Grids & Datums

Republic of Malta

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

"Malta was an important cultic center for earth-mother worship in the 4th millennium *B.C.* Archeological work shows a developed religious center there, including the world's oldest free-standing architecture, predating that of Sumer and Egypt. (*For example, Ġgantija near Xagħram on Gozo and Ħaġar Qim and Mnajdra on the southwest coast of the main island – Lonely Planet, 2010*). Malta's written history began well before the Christian era. The Phoenicians, and later the Carthaginians, established ports and trading settlements on the island. During the second Punic War (218 *B.C.*), Malta became part of the Roman Empire. During Roman rule, in *A.D.* 60, Saint Paul was shipwrecked on Malta. In 533 *A.D.* Malta became part of the Byzantine Empire and in 870 came under Arab control. Arab occupation and rule left a strong imprint on Maltese life, customs, and language. The Arabs were driven out in 1090 by a band of Norman adventurers under Count Roger of Normandy, who had established a kingdom in southern Italy and Sicily. Malta thus became an appendage of Sicily for 440 years. During this period, Malta was sold and resold to various feudal lords and barons and was dominated successively by the rulers of Swabia (now part of Germany), Aquitaine (now part of France), Aragon (now part of Spain), Castile (now part of Spain), and Spain. In 1522, Suleiman II drove the Knights of St. John out of Rhodes, where they had established themselves after being driven out of Jerusalem. They dispersed to their commanderies in Europe, and in 1530 Charles V granted them sovereignty over the Maltese islands. For the next 275 years, these famous "Knights of Malta" made the island their domain. They built towns, palaces, churches, gardens, and fortifications and embellished the island with numerous works of art. Over the years, the power of the Knights declined, and their rule of Malta ended with their peaceful surrender to Napoleon in 1798. The people of Malta rose against French rule, which lasted two years, and with the help of the British evicted them in 1800. In 1814, Malta voluntarily became part of the British Empire. Malta obtained independence on September 21, 1964, became a Republic on December 13, 1974. The last British forces left in March 1979. Malta joined the European Union (EU) on May 1, 2004" (*U.S. Department of State Background Note, May 2010*).

Slightly less than twice the size of Washington, D.C., the lowest point is the Mediterranean Sea (0 m), and the highest point is Ta'Dmejrek (253 m) which is near Dingli. The country comprises an archipelago, with only the three largest islands (Malta, Ghawdex or Gozo, and Kemmuna or Comino) being inhabited (*World Factbook, 2010*).

Prof. Peter Dare, Chairman of the Dept. of Geodesy & Geomatics Engineering at the University of New Brunswick performed a GPS survey of Malta in 1993 with a group of students from the University of East London. The historical details of early surveys in Malta have been extracted from Prof. Dare's GPS Survey Report. "A survey was carried out in 1896 as a basis for 1:2,500 scale mapping. In 1900 a connection from Sicily to the islands of Malta and Gozo was observed by the Italian government. The Royal Engineers carried out a retriangulation in 1928 due to the large number of discrepancies in the previous surveys. Although good station descriptions were made of these points, unfortunately most of these points can no longer be located. Coastal defense surveys were carried out by the British Navy and Army during the second world war. It is believed that coordinates for these points are accurate to about 0.2m (Directorate of Military Survey, 1956).

"A complete retriangulation of Malta took place during 1955 and 1956 again by the military personnel (*Logan, I., A Critical Report: The Provision of Ground Control for Aerial Triangulation and Photogrammetric Mapping of Malta – 1968, RICS, London, 1973*). This was to provide control for new 1:2,500 mapping and to provide a triangulation network for the future. Primary and secondary points are thought to be accurate to about 0.05m, while tertiary points (fixed by intersection and resections) are accurate to about 0.5m. During 1956 additional triangulation points were added and these are also thought to be accurate to about 0.5m (Directorate of Military Survey, 1956). In late June of 1968 the Directorate of Overseas Surveys (DOS) started fieldwork on the island of Malta to provide control for aerial photography so that new contoured maps at a scale of 1:2,500 could be produced. This was completed by January 1, 1969. A total of 85 control points were created for the aerotriangulation control. In addition, two 1955 primary points that had been destroyed were replaced by two new ones and three other 1955 points have since been classified as third order. This DOS work is documented in Logan (1973). The new system is now known as the Malta Precise Network 1993 (Malta PN'93)." The Holland office of Racal Survey previously determined the transformation from European Datum 1950 (ED50) to WGS 84 as: $\Delta X = -83.7$ m, $\Delta Y = -81.9$ m, and $\Delta Z = -131.6$ m. Prof. Dare found these shift parameters to agree well with his 1993 GPS survey, although he determined 7-parameter transformations also with SKI software.

Thanks to Mr. John W. Hager, the Malta Datum of 1928 origin is at Point de Vue, where: $\Phi_o = 35^\circ\ 52'\ 55.95"$ N, $\Lambda_o = 14^\circ\ 24'\ 15.32"$ W, and the defining azimuth (from North) to Gargur is: $\alpha_o = 48^\circ\ 20'\ 37.4"$, and the height, $H_o = 204.0$ m. Note that this old datum from the War Office Triangulation of 1928 is referenced to the International ellipsoid where: $a = 6{,}378{,}388$ m, and $^1/_f = 297$.

Hager points out a curiosity in that Eastern Telegraph Company Longitude Pillar is *also* at Point de Vue where: $\Phi_o = 35^\circ\ 55'\ 159.28"$ N, $\Lambda_o = 14^\circ\ 29'\ 22.35"$ W, and the defining azimuth (from North) to Gargur is the same: $\alpha_o = 48^\circ\ 20"\ 37.4"$, but the ellipsoid of reference is the Clarke 1880! That curiosity begins to make sense when we look at what was done in WWII.

The Geographical Section, General Staff of the British Army (GSGS) in WWII established a Maltese Lambert Zone. The tangent zone parameters are: Central Meridian, $\lambda_o = 14^\circ\ 27'\ 48.92"$ West of Greenwich, Latitude of Origin, $\varphi o = 35^\circ\ 55'\ 30.46"$ N, Scale Factor at Origin, $m_o = 1.0$ (*by definition for a tangent zone*), False Easting = 143,156.33 UK Yards, and False Northing = 129,524.33 UK Yards where 1 Meter = 1.093614249 UK Yards, and the Clarke 1880 is the ellipsoid of reference where $a = 6{,}378{,}249.145$ m and $^1/_f = 293.465$.

On the other hand, the European Datum of 1950 was computed for Malta after WWII, and it is referenced to the International ellipsoid, the same as the original Malta Datum of 1928. According to *TR 8350.2,* the transformation in Malta from ED50 to WGS84 is: $\Delta X = -107$ m ± 25 m, $\Delta Y = -88$ m ± 25 m, $\Delta Z = -149$ m ± 25 m, and this is based on one station collocated as of 1991. However, it is likely not as reliable as the parameters confirmed by Prof. Peter Dare in 1993.