

Grids & Datums

REPUBLIC OF BELARUS

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

"Belarus's origins can be traced from the emergence in the late 9th century *A.D.* of Kievan Rus', the first East Slavic state. After the death of its ruler, Prince Yaroslav the Wise, in 1054, Kievan Rus' split into a number of principalities, each centered on a city. One, Polatsk (*Polotsk*, in Russian), became the nucleus of modern-day Belarus. In 1240, after the Tatar overthrow of Kiev, the dominant principality of Kievan Rus', Belorussia and part of Ukraine came under the control of Lithuania. The resulting state was called the Grand Duchy of Lithuania, Rus', and Samogitia. Because territories inhabited by East Slavs made up about 90 percent of the Grand Duchy, they exerted a great cultural influence on the new state. Official business was conducted in a Slavic language (a predecessor of both Belorussian and Ukrainian) based on Old Church Slavonic, and the law code was based on that of Kievan Rus'. In its early history, the region was known as "Belaya Rus'," "Belorussia," "White Ruthenia," or "White Rus'." (A number of explanations have been proffered for the term "white.") As if this were not confusing enough, the terms "Rus'" and "Russia" have often been confused, sometimes deliberately. The original Rus' was Kievan Rus', which existed for centuries before Muscovy (which would later become Russia) gained significance. Russia later claimed to be the sole successor to Kievan Rus' and often blurred the line between the two. In the Russian language, both "*ruskiy*" and "*rossiyskiy*" mean "Russian." Since the late 19th century, national activists have based their attempts to create an independent Belarusian state based on the Belorussian language, which had been kept alive over the centuries mainly by peasants. The stage was set for the emergence of a national consciousness by the industrialization and urbanization of the nineteenth century and by the subsequent publication of literature in the Belorussian language, which was often suppressed by Russian, and later Polish, authorities. It is ironic, then, that the first long-lived Belorussian state entity, the Belorussian Soviet Socialist Republic (Belorussian SSR), was created by outside forces – the Bolshevik government in Moscow. And it was those same forces, the communists, whose downfall in 1991 precipitated the existence of an independent Belarus, which has been torn between its desire for independence and a longing for integration with newly independent Russia.

"Belarus, a generally flat country (the average elevation is 162 meters above sea level) without natural borders, occupies an area of 207,600 square kilometers, or slightly smaller than the state of Kansas. Its neighbors are Russia to the east and northeast, Latvia (*PE&RS*, September 2002) to the north, Lithuania (*PE&RS*, December 2008) to the northwest, Poland (*PE&RS*, September 2000) to the west, and Ukraine (*PE&RS*, June 2004), to the south. Belarus's mostly level terrain is broken up by the Belarusian Range (*Byelaruskaya Hrada*), a swath of elevated territory, composed of individual highlands, that runs diagonally through the country from west-southwest to east-northeast. Its highest point is the 346-meter Mount Dzyarzhynskaya (*Dzerzhinskaya*,

in Russian); named for Feliks Dzerzhinskiy, head of Russia's security apparatus under Stalin. Northern Belarus has a picturesque, hilly landscape with many lakes and gently sloping ridges created by glacial debris. In the south, about one-third of the republic's territory around the Prypyats' (*Pripyat'*, in Russian) River is taken up by the low-lying swampy plain of the Belarusian Woodland, or Palyessye (*Poles'ye* in Russian). Belarus's 3,000 streams and 4,000 lakes are major features of the landscape and are used for floating timber, shipping, and power generation. Major rivers are the west-flowing Zakhodnyaya Dzvina (*Zapadnaya Dvina* in Russian) and Nyoman (*Neman* in Russian) rivers, and the south-flowing Dnyapro (*Dnepr* in Russian) with its tributaries, Byarezina (Berezina in Russian), Sozh, and Prypyats' rivers. The Prypyats' River has served as a bridge between the Dnyapro flowing to Ukraine and the Vistula in Poland since the period of Kievan Rus'. Lake Narach (*Naroch'*, in Russian), the country's largest lake, covers eighty square kilometers. Nearly one-third of the country is covered with *pushchy* (sing., *pushcha*), large unpopulated tracts of forests. In the north, conifers predominate in forests that also include birch and alder; farther south, other deciduous trees grow. The Belavezhskaya (*Belovezhskaya*, in Russian) Pushcha in the far west is the oldest and most magnificent of the forests; a reservation here shelters animals and birds that became extinct elsewhere long ago. The reservation spills across the border into Poland; both countries jointly administer it" (*Library of Congress Country Studies*, 1995).

The tsarist Russians performed surveys and topographic mapping of Belarus in the 19th and early 20th centuries, but these works were for military purposes only. They did nothing with respect to individual land ownership registration, and they preferred the sazhen for their unit of measurement. At that time, the Russians preferred the Walbeck 1819 ellipsoid where $a = 6,376,896$ meters and the reciprocal of flattening, $1/f = 302.78$. Some of these old maps also referred longitudes to Ferro in the Canary Islands; a practice dropped after WW II. The Russian "System 42" Datum is referenced to the Krassovsky 1940 ellipsoid where $a = 6,378,245$ meters, and $1/f = 298.3$. The origin is at Pulkovo Observatory: $\Phi_0 = 59^\circ 46' 18.55''$ North, $\Lambda_0 = 30^\circ 19' 42.09''$ East of Greenwich, and the defining azimuth at the point of origin to Signal A is: $\alpha_0 = 317^\circ 02' 50.62''$. The Grid system used is the Russia Belts which are identical to the UTM Grid except that the scale factor at origin (m_0) at the Central Meridian is equal to unity for each of the 6° belts.

"Since January 01, 2010 (*the*) National Reference Frame – State Geodetic Reference System of 1995 of the Republic of Belarus (SGR95 RB) has been in use. Introduction of the National Reference Coordinate System on the territory of Belarus was caused by the necessity of preservation of the common coordinate space with (*the*) Russian Federation in accordance with the political agreements and demands of the Ministry of Defense.

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“The new structure of the National Geodetic Network consists of the:

- Fiducial Astro-Geodetic Network (FAGS in Minsk);
- Precise Geodetic Network (Zero order reference network);
- 1st class Satellite Geodetic Network (First order reference network);
- National Detail Geodetic Network.

Connection between the FAGS station and the coordinate system ITRS/ITRF2005 was exercised with fixed binding to 9 IGS stations.

Some details of the campaign are:

- Accuracy (RMS) of the coordinates: ± 0.8 mm, ± 0.3 mm, ± 2.0 mm in North, East and Up components.

Network solution includes 4 IGS stations + FAGS stations. Some details of the 1st class Satellite Geodetic Network are:

- Number of points: 846;
- Accuracy (RMS) of the coordinates: ± 2.2 mm, ± 1.6 mm, ± 4.2 mm in North, East and Up components.

(The) network solution includes 9 points of the Precise Geodetic Network. 306 points (36%) were compounded with old triangulation points (1st and 2nd classes Astro-geodetic network). (The) National Detail Geodetic Network includes 6,268 points” (*National report of Belarus, S. Zabahonski, N. Rudnitskaya, Minsk 2012*).



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