

Commonwealth of the Bahamas

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

Inhabited by Lucayan Indians at the time of sighting by Christopher Columbus on 12 October 1492, the islands were assigned to Spain by Papal grant. Subsequently occupied only by slave traders and buccaneers, the Bahamas were granted by the British Crown to Sir Robert Heath in 1629. The Commonwealth of the Bahamas became independent from the United Kingdom (*PE&RS*, October 2003) on 10 July 1973. Comprised of a 700-island and islet archipelago with an additional 2,400 cays and rocks in the North Atlantic Ocean, the total land area is 10,070 km², and it is slightly smaller than the State of Connecticut. With a total coastline of 3,542 km, the terrain of the Bahamas is primarily long, low coral formations with some low rounded hills. The lowest point is the Atlantic Ocean (sea level) and the highest point is Mount Alvernia (63 m) on Cat Island. Twenty-two of the main islands are inhabited; 70% of the population of 316,000+ live on New Providence, and 16% live on Grand Bahama.

Prior to World War II, the only surveys performed in the Bahamas were astronomical observations (*Astros*) of hazards to navigation and local cadastral-type surveys for some privately held properties. Initial geodetic ties of the islands to the mainland coast of Florida were performed with flare triangulations in the 1960s that were soon followed by BC-4 ballistic camera observations of the PAGEOS satellites. Flare triangulations were performed by simultaneous theodolite observations to parachute flares dropped from airplanes flying at high altitudes in order to make geodetic connections over the horizon. BC-4 observations were performed by photogrammetric triangulations of passive satellite reflections against a background of star fields. Dr. Helmut Schmid (one of the original V-2 rocket scientists) led that geodetic program for the U.S. Coast & Geodetic Survey. The BC-4 program was the intercontinental geodetic program that tied all of the continents into the first worldwide geodetic system. Dr. Schmid was the designer of the BC-4 ballistic camera and was the mentor to Dr. Duane C. Brown, a pioneer of modern analytical photogrammetry. The Bahamas have been referenced to the North American Datum of 1927 (Clarke 1866 ellipsoid) since the 1960s, where $a = 6,378,206.4$ m and $b = 6,356,583.8$ m. The datum origin point is Meades Ranch, Kansas (quite a distance away) at: $\Phi_0 = 39^\circ 13' 26.686''$ N, $\Lambda_0 = -98^\circ 32' 30.506''$ W., and the reference azimuth to station Waldo is $\alpha_0 = 75^\circ 28' 09.64''$ (*PE&RS*, April 2000).

Thanks to John W. Hager, the following positions have been determined in the Bahamas by classical observation techniques. These following geodetic positions (ϕ , λ) are presumably on the NAD27 while the astro positions (Φ , Λ) are independent: Elbow Cay Light (ECL), $\phi = 26^\circ 32' 21.715''$ N, $\lambda = -76^\circ 57' 10.870''$ W. Also there is the Astro Observations (1940) where $\Phi = 26^\circ 32' 22.500''$ N, $\Lambda = -76^\circ 57' 15.353''$ W, Astro Observations to light = 126.79 m, $\alpha = S 79^\circ 01' 27''$ E true. Flamingo Cay Light (FLA), $\phi = 22^\circ 52' 43.48''$ N, $\lambda = -75^\circ 51' 38.28''$ W. Great Inagua Island Light, $\phi = 20^\circ 55' 56.81''$ N, $\lambda = -73^\circ 40' 37.58''$ W. Great Isaac Light (GIL), $\phi = 26^\circ 01' 48.30''$ N, $\lambda = -79^\circ 05' 22.08''$ W. Great Ragged Island Light (GRL), $\phi = 22^\circ 11' 17.29''$ N, $\lambda = -75^\circ 43' 16.03''$ W. Great Stirrup Cay (GSC),

$\phi = 25^\circ 49' 36.41''$ N, $\lambda = -77^\circ 53' 50.20''$ W. Gun Cay Light (GUN), $\phi = 25^\circ 34' 30.22''$ N, $\lambda = -79^\circ 18' 01.18''$ W. Harvey Cay Light (HCL), $\phi = 24^\circ 09' 16.19''$ N, $\lambda = -76^\circ 28' 53.95''$ W. Hog Island Light (HIL), $\phi = 25^\circ 05' 35.3''$ N, $\lambda = -77^\circ 21' 13.5''$ W. Hogsty Reef Light (HRL), $\phi = 21^\circ 41' 27.71''$ N, $\lambda = -73^\circ 50' 56.81''$ W. Hole-in-the-Wall Light (HIW), $\phi = 25^\circ 51' 32.522''$ N, $\lambda = -77^\circ 10' 37.938''$ W. Observed astro (1940), $\Phi = 29^\circ 51' 22.320''$ N, $\Lambda = -77^\circ 10' 37.370''$ W. Corrected in 1945, $\Phi = 29^\circ 51' 21.1155''$ N, $\Lambda = -77^\circ 10' 36.2901''$ W. Little San Salvador Island (LIT), $\phi = 24^\circ 33' 53.73''$ N, $\lambda = -75^\circ 56' 08.00''$ W. Man Island Light (MAN), $\phi = 25^\circ 33' 31.34''$ N, $\lambda = -76^\circ 38' 26.83''$ W. Northwest Point Astro (NPA), $\Phi = 22^\circ 27' 24.42''$ N, $\Lambda = -73^\circ 07' 44.86''$ W. Northwest Point Light (NPL), $\phi = 22^\circ 27' 35.56''$ N, $\lambda = -73^\circ 07' 47.43''$ W. Pinder Point Light (PPL), $\phi = 26^\circ 30' 08.92''$ N, $\lambda = -78^\circ 46' 00.71''$ W. Rum Cay Light (RUM), $\phi = 23^\circ 38' 36.1''$ N, $\lambda = -74^\circ 50' 05.7''$ W. Santa Maria Light (SML), $\phi = 23^\circ 40' 54.54''$ N, $\lambda = -75^\circ 20' 27.60''$ W. South Point Light (SPL), $\phi = 22^\circ 50' 56.48''$ N, $\lambda = 74^\circ 51' 14.42''$ W. Stocking Island Astro (SIA), $\Phi = 23^\circ 32' 33.97''$ N, $\Lambda = -75^\circ 46' 10.75''$ W. Sweetings Cay Light (SWC), $\phi = 26^\circ 36' 40.62''$ N, $\lambda = -77^\circ 54' 00.86''$ W.

The NGA lists the three-parameter transformation from NAD27 to WGS84 for the Bahamas *excluding San Salvador Island* as $\Delta X = -4$ m ± 5 m, $\Delta Y = +154$ m ± 3 m, and $\Delta Z = +178$ m ± 5 m, where the 1987 solution is based on 11 station observations. For San Salvador Island, $\Delta X = +1$ m ± 25 m, $\Delta Y = +140$ m ± 25 m, and $\Delta Z = +165$ m ± 25 m, and the 1987 solution is based on one station observation. In 1997, the U.S. National Geodetic Survey observed a number of high-order positions in the Bahamas on the NAD83 datum. The only grid ever used in the Bahamas is the UTM.

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