs external contour using a sharp knife.
- (h) Using the cartridge extraction tool, re-assemble the striker, taking care to ensure that the striker point is not damaged.
- (i) Fit a new shear wire, and bend up the ends to lock.
- (j) Gauge the striker point by pressing the striker gently rearward using the cartridge extraction tool whilst applying a steel rule across striker guide bush. The point must not protrude.
- (k) Coat the contact surfaces of the frangible nose cap with Araldite and fit in the nose aperture of the striker housing.

9. Testing After Embodiment

The Modification is to be inspected in accordance with current procedure.

10. Recording Action

Record the incorporation of this Modification in the appropriate servicing documents.

11. Disposal of Redundant Parts

The following components are rendered redundant by this modification and are to be disposed of as salvage under Unit arrangements.

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Store</u> |
|-----------------|-----------------|-------------------------|------------|-----------------------|
| | | Pin, safety, transit | 1 | 'C' |
| | | Wire, safety o/w collar | 1 | 'C' |
| | | Plunger, safety | 1 | 'C' |
| | | Spring, safety | 1 | 'C' |

12. Effect on Weight

The modification causes a weight change to the in-flight condition of the store of minus 13 ozs.

RESTRICTED

Appendix VI

Bomb, Practice, 25 lb. S. & F. No.1 - Improved
Striker Mechanism

Stage Two Modification

1. Introduction

This modification improves safety and reliability of the No.1 Mk.1 Practice Bomb (Ref. 12B/597).

2. Embodiment

(a) This modification is to be embodied by:-

2nd Line Servicing Units:- As soon as possible.

3rd and 4th Line Servicing Units:- Before issue.

Equipment Depots:- Before issue.

(b) Special Instructions. N/A.

3. Approximate Time Required for Embodiment

The work will take approximately 1 man hour.

4. Drawings Required

Drawings SK.B.1130, SK.B.1131, SK.B.1132 and SK.B.1133 are incorporated in this issue.

5. Parts and Special Tools Required

(a) Parts and/or Materials

The following materials are required:-

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|--------------------------------------|------------|---------------------------|
| | | Nose cap, frangible, plastic, white. | One | 'C' |
| | | Spring, striker creep | One | 'C' |
| | | Spring, striker non-return. | One | 'C' |
| | | Corks | Two | 'C' |
| | | Wire, brass hard 18 S.W.G. | 1.25 in. | 'C' |

(b) Special Tools and/or Test Equipment

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|----------------------------------|------------|---------------------------|
| 27L/706 | A/MBEU/5826 | Tool, cartridge extraction. | One | 'C' |
| | | Jig, drilling striker guide bush | One | 'B' |

6. Spares Affected

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Class of Store</u> |
|-----------------|-----------------|---------------------|-----------------------|
| | | Striker No.1 | |

7. Changes of Reference Part and Assembly Number

8. Sequence of Operations

The following is the sequence of operations:-

- (a) Remove the shear wire.
- (b) Remove the transit safety pin, safety wire, safety plunger and spring.
- (c) Remove the striker, taking care not to damage the point.
- (d) Unscrew and remove the striker guide bush.
- (e) Mount the striker in the 3-jaw chuck, part off nose of striker with hacksaw, leaving a diaphragm of steel approx. $\frac{1}{8}$ " thick and machine to the dimensions of the attached drawing.
- (f) Place the striker guide bush in the drilling jig, engage the locating pin, and drill No.55.
- (g) Coat the two corks with cement and press into the transit safety pin and safety plunger housings.
- (h) Trim the corks to the external contour of the bomb with a sharp knife.
- (i) Examine the axial striker way and ensure that it is not fouled by the corks on cement. Clean as necessary.
- (j) Lightly coat the threads of the striker guide bush with cement and screw it fully home.
- (k) Fit the creep spring to the striker (small end towards head).
- (l) Using the cartridge extraction tool, re-assemble the striker, taking care to ensure that the striker point is not damaged.
- (m) Fit a new shear-wire, and secure by bending up the ends.
- (n) Ensure that the striker point does not protrude by applying a steel rule to the striker guide bush.
- (o) Fit the striker non-return spring to the original shear wire holes in the striker guide bush.
- (p) Coat the contact surfaces of the frangible nose cap with Araldite and fit in the nose aperture of the striker housing.

9. Testing After Embodiment

The modification is to be inspected in accordance with current procedure.

10. Recording Action

Record the incorporation of this modification in the appropriate servicing documents.

11. Disposal of Redundant Parts

The following components are rendered redundant by incorporation of this modification and are to be disposed of as salvage under Unit arrangements.

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Store</u> |
|-----------------|-----------------|-------------------------|------------|-----------------------|
| | | Pin, safety, transit | 1 | 'C' |
| | | Wire, safety o/w collar | 1 | 'C' |
| | | Plunger, safety | 1 | 'C' |
| | | Spring, safety | 1 | 'C' |

12. Effect on Weight

The modification causes a weight change to the in-flight condition of the store of minus 13 ozs.

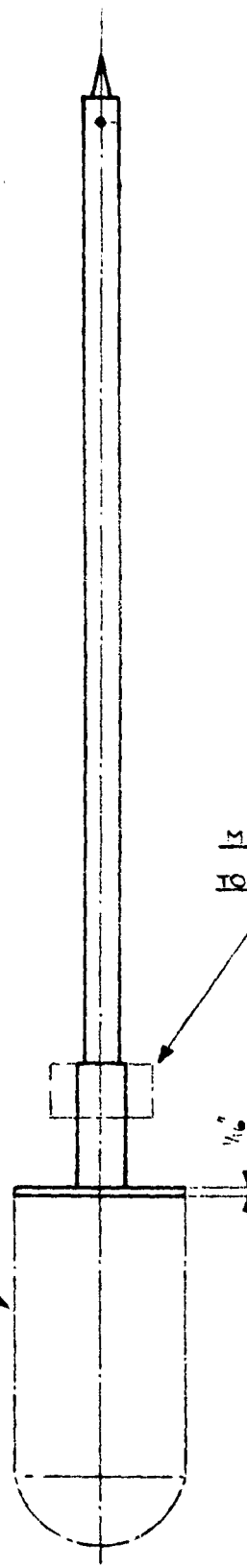
SK. N° 81130 5TH PART OF REPORT N° A. 8 A. EE/86/10 CANBERRA B15 WH 967 TR. D 5 CH. P. O. BENN APP. 14.2.62

SECRET

APP. VI. FIG. 1.

MACHINE OFF BOSS
TO DIMENSION SHOWN.

MACHINE OFF COLLAR
TO EXISTING DIA.



SECRET

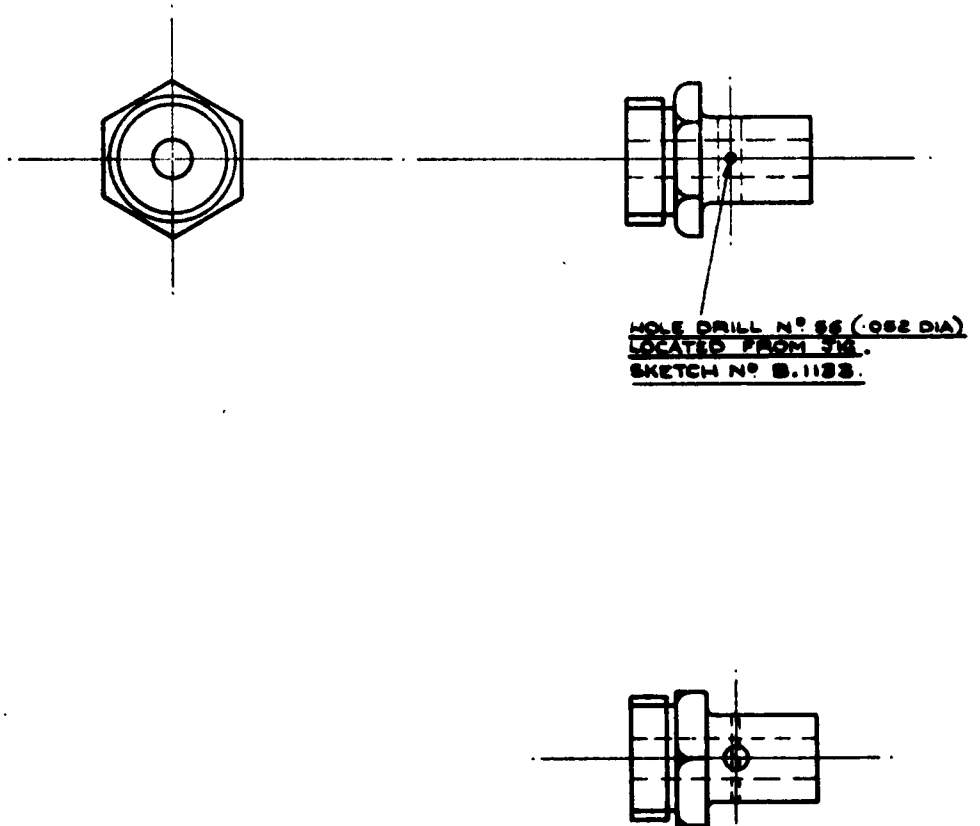
SCALE:- FULL SIZE.

**BOMB, PRACTICE, 25LB S&F N°1 MKI.
MODIFICATION TO STRIKER.**

SK N° 8.1131 5TH PART OF REPORT N° A.3.A.E.E/661/10 CANBERRA B15. WH 967 TR. L. ERL CH. PO BENN APP. *Ch. Po* for S of A 14.2.62

SECRET.

APP. VI. FIG. 2.



SECRET.

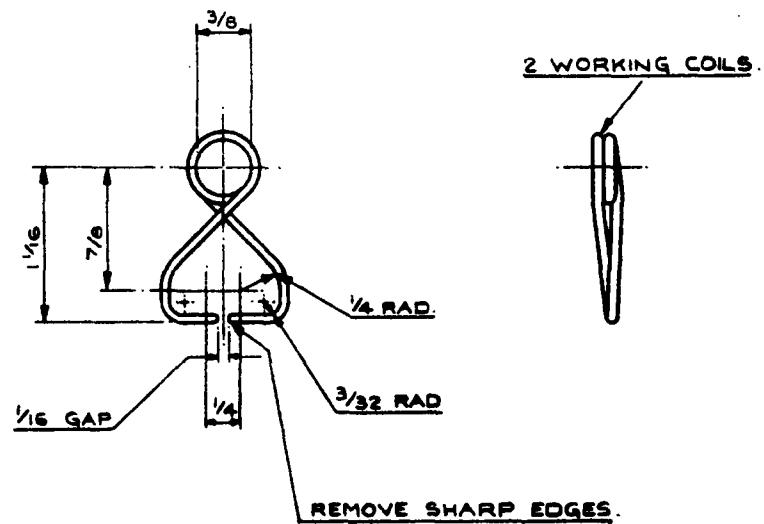
SCALE :- FULL SIZE.

BOMB, PRACTICE, 25LB. S & F, N° L MKI.
MODIFICATION TO STRIKER GUIDE BUSH.

SK No. B 1132 5TH PART OF REPORT No. A. & A. E. E. / 861 / 0 CANBERRA B15 WH 967 TR SPT CH. F/O BENN APP 16-6-61 of 5 of A 26 363

SECRET

APP VI. FIG. 3.



MAT. PIANO WIRE 17 S.W.
(.036) OR SIMILAR.

SECRET

SCALE: FULL SIZE

BOMB, PRACTICE, 25 LB. S. & F., No. 1, MK. I.
STRIKER NON-RETURN SPRING.

APP. VI. FIG. 4.



**BOMB, PRACTICE, 25 LB. S.&F. No.1, MK.I
DRILLING JIG FOR STRIKER GUIDE BUSH.**

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Appendix VII

Bomb, Practice, 25 lb., S. & F., No.1 - Improved
Striker Mechanism

Stage Three Modification

1. Introduction

This modification improves safety and reliability of the No.1 Mk.1 Practice Bomb (Stores Ref. 12B/597).

2. Embodiment

(a) This modification is to be embodied by:-

2nd Line Servicing Units:- As soon as possible.

3rd and 4th Line Servicing Units:- Before Issue.

Equipment Depots:- Before Issue.

(b) Special Instructions. N/A.

3. Approximate Time Required for Embodiment

The work will take approximately $\frac{1}{2}$ man hour.

4. Drawings Required

Drawings SK.B.1134 is incorporated in this issue.

5. Parts and Special Tools Required

(a) Parts and/or materials

The following parts and materials are required and will be issued as a modification kit under Stores Reference (Section and Ref. No. to be allocated).

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|---------------------------------------|------------|---------------------------|
| | | Nose cap frangible, plastic white. | 1 | 'C' |
| | | Striker No.2 | 1 | - |
| | | Spring, striker, non- return. | 1 | 'C' |
| | | Spring, striker creep | 1 | 'C' |
| | | Corks | 2 | 'C' |
| | | Wire, brass, hard 18 S.W.G. | 1.25 in. | 'C' |
| | | Bush, striker guide, modified | 1 | 'C' |

(b) Special Tool and/or Test Equipment

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Equipment</u> |
|-----------------|-----------------|------------------------------|------------|---------------------------|
| 27L/706 | A/MBEU/5826 | Tool, cartridge extractor | 1 | 'C' |

6. Spares Affected

7. Changes of Reference and Assembly Numbers

8. Sequence of Operations

The following is the sequence of operations:-

- (a) Remove the shear wire.
- (b) Remove the transit safety pin, safety wire, safety plunger and spring.
- (c) Remove the striker.
- (d) Unscrew and remove the striker guide bush.
- (e) Examine the striker way and clean as necessary.
- (f) Coat the two corks with cement and press into the transit safety pin and safety plunger housings.
- (g) Trim the corks to the external contour of the bomb with a sharp knife.
- (h) Examine the axial striker way and ensure that it is not fouled by the corks or cement. Clean as necessary.
- (i) Lightly coat the threads of the modified striker guide bush with cement and screw fully home.
- (j) Fit the striker creep spring to the modified striker (small end towards head).
- (k) Using the cartridge extraction tool, assemble the modified striker o/w creep-spring taking care to protect the point.
- (l) Fit a new shear wire and bend up the ends to lock.
- (m) Ensure striker does not protrude using a steel rule.
- (n) Assemble the striker non-return spring to the old shear wire holes.
- (o) Coat the frangible plastic nose cap with araldite and fit to the nose aperture of the striker housing.

9. Testing After Embodiment

The modification is to be inspected in accordance with current procedure.

10. Recording Action

Record the incorporation of this modification in the appropriate servicing documents.

11. Disposal of Redundant Parts

- (a) The following component is to be returned to the appropriate equipment depot for modification.

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Store</u> |
|-----------------|-----------------|-------------------------------------|------------|-----------------------|
| | | Bush, striker guide (unmodified) | 1 | 'C' |

/(b) ...

- 3 -

(b) The following components are rendered redundant by incorporation of this modification and are to be disposed of as salvage under Unit arrangements.

| <u>Ref. No.</u> | <u>Part No.</u> | <u>Nomenclature</u> | <u>Qty</u> | <u>Class of Store</u> |
|-----------------|-----------------|-------------------------|------------|-----------------------|
| | | Striker, No. 1 | 1 | 'C' |
| | | Pin, safety, transit | 1 | 'C' |
| | | Wire, safety c/w collar | 1 | 'C' |
| | | Plunger, safety | 1 | 'C' |
| | | Spring, safety | 1 | 'C' |

12. Effect on Weight

The modification causes a weight change to the in-flight condition of the store of minus 14 ozs.

Carriage Flights at Lyme Bay Range
Tests on Tails of 25 lb. Practice Bombs No.1
1,650 lb. Role with Simulator

| Carriage Flight No. | Date and Time | Number of L.A.B.S. Manoeuvres | Type of Bomb Carried | | Remarks |
|---------------------|-----------------------|-------------------------------|------------------------|-----------------------------|---|
| | | | Port (Inner and Outer) | Starboard (Inner and Outer) | |
| 1 | 2.2.62 (1500-1650) | 5 | No.1 Mk.2 | No.1 Mk.1 | Tail unscrewed from No.1 Mk.1 Practice Bomb on P.O. Station and lost. |
| 2 | 2.2.62 (1600-1700) | 5 | No.1 Mk.1 | No.1 Mk.2 | |
| 3 | 8.2.62 (1225-1305) | 4 | No.1 Mk.2 | No.1 Mk.1 | |
| 4 | 9.2.62 (1030-1115) | 4 | No.1 Mk.1 | No.1 Mk.2 | |
| 5 | 9.2.62 (1120-1210) | 4 | No.1 Mk.2 | No.1 Mk.1 | |
| 6 | 9.2.62 (1500-1545) | 4 | No.1 Mk.1 | No.1 Mk.2 | |
| 7 | 9.2.62 (1550-1635) | 4 | No.1 Mk.2 | No.1 Mk.1 | |

NOTES 1. Trials conducted with aircraft in 1,650 lb. training, internal carriage role with Type 101 simulator.

2. All manoeuvres executed at 434 kts. T.A.S. with 3.4 'g' applied.

3. All trials of Canberra B.16 WT.302.

Appendix IX

Carriage Flights at Lyme Bay Range
Tests of Tails of 25 lb. Practice Bombs No.2
1,650 lb. Role with Simulator

| Carriage Flight No. | Date and Time | Number of L.A.B.S. Manoeuvres | Type of Bomb Carried | | Remarks |
|---------------------|-----------------|-------------------------------|----------------------------|------------------------------|---|
| | | | Port (Inner and Outer) | Starboard (Inner and Outer) | |
| 1 | 11.7.61 0945 | 4 | No.1 Mk.1 Hobbies Tails | No.2 Mk.1 Bulpitt Tails | 'Hobbies' Tail broke up. Plastic cap from 'Bulpitt' Nose blown out. Bomb Bay Deflector damaged by tail (Figs. 14 and 15). |
| 2 | 14.7.61 1015 | 4 | No.2 Mk.1 Bulpitt Tails | No.2 Mk.2 | No damage to tails. |
| 3 | 17.7.61 1115 | 4 | No.2 Mk.2 | No.2 Mk.1 Bulpitt Tails | Successful. |
| 4 | 17.7.61 1445 | 4 | No.2 Mk.1 Bulpitt Tails | No.2 Mk.2 | Successful. |
| 5 | 18.7.61 1030 | 4 | No.2 Mk.2 | No.2 Mk.1 (Bulpitt Tails) | Successful. |

NOTES 1. Trials conducted with aircraft in 1,650 lb. training role, internal carriage with Type 101 simulator.

2. All manoeuvres executed at 434 kts. T.A.S. and 3.4 'g' applied.

3. All trials on Canberra B.15 WH.967.

Appendix X

Ballistic Bombing Releases at Lyme Bay Range
4 x 25 lb. Practice Bombs

| Release Flight No. | Date and Time | Height (ft) | Speed (I.M.N.) | Role | Description of Installation | Bomb Station | Remarks |
|--------------------|---------------|-------------|----------------|--|---|----------------------------|--|
| 1 | 25.5.61 | 25,000 | 0.75 | 2,000 lb. Training (Internal Carriage) | Light Series Bomb Carrier Mk.3 fitted to front section of Auxiliary Bomb Beam using transverse Adaptor Beams. | Practice Bomb Station No.4 | Excessive Bomb Bay disturbance with strikes on Bomb Doors. Erratic behaviour of Bombs at release caused excessive trail resulting in inaccuracy. |
| 2 | 25.5.61 | 25,000 | 0.75 | 2,000 lb. Training (Internal Carriage) | As above. | Practice Bomb Station No.5 | As above. |
| 3 | 6.6.61 | 25,000 | 0.75 | 2,000 lb. Training (Internal Carriage) | Light Series Bomb Carrier Mk.3 attached to lower slip position of Avro Triple Carrier Mk.2 using modified adaptor Mk.3. L.S.B.C. plugged into P.B. Station 5. | Slip Position No.3 | Smooth releases except for small yaw movements and pitch oscillations. |

NOTE: The Bomb Bay Deflector to Mod/Canberra/3154 was fitted for all sorties. The rear section on the auxiliary bomb beam Mk.1 was not fitted.

Appendix XI

Loft Bombing Releases at Lyme Bay Range
4 x 25 lb. Practice Bombs - Internal Carriage

| Release Flight No. | Date and Time | Entry Height (ft) | Entry Speed (Kts. T.A.S.) | Applied "g" | Flight Path Angle | Gyro Angle | Ballistic Data | Role | Description of Installation | Remarks |
|--------------------|----------------|-------------------|---------------------------|-------------|-------------------|------------|----------------|--------------------|-----------------------------|---|
| 4 | 7.6.61 | 500 | 434 | 3.4 | 60° | 60° | None | 2,000 lb. Training | As for release flight No.3 | All releases smooth |
| 5 | 8.6.61 | 500 | 434 | 3.4 | 45° | 45° | None | 2,000 lb. Training | As for release flight No.3 | |
| 6 | 8.6.61 | 500 | 434 | 3.4 | 125° | 125° | None | 2,000 lb. Training | As for release flight No.3 | |
| 7 | 14.6.61 | 500 | 434 | 3.4 | 125° | 125° | None | 1,650 lb. Training | Standard using Piff Adaptor | Tail broke off No.3 Bomb (See Figures 17 and 18). |
| 8 | 15.6.61 (1400) | 500 | 434 | 3.4 | 60° | 60° | None | 1,650 lb. Training | Standard using Piff Adaptor | |
| 9 | 15.6.61 (1700) | 500 | 434 | 3.4 | 45° | 60° | None | 1,650 lb. Training | Standard using Piff Adaptor | |

NOTE: Bomb Bay Deflector to Mod./Canberra/3154 fitted for all sorties.

Appendix XII

Loft Bombing Releases at Luce Bay Range
4 x 25 lb. Practice Bombs - Internal Carriage

| Release Flight No. | Date and Time | Entry Height (Ft) | Entry Speed (Kts. T.A.S.) | Applied "G" | Flight Path Angle | Gyro Angle | Ballistic Data | Role | Description of Installation | Remarks |
|--------------------|-------------------|-------------------|---------------------------|-------------|-------------------|------------|----------------|--------------------|-----------------------------|--|
| 10 | 16.6.61 (1050) | 500 | 434 | 3.4 | 45° | 47.8° | Yes | 1,650 lb. Training | Standard using Piff Adaptor | |
| 11 | 19.6.61 (1100) | 500 | 434 | 3.4 | 60° | 63.6° | Yes | 1,650 lb. Training | " | Hang up on last bomb. Auto-selector jumped from 3 to 1 instead of stopping at 4. |
| 12 | 11.7.61 (0950) | 500 | 434 | 3.4 | 125° | 125° | Yes | 1,650 lb. Training | " | Abortive. |
| 13 | 13.7.61 | 500 | 434 | 3.4 | 125° | 125° | Yes | 1,650 lb. Training | " | Abortive. |
| 14 | 18.7.61 (1500) | 500 | 434 | 3.4 | 125° | 125° | Yes | 1,650 lb. Training | " | Hang up similar to release flight No. 11 above. |

Appendix XIII

Loft Bombing Releases at Mainflect Range
4 x 25 lb. Practice Bombs 1,650 lb. and 2,000 lb. Roles
External Carriage

| Flight Run | Date | Take-Off | Release Angle | Gyro Angle | Type of Practice Bomb | Windspeed and Direction | Barometric Pressure | R.A.S. | Calculated Temperature at 500 ft. C° | Timer Setting | Aircraft Heading | Radial Error | | Remarks |
|------------|------|----------|---------------|------------|-----------------------|-------------------------|---------------------|--------|--------------------------------------|---------------|------------------|--------------|---------------|--|
| | | | | | | | | | | | | (Yds) | Bearing (Deg) | |
| 15 | 1 | 24.7.61 | 16.30 | 45° | 47.8° | No.1 Mk.1 | 280/12 | - | - | 16.8 | 046 | 75 | 340 | Wide Bomb |
| | 2 | | | | | | | | | | " | 240 | 094 | |
| | 3 | | | | | | | | | | " | 925 | 165 | |
| | 4 | | | | | | | | | | | 305 | 214 | |
| 16 | 1 | 25.7.61 | 09.30 | 60° | 63.6° | No.1 Mk.1 | 190/14 | - | - | 19.0 | Not known | 770 | 315 | Poor Visibility Pilot had difficulty in maintaining heading by compass |
| | 2 | | | | | | | | | | | 1270 | 294 | |
| 17 | 1 | 31.7.61 | 13.45 | 60° | 63.6° | No.1 Mk.1 | - | - | - | 19.0 | 046 | 240 | 345 | |
| | 2 | | | | | | | | | | " | 430 | 278 | |
| | 3 | | | | | | | | | | " | 630 | 251 | |
| | 4 | | | | | | | | | | " | 425 | 205 | |
| 18 | 1 | 3.8.61 | 09.30 | 45° | 47.8° | No.2 Mk.1 | 10 kt. Tail | 436 | +10° | 16.6 | 046 | 370 | 235 | |
| | 2 | | | | | | | | | | " | 270 | 283 | |
| | 3 | | | | | | | | | | " | 290 | 158 | |
| | 4 | | | | | | | | | | " | 425 | 114 | |
| 19 | 1 | 9.8.61 | 09.54 | 60° | 63.6° | No.2 Mk.1 | 240/20 | 430 | +18° | 17.4 | 046 | 325 | 255 | Hang-up Double Release. Auto-Selector Type 'A' |
| | 2 | | | | | | | | | | " | 345 | 240 | |
| | 3 | | | | | | | | | | " | - | - | |
| | 4 | | | | | | | | | | " | 335 | 241 | |
| | 5 | | | | | | | | | | " | 445 | 237 | |
| 20 | 1 | 10.8.61 | 10.10 | - | 125° | No.2 Mk.1 | 210/10 | - | +20° | 2.0 | 046 | 95 | 089 | Speed incorrect on this run |
| | 2 | | | | | | | | | | " | 150 | 258 | |
| | 3 | | | | | | | | | | " | 250 | 207 | |
| | 4 | | | | | | | | | | " | - | - | |

Appendix XIII (Cont'd)

- 2 -

| Flight Run | Date | Take-Off | Release Angle | Gyro Angle | Type of Practice Bomb | Windspeed and Direction | Barometric Pressure | R.A.S. | Calculated Temperature at 500 ft. C° | Timer Setting | Aircraft Heading | Radial Error | | Remarks |
|------------|------|----------|---------------|------------|-----------------------|-------------------------|---------------------|--------|--------------------------------------|---------------|------------------|----------------|---------------|---------------------------|
| | | | | | | | | | | | | Distance (Yds) | Bearing (Deg) | |
| 21 | 1 | 11.8.61 | 09.45 | - | 125° | No.1 Mk.1 | 090/10 | 1014 | 432 | +14° | 2.0 | 046 | 385 | 230 |
| | 2 | | | | | | | | | | | " | 450 | 243 |
| | 3 | | | | | | | | | | | " | 445 | 241 |
| | 4 | | | | | | | | | | | " | 520 | 229 |
| | | | | | | | | | | | | | | 3-4 kts. slow at pull-up. |

Appendix XIV

Loft Bombing Releases at Main Fleet Range
4 x 25 lb. Practice Bombs 1,650 lb. Role
Internal Carriage

| Flight Run | Date | Take-Off | Release Angle | Gyro Angle | Type of Practice Bomb | Windspeed and Direction | Barometric Pressure | R.A.S. | Calculated Temperature at 500 ft. C° | Timer Setting | Aircraft Heading | Radial Error | | Remarks |
|------------|---------|----------|---------------|------------|-----------------------|-------------------------|---------------------|--------|--------------------------------------|---------------|------------------|----------------|---------------|---|
| | | | | | | | | | | | | Distance (Yds) | Bearing (Deg) | |
| 22 | 11.8.61 | 13.50 | - | 125° | No. 2 Mk. 1 | 035/10 | 1016 | 430 | +15° | 2.0 | 046 | 660 | 200 | |
| | 2 | | | | | | | | | | " | 590 | 207 | |
| | 3 | | | | | | | | | | " | 675 | 198 | |
| | 4 | | | | | | | | | | " | 565 | 208 | |
| 23 | 17.8.61 | 10.30 | - | 125° | No. 1 Mk. 1 | 340/16 | 1018 | 432 | +16° | 2.0 | 046 | 560 | 170 | Wide |
| | 2 | | | | | | | | | | " | 760 | 170 | |
| 24 | 17.8.61 | 14.30 | 60° | 63.6° | No. 1 Mk. 1 | 360/10 | 1018 | 430 | +19° | 21.2 | 046 | 540 | 347 | |
| | 2 | | | | | | | | | | " | 185 | 033 | |
| | 3 | | | | | | | | | | " | 275 | 040 | |
| | 4 | | | | | | | | | | " | 205 | 025 | |
| 25 | 18.8.61 | 14.00 | 45° | 47.8° | No. 1 Mk. 1 | 250/18 | 1008 | 429 | +18° | 16.0 | 046 | 145 | 097 | Double Release Auto-Selector Type 'P' |
| | 2 | | | | | | | | | | " | 225 | 082 | |
| | 3 | | | | | | | | | | " | 125 | 199 | |
| | 4 | | | | | | | | | | " | 115 | 104 | |
| 26 | 23.8.61 | 10.30 | 45° | 47.8° | No. 1 Mk. 1 | 250/12 | 1018 | 430 | +16° | 16.6 | 046 | 185 | 244 | |
| | 2 | | | | | | | | | | " | 190 | 270 | |
| | 3 | | | | | | | | | | " | 260 | 246 | |
| | 4 | | | | | | | | | | " | 40 | 185 | |

Loft Bombing Results at Mainfleet RangeSummary of Bomb Plots
25 lb. Practice Bombs

| Gyro Angle (Degrees) | Mean Errors (Yards) | | Standard Deviations (Yards) | |
|-------------------------|------------------------|-----------|--------------------------------|------|
| | Range | Line | Range | Line |
| 47.8 | 60 undershoot | 40 right | 170 | 170 |
| 63.6 | 90 undershoot | 130 left | 300 | 170 |
| 125 | 380 undershoot | 100 right | 200 | 190 |

NOTES

1. A constant timer setting was maintained and in forward lofts the timer setting was corrected for approach wind.
2. The gyro setting used in "over the shoulder" attacks was the greatest that could be foreseen in L.A.B.S. training and not the optimum for the condition encountered, this gyro setting of 125° would be expected to produce undershoots of about 400 yards.

SECRET.

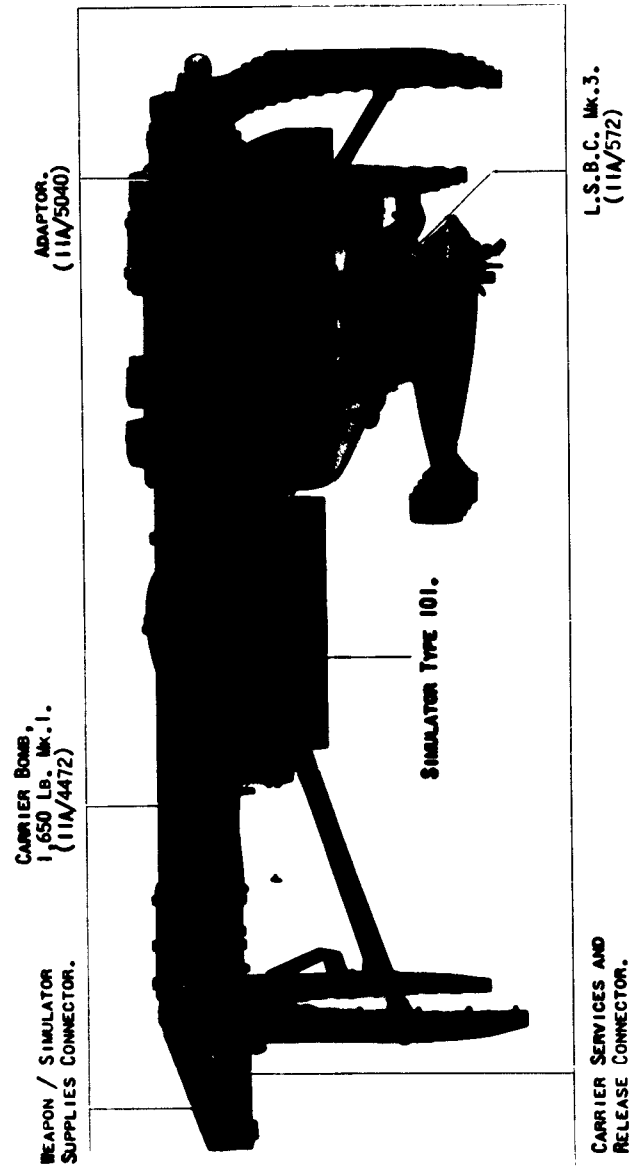


FIG. 1.

FIG. 1. INTERNAL CARRIAGE OF 25 LB. PRACTICE BOMBS AND SIMULATOR TYPE 101. IN 1,650 LB. ROLE.

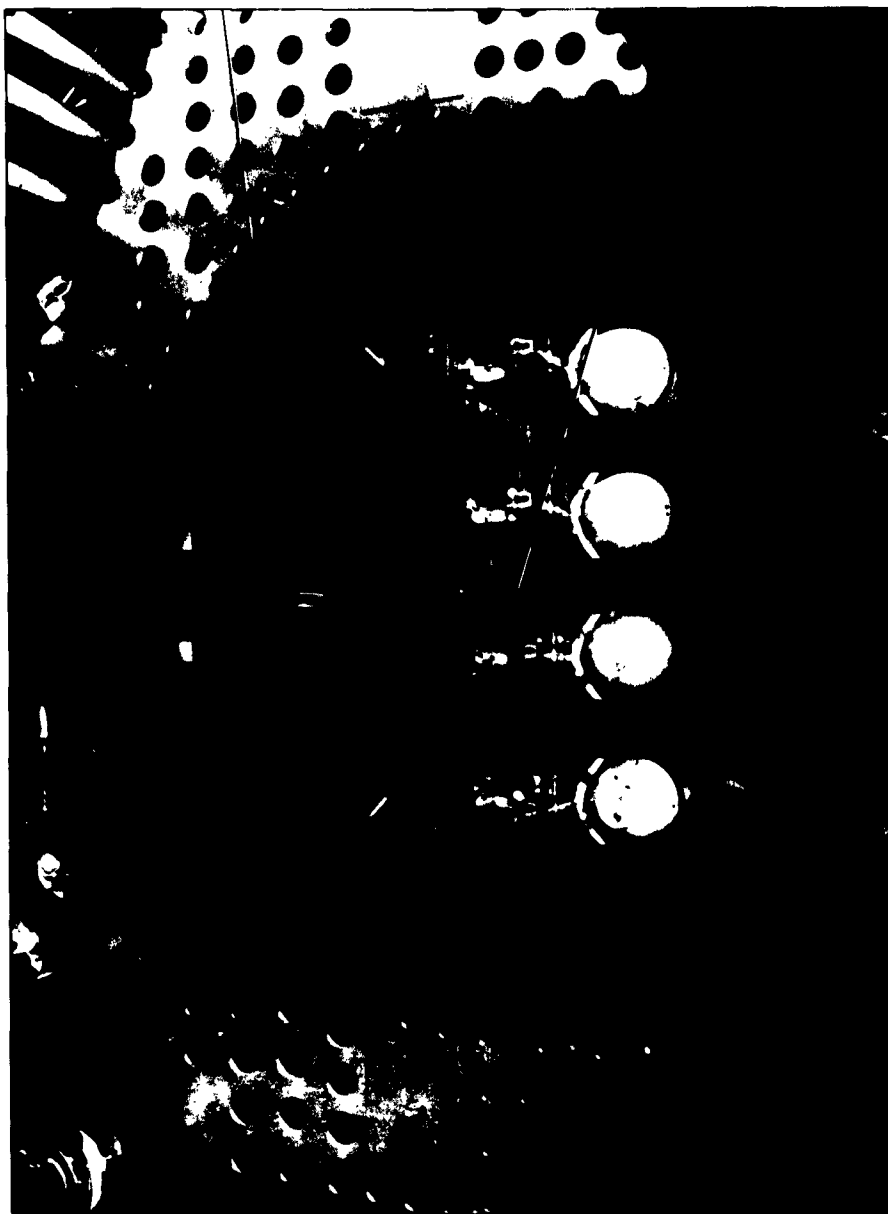
SECRET.

FIG. 2.

SECRET.

ADAPTOR.
(11A/5040)

TYPE 'C' AUTO
SELECTOR SWITCH.



FRONT VIEW OF 1,650 LB. TRAINING INSTALLATION - INTERNAL CARRIAGE.

FIG. 2.

SECRET.

1,650 LB. BOMB
CARRIER BAFFLES.

FIG. 3.

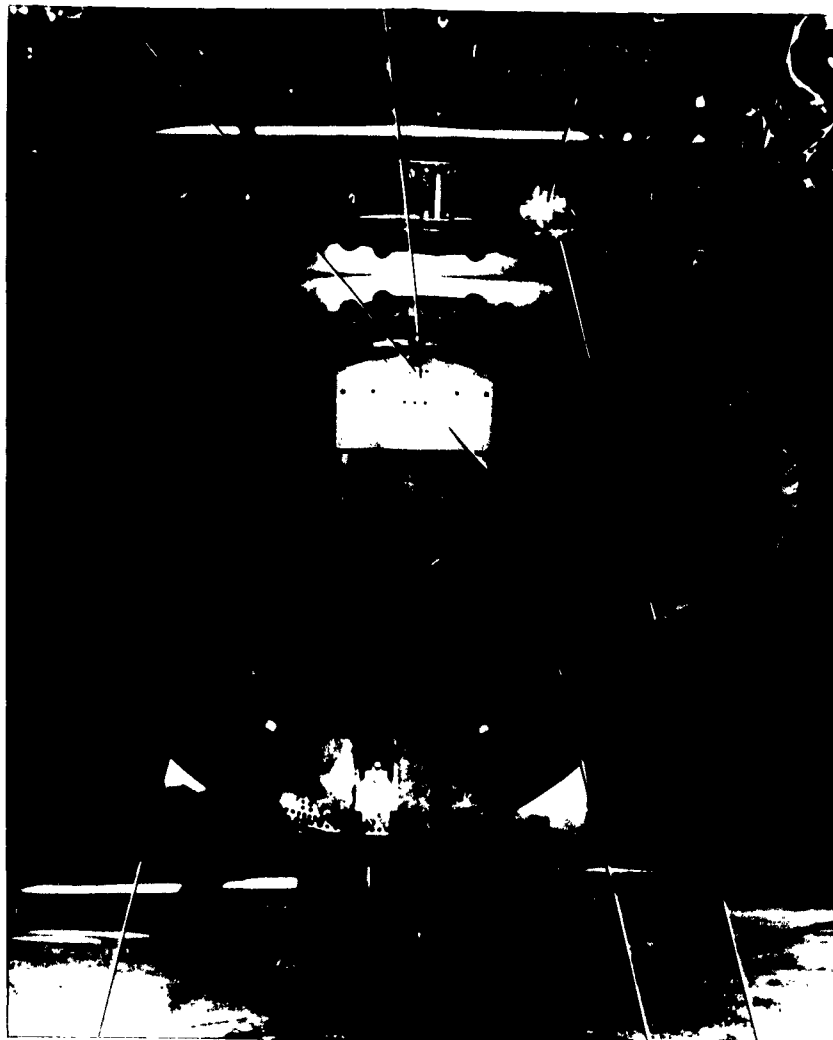
SECRET.

SIMULATOR ARM AND
PIP PIN.

"STORE GONE" PLUNGER
AND "DASH POT".

WEAPON SUPPLIES
CONNECTOR.

AIRCRAFT
SUPPLY
LOOM.



1,650 LB. BOMB
CARRIER BAFFLES.

SIMULATOR
TYPE 101.

BOMB CARRIER
SUPPLIES
CONNECTOR.

FIG. 3.

REAR VIEW OF 1,650 LB. TRAINING INSTALLATION -
INTERNAL CARRIAGE - SHOWING SIMULATOR TYPE 101.

SECRET.

SECRET.

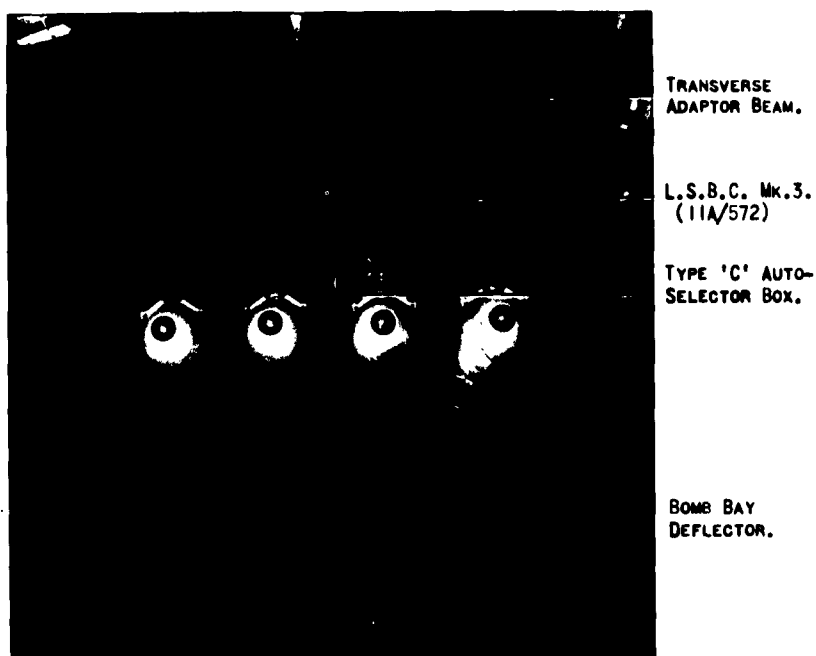


FIG. 4.

INTERNAL CARRIAGE OF 25 LB. PRACTICE BOMBS IN 2,000 LB. ROLE, USING TRANSVERSE ADAPTORS. (FRONT VIEW).

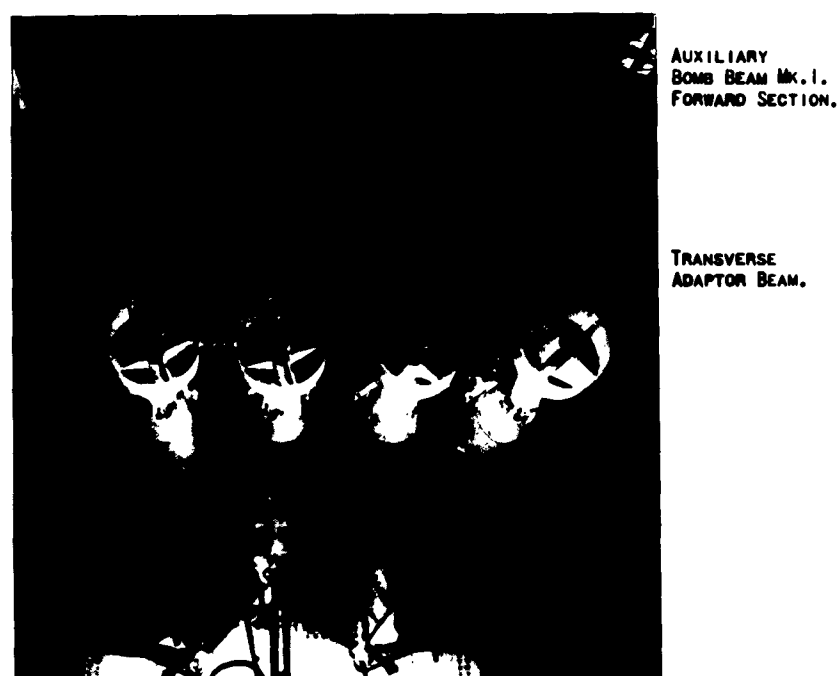


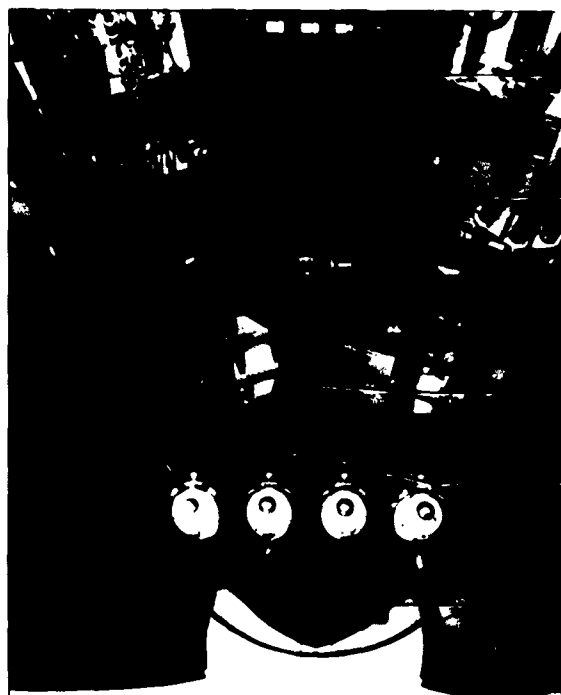
FIG. 5.

INTERNAL CARRIAGE OF 25 LB. PRACTICE BOMBS IN 2,000 LB. ROLE, USING TRANSVERSE ADAPTORS. (REAR VIEW).

SECRET.

SECRET.

FIGS. 6, AND 7.



AUXILIARY
BOMB BEAM Mk.1.
FORWARD SECTION.

ARMAMENT SUPPLY
CABLE LOOM.

AVRO TRIPLE
BOMB CARRIER.

MODIFIED Mk.3.
ADAPTOR.

L.S.B.C. Mk.3.
(11A/572)

BOMB BAY
DEFLECTOR.

FIG. 6.
INTERNAL CARRIAGE OF 25 LB. PRACTICE BOMBS
IN 2,000 LB. ROLE, USING SPECIALLY MODIFIED
Mk.3. ADAPTOR. (FRONT VIEW).

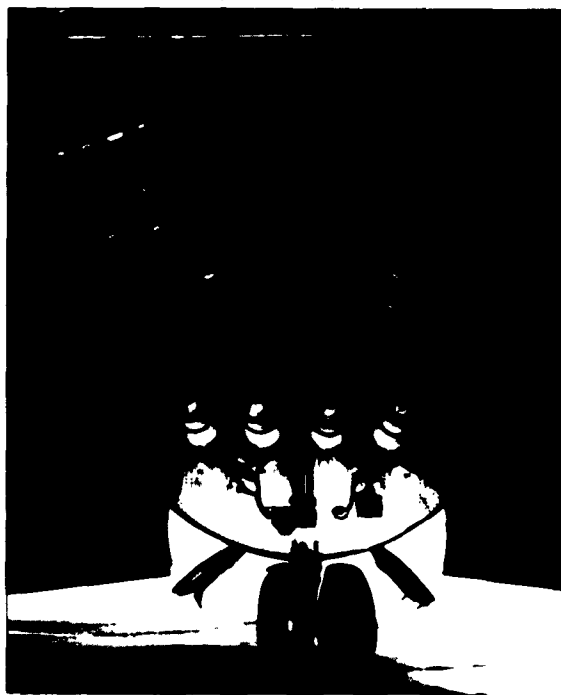


FIG. 7.
INTERNAL CARRIAGE OF 25 LB. PRACTICE BOMBS
IN 2,000 LB. ROLE, USING SPECIALLY MODIFIED
Mk.3. ADAPTOR. (REAR VIEW).

SECRET.

A. & A.E.E. 1675.

SECRET.

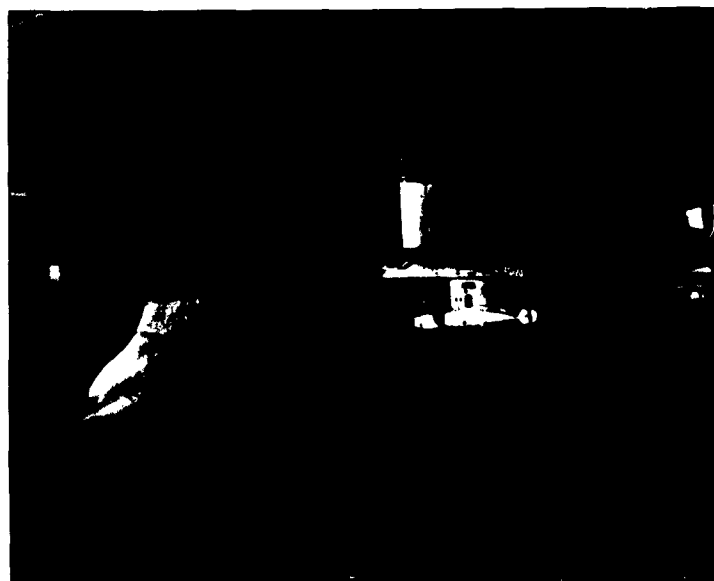


FIG. 8. GENERAL VIEW OF EXTERNAL CARRIAGE INSTALLATION, IN 1,650 LB. AND 2,000 LB. ROLES.



FIG. 9.
REAR VIEW OF EXTERNAL PRACTICE BOMB CARRIER AND PYLON.

SECRET.

SECRET.

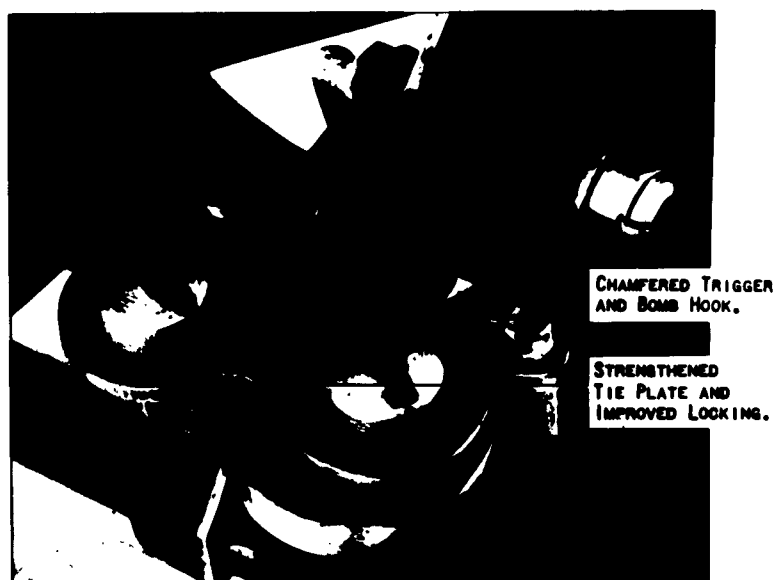


FIG. 10. CLOSE-UP OF RELEASE UNIT TYPE 'A' Mk. 3.
INCORPORATING MOD. ARM. 3106.

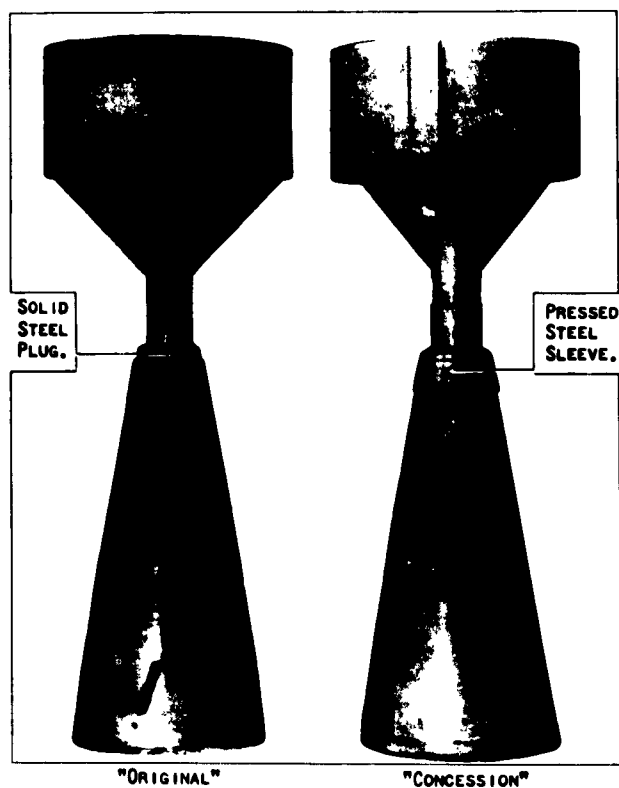


FIG. 11. DETAILS OF NO. 1, Mk. 1, TAIL UNITS.-
"ORIGINAL" AND "CONCESSION" DESIGN.

SECRET.

SECRET.

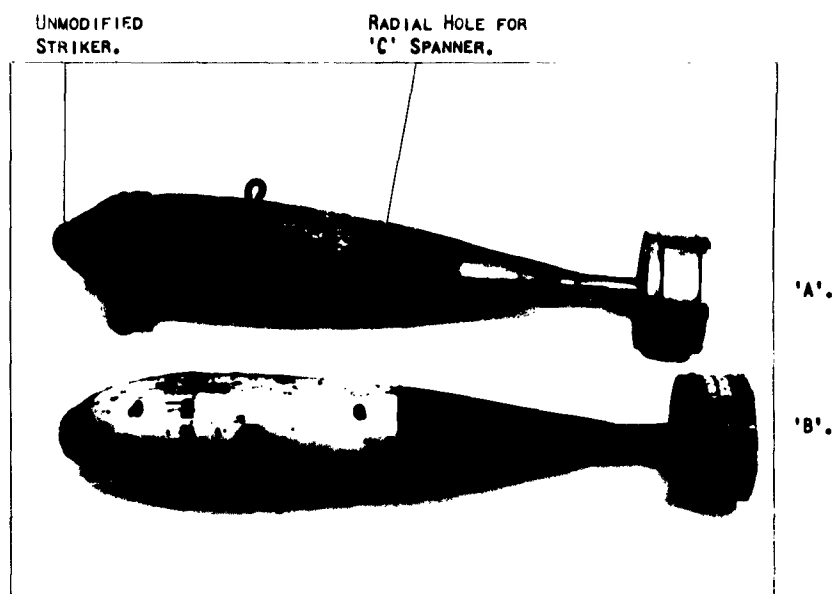


FIG. 12. (A) BOMB, PRACTICE, AIRCRAFT, S/F, 25 LB. No.1.Mk.2.
(B) BOMB, PRACTICE, AIRCRAFT, S/F, 25 LB. No.2.Mk.2.

SPOT WELDS.



FIG. 13. DETAILS OF Mk.2. PRACTICE BOMB TAIL.

SECRET.

FIG. 14.

SECRET.

INSTRUMENTATION
SWITCHES.

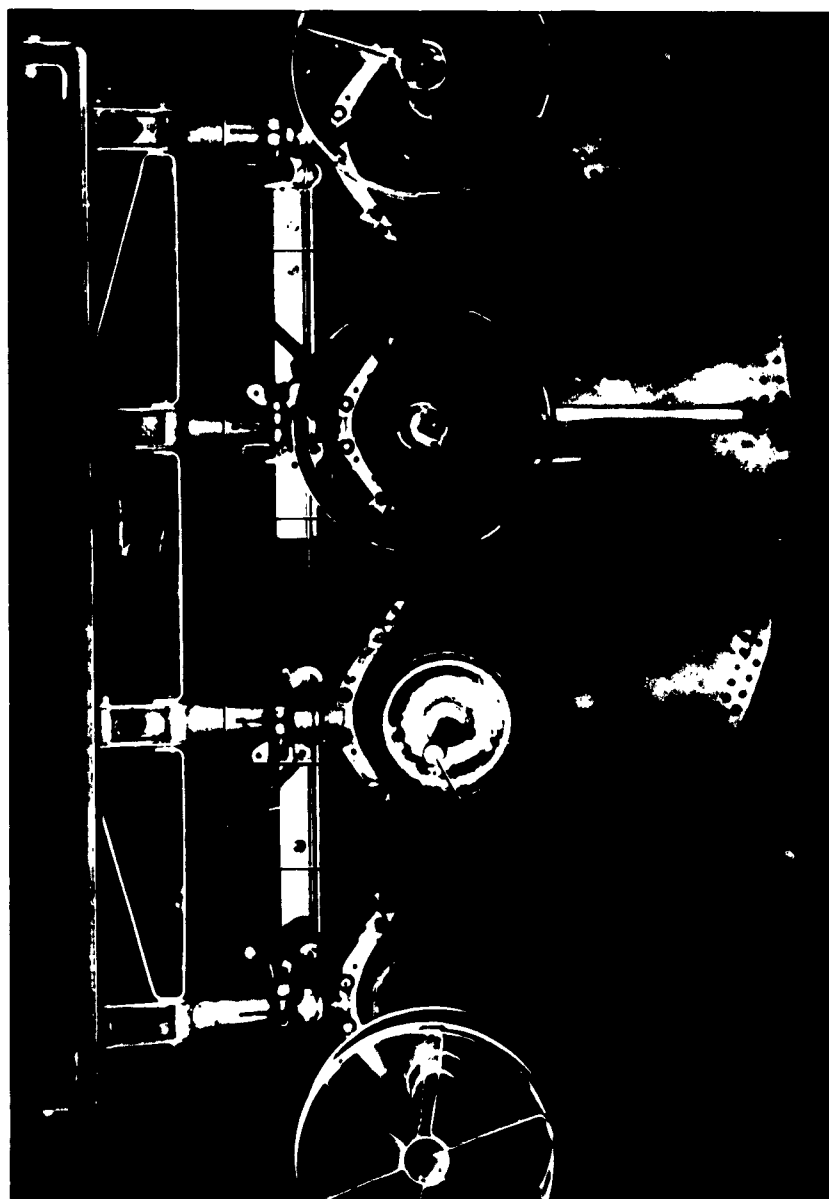


FIG. 14. BOMB, PRACTICE, 25 LB.S/F, No.2.Mk.1.- FAILURE OF "HOBBIES" TAIL.

EXPERIMENTAL FLANGED
CRUTCH ADAPTOR.

SECRET.

DETONATOR
POCKET.

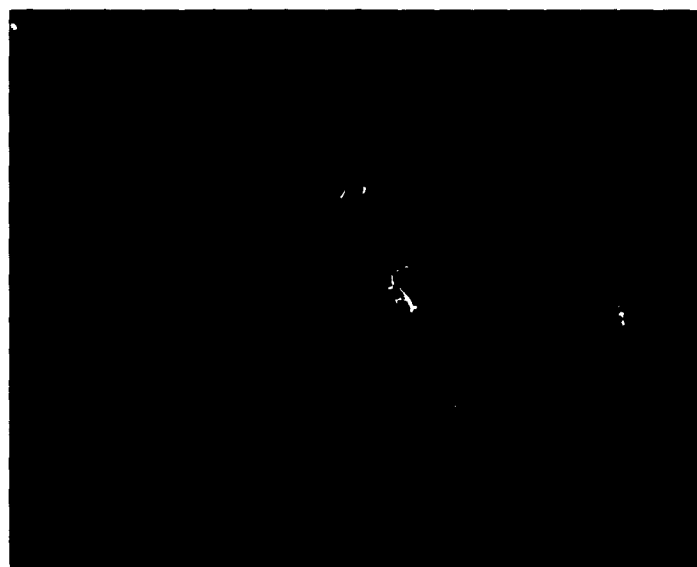
SECRET.

CINE CAMERA TO PHOTOGRAPH
PRACTICE BOMB TAILS.



REPAIRED
EARLIER
DAMAGE.

FIG. 15. GENERAL VIEW OF DAMAGE TO BOMB-BAY DEFLECTOR BY THE
BY THE TAIL OF A NO. 2 MK. 1. (HOBBIES) PRACTICE BOMB.



UPPER
DEFLECTOR
PANEL.

NUTS AND
FIXED BOLTS
SECURING
PANELS.

LOWER
DEFLECTOR
PANEL.

FIG. 16. CLOSE-UP OF DAMAGE TO BOMB-BAY DEFLECTOR.

SECRET.

SECRET.

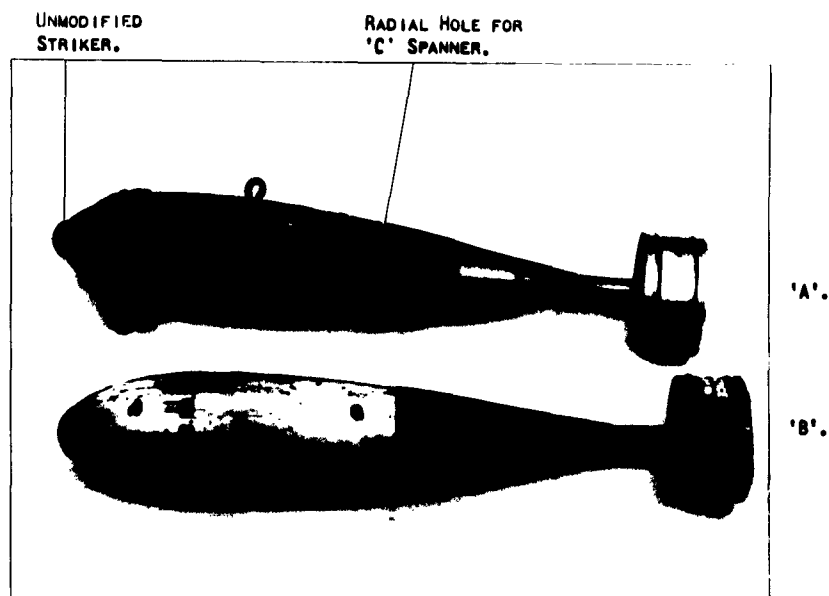


FIG. 12. (A) BOMB, PRACTICE, AIRCRAFT, S/F, 25 LB. No.1.Mk.2.
(B) BOMB, PRACTICE, AIRCRAFT, S/F, 25 LB. No.2.Mk.2.

SPOT WELDS.



FIG. 13. DETAILS OF Mk.2. PRACTICE BOMB TAIL.

SECRET.

SECRET.

FIGS. 19, AND 20.

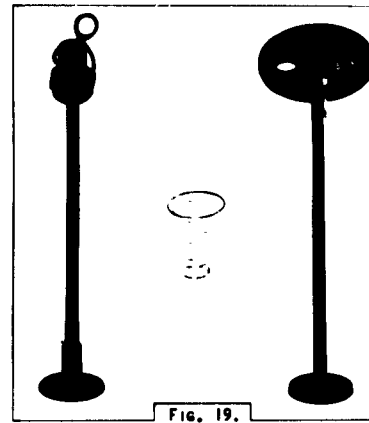


FIG. 19.

COMPARISON OF SAFETY DEVICES
MODIFIED NO. 1, AND EXISTING NO. 2. PRACTICE BOMB.

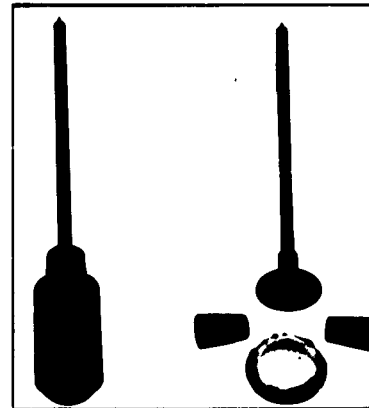


FIG. 20.

DETAILS OF PROPOSED MODIFICATION TO NO. 1. PRACTICE BOMB.
(SEE APPENDICES 'D', 'E', AND 'F'.)

SECRET.

A. & A.E.E. 16755.

SECRET.

'A'.

'B'.

APPROX. 0-10 SEC. INTERVALS.

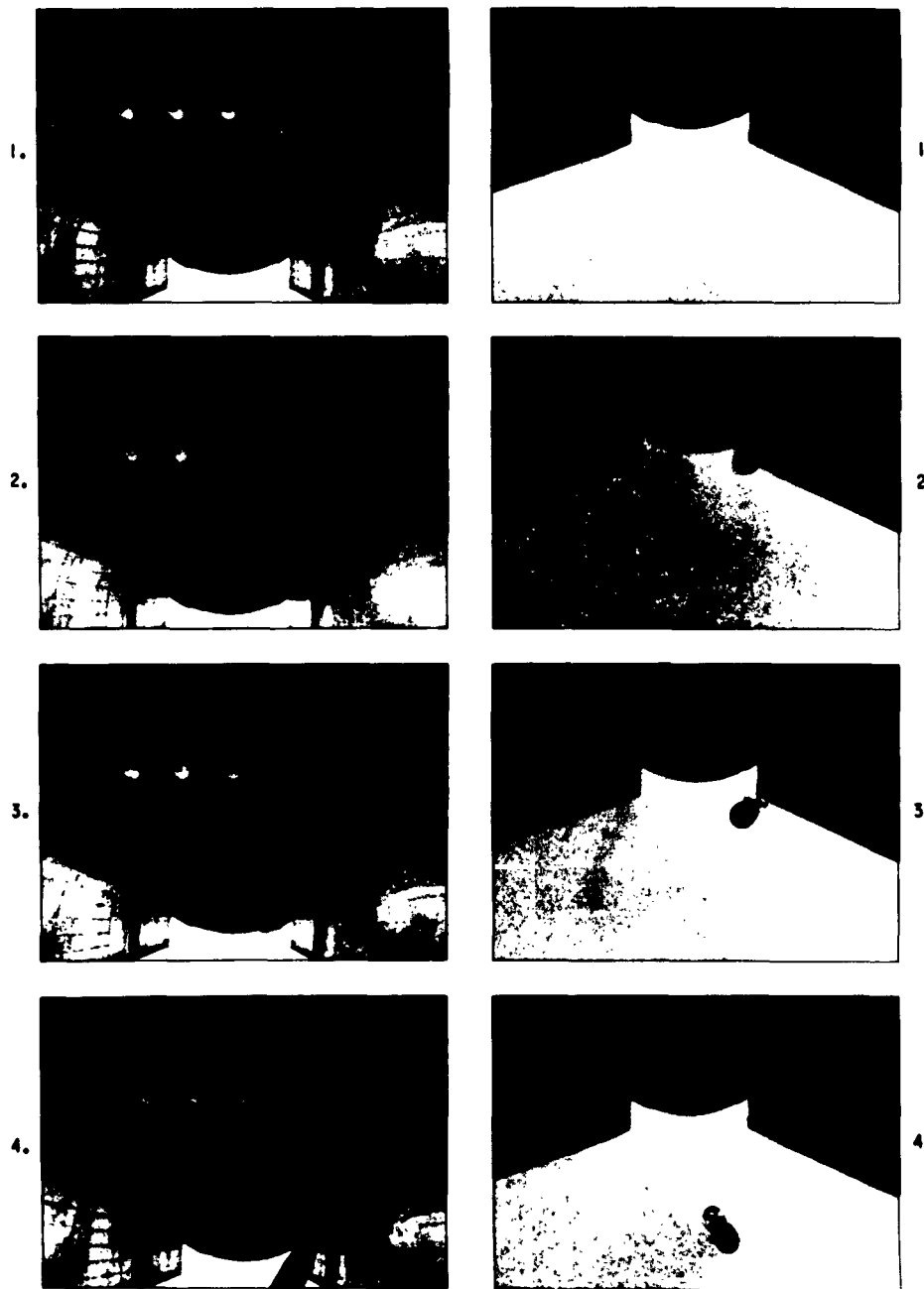


FIG. 21.

COMPARISON OF RELEASE CONDITIONS. (FROM FRONT OF BOMB BAY.)

'A' INTERNAL CARRIAGE ON AUXILIARY BEAM.

'B' INTERNAL CARRIAGE AT LOWER POSITION OF AVRO TRIPLE CARRIER.

SECRET.

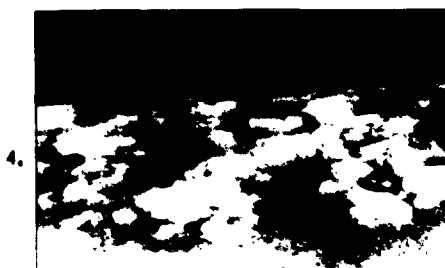
A. & A.E.E. 16755.

S E C R E T .

'A'.

'B'.

APPROX. 0.10 SEC. INTERVALS.



NOTE EXCESS TRAIL OF BOMB.

FIG. 22.

COMPARISON OF RELEASE CONDITIONS. (VIEWED FROM WING TIP CAMERAS.)

'A' INTERNAL CARRIAGE ON AUXILIARY BEAM. APPROX. 0.10 SEC. INT.
 'B' INTERNAL CARRIAGE AT LOWER POSITION OF AVRO TRIPLE CARRIER.

S E C R E T .

A. & A.E.E. 16755.



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Date of Search: 19 May 2009

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Title: Canberra B. MK. 15 – Clearance IN 1,650 LB. and 2,000 LB. Training Roles Using
25 LB. Practice Bomb
Availability Open Document, Open Description, Normal Closure before FOI Act: 30 years
Former reference (Department), 861/10 Pt 5
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