BRINGING THEM HOME BLIND—(1)

It is the object of this series of articles to give an appreciation of the problems of Blind Approach, Homing and Traffic Control in Naval Aviation.

There is a requirement of high priority for a system to reduce the loss of aircraft and crews due to the inability to land in low visibility. This is obviously both a peacetime and wartime requirement. Closely interlinked with this requirement is the problem of Traffic Control and Homing.

The principal staff requirement for " Homing and Blind Approach of Aircraft " is to bring groups or individual aircraft (after a strike) on to the deck of a moving aircraft carrier in all types of visibility (with special reference to low visibility).

The rate of deck landings must not be reduced more than is absolutely necessary. It must be possible to identify individual aircraft from groups, which may be as large as 100 aircraft when several aircraft carriers are working in company (e.g. the final stages of the Pacific war).

A concensus of flying opinion shows that pilots, generally, prefer to be controlled from the ship rather than read an additional number of instruments incorporated in their aircraft. Further, it is an already established aim that the quality of radio equipment carried in Naval Aircraft must be reduced to an absolute minimum, and the fatigue of pilots at the end of a long flight is a most important factor in the failure of systems which use airborne instruments or require any mental effort on the part of the pilot.

Fundamental research is proceeding at Naval Establishments upon radar and radio aids to meet the highly complex problem. Ground Controlled Approach has had a certain amount of success and more is expected when Type 962 is installed in H.M.S. *Illustrious* for extensive trials.

THE PROBLEM

The problem can be divided into four sections to break the traffic down into proportions easily workable by the facilities available at various stages of the approach.

(a) *Homing*

Bringing any number of groups from the target area to a point from which aircraft from individual carriers may be controlled to approach their parent ships.

In the Pacific, this point was over a Picket ship (destroyer or cruiser) and, for the purpose of this article, is called the " Picket Marshalling Position."

(b) *Air Direction*

Bringing the individual ship's groups from the " Picket Marshalling Position " to a point approximately 10-15 miles from the carrier (termed " Carrier Marshalling Position " for ease of reference).

(c) *Traffic Control*

Selection of individual flights from those at the " Carrier Marshalling Position " and controlling them into the " Approach Waiting Position " (a point approximately 6-8 miles astern of each carrier).

(d) *Final Approach Control*

Controlling the aircraft from the " Approach Waiting Position " to proceed singly down the " Approach Lane " to the deck or within sight of it in such a position that a " bat landing " can be made.

Note.—It would seem necessary for aircraft to proceed to the " Final Approach Waiting Position " in good visibility ; however, adopting the same procedure in all visibility conditions would give practice in a system whose very success depends upon the amount of practice obtained.

Taking each section separately, the apparatus available (or being developed) for use is as follows:—

(a) *Homing.*

(i) YE/YG Beacon with ZBX receiver in the aircraft.
(ii) Type 251 Radar beacon.
(iii) X-band Beacon (To replace Type 251).
(iv) Rebecca with Eureka in some Naval aircraft working from shore stations only.
(v) D/F Bearing—For emergency use. Reception through normal R/T from ship's D.F.

(b) *Air Direction and Traffic Control*

Normal radio communication apparatus in the aircraft with R/T control from A.D.R. or Talk-down Control Room. The Talk-down Control Room utilises a system of displays combining information from " S " and " X " band radar with V.H/F.D/F.

(c) *Final Approach*

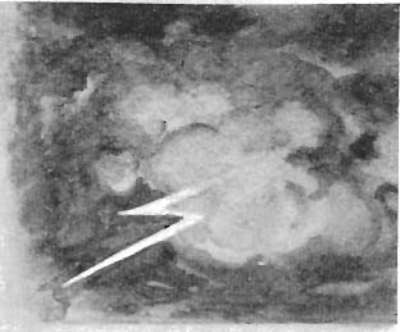
(i) Type 93—with apparatus in the aircraft utilising the " Lorenz " principle.
(ii) Type 961.
(iii) Type 962.

Considering the future high speed and pilotless aircraft, labour and financial limitations must be borne in mind. A complete system and a standard piece of equipment to fulfil the requirements of that system is one aim.

It is considered the cost and labour involved in producing, modifying and installing the many different types of equipment at present in service for this commitment, can be considerably reduced if a definite decision is made to develop one line of thought. The following might be considered as an answer to the problem :

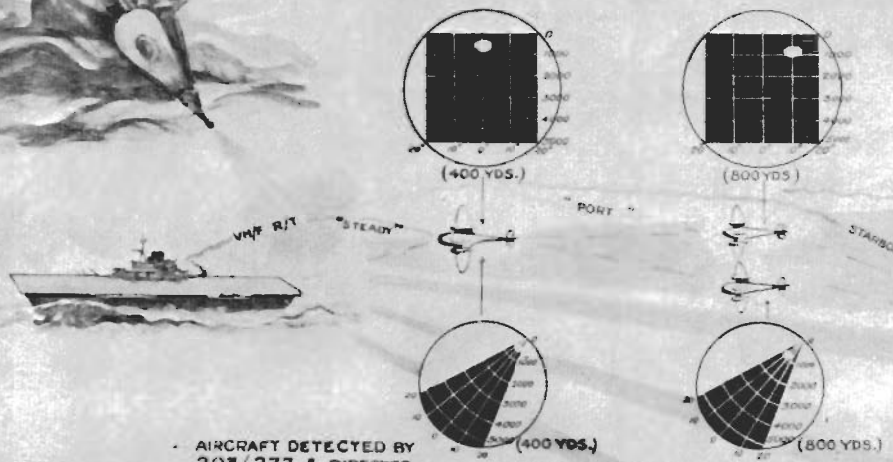
RADAR TYPE 962X (GCA)

B SCOPE PRESENTATION AS VIEWED IN THE FLYING CONTROL ROOM

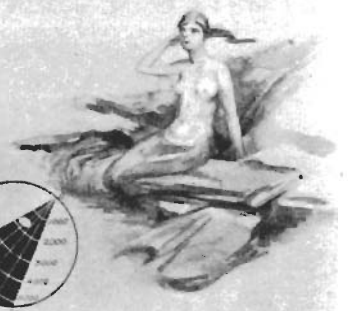


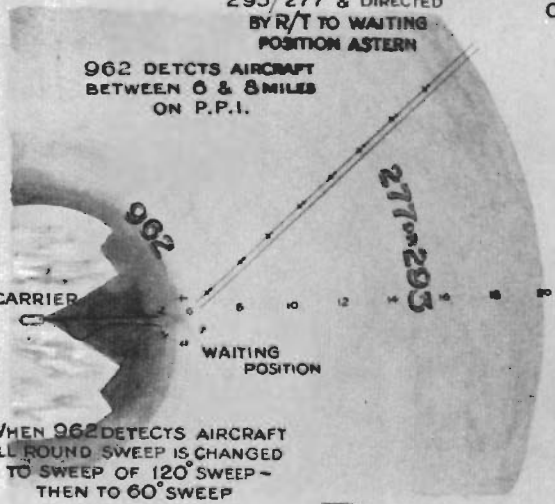
FINAL STAGES *of the* APPROACH

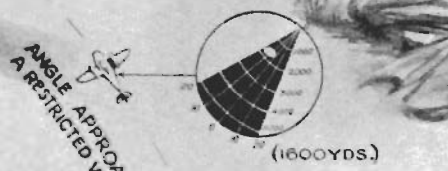
DIRECT APPROACH FOR AIRCRAFT WITH CLEAR VIEW AHEAD e.g. VAMPIRES, JETS.



OFF CENTRE P.P.I. AS VIEWED IN THE FLYING CONTROL ROOM

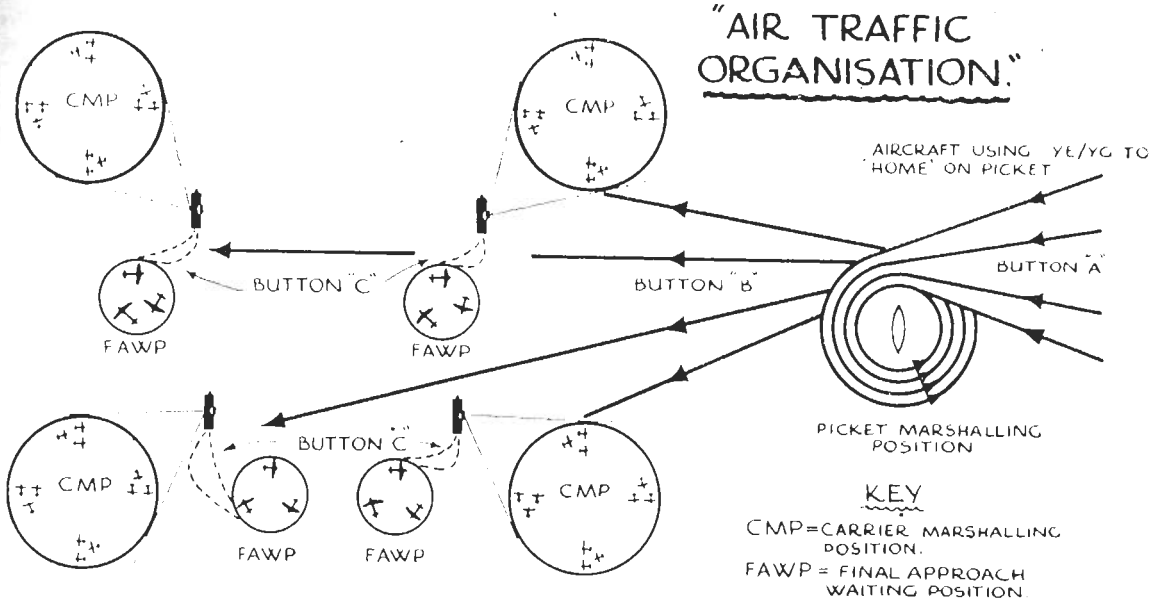






ANGLE APPROACH FOR SMALLER AIRCRAFT WITH A RESTRICTED VIEW AHEAD e.g. HELLCATS & CORSAIRS

EARLY STAGES *of the* APPROACH



(a) *Homing*

Concentration on Type YE/YG beacons, and their replacements in conjunction with ZBX receivers which are a staff requirement for all Naval aircraft.

Rejection of Type 251, since these require apparatus which is only used in certain Naval aircraft and are in practice rarely used.

Use of the normal communication receiver with D/F bearings can still be made to provide a stand-by system for the YE/YG if required. The aircraft can still be brought to the " Picket Marshalling Position " should YE/YG fail.

(b) *Air Direction*

Development of R/T and Radar facilities available in the ship to the A.D.R.

(c) *Traffic Control*

Concentration on development of the multi-channel aircraft receiver and extensive trials of the Talk-down Control Room Equipment to finalise the future system based on Talk-down Techniques.

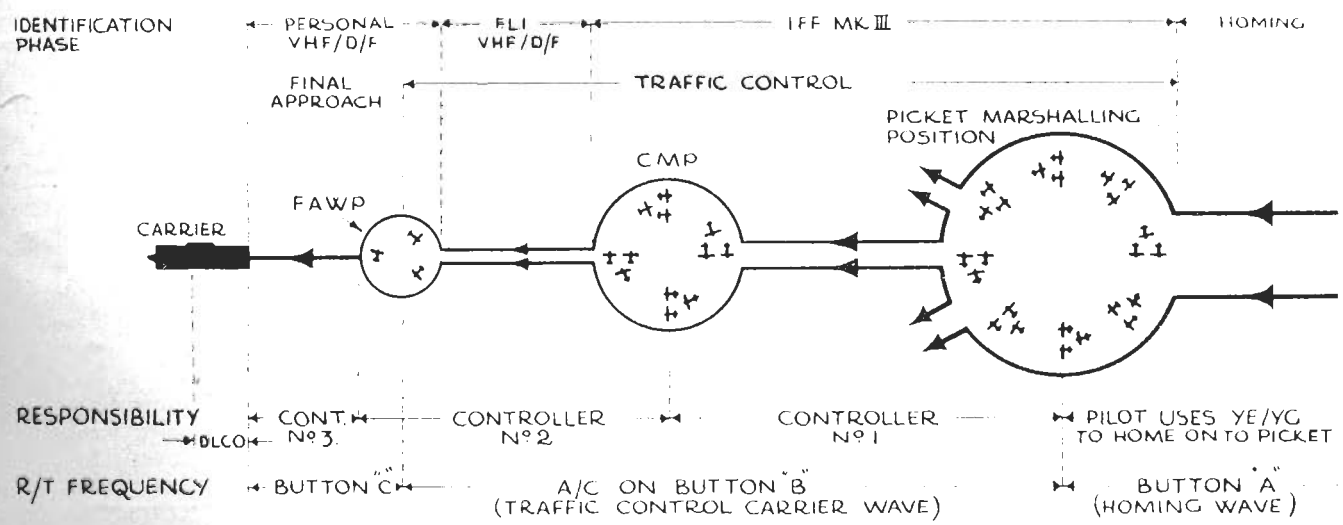
(d) *Final Approach*

Concentration on Type 962 and approach control from the ground or ship, to bring aircraft from the Approach Waiting Position to a point from which a " bat " landing can be made.

Rejection of Type 93 series which requires additional apparatus in the aircraft, drastic modification to ensure successful working with aircraft employing the quarter approach type of landing, and a considerable labour to overcome stabilisation difficulties. Further, Type 93 does not form a " basis " for further development, as the glide path is only a small part of the whole problem of the auto-control and, in any case, is not considered practical to stabilise the large aerials required to high degrees of accuracy.

CONCLUSION

The future system must be able to be modified to complete automatic control and landing. By adopting the " Controlled Approach Technique " utilising Type 962 and the " Talk-down Control Room " system we shall be using equipment that lends itself to automatic control in the future.



The final system might even develop on a Jules Verne line as follows :—

" A continuously rotating control transmitter in the aircraft carrier would " pump out " bursts of information in any selected direction to any selected aircraft utilising :—

(*a*) Pulse separation technique for the direction and

(*b*) Multi-channel gating in the aircraft receiver for selection of aircraft."

This information (i.e. order to fly left, right, up or down, etc.) would be received by the aircraft and passed direct to the auto pilot which would act on these orders.

The Controller, having assessed the overall picture from radar screens, would dial the aircraft's number on a control unit (thereby adjusting the " gate " to the aircraft receiver's). Operation would be *fully* automatic, Controller would " put on " an Auto-following circuit on to the aircraft and the equipment would deduce control information and send it to the aircraft for automatic introduction into the auto pilot.

One visualises screens like present day air plots or vertical skiatrons with approach lanes marked on them and the Controller keeping the bright moving spots in the lanes or marshalling positions.

Safety devices might even be fitted in these systems (like the railways) so as to avoid two targets on the same lane getting too close.

Monitoring equipment in the aircraft would control a transponder which would be triggered by the main rotating beacon—if all was not well in the aircraft the signal back from the aircraft would cause the white spot (echo) on the screen to become red (as used in Mark V, I.F.F. system) and the Controller could act accordingly.