GPS Airborne Accuracies

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GPS positioning has been used for a number of airborne applications. Accuracy requirements for these applications range from many hundreds of metres to many centimetres. Applications requiring a few metres accuracy or lower will always require a differential configuration, and applications requiring sub-metre level accuracy will require the use of carrier phase and is capable of generating airborne positions accurate to several centimetres.

Regardless of the accuracy requirement, it is difficult to check the accuracy of GPS using some sort of independent means. However, one such method does exist, and it uses the method of photogrammetry. Photogrammetry is used to map large areas of the ground using overlapping photographs. Traditionally, the photographs were positioned using control points on the ground combined with conjugate points in the overlap areas which hold the photographs together. However, airborne GPS has recently been used to replace some or all of the ground control points. Instead of putting control points on the ground, the airborne GPS positions each photograph accurately by acting like a control point for each photo.

For the evaluation of airborne GPS accuracies, the points on the ground that would normally have been used to position the photos can now be solved for. The result is that for each of these points, an error in northing, easting and height can be computed. Although the error is computed on the ground, the magnitude of the error is a good indication of how accurate the airborne GPS is. This is because these points were almost solely computed from the airborne GPS.

1st Part			
ID	RX (m)	RY (m)	RZ (m)
308565	-0.105	0.036	-0.094
800125	-0.008	0.084	-0.052
699415	-0.061	-0.035	-0.051
605	-0.070	-0.043	
615	-0.057	-0.103	0.005
RMS	0.068	0.066	0.556

Tables 1 and 2 show some comparisons on the ground. The photography scale is 1:3000. The area covered is approximately 30 km long by 10 km wide. The flying height above ground is 450 metres. The aircraft was traveling approximately 60-80 m/s, and the position of each photograph was marked by a pulse emitted from the camera during the midpoint of the exposure.

2nd part			
ID	RX (m)	RY (m)	RZ (m)
75	0.086	-0.023	-0.013
85	-0.072	-0.002	0.056
704145	0.021	-0.083	-0.039
909235	0.034	0.033	-0.049
103615	-0.007	0.000	0.030
804795	-0.132	-0.027	0.045
RMS	0.072	0.039	0.041