

Group 1—THE SYSTEM

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Introduction

1. The Navigation and Bombing System Mk. 1 (A.R.I.5810), described in A.P.2894K, Vol. 1, is an airborne equipment for use when the aircraft is operating beyond the range of ground-based aids and comprises a navigation and bombing computer (N.B.C. Mk. 2), a range-finding radar (H2S Mk. 9A), and a visual sight attachment (V.S.A.), the latter on aircraft pre-Mod. 1673 only.

2. It is convenient in detailing the facilities which this equipment offers, to consider it progressively in the various roles to which it can be adapted. First, the equipment can be considered as a navigation aid consisting of dead reckoning navigation computing combined with the radar. The addition of ballistic computing to this arrangement provides facilities for "blind" bombing. Additional facilities become available by the addition to the navigational and "blind" bombing arrangement, of a visual bomb sight and its allied computing. In this latter arrangement the "blind" and "visual" systems are synchronized and operate under a common system of control. Finally the equipment can be used as a purely "visual" bombing arrangement permitting "visual" bombing in which the radar takes no part.

3. This conception of the equipment is adopted merely for convenience of description although in actual operation there may

be no such well defined division of operating roles.

4. The air mileage unit (A.M.U.) and the gyro-magnetic compass (G.M.4B) are used to feed information into the equipment. Control of the aircraft can be either manual or automatic as automatic pilot Mk. 10 can be coupled directly into the system.

Navigation computing

5. The dead-reckoning navigation computing performs the functions of a ground position indicator. It is designed to relieve the navigator of the calculations involved in the usual D.R. methods, by providing a continuous and automatic ground plot of the aircraft's present position in flight and also an indication of its current motion.

6. The navigation computer is fed with inputs representing true air speed from the A.M.U. and compass heading from the G.M.4B. From this information and from N/S and E/W components of wind velocity, set into the equipment either manually or semi-automatically, aircraft track and ground speed are computed and displayed. From N/S and E/W components of ground velocity, the aircraft's ground displacement (N/S and E/W) from a starting point is also calculated. The present position is recorded in terms of latitude and longitude, except in position fixing, when the position recorded is that of the fixing point.

Ballistic computing

7. The ballistic computing is that part of the equipment which calculates the likely behaviour of a falling bomb from information relating to the bomb characteristics and the current motion of the aircraft.

8. Ballistic information relevant to the type of bomb to be dropped is fed, from a short length of 35 mm. cine film into the calculator, Type 3, Mk. 1, which incorporates a height capsule, the casing of which is connected to the static air line for the cabin pressure controller. The equipment then calculates the required track to the release point, and provides steering signals to the pilot's heading indicator Mk. 1 and, through the bombing coupling unit, to the automatic pilot Mk. 10. Signals to open the bomb doors and initiate bomb release are also provided.

9. During the bombing run, a camera will photograph the P.P.I. display on the H2S indicating unit, Type 301, at intervals of 8 seconds. At bomb release, the film is marked automatically and the P.P.I. will continue to be photographed until the bombing run is terminated by switching off BOMB.

Time-of-fall computing

10. For use when the alternative store is carried, the calculator, Type 7, Mk. 1, or Mk. 2a (post Mod. 2397) accurately deter-

mines the time-of-fall of a bomb through a given height. The various factors affecting the computing are set into the computer mechanically, some by a manual setting of a dial or a curve to the appropriate value and the others by the movement of a dial to balance a voltage input from the main equipments of the N.B.C. Mk. 2.

11. These mechanical movements are added in differentials and the output is shown on a dial (graduated in seconds) and is also transmitted to the timing mechanisms of the bomb.

12. A remote control unit Type 7, Mk. 1, is provided to enable the 2nd pilot of the aircraft to set the correct height and height rate into the calculator Type 7, although it may be mounted some distance away. (Post Mod. 2397, this facility is entirely automatic and a Remote Control Unit Type 7, M.2A is fitted to the radio crate.)

Visual navigation facilities (Pre-Mod. 1673 only)

13. The navigational facilities available with the "blind" system can, in conditions of suitable visibility, be supplemented by the inclusion of "visual" computing and a visual sighting head (V.S.A.). In this arrangement wind finding and position fixing are possible using visually selected ground aiming points.

14. The visual sighting head incorporates a reflector glass through which the operator can view the ground and from which is reflected the collimated image of a graticule. The graticule takes the form of a dagger with its long arm pointed along the aircraft's track, the point of reference being the intersection of the arms of the dagger. The sighting head is suitably stabilized against the pitch and roll motion of the aircraft and the reflector glass can be rotated to adjust the line of sight:—

(1) About a vertical axis passing through the aircraft, for the drift angle.

(2) About a horizontal axis passing through the aircraft and parallel to the horizontal projection of the long arm of the graticule, for the tilt angle, and

(3) About an axis passing through the aircraft and perpendicular to the tilted plane, for the sighting angle.

◀ Note . . .

Post Mod. 1673, the visual sighting aid will not be fitted. ▶

A.R.I.5910

◀ 15. Aircraft (B/K/PR Mk. 1) converted to the P.R. role will have SRIM 1896 incorporated. This introduces the A.R.I.5910 in lieu of the A.R.I.5810. The 'prox fusing' switch on the p.d. box being relabelled and used for the power supplies. No other details of the A.R.I.5910 installation will be given in this publication. ▶

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