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NOTE BY THE INSTITUT GEOGRAPHIQUE NATIONAL  
ON THE USE OF APR (AIR PROFILE RECORDER) FLIGHTS ABOVE THE EQUATORIAL  
FOREST

(Document submitted by the French Government)

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ON THE USE OF APR (AIR PROFILE RECORDER) FLIGHTS ABOVE THE EQUATORIAL  
FOREST

For five years the Institut Géographique National (IGN) has systematically applied the APR in compiling regular small-scale maps of desert, more or less flat regions. It is known that the procedure permits direct determination of the overall vertical control necessary for plotting.

The IGN has tried to extend the application of the method in equatorial regions where the thickness of the vegetation, difficulties of access and the virtual impossibility of finding on the ground "ground points" identifiable on the photographs practically preclude the adoption of the classical stereoscopic ground control procedures.

To this end, the IGN has recently made an experiment in the Franceville (Gabon) region, which is already covered by a 1:50,000 map.

The following are the conditions under which this experiment was undertaken: the comparative study of the profiles was made following the simultaneous taking of photographs on APR plates, at a height of 1700 to 1800 m. and of stereoscopic photos on 19 x 19 cm film, with a focal distance of 125 millimetres.

The study consisted, successively, of :

(a) selection of a certain number of pairs from among the most characteristic in view of the vegetation cover, going progressively from almost bare ground with some forest galleries, to land entirely covered by the great forest;

(b) identification of the photographed strip on the 1:50,000 map and the scribing of the axis of flight;

(c) construction of a profile of the land following the contours (contour-interval 20 m) of the 1:50,000 map. It should be noted that this profile allows serious doubts to remain as regards wooded areas, because of the differences in the heights of trees;

(d) installation of all the pairs chosen on a type D Poivilliers plotting device and the scribing of the profile of the vegetation cover by successive points along the axis followed by the aircraft;

(e) reduction of the profile recorded to the same scale.

With these various elements it was possible, by causing the three scribings to coincide everywhere where the land was bare, to compare the recorded profile, the ground profile as deduced from the map and the profile, obtained from plotting, of the top of the vegetation.

The results obtained suggest the following remarks:

- (1) on bare ground, the recorded ground profile is well represented;
- (2) the narrow forest galleries do not influence recording;
- (3) the average dense forest with trees of unequal height gives an appreciable ground profile;
- (4) the dense forest with trees of unequal height sometimes gives a profile which is fairly close to that of the tree tops while being clearly below the tallest trees; sometimes the profile obtained is much nearer that of the ground;
- (5) in dense forest regions where the trees are of relatively even height the recorded profile seems to follow an intermediary line between the top of the vegetation cover and the ground.

It happens, moreover, that in places the APR profile passes beneath the ground. This is due to the fact that this profile, scribed from the 1:50,000 map is itself imprecise because the plotter who compiled the map naturally could only estimate the top of the vegetation, the height of which varies in these regions from 10 to 50 m.

#### CONCLUSIONS

Before trying to draw any serious conclusions from these experiments, it is therefore necessary to determine on the ground by cross-riding and direct levelling an exact profile of the terrain along the flight axis followed by the aircraft.

It does seem, however, that in regions of this type the APR cannot be used for the direct determination of the plotting control, whatever the scale of the plates and the survey to be effected. Nevertheless, its use might supply a control network of main points, at a sufficient distance from each other for the influence of the mean error on their absolute altitude to be negligible, on which an aerial traverse might be based. The APR flights will then be effected following the lines of a more or less regular grid, (for example 50 km. apart on an average) but with a very high degree of tolerance on the routes of these flights, which will make it possible for them to be carried out in the most convenient places, account being taken of the terrain and of the photographic coverage to be equipped.

The grid nodes, i.e. the intersections between obviously perpendicular profiles, will afford the possibility of carrying out a general adjustment of the network, as in the customary method; and it will then be sufficient for some profiles to cut the precision levelling network for all points on any profile whatever to be landmarked. There will, therefore, be great latitude in selecting the supports for the aerial traverse, and advantage of this will be taken to select the most suitable points after examination of the photographic coverage.

This method is obviously less advantageous than the method used by the IGN in the Sahara for it does not eliminate aero-triangulation. It does, however, eliminate all barometric traversing on the ground and enables the value of the results of aero-triangulation to be kept at least equal to the value of present results.

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