Data precision required to define Flight Information Regions (FIRs)

Note:

1) ***Accuracy.*** A degree of conformance between the estimated or measured value and the true value.

Note.— For measured positional data the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.

2) ***Precision.*** The smallest difference that can be reliably distinguished by a measurement process.

Note.— In reference to geodetic surveys, precision is a degree of refinement in performance of an operation or a degree of perfection in the instruments and methods used when taking measurements.

It is important to note the difference between the accuracy with which a chart is plotted and the precision of the data from the land survey used to plot the chart. Different equipment with different precision should be used for land surveying depending on the type of chart to be plotted and the acceptable error rate associated to the resulting data from the survey.

In the past, the charts used for the definition of FIRs were not produced with the appropriate accuracy according to the precision of the data (from land surveying) used to make these charts. Therefore, the regional agreements made at that time on this matter were made on degrees and minutes based on the available accuracy of the charts at scales of 1:10 000 000, 1:30 000 000 or 1:60 000 000; and when a FIR boundary coincides with a State boundary, the statement 'follow the boundary' was used in order to avoid interpretations arising from ambiguous definition of national boundaries between States.

Nowadays, it is possible to collect more accurate data due to the advances made in the geodetic science and digital mapping, by making land surveys through Differential Global Positioning System (DGPS), total Station, photogrammetry or satellite. Furthermore new technologies such as Light Detection and Ranging (LIDAR) or Remote Piloted Aircraft Systems (RPAS), not available before, are currently used in land surveying.

The Geographical Information Systems (GIS) are currently more powerful and accurate and have new functionalities such as ‘connect point to line’. With them, it is possible to zoom and enlarge charts until scales of 1:30, 1:100 or others. Understanding error inherent in GIS data is critical to ensuring that any spatial analysis performed using those datasets meets a minimum threshold for accuracy. The data provided in the past (hand-drafting in large chart scales) to produce the charts is not accurate enough nowadays to be used in GIS and consequently generates confusion. It is then necessary to make land surveys with the new technology available in order to provide data with the acceptable accuracy.

There is not a rule related to the way of collecting data and its quality for the definition of FIR boundaries, hence there is not an International Standard Organization (ISO) standard nor an international rule. States proceed according to their own resources and capabilities, therefore it is difficult to achieve a global standard regarding the accuracy on which the FIR coordinates have to be defined.

For example, if a land survey is made to produce a chart at a scale of 1:25 000, then an enlargement (zoom) of the chart till a scale of 1:12 500 will bring twice the error detectable on the 1:25 000 chart. This means that an error of 25 feet will become an error of 50 feet. The error will multiple as we keep zooming, for instance, if we zoom with GIS to a scale of 1:25, the inaccuracy associated with the points would be of 25,000 feet and points that should appear on the land mass may appear on the water.

The UN body that defines national boundaries in New York, works with different land surveys, therefore the precision of the data is not uniform and because of this when we zoom too much around different boundaries between two States, the line plotted in the chart is not aligned with any other,

resulting in different chart backgrounds (base maps) from different companies, such as: ESRI , Delormemap , Google, NatGeo , UN among others.

Summarizing, FIR boundaries are defined based on regional air navigation agreements. The accuracy of the cartographic points defined in the charts do not reflect the data precision from the land survey, therefore it is difficult to ask States a better precision than degree, minute and second. Only if States are able to make agreements and propose amendments based on more precise land surveys, the accuracy with which FIRs are defined can be improved.

Gilbert Lasnier