

REPORT ON THE USE OF AIR PHOTOGRAPHS

(Surveys of the H.M.S. *White Bear*, March to May, 1946).

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PREFACE

1.—It is well established that excellent use can be made of air survey for the coastline and coastal topography of a hydrographic survey when photo cover exists or can be obtained.

2.—The combination of hydrographic and air surveys may, however, on the one hand require, or on the other hand be facilitated by some adaptation of text book methods on the use of air photos.

3.—In this paper is a report of the actual use of air photos on a recent hydrographic survey, and some interesting points are brought out, e.g. the ease with which a surveyor with an air photo in his hand can locate on the ground and mark a spot previously selected as suitable for its purpose.

4.—Good quality well flown strips combined with proper methods of plotting are necessary to obtain the highest order of accuracy. However, the close ground control in any event established on the coastline of a hydrographic survey may well admit some relaxation of plotting principles.

This will be welcome in a surveying ship where the personnel, the instruments and the time available are limited.

5.—In the case of a sketch survey or where the expenditure of effort on other methods would not be justified, a sufficient accuracy will be obtained by :—

Making up photos as a block mosaic; tracing detail from it; squaring, or if equipment is available, photographing to desired scale; and finally, transferring to a tracing on which ground control points have been plotted and which is fitted over locally.

6.—Stereoscopic viewing with the use of a parallax bar must be used for accurate contouring. When, however, a number of spot heights have been established and the topography can be under observation from the ship, form lines may sometimes be sketched in with sufficient accuracy. Simple stereoscopic viewing of parts of photos should, however, be used in conjunction whenever practicable.

7.—The interpretation of high water line from photos and the avoidance of confusion from shadows thrown by cliffs, etc., cannot but present difficulties. For this reason amongst others, accessible coastline in a normal hydrographic survey, must always as therefore, be surveyed on the ground.

8.—It will be important to note on the Fair-Chart of the survey or equivalent document, the extent to which and how air photos have been used.

H.M.S. "White Bear" Surveys March to May, 1946.

1° Pulo Klang to Angsa Bank (N. portion), 1 : 50 000 ;

2° Kuala Selangor to Kuala Bernam (S. portion), 1 : 100 000.

1.—The completion of the two mentioned surveys entailed a survey of the coastline for a stretch of about 40 miles, 10 miles on a scale of 1 : 50 000 and 30 miles on the 1 : 100 000 scale. Fully 90% of this 40 mile stretch of coastline was composed of mangrove swamps and as it was practically impossible to reach the coastline from the landward side and only from the seaward side at above half tide, it was decided to make the survey of the coastline from aerial photographs. The only recognisable marks along the coast were Bukit Jeram, Selangor Lighthouse, and a prominent tree; positions of the first two of these were known from the Federated Malay States triangulation data and the tree was fixed later in the survey by resection. In view of the scarcity of ground control and to the fact that only a survey of the actual coastal strip was required (other detail further inland could be obtained from the F.M.S. maps) it was further decided to use only the actual coastline photographs and provide the necessary control by boat fixing of certain chosen points along the coastline.

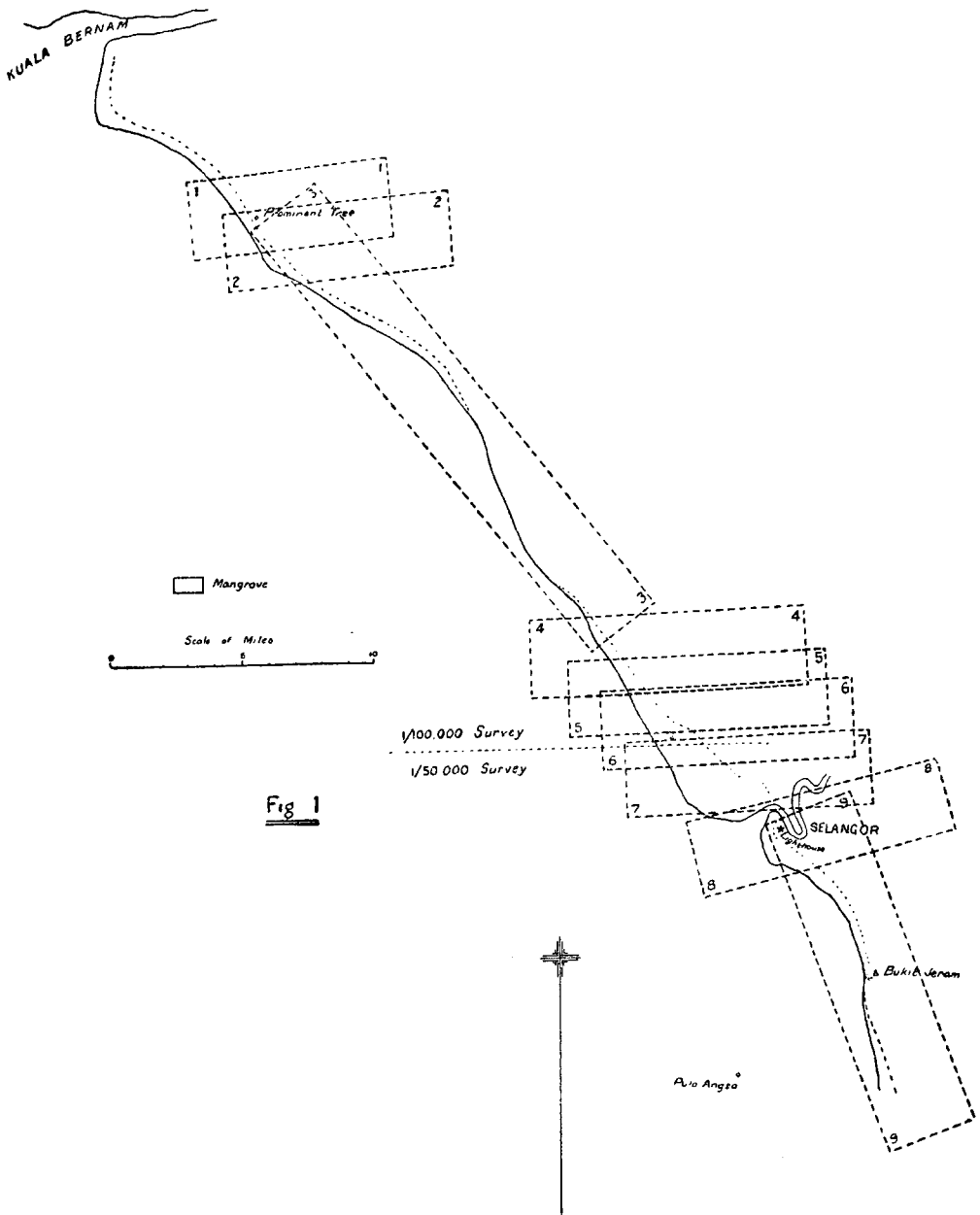


Fig 1

2.—South of Kuala Selangor strips of photographs had already been flown for the "Zipper" operation and North of this they were in course of being flown as part of a post war mapping programme. The photographs were therefore readily available and were obtained from the Air Survey Liaison Section in conjunction with the Director of Survey, Allied Land Forces, South East Asia. Those obtained were as shown in fig. 1. It should be noted that two of the strips, strips 3 and 9, were parallel to the coast whilst the remainder were transverse to it. The scale of the photographs was 1:25 000 (Strip 9 1:42 000) and size 9" × 9". These gave detail very clearly but each photograph only covered an area of approximately 9 square miles.

3.—A brief outline will now be given of the method in which the photographs were used, with emphasis on the difficulties arising from the use of coastline photographs.

4.—In the case of strips 3 and 9 all the photographs were used, whilst for the transverse strips the number used was such to cover the required detail behind the coast—generally about 5 or 6.

5.—Each strip of photographs was now treated separately and a minor control plot made from each, following the radial line method of plotting as given in a. "A simple method of surveying from air photographs" Professional Papers of the Survey Committee No. 8 (H.M.S.O.) or in b. Chapter 7 of "Air photography applied to surveying" by Major C. A. Hart, R.E.

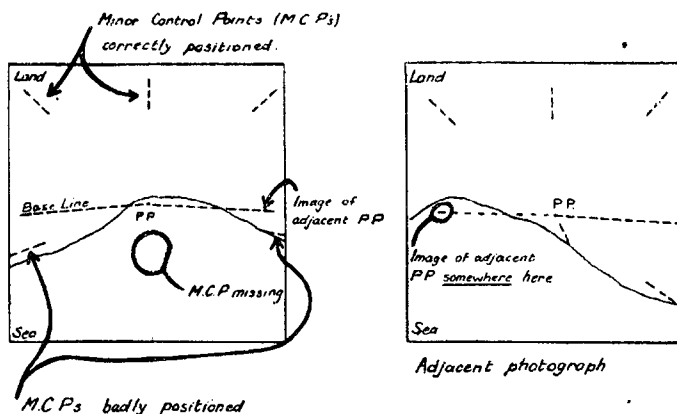


Fig 2

6.—Base lining was difficult in that the Principal Points of the photographs often fell in the middle of rubber plantations or mangrove swamps, but in these photographs it was possible to base line by inspecting the detail under the stereoscope. In one case the Principal Point fell in the sea and the stretch of sea between this point and the images of the Principal Points of the two adjacent photographs was too large for the base lines to be accurately drawn through the same points of detail. See fig. 2. This then would be a portion of the plot where the azimuth would not be accurately carried through from photograph to photograph and so was earmarked for the obtaining of a shore fix.

7.—The large expanse of water on some of the photographs of strips 3 and 9 was also the cause of inaccuracy in carrying the scale through from photograph to photograph. Where the coastline occurred close to the base line, the minor control points on the seaward side of the base line could not be positioned at their most advantageous positions. In the case of the photograph in fig. 2, it was of course impossible to use a minor control point on the seaward side of the base line and it was found when later adjusting the minor control plot to the shore fixes that there was inaccuracy in carrying through the scale as well as azimuth at this point.

8.—In passing it might be mentioned that strips 4, 5 and 6 were plotted on the same minor control plot. This was possible because of a 50% overlap between the strips, thereby allowing the principal points of the strip 5 photographs to be plotted on the minor control plot of strip 4, so giving the correct scale and azimuth for the photographs of strip 5. Similarly with strip 6. See fig. 3. The principal points of two of the photographs of strip 2 fell on the most northerly photographs of strip 3 and, as above, it was possible to plot strips 1, 2 and 3 on the same minor control plot. Thus the number of minor control plots was reduced to five—numbered a. to e. in fig. 4. On these five plots the coastline and immediate hinterland detail was now plotted.

9.—The next stage was to decide the position and number of shore fixes required. In paragraphs 6 and 7 it is seen how the azimuth and scale are liable to change at certain places—

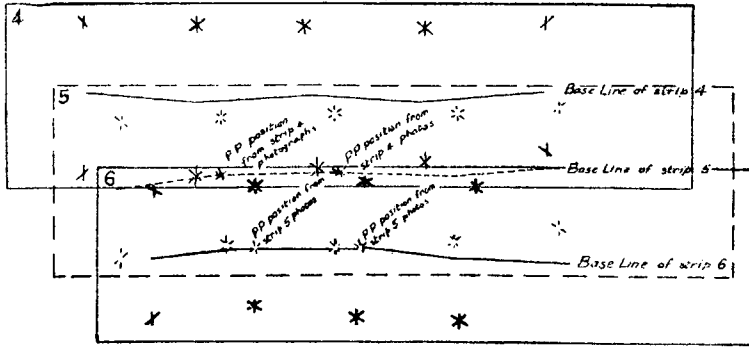


Fig 3

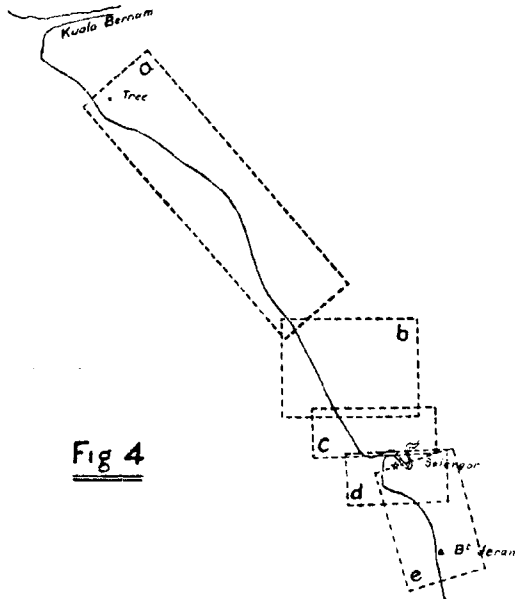
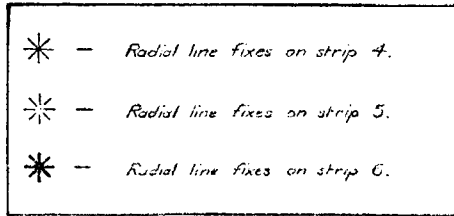


Fig 4

these then are the first places requiring a shore fix. In addition to these, it was decided that for the plots a and e, fixes about every four or five miles would suffice. For plots b, c and d, the same four or five mile interval was followed, though it had to be slightly modified in order that each plot should be controlled by at least two shore fixes, one at the Northern end and one at the Southern end. The actual position of the shore fixes had to be selected so that the marks used could be readily identified both on the photographs and on the ground. Such marks were isolated mangrove trees, prominent points of mangrove, or a stream mouth. In practise it was found that the surveyor taking away the photograph could easily find the previously selected spot on the ground.

10.—The shore fixes were then plotted on the plotting sheets and two tracings, one for each scale, pricked through from these. Each minor control plot was then taken in turn and the coastline details transferred to the tracing by "squaring down" between each pair of shore fixes. The tracings obtained in this way were then treated as "fair tracings".

11.—In order to test the finally positioned coastline with the result which would have been obtained had no shore fixes been taken, plots d. and e. were photographed down to the scale of the final tracing i.e. 1:50 000. Plot d. differed only negligibly from the final result but in plot e. which was known to be the least sound of all the minor control plots for reasons as in paragraphs 6 and 7, the maximum difference in scale was found to be 0.1", corresponding to a ground distance of 2/3 cable, and a maximum error in azimuth of 3 1/2°.

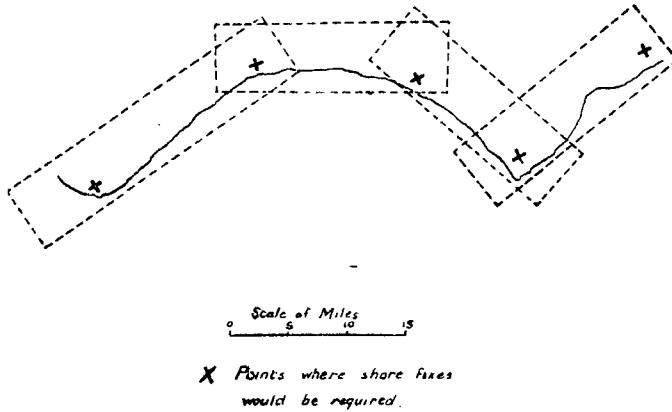


Fig 5

12.—If it had been possible to fly the photographs specially for the coastline survey, several improvements could have been made which would have increased the accuracy and decreased the time taken. Remembering that the photographs are for coastline alone and not for the landwork as a whole, curves in the coastline could be covered by a series of strips along the coastline, as in fig. 5, and not by a series of strips along and transverse to the coastline. This would cut down the number on minor control plots and also the number of shore fixes required. Secondly a photograph scale of 1:50 000, giving each photograph a ground size of 6 miles X 6 miles, would enable the strips to be flown further inland. This would improve the positioning of the minor control points and would allow all the principal points to lie on the land, thus giving greater accuracy in scale and azimuth. See fig. 6.

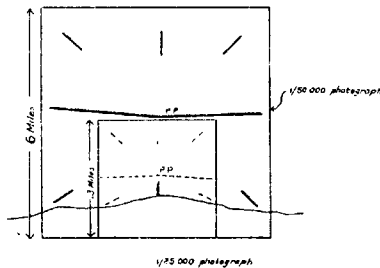


Fig 6

