Republic of Austria

Clifford J. Mugnier, C.P., C.M.S.

On 1 November 996, an area of land popularly known as “Ostarrichi” was given by Emperor Otto the Third to the Bishop of Freising as a gift. In 1156 the Privilegium Minus elevated Austria to the status of a Duchy. When the Habsburg dynasty ascended to power, the lands of Vorarlberg were added, with Bohemia and Hungary added as provinces to their holdings. These acquisitions, completed under the Habsburg rule, were the foundation for the country of Austria as it appears today. After the crowning of Maria Theresa as Queen of Bohemia in 1743, her husband Franz was elected Holy Roman Emperor in 1745. As a measure of standing to other royal courts, Queen-Empress Maria Theresa ordered a survey of all of the Habsburg holdings in 1763. This was the first Topographical Survey (Josephinische Aufnahme) of the Habsburg provinces. The Liesganig triangulation and attached supplemental surveys were executed graphically with plane table and alidade. There was no geodetic survey used as a foundation. The associated topographic survey was performed at a scale of 1:28,800 and was based on the Vienna Klafter System where 1 Zoll = 400 Klafters. Altogether there were about 4,500 sheets surveyed and all of them were kept secret for military purposes. After completion of this first survey in 1787, Emperor Franz I declared Austria an Empire.

The second topographic survey of Austria (Franziszeische Aufnahme) was conducted from 1806 to 1869. The Vienna Datum of 1806 was established based on the origin of St. Stephan Turm (St. Stephan’s Tower) where \( \Phi_o = 48^\circ\,12'\,31.5277'' \) North and \( \lambda_o = 16^\circ\,22'\,27.3275'' \) East of Greenwich. (These longitudes were originally referenced to Ferro, in the Canary Islands, which is 17º 39’ 46.02’ West of Greenwich.) The defining azimuth of the Datum was from St. Stephan Turm to Leopoldsberg where \( \Phi_o = 48^\circ\,02'\,18.4753'' \) N and \( \lambda_o = 14^\circ\,08'\,15.0242'' \) East of Greenwich; the Schöcklberg Grid (near Graz) was the Province of Steiermark where \( \Phi_o = 42^\circ\,11'\,54.8745'' \) N, \( \lambda_o = 15^\circ\,27'\,59.9472'' \) East of Greenwich; the Krimberg (Laibach) Grid near Ljubljana was for the provinces of Carnithia, Carniola, and Littoral (now Italy) where \( \Phi_o = 45^\circ\,55'\,43.7228'' \) N and \( \lambda_o = 14^\circ\,28'\,18.8027'' \) East of Greenwich; and the Innsbruck Grid, centered at the tower of the city-parish church (Pfarrturm), was for the provinces of Tyrol and Vorarlberg where \( \Phi_o = 47^\circ\,16'\,11.3060'' \) N and \( \lambda_o = 11^\circ\,23'\,39.3157'' \) East of Greenwich. The Bohnenberger ellipsoid was used from 1810 to 1845 where \( a = 6,376,602 \) meters and \( f = 1/299.1528 \). The Zach ellipsoid was used from 1845 to 1863 where \( a = 6,376,602 \) meters and \( f = 1/324 \). From 1847 to 1851 the Walbeck ellipsoid was also used where \( a = 6,376,896 \) meters and \( f = 1/302.78 \).

Some small-scale derivative mapping was done on the Bonne projection. The main chains of the second military triangulation surveyed from 1806 to 1829 covered the western part of the Empire (west of the Budapest meridian) and the chain which extended along the Carpathian Mountains to Transylvania. The baselines used were at Wiener-Neustadt (1762), 6410.90 Klafters; at Wels (1806), 7904.045 Klafters; at Raab (1810), 9429.429 Klafters; at Radovec (Radutz 1818), 5199.597 Klafters.

The third topographic survey of the Austro-Hungarian Empire (Neue Aufnahme) was conducted from 1869 to 1896 and was mainly based on the Vienna Datum and the Bessel 1841 ellipsoid (actually adopted in 1863) where \( a = 6,377,397.15 \) m and \( \frac{1}{f} = 302.78 \). Some small-scale dimensional coordinates of \((X,Y,Z)\) of AT_MGI were derived using ellipsoidal heights, which are computed from leveling heights related to Molo Sartorio (Trieste) and a Geoid related to AT_MGI Datum Hermannskogel and Josefstadt in Bohemia. Note that the signs of the rotations have been changed to conform to the United States standard convention as used and published by the NGA and by the NGS. The standard projection for civil-military topographic mapping in the republic is the Gauss-Krüger Transverse Mercator where the belts are 3º wide such that, for Belt 3, \( \lambda = 9^\circ \); the False Easting is 3,500 km; for Belt 4, \( \lambda = 12^\circ \), the False Easting is 4,500 km; etc. There is no False Northing and the scale factor at origin, \( m_0 = 1.0 \).

The military standard 1:50,000-scale topographic series of Austria is on the ED50 datum and the parameters published by the NGA from ED50 to WGS84 are \( \Delta a = -251, \Delta f = 10^4 \times \Delta X = -0.14192702, \Delta Y = -86 m \pm 3 m, \Delta Z = -121 m \pm 5 m \).
The Reader is cautioned that the above Austrian-government furnished seven parameters from Hermannskogel 1871 Datum to WGS 84 Datum may NOT be truncated to three parameters. Much of this was obtained from AMS Technical Report 25 by Andrew Glusic and from Suzanne Van Cooten’s term paper in a graduate course she took from me years ago. I understand that it will soon be Dr. Van Cooten, according to her major professor at UNO.

Cliff Mugnier teaches Surveying, Geodesy, and Photogrammetry at Louisiana State University. He is the Chief of Geodesy at LSU’s Center for Geoinformatics (Dept. of Civil and Environmental Engineering), and his geodetic research is mainly in the subsidence of Louisiana and in Grids and Datums of the world. He is a Board-certified Photogrammetrist and Mapping Scientist (GIS/LIS), and he has extensive experience in the practice of Forensic Photogrammetry.

The contents of this column reflect the views of the author, who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the American Society for Photogrammetry and Remote Sensing and/or the Louisiana State University Center for Geoinformatics (C4G).