(e) Topographic and large-scale mapping

MAP-ACCURACY SURVEYS BY THE DIVISION OF NATIONAL MAPPING*

Paper submitted by Australia

RESUME

La Division de cartographie effectue régulièrement des levés de terrain afin de tester l'exactitude des cartes topographiques au 1:100 000 par rapport aux normes du Conseil national de cartographie. Des méthodes ont été mises au point et améliorées lors de récents levés et, à l'avenir, il sera fait davantage appel aux techniques photogrammétriques pour les évaluations d'exactitude.

Since 1970, the Division of National Mapping (Natmap) has undertaken map-accuracy surveys in order to test the quality of the 1:100,000 scale national topographic map series against the standards of map accuracy set by the National Mapping Council (NMC).

Those standards are:

(a) Horizontal accuracy. The horizontal accuracy of sandard published maps shall be consistent with the criterion that "not more than 10 per cent of points tested shall be in error by more than 0.5 mm". This limit of accuracy applies to the positions of well-defined points only. Well-defined points are those which are easily visible or recoverable on the ground;

(b) Vertical accuracy. Vertical accuracy, as applied to the contours of standard published maps, shall be consistent with the criterion that "not more than 10 per cent of the elevations tested shall be in error by more than one half the contour interval". In checking elevations taken from the map, the

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apparent vertical error may be decreased by assuming a horizontal displacement within the permissible horizontal error for a map of that scale.

Currently, Natmap carries out accuracy surveys for two 1:100,000 map-sheets each year--about 1 per cent of the annual compilation production at 1:100,000 scale.

The sheets selected for field evaluation are those representative of a group of sheets within a photogrammetric block with common compilation methods and ground control distribution. A variety of ground control and compilation methods have been used in original compilations, and the accuracy surveys influence decisions on whether to upgrade control or compilation in areas where maps are due for revision.

METHODS

The current methods evolved during the three most recent accuracy projects, undertaken since October 1981.

The first of these three surveys established ground co-ordinates of points of well-defined identifiable map detail directly, by measuring a closed electronic distance measurement (EDM) traverse within the area of the map-sheet, supplemented by local survey radiations.

This technique suited the topography and road access, but a party of six was still unable to fix enough map-detail points in the three-week period to draw a sound conclusion as to the accuracy of the map. However, the new ground control established was used in an analytical aerotriangulation adjustment, which in turn was used to assess the accuracy of the original analogue planimetric model control (which came from an assembly of slotted photo-templates).

The second survey used JMR Doppler positioning equipment in order to establish photo-identified horizontal control points, with an accuracy better than +3 m at 15-minute intervals on the perimeter of the map area. This control, together with four existing ground control points, was used in an analytical adjustment to:

(a) Determine the standard errors in the original analogue model control points;

(b) Compare the analytical values of map-detail points with the surveyed values.

Further points of well-defined map detail within the map area were identified and fixed by Doppler point-positioning and local traversing. A total of 37 detail points were fixed and comparisons made between: ground survey and analytical; ground survey and compilation (digitized values); compilation and printed map; and ground survey and printed map.

The ground survey and printed-map comparison showed that the map-sheet was well within the NMC horizontal accuracy standard. The aim of the other comparisons was to find out how much accuracy was lost in mapping.

The latest survey, carried out in June 1982, has further developed the procedures, particularly those for vertical accuracy evaluation. Level connections wre made to the original vertical model control points, fixed by laser terrain profiler, in order to check the accuracy of this technique.

THE FUTURE

The next accuracy project will establish ground control--on the perimeter of a map-sheet--for a new analytical adjustment which will include observations of a large number of well-defined map detail points. The derived analytical co-ordinates for the field-identified detail points will then provide a comprehensive comparison with the scaled map-sheet values. Apart from a few vertical check-points to strengthen the analytical adjustment, no further field survey of map detail will be required. Previous accurate surveys indicate that the horizontal analytical co-ordinates produced for the well-defined points will be within +5 m of the true values. This difference is considered negligible for the purpose of assessing 1:100,000 map accuracy.

The check of vertical accuracy will be supplemented by independently controlling selected models of undulating terrain, by trigometrical heighting or spirit-levelling of the model control points and by replotting of the contours for comparison with the published map in order to determine likely error components.