

ARUBA AND THE NETHERLANDS ANTILLES

Originally a single colony of the Kingdom of the Netherlands, these islands consist of two groups: the Windward Islands — Aruba (now independent), Curaçao, and Bonaire — and the Leeward Islands — Sint Maartin (shared with French Guadeloupe), Saba, and Sint Eustatius. The Leeward Islands were discovered by Hojeda in 1499 and were occupied by Spain in 1527. Taken by the Dutch in 1634, Curaçao immediately became an important post, trading with Coro, Puerto Cabello, and La Guaira, Venezuela. Once the center of slave trading in the Caribbean, Curaçao was hard hit by the abolition of slavery in 1863. Aruba and Curaçao recovered economically in the early 20th century after oil refineries were built to service the crude oil being produced in Venezuela's Lake Maracaibo. During WWII, Aruba was bombed by German submarines in 1942.

Aruba has an area of 193 sq km, and is slightly larger than Washington, D.C. The island is barren, with the capital in Oranjestad. Part of the Kingdom of the Netherlands, full autonomy in internal affairs was obtained in 1986 upon separation from the Netherlands Antilles; the Dutch government remains responsible for defense and foreign affairs. Offshore banking as well as oil refining and storage are important to the Aruban economy, but the mainstay is tourism.

The Netherlands Antilles have a combined area of 960 sq km, and the capital is Willemstad on the island of Curaçao. Part of the Kingdom of the Netherlands, full autonomy in internal affairs was obtained in 1954; the Dutch government remains responsible for defense and foreign affairs. The economy is quite similar to that of Aruba.

The original geodetic datums in the Netherlands Antilles were astro stations established at Willemstad on Curaçao and on Aruba in 1908. Topographic maps were compiled at 1:200,000 scale by the Dienst van het Kadaster from 1911 to 1915. The French observed a position on Sint Maarten in 1949 at Fort de Marigot Astronomic Pillar where $\Phi_0 = 18^\circ 04' 28.1''$ N, $\Lambda_0 = 63^\circ 05' 14.654''$ West of Greenwich, $h_0 = 61.84$ m, and the reference azimuth from the Fort to Mat K.L.M is $\alpha_0 = 218^\circ 14' 07.8''$. The ellipsoid of reference was the International 1909 where $a = 6,378,388$ m and $1/f = 297$.

Geodetic Surveys were conducted by the Dienst van het Kadaster on all the islands

comprising the Netherlands West Indies starting in 1951, and each island received a complete classical triangulation network and Transverse Mercator Grid system. Each grid is on the International Ellipsoid, and each grid has a scale factor at origin equal to unity. About the same time, the U.S. Army Map Service's Inter-American Geodetic Survey (IAGS) started a massive triangulation campaign in the Caribbean and most of Latin America.

The triangulation network of Aruba consists of 24 stations, and all angles were measured with a Wild T-2 (one arc second precision) theodolite. The base of the network (Station 2-Station 21), was measured with a standard measuring tape. The origin point for the Aruba Datum of 1951 is at Station No. 8 where $\Phi_0 = 12^\circ 31' 12.360''$ N and $\Lambda_0 = 69^\circ 59' 34.586''$ West of Greenwich. This is also the origin for the Aruba Transverse Mercator Grid, and the False Easting is 10 km and the False Northing is 15 km. The IAGS collocated with Jamanota, Station No. 12. From the Aruba Datum of 1951 to the WGS84 Datum implemented as the North American Datum of 1983 by the National Geodetic Survey, $\Delta X = -266\text{m} \pm 1\text{m}$, $\Delta Y = +112\text{m} \pm 1\text{m}$, and $\Delta Z = -360\text{m} \pm 1\text{m}$, and my solution is based on two stations.

42,098.45 m and the False Northing is 60,044.53 m. From the Curaçao Datum of 1951 to the WGS84 Datum, implemented as the North American Datum of 1983 by the National Geodetic Survey, $\Delta X = -266\text{m} \pm 1\text{m}$, $\Delta Y = +109\text{m} \pm 1\text{m}$, and $\Delta Z = -361\text{m} \pm 1\text{m}$, and my solution is based on three stations.

The triangulation network of Bonaire consists of 35 stations, and all angles were measured with a Wild T-3 theodolite. The baselines of the network (Station 1-Station 2, 1-3, and 2-3), were measured with a Tellurometer MRA 1. The origin point for the Bonaire Datum of 1951 is at Station Grandi where $\Phi_0 = 12^\circ 10' 46.971''$ N, $\Lambda_0 = 68^\circ 15' 06.639''$ West of Greenwich, and $h_0 = 98.45$ m. The IAGS collocated with stations Grandi, Brandaris, and Will. Station Grandi is also the origin for the Bonaire Transverse Mercator Grid, and the False Easting is 23 km and the False Northing is 20,980.49 m. From the Bonaire Datum of 1951 to the WGS84 Datum, implemented as the North American Datum of 1983 by the National Geodetic Survey, the geocentric translations are probably quite similar to those for both Aruba and for Curaçao.

The triangulation network of Saba consists of 14 stations, and all angles were measured with a Wild T-3 theodolite. The baselines of

Much to my surprise, I found a number of "DP" points (Dienst Punkt) listed in an old 1971 report of the French Navy. After comparing coordinates of the French with those of the Dutch, I realized that the French Navy occupied four Dutch survey points on St. Martin and came up with their own local French Datum rather than accept the Dutch values!

The triangulation network of Curaçao consists of 59 stations, and all angles were measured with a Wild T-3 (one-half arc second precision) theodolite. The baseline of the network (Station 8-Station 9) was measured with a Geodimeter Model 2. The origin point for the Curaçao Datum of 1951 is at Station No. 8 where $\Phi_0 = 12^\circ 11' 58.145''$ N, $\Lambda_0 = 69^\circ 00' 31.791''$ West of Greenwich, and $h_0 = 96.66$ m. The IAGS collocated with Taf, Station No. 3 and Chris, Station No. 13. Station No. 8 is also the origin for the Curaçao Transverse Mercator Grid, and the False Easting is

the network (Station 2-Station 4, 4-5, 5-6, 6-7, 7-8, and 8-9) were measured with a Tellurometer MRA 1. The origin point for the Saba Datum of 1951 is at Station Saba No. 1C where $\Phi_0 = 17^\circ 38' 07.606''$ N, $\Lambda_0 = 63^\circ 14' 17.187''$ West of Greenwich, and $h_0 = 834.20$ m. The IAGS collocated with station Saba. Station Saba is also the origin for the Saba Transverse Mercator Grid, and the False Easting is 4,714.87 m and the False Northing is 1,967.19 m.

The triangulation network of Sint Eustatius
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consists of 21 stations, and all angles were measured with a Wild T-3 theodolite. The baselines of the network (Station 1-Station 1A, 1-1C, 1-5, 1-7, 7-6, 6-5, 11-12, and 12-13) were measured with a Tellurometer MRA 1. The origin point for the Sint Eustatius Datum of 1951 is at Station Quill No. 1A where $\Phi_o = 17^\circ 28' 33.272''$ N, $\Lambda_o = 62^\circ 57' 37.458''$ West of Greenwich, and $h_o = 600.44$ m. The IAGS collocated with station Quill. Station Quill is also the origin for the Sint Eustatius Transverse Mercator Grid, and the False Easting is 4,782.15 m and the False Northing is 1,831.37 m.

The triangulation network of Sint Maarten consists of 19 stations, and all angles were measured with a Wild T-3 theodolite. The baselines of the network (Station 11-Station 14, 14-15, 15-12, 12-9, 9-1, and 1-7) were measured with a Tellurometer MRA 1. The origin point for the Sint Maarten Datum of 1949 is at Station Naked Boy, No. 1 where $\Phi_o = 18^\circ 02' 19.391''$ N, $\Lambda_o = 63^\circ 01' 55.766''$ West of Greenwich, and $h_o = 296.14$ m. The IAGS collocated with Naked Boy, Station No. 1. Naked Boy is also the origin for the Sint Maarten Transverse Mercator Grid, and the False Easting is 12,598.47 m and the False Northing is 3,999.18 m. From the Sint Maarten Datum of 1949 to the WGS84 Datum, implemented as the North American Datum of 1983 by the National Geodetic Survey, $\Delta X = -85\text{m} \pm 1\text{m}$, $\Delta Y = +307\text{m} \pm 1\text{m}$, and $\Delta Z = +45\text{m} \pm 1\text{m}$, and my solution is based on four stations. Based on the Dutch triangulation diagrams I have examined, I would venture to say that the rough geocentric translation parameters for Saba and for Sint Eustatius would be quite similar, if not identical, to those of Sint Maarten.

Because the Netherlands West Indies occupies only part of the island of Sint Maarten, and the other part (Saint Martin) is occupied by the Department of Guadeloupe (*PE&RS*, Vol. 66, No. 3, March, 2000, pp. 255-256), I decided to scrounge my research files a bit more. Much to my surprise, I found a number of "DP" points (Dienst Punkt) listed in an old 1971 report of the French Navy. After comparing coordinates of the French with those of the Dutch, I realized that the French Navy occupied four Dutch survey points on St. Martin and came up with their own local French Datum rather than accept the Dutch values! From the Sint Maarten Datum of 1949 to the French Saint Martin Datum of 1951, $\Delta X = +138\text{m} \pm 1\text{m}$, $\Delta Y = +246\text{m} \pm 1\text{m}$, and $\Delta Z = -431\text{m} \pm 1\text{m}$, and my solution is based on four stations. The original Astro observation of the origin point was performed in 1949, therefore the earlier date. Thanks go to John W. Hager, retired from AMS/DMA/NIMA; to Dave Doyle, senior geodesist, United States National Geodetic Survey; and to Dwingo E. Puriël, chief of Cadastral Office (Dienst van het Kadaster, Nederlandse Antillen), Curaçao.



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