During the 16th century, Portuguese and Spanish navigators visited the island. Annexed by Queensland in 1883, the region became a British Protectorate in 1884 and was annexed by Great Britain in 1888 as British New Guinea. Administration was passed to Australia in 1905, and the name was changed to the Territory of Papua. In 1949, it was united with the Territory of New Guinea to form Papua New Guinea.

The Independent State of Papua New Guinea became independent in 1975. The country is comprised of the Eastern part of New Guinea, the island of Bougainville, and the Bismarck Archipelago: a total area of 462,840 km² which is slightly larger than the State of California. The land area totals 820 km² and is mostly mountains with coastal lowlands and rolling foothills. The lowest point is the Pacific Ocean, and the highest point is Mount Wilhelm (4,509 m).

The first Australian Engineer Officer for mapping was posted to Rabaul on New Britain in 1914. Topographic mapping of the area began during World War II, and consisted mainly of one inch to the mile compilations with classical triangulation control. The Australian military mapping installations consisted of drafting and computation sections quartered in tents. Map printing services in Queensland were transferred to the U.S. Army 69th Engineer Topographic Battalion’s lithographic detachment in Port Moresby. Supplemented by reconnaissance aerial photo mosaics, additional mapping control continued through the 1950s with assistance from the Royal Australian Survey Corps and the U.S. Army (Australia’s Military Map-makers, 2000).

The oldest “Astro station” serving as a local datum is Paga Hill 1939 near Port Moresby where: $\phi_o = 9^\circ 29' 00.31'' S$, $\Lambda_o = 147^\circ 08' 21.66'' E$ of Greenwich, and the ellipsoid of reference is the Bessell 1841 where: $a = 6,378,397.155$ m, and $1/\epsilon = 299.1528$. The grid system commonly associated with the Paga Hill Datum of 1939 is the 1943 Southern New Guinea Lambert Zone where the Latitude of Origin, $\phi_o = 8^\circ S$, Central Meridian, $\Lambda_o = 150^\circ E$, Scale Factor at Origin, $m_o = 0.9997$, False Northing = 1,000 km, False Easting = 3,000 km. The original limits of the Zone were for the North: Parallel of 7° S, east to 153° 30’ E, thence north along this meridian to 5° S, thence east along this parallel to 165° E. East: Meridian of 165° E. South: Parallel of 12° S, west to 145° E. thence west along this parallel to 141° E, thence south along this meridian to 11° S, thence west along this parallel to 137° E. West: Meridian of 137° E. Recent source data for Paga Hill Datum of 1939 now state the ellipsoid of reference as: International 1924 where: $a = 6,378,388$ m and $1/\epsilon = 297$. When this supposed change occurred is unknown.

Thanks to John W. Hager for the following: other astro positions in Papua New Guinea include: Brown Island, East New Britain Province $\phi_o = 5^\circ 01' 40.4'' S$, $\Lambda_o = 151° 58' 54.4'' E$; Cay, Panatea & Deboyy Island, Milne Bay Province $\phi_o = 14° 41' S$, $\Lambda_o = 152° 22' E$; Dedele Point, Central Province $\phi_o = 10° 14' S$, $\Lambda_o = 148° 45' E$; Doboduru Astro Fix, Northern Province, $\phi_o = 8° 45' 50.13'' S$, $\Lambda_o = 148° 22' 38.8'' E$; Dumpu, Madang Province, $\phi_o = 5° 50' 34.4'' S$, $\Lambda_o = 145° 44' 20.55'' E$; Guadagalas Astro Fix, Gulf Province, $\phi_o = 7° 15' 33.6'' S$, $\Lambda_o = 146° 58' 42.0'' E$; Guasoso B, Woodlark Island, Milne Bay Province, $\phi_o = 9° 13' 39'' S$, $\Lambda_o = 152° 57' 03'' E$; Hetau Island Naval Astro, Buka Island, North Solomons Province, $\phi_o = 5° 09' 57'' S$, $\Lambda_o = 154° 31' 12'' E$; Hong Astro (1947), Manus Island, Manus Province, West Base, $\phi_o = 1° 58' 03.930'' S$, $\Lambda_o = 147° 22' 03.320'' E$, azimuth $\alpha_0 = 111° 55' 58.00''$ to Azimuth Mark from south, Clarke 1866 ellipsoid, elevation = 6.0 ft.; Jammer Bay, Milne Bay Province, $\phi_o = 9° 58' 28'' S$, $\Lambda_o = 152° 11' 15'' E$; Kavieng, New Ireland Province, $\phi_o = 2° 36' S$, $\Lambda_o = 150° 50' E$; Keila Island Astro, East New Britain Province, $\phi_o = 4° 48' 28'' S$, $\Lambda_o = 152° 11' 15'' E$; Kleta, North Solomons Province, Ashton, $\phi_o = 6° 12' 42.68'' N$, $\Lambda_o = 155° 37' 43.69'' E$; Koiaris, North Solomons Province, Koiaris Astro 1947, $\phi_o = 6° 18' 06.11'' S$, $\Lambda_o = 155° 11' 47.32'' E$, azimuth $\alpha_0 = 322° 19' 42.4''$ to Azimuth Mark #1 from south, International ellipsoid, established by 657th Engineering Astronomic Determination, March 1947; Losuia, Milne Bay Province, Losuia, $\phi_o = 8° 32' 33.825'' S$, $\Lambda_o = 151° 03' 59.466'' E$, Matupi, East New Britain Province, Matupi Astronomic Station 1957, $\phi_o = 4° 14' 12.120'' S$, $\Lambda_o = 152° 11' 26.54'' E$, International ellipsoid, Elevation = 2.4 meters; Popondetta, Astro fix, $\phi_o = 8° 46' 07.76'' S$, $\Lambda_o = 148° 12' 51.55'' E$; St. Matthais, New Ireland Province, South Base, $\phi_o = 1° 40' 30'' S$, $\Lambda_o = 149° 54' 54'' E$; Salakaua, Morobe Province, $\phi_o = 6° 33' 28.44'' S$, $\Lambda_o = 147° 51' 07.2'' E$; Torokina, North Solomons Province, Naval Astronomic Station, $\phi_o = 6° 12' 18'' S$, $\Lambda_o = 155° 02' 02.5'' E$; Watabutina, Milne Bay Province, Wabuskin (spelling may be Wabutima), $\phi_o = 8° 30' 54.628'' S$, $\Lambda_o = 151° 03' 24.947'' E$; Wau, Morobe Province, $\phi_o = 7° 20' 28.12'' S$, $\Lambda_o = 146° 42' 55.6'' E$; Wewak, $\phi_o = 3° 32' 52'' S$, $\Lambda_o = 143° 37' 37'' E$.

The various local astro datums listed above represent the fixes used for navigational charts. In regard to how these various datums are related to the WGS 84 Datum, the Australian Maritime Safety Authority comments: “For some charts, particularly in Papua New Guinea, the correction to be applied to GPS cannot be calculated and continued on page 251.”
these charts display a specific warning to this effect. Use of GPS alone on these charts is hazardous.”

For the most part, cartographic products of Papua New Guinea have been on the Australian Geodetic Datum of 1966 with its origin at Johnston Cairn where: $\Phi_o = 25^\circ 56' 54.5515"$ S, $\Lambda_o = 133^\circ 12' 30.0771'$ E, $h_o = 571.2$ m., and the ellipsoid of reference is the Australian National Spheroid: $a = 6,378,160$ m, and $1/f = 298.25$. A new system is the Papua New Guinea Geodetic Datum 1994 (PNG94), which is a geocentric datum defined by a widespread network of geodetic stations around PNG. There are three permanent GPS base stations operating in PNG. The Papua New Guinea Map Grid 1994 (PNGMG) is the UTM grid on the GR80 ellipsoid. According to the Department of Surveying and Land Studies of the Papua New Guinea University of Technology, “A very approximate relationship between AGD66 and PNG94 coordinates is as follows: PNG94 Latitudes are approximately 5’ north of AGD66 latitudes, PNG94 Longitudes are approximately 4’ east of AGD66 longitudes, PNGMG Eastings are approximately 120 m greater than AMG66 Eastings, and PNGMG Northings are approximately 160 m greater than AMG66 Northings.”

There is a caveat to this approximate relationship between AGD66 and PNG94. Again, according to the Department of Surveying and Land Studies, “Tectonic motion is unaccounted for in the realization of the datum. Relative motion between different tectonic regions in PNG is often in excess of 8 cm per year. There are inconsistencies of up to 12 m between tabulated PNG94 coordinates and those derived from high precision GPS survey network adjustments….”

Thanks to John W. Hager for his patience with my requests and his generous help.

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