AERONAUTICAL CHART RESEARCH AND DEVELOPMENT*

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A FRIEND of mine, recently returned from Korea, stated that his photo reproduction unit, on the average, produced some 1,000,000 9×9 inch prints per month. This huge number indicates the importance that military intelligence places on procuring information by aerial photography. Intelligence data from these photographs, in general, can then be presented either in the form of photo interpretation reports or of aeronautical charts.

The purpose of my talk is to outline Air Force research and development work in the field of aeronautical charting, as carried out in the Photo Reconnaissance Lab of the Wright Air Development Center. A simplified organizational and functional chart of the Laboratory gives some idea of the extent of the Research and Development Program underway in the Mapping and Charting Branch. The Branch is concerned with all new airborne and ground equipment

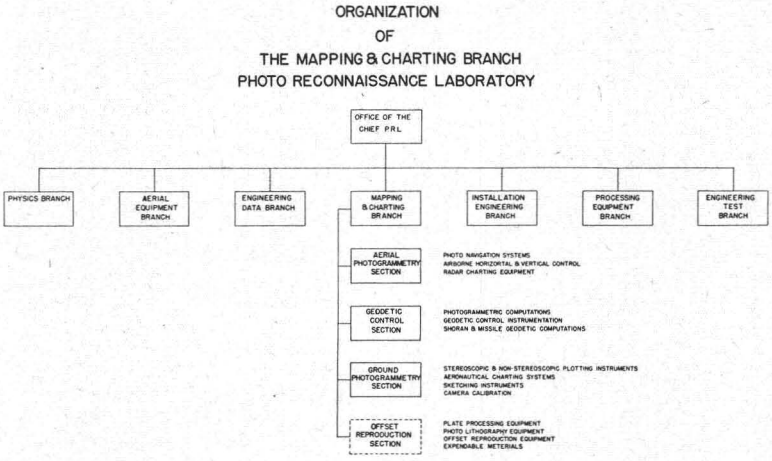

FIG. 1

required to record airborne intelligence (either photo or radra), to transfer data on the photograph to a charting sheet, and to reproduce the resulting chart in quantity (Figure 1).

Our most important "customers" for new equipment and techniques are Air Force Reconnaissance Technical Squadrons, and the Aerial Photographic and Charting Service. The "Chart Service" is charged with producing and distributing Air Force charts of all types on a world-wide basis. The St. Louis plants have met and continue to meet this tremendous responsibility by means of a staff of experts in photogrammetry and cartography, combined with a large organization capable of taking in photographs at one end of an "assembly line" and turning out charts at the other end. Reconnaissance Technical Squadrons in the field have a cellular organization capable of photo processing, photo interpretation, and cartographic revision and reproduction. The difference in equipment requirements for the two types of organization is obvious.

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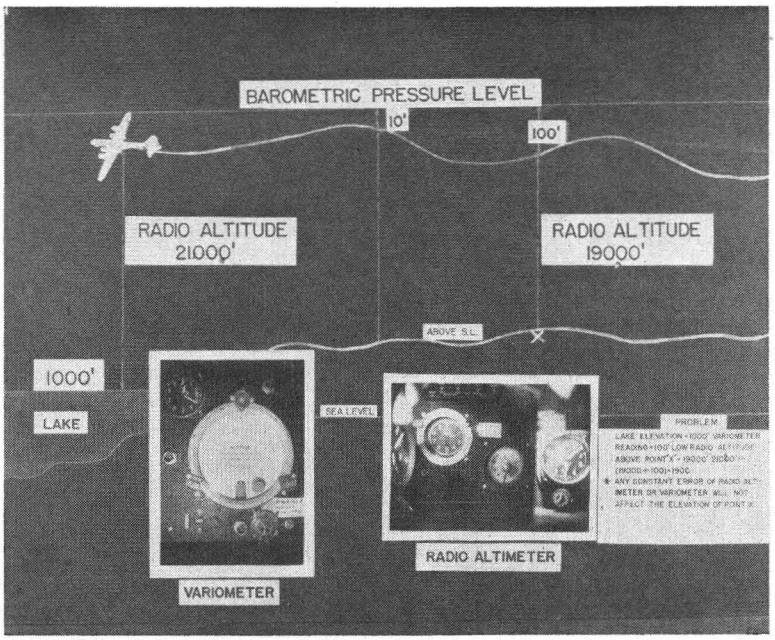

FIG. 2

Our customers are confronted with a wide variety of requirements as to charts scale, format size, use, etc. Scales vary from 1:10,000 target charts to 1:5,000,000 navigation sheets. The success of a tactical operation, be it bomber, reconnaissance, or a fighter mission, depends to a large degree on the availability of an up-to-date and correct chart for both planning and actual flight use.

The Branch must also take into account, in its research program, the require-

FIG. 3

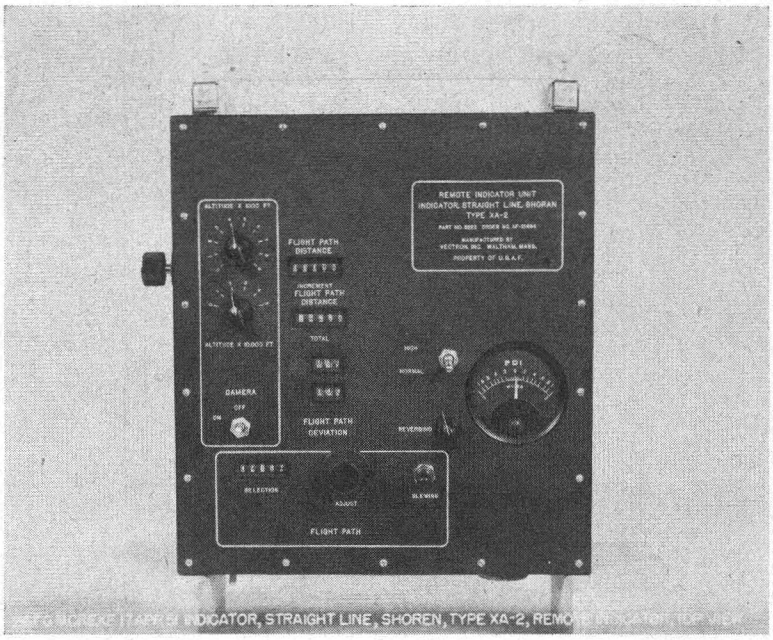

FIG. 4

ments of the Department of the Army as to airborne equipment which will produce precision photography suitable for ground force large-scale maps.

Photographic recordings available for compilation onto charts are of widely varying types. The T-11, 6 inch precision mapping camera is perhaps the best answer to date. Preferably the T-11 would be in a stabilized mount capable of keeping X and Y tilt to a minimum. However, the Air Force Cartographer must be prepared to utilize reconnaissance photography of other focal lengths such as

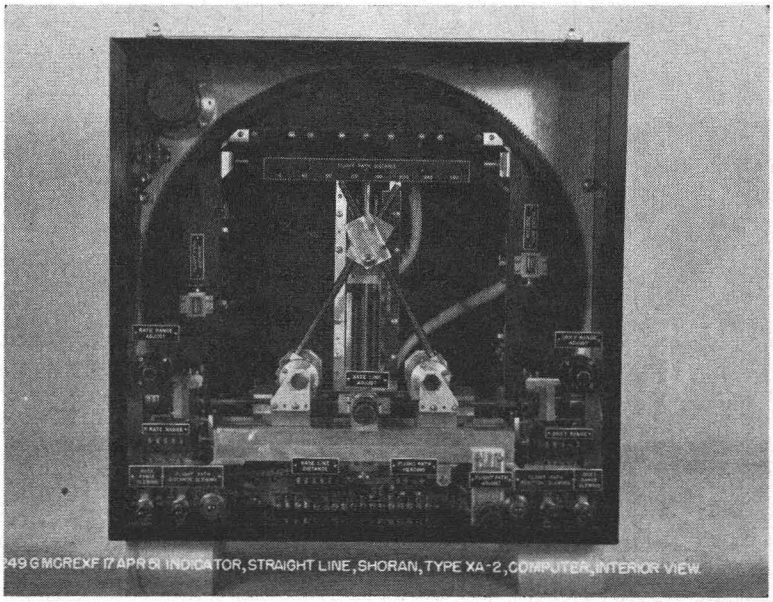

FIG. 5

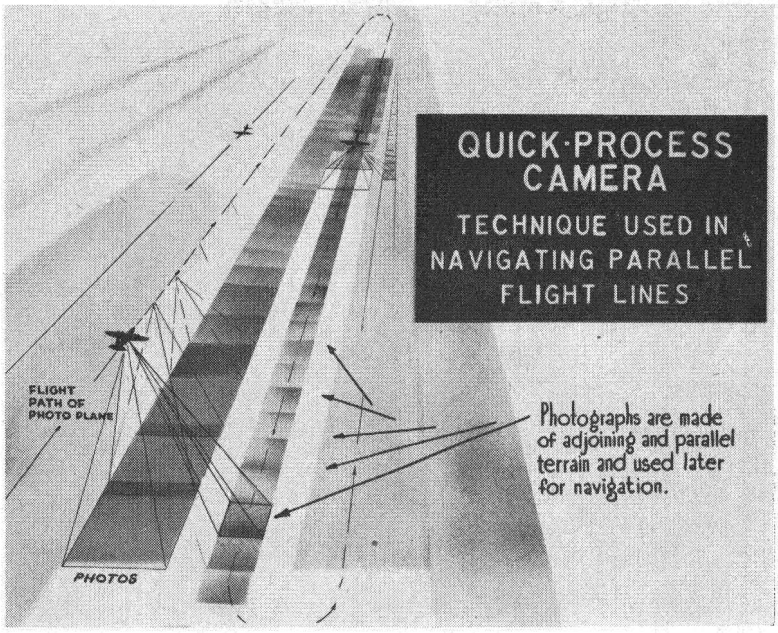

FIG. 6

12 inch, 24 inch, 36 inch, 48 inch, etc. Attitude of the camera may be vertical or almost any angle of obliquity. Reconnaissance photography, as contrasted to mapping prints, is nearly always lacking in precision features, such as exact focal length, positioning of fiducial marks, adequate flight data, etc.

Enough of the scope and problems confronting the AF charting organizations! What are a few typical current projects now underway? Perhaps the most interesting unclassified projects are those of (a) obtaining the exact position of the aircraft in space at the time when the shutter clicks, and (b) directing the photographic aircraft on straight and parallel flight lines.

Flights will be underway soon to test the practicability of the radio altimeter

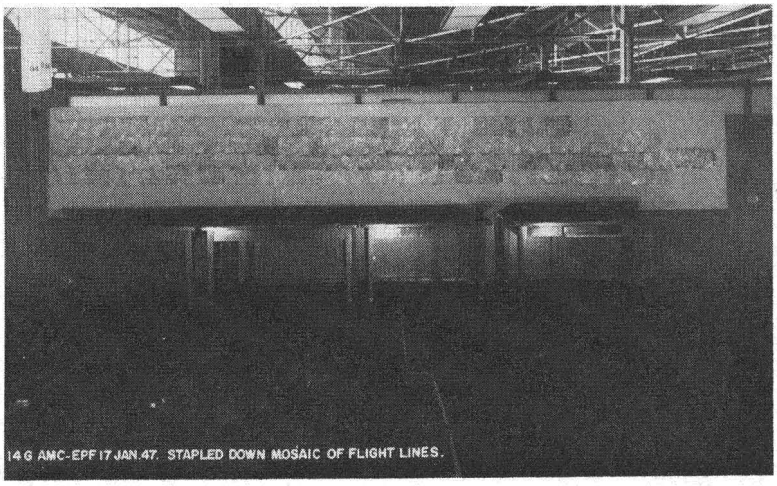

FIG. 7

carry method of extending vertical control while photography is being taken. It is hoped that isobaric surfaces at higher elevations will serve as a datum from which the radio altimeter can measure down to terrain. The result should be a profile under the plane with both ends of the course tied to a known elevation such as a lake surface. Horizontal position would be provided by Shoran and other methods under development (Figure 2).

The problem of directing the photographer's aircraft on a straight and parallel flight line to assure complete coverage can be solved by Shoran combined with the system in an airborne gadget which literally forces the pilot to fly the correct course via PDI needle (Figures 3, 4, and 5). Experimental flights have also been made with a quick-process camera mounted obliquely and photographing check points on the next flight line. A 250-mile flight from Dayton to Pittsburgh was made with this simple and ingenious method. Photos taken on one flight line are used by the navigator to stay on the next, adjacent line (Figures 6 and 7).

It must be thoroughly understood that all problems have not been solved. Several knotty ones still remaining are:

a. Charting through darkness and obscurity.
b. Precise transfer of a horizontal position "fix" in an aircraft to the nadir point on the ground below.
c. Automatic or semi-automatic means, preferably electronic, of plotting contours from near vertical photography.

In conclusion, I recommend that you examine our exhibits illustrating an overlap control system using the bombsight, a new 9 ×18 inch photo oblique alidade, a new method of representing relief on charts, as well as a most interesting Aerial Photographic and Charting Service display.