

## Response to Surveyor Connect Thread RE: 2022 Geometrical Datum & SPC

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This item is posted on the Global COGO, Inc. web page and is intended to support/address issues raised in two separate threads on the Surveyor Connect Bulletin Board.

- A. Original thread posted by Shawn Billings on February 20, 2015. See – <http://surveyorconnect.com/index.php?mode=thread&id=304269>
- B. Follow-up thread posted by Earl F. Burkholder on February 23, 2015. <http://surveyorconnect.com/index.php?mode=thread&id=304826>

The follow-up thread above was started because the original thread got to be quite long and contains significant extraneous material/comment. The intent of the follow-up thread is to re-focus the discussion while being clear about background information:

1. The surveying profession collects, manipulates, analyzes, organizes, displays, and reports spatial data in support of various disciplines worldwide. Spatial data are the bread/butter of surveying.
2. With regard to providing competent services and protecting the health, safety, and welfare of the public (at least in the U.S.) persons offering services to the public are required to be licensed by the state in which they operate. The basis of such licensure is education, experience, and references from other licensed professionals. This process also has challenges to be addressed.
3. Even so, some spatial data activities fall outside the purview of licensure leaving a “hole” in the process with regard to ensuring a consistent level of high-quality services.
4. Our capitalistic system encourages competitive innovation and is responsible for advances in many sectors of modern society. With regard to use of spatial data, the digital revolution has spawned many impressive applications of 3-D digital spatial data worldwide. Appropriate checks and balances are needed to ensure promotion of “best practices” throughout.
5. There are many economic opportunities in the spatial data sector for persons at various levels – technicians who collect the data, analysts who manipulate data, professionals who use those data in various ways to serve a client, bureaucrats who administer policies related to spatial data, programmers who develop tools to enhance productivity, and researchers who develop standards and specifications to guide efficient use of spatial data. Persons at all levels contribute ideas for making the “system” more productive and enhancing the value of spatial data and its applications.
6. Efficient use of 3-D digital geospatial data as used by many disciplines is enhanced by:
  - a. Education and a fundamental understanding of 3-D geometry including –
    - Knowing specifically what definition of horizontal distance is being used.
    - Realizing that meridians are not parallel and using angle/directions properly.
    - Being able to accommodate various expressions of the third dimension - geoids, etc.
    - Understanding the requirements and limitations of spatial data accuracy.
    - The ability to preserve the geometrical integrity of spatial data in all applications.
  - b. Having and using a common global standard format for spatial data exchange.

- c. Knowing how various coordinate systems are related to each other.
7. In addition to those persons providing services directly to the public in collecting, manipulating, and using 3-D digital spatial data (i.e., members of NSPS, ASPRS, ASCE, and others) , there are agencies/organizations working to address policies that affect the manner in which 3-D geospatial data are collected, manipulated, and used. Examples include:
- a. The NOAA BIG DATA Initiative seeks to exploit existing (and future) data holdings for commercial value. A significant challenge here is use of a common spatial data model. See – [www.globalcogo.com/BIGDATA.html](http://www.globalcogo.com/BIGDATA.html).
  - b. The FAA is charged with developing policies for administering airspace for Unmanned Aerial Systems (UASs) with regard to operating drones. See [www.globalcogo.com/FAAGSDM.pdf](http://www.globalcogo.com/FAAGSDM.pdf).
  - c. On February 6, 2015, The Coalition of Geospatial Organizations (COGO) published a Report Card on the status of seven components of the Geospatial Data Infrastructure. The overall comprehensive grade is a C-. That needs to be improved! Perhaps one of the most “telling” comments in the Executive Summary is, “While Framework data have been collected and made available for use over the past two decades, a digital geospatial Framework that is national in scope, is not yet in place and may never exist.”  
  
<http://www.asprs.org/Press-Releases/Coalition-of-Geospatial-Organizers-COGO-Announces-the-Release-of-the-Report-Card-on-the-U-S-National-Spatial-Data-Infrastructure.html>
  - d. The National Geodetic Survey (NGS) currently promotes use of Low Distortion Projections (LDPs) for local implementation. LDPs have merit but a serious limitation is that a map projection is strictly a two-dimensional model and we work with 3-D digital spatial data. This author has significant experience with LDPs and presented a 4-hour workshop on LDPs on February 26, 2015 in Colorado - see [www.globalcogo.com/COLDP.pdf](http://www.globalcogo.com/COLDP.pdf).
8. The point of this document is that the global spatial data model (GSDM) is an appropriate candidate for addressing the overall challenges and concerns discussed herein. The rigor and technical characteristics of the GSDM have been tested and proven. The uniqueness of the GSDM which includes both a functional model and a stochastic model is based upon:
- a. The assumption of a single origin for 3-D geospatial data.
  - b. Utilization of the earth-centered earth-fixed (ECEF) coordinate system devised by the U.S. DoD for development and operation of the GPS.
  - c. The rules of solid geometry established by Rene Descartes (1596 to 1650)
  - d. Standard error propagation procedures given by  $\Sigma_{yy} = J \Sigma_{xx} J^T$

Of the objections to implementing the GSDM, the most legitimate objection (and one that can be overcome) is that when using ellipsoid height to represent the third dimension, a negative value of ellipsoid height is counter-intuitive for a person standing on the dock next to the ocean. How can my feet be dry if height is negative? Other objections are more easily addressed.