Republic of Vanuatu
by Clifford J. Mugnier, C.P., C.M.S.

Inhabited for thousands of years by Melanesians before discovery by the Portuguese navigator Pedro Fernandes de Queirós, the islands were forgotten for 160 years and were then visited by the French navigator Louis-Antoine de Bougainville in 1768. The English mariner Captain James Cook explored the islands in 1774 and named it the New Hebrides. “The British and French, who settled the New Hebrides in the 19th century, agreed in 1906 to an Anglo-French Condominium, which administered the islands until independence in 1980.” What the World Factbook doesn’t say is that the local people referred to it as the Pandemonium!

“The IGN [datum – Ed.] was based on the astronomical observation made at Belleveuve on Îfate.” (Note that another common spelling for the island of Îfate is Île Vaté.) The Vanuatu (IGN) 1960 Datum origin coordinates at Belleveuve are $\Phi = 17^\circ 44’ 17.40 ”$ South, $\Lambda = 168^\circ 20’ 33.25 ”$ East of Greenwich, and the ellipsoid of reference is the International 1909 (Madrid 1924) where $a = 6,378,388$ m, $b = 6,356,520$ m, $\Delta f = 297$. The National Geospatial Intelligence Agency (NGA) lists the transformation parameters from The Vanuatu (IGN) 1960 Datum (Belleveuve) to the WGS84 Datum as $\Delta x = -251m$, $\Delta y = -0.14192702$, $\Delta z = -127m$, $\Delta X = 20m$, $\Delta Y = 769m$, $\Delta Z = 472m$, and $\Delta Z = 20m$. This relation is based on observations at three stations. John W. Hager, retired from what is now NGA says, “The transforming statement is for the island of Îfate. Erromango, Tanna, Anatom and Futuna in the south. The DOS adjustment covers the islands of Santo, Aoba, Maewo, Pentecost, Ambrym, Malekula and Panama in the north and Îfate, Erromango, Tanna, Anatom and Futuna in the south. The DOS adjustment was done through the islands between the two blocks, however for some reason this was not done. The technology at that time may have been limited by the fact that the transverse Mercator projection I find is for Nouvelles Hébrides, Calédonie-Hébrides, Gauss projection, [Transverse Mercator – Ed.], International ellipsoid, meter, latitude of origin = equator, longitude of origin = 167° East, scale factor unknown but probably unity, false northing (y) = 2,600,000 meters, false easting (x) = 1,000,000 meters. This is from ‘Catalogue de Cartes en Service Publiées par l’Institute Géographique National,’ Paris, 1 July 1949.’

Referring back to the Vanuatu Geodetic Control Network Report. “The adjustment used by DOS [Directorate of Overseas Surveys, UK – Ed.] was initiated from the same points as the IGN however the astronomical observations and adjustment was done separately. The DOS adjustment covers the islands of Santo, Aoba, Maewo, Pentecost, Ambrym, Malekula and Panama in the north and Îfate, Erromango, Tanna, Anatom and Futuna in the south. The DOS however extended its triangulation further throughout the country covering and strengthening the network to other islands, except Bank and Torres in the far north. This adjustment was used for mapping as well as cadastral. DOS adjustment uses the same scale factor of one (1.0000) throughout the country, though each island has its own origin.”

Continuing, early in the 1980s the Vanuatu Government attempted to connect the DOS north and south block using traverse methods with the introduction of Telurometer distance measurements. However, it was found that there was some discrepancy between the two blocks. It was uncertain then that the error was in the traverse observation or the astronomical observation of the two blocks. It was also difficult to undertake alternative method of triangulation as the sights between Epi and Emas islands was very difficult. It was seen that it may be easier if a triangulation was done through the islands between the two blocks, however for some reason this was not done. The technology at that time may have been limited by the fact that the transverse Mercator projection I find is for Nouvelles Hébrides, Calédonie-Hébrides, Gauss projection, [Transverse Mercator – Ed.], International ellipsoid, meter, latitude of origin = equator, longitude of origin = 167° East, scale factor unknown but probably unity, false northing (y) = 2,600,000 meters, false easting (x) = 1,000,000 meters. This is from ‘Catalogue de Cartes en Service Publiées par l’Institute Géographique National,’ Paris, 1 July 1949’.
also be the cause of the inaccuracy of the observations. In mid 1990s the Australian Government assisted the Vanuatu Government by providing funds, technology and human resources through the Australian Defense Cooperation to run a Doppler network that covers the whole country. This has enabled the Vanuatu Government to anticipate the strengthening of the country’s survey control network on the WGS72 spheroid. The network was produced to control the aerial photography of the country. For cadastral purposes the DOS geodetic adjustment is still maintained.”

I asked Russell Fox, now retired from the International Geodetic Library of the Ordnance Survey International, United Kingdom, if he had anything to help me on my column on Vanuatu. To my (usual) surprise, he certainly did have something. Fox had worked there for three years! “The Condominium (known as the Pandemonium locally) was a strange form of government, the British and French running parallel but separate administrations in the same territory (so not analogous with St. Maarten/St. Martin). There were French and British police forces, hospitals, schools, etc. Residents had to use “their” facilities. Citizens of countries other than Britain (& Commonwealth) or France had to opt for either honorary British or honorary French status and use the appropriate services. This split the local people also, half of whom were educated in the French milieu and half in British traditions. There was “trouble in paradise,” as the newspapers put it, during the immediate pre-and post-independence period, as the more radical and pro-independence English-speaking ni-Vanuatu jostled for power with the French speakers and French settlers, who preferred the status quo (not least because French plantation owners would be most affected by proposed changes in land tenure).”

Fox continued. “I worked in Vanuatu from 1983-86. Independence had come in 1980, so I did not personally witness this, but one of the Survey Department’s tasks pre-independence was to measure the heights of the flagstaffs at the British and French Residences in Port Vila. There would have been a diplomatic incident if either the Union Jack or the Tricolour had been flown slightly higher than the other! The Condominium was the result of Anglo-French rivalry in the Pacific during the late 19th century; I believe that the Australian colonies were particularly keen to avoid a French takeover of the New Hebs as well as New Caledonia and they lobbied the British Govt. to do something about it. The answer was Condominium, if only to avoid an Anglo-French war. Another Condominium was the Anglo-Egyptian Sudan. The WWII US presence in the New Hebs was still evident in the 1980s, with 6-wheel trucks on plantations, USN dustbins (galvanized trash cans?) being used as water containers and metal plates from airfield runways being used as property fences.” [I remember seeing the same things when I lived in Panama – Ed.]

“The main post-1978 survey activities I know of were: 1980 – A dozen Doppler stations were observed by 512 Specialist Team, Royal Engineers. 1983-86 ‘Operation Algum’ – major support for the Survey Department was received from the Royal Australian Survey Corps. This involved a Doppler campaign throughout the islands, new aerial photography, readjustment of the DOS and IGN trig networks on WGS84 and setting up a map production facility in the Survey Department. 1980s-1990s New Editions of the DOS 1:1,000,000 map were produced by the Survey Department, also a new 1:50,000 series. The Vanuatu Map Grid was introduced, a national TM projection to replace the assorted island grids that existed previously. The Survey Department produced a brief paper in about 1976/77 that discussed the significant differences between DOS and IGN positions in the New Hebs (nearly a km in the northern islands if I recall correctly). Those discrepancies weren’t solved – or circumvented – until OP Algum, but the Survey Department did develop a TM grid (called Efate TM 77) for the main island, Efate or (Vaté), in 1977 to improve the control situation there by unifying disparate surveys and replacing the old Cassini grid. Both DOS and IGN used International Spheroid, but had datums in different places, and trig block boundaries in different places – the DOS North Block was islands North of Efate, and South Block was Efate and islands south. IGN had a North Block (Efate and islands North) and South Block (Erromango to Aneityum). I think the most northerly island in the New Hebs, the Banks and Torres Islands, were not reached by either the DOS or IGN networks and had local astro fixes only.”

The National Geospatial Intelligence Agency (NGA) lists the transformation parameters from the Santo (DOS) 1965 Datum (Espiritu Santo Island) to the WGS84 Datum as: Δa = -251m, Δf = -0.14192702, ΔX = +170m ±25m, ΔY = +42m ±25m, and ΔZ = +84m ±25m. This relation is based on observations at one station. Thanks to John W. Hager; Russell Fox; Tony Kanas, surveyor; and, the Vanuatu Department of Land Surveys for their generous assistance.

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