



# GRIDS & DATUMS

BY Clifford J. Mugnier, CP, CMS, FASPRS

REPUBLIC OF

# GUINEA

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 Republic of Guinea was originally printed in 2002 but contains updates to their coordinate system since then.

The original inhabitants of Guinea were forced out of the area around 900 A.D., and numerous kingdoms were subsequently established. By the mid 1400s, the Portuguese visited the area and a slave trade was established. The area was under active trade with the British, French, and Portuguese in the 17<sup>th</sup> century; and the coastal region was declared a French Protectorate in 1849. Ad-administered at various times by Senegal and the Rivières du Sud, the territory of French Guinea was made a colony in 1893. The Federation of French West Africa, which included Guinea as a member, was established in 1895. Its status was changed to that of an overseas territory in 1946, and on 02 October 1958, Guinea became the first state of the former French West Africa to gain independence. Guinea includes the Los Islands, an island group west of the capitol city of Conakry. The seacoast is marshy and is about 274 km long; the interior rises to hilly and plateau regions. The highest point is Mount Nimba (1,752 m), near the tri-point with Côte d'Ivoire and Liberia. Going clockwise from the north Atlantic Ocean to the west, Guinea shares borders with Guinea-Bissau, Senegal, Mali, Côte d'Ivoire, Liberia, and Sierra Leone. The Guinean maritime boundary is defined in large part by a single, unique (in the world) Straight Baseline. By Decree of the President of the Republic in 1964, the limits of the territorial waters are fixed "to the north, by parallel of altitude 10° 56' 42.55" north, and to the south, by parallel of altitude 9° 03' 18" north, along a distance of 130 sea miles seaward, reckoning from a straight line passing by the south-west of Sene Island of the Tristao group, and to the south, by the south-west foreland (cape) of Tamara Island, at low tide." The boundary between Guinea and Guinea-Bissau was established through a Franco-Portuguese convention of 12 May 1886. The demarcation of the 384-km



boundary with straight lines between 58 markers and along thalwegs of rivers was completed and approved by 1906. In 1915 an *arrêté* (decision) by the Governor General of French West Africa promulgated a French decree establishing a 328 km boundary between French Guinea and Senegal. Early in 1934 an *arrêté* promulgated a decree of the previous December changing the French Guinea –Senegal boundary in the sector between the head of the Tanague River and the junction of the Bitari and Koïla Kabé. A Franco-Liberian convention of 08 December 1892 delimited a boundary between the possessions of France (Côte d'Ivoire and French Guinea) and Liberia inland from the mouth of the Cavalla River to the tripoint with Sierra Leone. That 560 km boundary with French Guinea was redrawn on 18 September 1907. Further surveys and commissions settled the matter with several *procès verbaux* (verbal proceedings) finally in 1926. The Guinea-Sierra Leone boundary has a length of approximately 648 km. Established by Anglo-French convention of 28 June 1882, a boundary was delimited from the Atlantic

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Ocean inland along the drainage divide of the Great Scarcies and Mélikhouré (rivers) to an in-definite point in the interior. Later determined by field surveys, the last agreement fixing the boundary was signed on 04 September 1913. In places, the boundary measurements are described to the closest half-meter. Reading between the lines, I'd guess that the boundary commission surveyors had people literally looking over their shoulders during that process!

When the federation of the eight territories constituting French West Africa came into being in 1904, the *Annexe de l'Institut Géographique National à Dakar* had the local responsibility for topographic mapping. Also known as the *Service Géographique de l'Afrique Occidentale Française* SGAOF (Geographic Service of the French West Africa), topographic mapping of Guinea has been largely at the scales of 1:200,000 and 1:500,000. This agency has performed a small amount of mapping at the scales of 1:20,000, 1:50,000, and 1:100,000. Topographic mapping of Guinea was in the past largely the result of rapid ground surveys. After WWII, the French adopted aerial photography controlled by astronomical points ("Astro" stations) as the means of surveying and mapping at scales of 1:50,000 and 1:200,000. These compilations were also used for derivative mapping at smaller scales. There is complete coverage of the country at 1:500,000 scale, and at

1:200,000 scale. The latter consists of sheets mainly based on ground surveys. A small portion of Guinea has 1:50,000-scale topographic sheets compiled, mostly by the French IGN in the coastal west, and by a cooperative agreement with the Japanese (JICA) for some sheets around Kankan and Kérouané-Macenta.

The oldest coordinate system in Guinea that I have been able to locate (with help) is the Conakry Datum of 1905 where  $\Phi_0 = 9^\circ 30' 58.997''$  N,  $\Lambda_0 = 13^\circ 42' 47.483''$  West of Greenwich,  $\xi_0 = -4.50''$ ,  $\eta_0 = -0.02''$ , and the ellipsoid of reference is the Clarke 1880 (IGN) where  $a = 6,378,249.2$  m and  $1/f = 293.4660208$ . Thanks go to both John W. Hager, retired from NIMA, and to Russell Fox of the Ordnance Survey of the U.K. The origin point is at the Public Works Building in Conakry, and John W. Hager went on to say: "Reingold cites *Les Manuels Coloneaux*, "Cartographie Coloniale," Paris, 1935 and "Catalogue de Positions Géographiques," Paris, 1923 give the position to the nearest second. *Annales Hydrographiques*, 4e Série, Tome 1, Année 1950, Paris 1951, p. 155 gives the above but is listed as 3rd order. A position for the Railway Astro Pillar is given as latitude =  $9^\circ 30' 54.5''$  N and longitude =  $13^\circ 42' 47.1''$  W, a difference in position of 138.6 meters. I would assume that the astro pillar was not permanently marked."

Some minor hydrographic surveys were performed by the

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French Navy, and these were based on local astro stations that served as origins of grids computed on the Hatt Azimuthal Equidistant projection. The Tabola River survey had its origin at Cabrion Base North End (1936) where  $\Phi_0 = 9^\circ 56' 08.1''$  N and  $\Lambda_0 = 13^\circ 54' 42.4''$  West of Greenwich.

The defining azimuth to Cabrion Base South End was  $\alpha_0 = 123^\circ 34' 00''$ , and the baseline length was 1017.537 m. I was wondering why the French performed a survey in such a tiny locale that did not even appear on the standard CIA map of the country. I examined my *Carte Générale of Guinée* and noticed that there is a road to there through the town of Koba that winds north up into the hills. Apparently, something valuable was being trucked out of those hills to the port of Taboriya. Hager found one at “Binari 1949 (code BIN) at the I.G.N. Astro, latitude =  $10^\circ 30' 26.2''$  N, longitude =  $14^\circ 38' 45.0''$  W (1) or ...  $41.03''$  (2) or ...  $40.0''$  (3), Clarke 1880. Position (1) is from *Annales Hydrographiques*, 4e série, Tome Sixième, Année 1955, p. 247. Position (2) is from *Annales Hydrographiques*, 4e série, Tome Dixième, Années 1959-1960, p. 65, Paris 1961. Position (3) is a footnote to (2) and refers to the 1954 survey by M. Sauzey.”

There have been some other rather curious coordinate systems devised for Guinea during the 20<sup>th</sup> century. Prior to and during WWII, there were a number of military Grids that were collectively termed the “British Grids.” These were all documented and computed into projection tables by the U.S. Army. One published by the U.S. Army Corps of Engineers Lake Survey in 1943 was the Guinea Zone based on the Lambert Conical Orthomorphic Projection Tables. The defining parameters are Latitude of Origin, ( $\phi_0$ ) =  $7^\circ$  N, Central Meridian ( $\lambda_0$ ) =  $0^\circ$  (Greenwich), Scale Factor at the Parallel of Origin ( $m_0$ ) = 0.99932, False Northing, FN = 500 km, and False Easting, FE = 1,800 km. The wording for the projection is characteristically British, as is the method of presenting the defining parameters, and the projection is definitely the fully conformal version rather than the French Army version of the time. Furthermore, the parameters given for the Clarke 1880 ellipsoid were the British version where  $a = 6,378,249.145$  m and  $1/f = 293.465$ . This grid continued in use by the U.S. Army Map Service for a couple of de-cades after WWII.

Immediately after WWII, the French Institut Géographique National devised a number of grids for l'A.O.F. usage as of 12 December 1945. The region of French Guinea was to be covered by two fuseau, or zones: “Fuseau Sénégal” with  $\lambda_0 = 13^\circ 30'$  West of Greenwich, and “Fuseau Cote d'Ivoire” with  $\lambda_0 = 6^\circ 30'$  West of Greenwich. The scale factor at origin ( $m_0$ ) = 0.999 and the ellipsoid of reference was to be the International (Hayford 1909) where  $a = 6,378,388$  m and  $1/f = 297$ . Because there was not a great deal of existing mapping in French West Africa at the time, most datums were established by astro shots and few classical chains of quadrilaterals had been surveyed. The introduction of a new ellipsoid was therefore not of major geodetic importance to existing cartographic work. French Navy Hydrographic surveys of the late 1940s in Guinea were cast on the Fuseau Sénégal Grid. When I was in

college, I once read a science fiction novel about a disgruntled cartographer on a lonely expedition to a new planet. He chose risqué names for his gazetteer, and that fact went undiscovered for many years. While perusing the report of the French Navy hydrographic survey of the mouth of the Saloum River (*Mission Hydrographique de la Côte Ouest d'Afrique, 11 Mai 1950 – 18 Mai 1952*), guess what I found? Yep, an American vulgarism and an American gangster's name for triangulation stations!

The U.S. Army Map Service concocted the Universal Transverse Mercator (UTM) Grid System for worldwide use in 1948. France had been trying to gain an international consensus for some sort of similar system, and quickly adopted the UTM for most of its colonies. As of 30 September 1950, all new surveying and mapping of French Guinea was done on the UTM Grid. That situation remains to this day. The only information available on a datum shift from the local datum to WGS84 for the entire country of Guinea is the entry in NIMA's TR8358.2 for “Dabola Datum” where  $\Delta a = -112,145$ ,  $\Delta f \times 10^4 = -0.54750714$ ,  $\Delta X = -83\text{m} \pm 15\text{m}$ ,  $\Delta Y = +37\text{m} \pm 15\text{m}$ , and  $\Delta Z = +124\text{m} \pm 15\text{m}$ . This four-point solution was published by NIMA in 1991. Because there is only a 1:200,000 scale map published of Dabola, and there are no 1:50,000-scale topographic maps nearby, I am unable to find a plausible reason for the choice of this transformation name or location other than it is more or less in the center of the country. I have found no other evidence of such a datum in existence.

## UPDATE

### Missions

The National Geographic Institute's mission is to design, implement and monitor the National Policy for National Geospatial Data Infrastructures (INDG).

As such, it is particularly responsible for:

- create, densify and protect the geodetic reference and leveling networks;
- to produce updated basic maps on a variable scale corresponding to the economic vocation of the country;
- to develop and ensure the application of national standards in terms of geodesy, cartography and aerial and satellite shots and to ensure control and harmonization of production in these areas,
- to set up, at national level, a harmonized Geographic Information System (GIS);
- participate in carrying out work relating to the materialization of national borders and administrative boundaries;
- to participate in the development of terms of reference for tender documents and in the examination of offers from the geodesy, cartography and aerial photography markets.

The National Geographic Institute is the legal depositary of all cartographic, geodetic and aerial photography production on the national territory of which it ensures the filing.

## Organization / Teams

To accomplish its mission, the National Geographic Institute includes:

- **A Land Survey Service**, responsible for:
  - to design, establish, densify and maintain the national geodesic canvas, the general state leveling networks and any other network or canvas such as the astronomical and gravimetric network;
  - to draw up technical standards in terms of topography, geodesy and to ensure their correct use;
  - to provide services in its field of activity;
  - to carry out topographic and geodetic work relating to the materialization of borders and administrative boundaries.
- **A Cartography and Geographic Information System (GIS) Service**, responsible for:
  - to design and carry out basic mapping work throughout the national territory;
  - ensuring the control and harmonization of cartographic production;
  - to draw up technical standards, in particular conventional signs and to ensure their application;
  - to set up and manage the National Geographic Information System;
  - to carry out toponymic surveys with a view to standardizing geographical names;
  - manage, maintain and develop the map library;
  - participate in the development and / or validation of TORs, tender documents for mapping projects,
  - to participate in the analysis and analysis of the offers of the public mapping markets.
- **An Air Surveys and Remote Sensing Service**, responsible for:
  - to regulate all aerial shots
  - to carry out photo-interpretation and stereo preparation work;
  - carry out remote sensing and photo laboratory work as a service;

- develop technical standards in the field of aerial surveys and remote sensing and ensure their correct use;
- draft specifications for projects relating to aerial photography;
- ensuring the control and harmonization of aerial photography;
- manage and maintain the photo library;
- to participate in the preparation of tender documents and in the analysis and analysis of offers from aerial photography markets.

- **An Administrative and Financial Service**, responsible for:

- to provide the central secretariat of the Institute;
- to draw up the annual budget of the Directorate in relation to the technical services and to carry out all financial and accounting operations;
- to maintain the premises, rolling stock and IT equipment of the Institute;
- prepare and / or supervise the production of the financial reports of the Institute and present them.

A new territorial waters boundary is written that references positions on the WGS84 Datum but offers no ties to existing terrestrial coordinate systems.

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<https://www.mtp.gov.gn/le-ministere/etablisements-publics/ign/>

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