



& GRIDS DATUMS

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CO-OPERATIVE REPUBLIC OF GUYANA

The Grids & Datums column has completed an exploration of every country on the Earth. For those who did not get to enjoy this world tour the first time, *PE&RS* is reprinting prior articles from the column. This month's article on the Co-operative Republic of Guyana was originally printed in 2003 but contains updates to their coordinate system since then.

The region known as Guiana or Guayana is on the northeastern coast of South America. It is comprised of the former British Guiana, now Guyana, the former Netherlands Guiana, now Suriname (*PE&RS*, March 2002), and French Guiana. Originally inhabited by the Surinen Indians, the coast was probably sighted by Christopher Columbus in 1498 and by Ojeda and Vespucci in 1499. Vicente Yáñez de Pinzón in 1500 was the first to sail close along the shore. He entered some of the rivers, and the Oyapock River was at first called the Yáñez Pinzón River by the Dutch, and later called the Vincent Pinzón River by the French. Initially, both Spanish and Portuguese mariners avoided the coast between the Oyapock and Orinoco rivers. In 1597-1598, a Dutch expedition examined the river mouths from the Amazon to the Orinoco. This started a series of colonies settled initially by the Dutch, then by the French and the English that all attempted to simultaneously fight the climate, the jungle, and the Indians. The country was eventually ceded to Great Britain by the Dutch in 1814, and it became the British Guiana Crown Colony in 1831. Guyana achieved independence in 1966, it became a republic in 1970, and it adopted a new constitution in 1980.

Slightly smaller than Idaho, Guyana borders Brazil (1,119 km), Suriname (600 km), and Venezuela (743 km). Its coastline on the Atlantic Ocean is 459 km long; it claims a territorial sea of 12 nautical miles, and it claims mineral rights to 200 nautical miles or to the outer edge of the continental margin. Guyana terrain is mostly rolling highlands with a low, swampy coastal plain and a savanna in the south. The



lowest point is the Atlantic Ocean and the highest point is Mount Roraima (2,835 m) in the Pakaraima Range along the Venezuela-Brazil border.

According to Russell Fox of the Ordnance Survey's International Library, "In the first half of the 20th century the Lands and Mines Department had observed some high-order astro fixes and traverses in the coastal zone and along the main river valleys leading to the mining areas in the interior of the northern part of British Guyana. There were also a few railway traverses by other entities, such as the Bauxite Company. The only triangulation appears to have been the British Guyana-Brazil boundary survey of the 1930s. The absence of a national triangulation network resulted from logistical, topographical and economic limitations. In the early 1950s the Directorate of Colonial Surveys (DOS) observed some astro fixes, assessed the existing Lands and Mines Department and Bauxite Company work and agreed

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with them on an adjustment strategy to produce a unified set of coordinates from the disparate (albeit high quality) traverses and astro fixes. The method was to accept certain fixes and traverses and to adjust weaker ones to fit; there was not a single datum station. The system adopted was the British Guyana Grid on the Transverse Mercator projection referenced to the International ellipsoid where $a = 6,378,388$ and $1/f = 297$. Latitude of Origin, $\phi_0 =$ equator, Central Meridian, $\lambda_0 = 59^\circ$ West of Greenwich, False Easting = 900,000 feet, False Northing = nil, and the Central Scale Factor, $m_0 = 0.99975$. The U.S. Inter American Geodetic Survey observed a Hiran trilateration between Venezuela and Brazil in the late 1960s. DOS decided to use that as the basis of a new national network for Guyana and, in 1971, computed an adjustment based on the 1970 Aerodist values of Hiran stations Atkinson and Rose. DOS called the datum Provisional South American 1956. The International ellipsoid was retained but the UTM Grid replaced the British Guyana Grid. That system was used on all subsequent DOS mapping. Note that the 1978 readjustment of the Aerodist trilateration by Matti Jaakkola was not used by DOS. The Royal Engineers and DOS did a lot of Doppler work, DOS to control the aerial photography for its 1:50,000 and large-scale coastal zone map series.”

According to John W. Hager, now retired from NIMA, the DOS astro fix at Georgetown Lighthouse was published as a mean of determinations observed in 1926 and 1951 where $\Phi_0 = 6^\circ 49' 31.12''$ N and $\Lambda_0 = 58^\circ 09' 52.76''$ West of Greenwich. The International ellipsoid was used at the time, as published in the *Guyana Trig List, 3rd edition*, 1967. Hager went on to say, “Five stations were established in Guyana as part of the Hiran net from the Caribbean to Brazil. Only station Eagle was held fixed in the Terra Surveys Limited of Canada network established about 1968. The position of Eagle is on the Provisional South American Datum of 1956 where, for Aerodist Station Eagle, $\phi_0 = 5^\circ 13' 23.6660''$ N and $\lambda = 59^\circ 06' 10.0549''$ W.”

The origin of the Provisional South American Datum of 1956 (PSAD56) is at La Canoa, Anzoátegui Province, Venezuela where $\Phi_0 = 08^\circ 34' 17.170''$ N, $\Lambda_0 = 63^\circ 51' 34.880''$ W, and the defining azimuth to station Pozo Hondo $\alpha_0 = 40^\circ 22' 45.96''$ (PE&RS, December 2000). La Canoa is about 657 km from Georgetown Lighthouse, and the Zanderij Datum origin in Suriname (PE&RS, March 2002) is about 361 km from Georgetown Lighthouse.

Of all of the borders of Guyana, only the Brazil-Guyana boundary appears to be currently stable and uncontested. Reading the history of the region is a veritable jumble of squabbles among the European powers over centuries that were reflected in the whole of the Guianas by the British, Dutch, French, Venezuelan, and Portuguese. Of late, there has even been some gunboat diplomacy between Guyana and Suriname over the mineral (oil and gas) resources of the offshore continental shelf. Some of the diplomatic position papers are available over the internet, and make for some fascinating reading about the history of the border negotiations.

The latest transformation parameters available from NIMA regarding the shift from the PSAD56 to the WGS84 Datum in Guyana are $\Delta X = -298 \text{ m} \pm 6 \text{ m}$, $\Delta Y = +159 \text{ m} \pm 14 \text{ m}$, $\Delta Z = -369 \text{ m} \pm 6 \text{ m}$, and this is based on a solution of nine points in Guyana. Early in 1997, the U.S. National Geodetic Survey published NAD83 coordinates of several local marks in Guyana that were observed by NGS personnel. Being consistent in the NGS “policy” that I consider to be ill conceived and wasteful of U.S. taxpayer funds, no local datum coordinates were researched by NGS personnel nor published in the NGS data sheets. Considering the expenses of a geodetic expedition, consistently not having “sufficient funds” to research a local survey office nor occupy original datum origin points is a specious argument. Let’s try harder, NGS!

Guyana Update

Guyana has established eight GPS CORS sites throughout the republic, and during the first phase of the Guyanan government’s infrastructure development project, a geodetic survey was conducted in 2019. The localized Provisional South American Datum of 1956 (PSAD56) was bypassed and a new “grid system” (sic) was established on the WGS84 ellipsoid.

<https://www.rics.org/north-america/news-insight/latest-news/news-opinion/a-grid-for-guyana/>

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). This column was previously published in PE&RS.

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