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Mountainpathfinder>> Georgia SAR>> Use of the US National Grid in Georgia search and rescue

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Knowing how to search or how to rescue is important in SAR. That knowledge, though, is useless if you don't know the where of the search or the rescue. We must concisely and simply communicate whereabouts in commonly-used terminology during an emergency. We aren't always doing that in Georgia. There's a lot of room for error. We place a lot of value in the "crutch" of the Global Positioning System without looking at the details of coordinate systems and datums. Right now may be the time to solve this with state-wide implementation of a nationally accepted standard - the US National Grid. This page explains USNG and points you to tools to learn the system, its history, and how to prepare your organization to operate in a Federally-driven catastrophic incident. I hope that it encourages all Georgia SAR responders to adopt US National Grid as a means to "reasonably eliminate opportunities for failure."

Background: Humans have sought some means of communicating their whereabouts - and how to get to some other point - ever since they wanted to tell each other about a resource that was beyond their range of vision. Systems were as simple as immediate relative ones ("walk down the creek to the cane patch"), or as complex as celestial ones (utilizing the location/motion of the sun and stars). The need to travel greater distances, and to explain whereabouts with greater precision called for two things: a mutually-accepted way to communicate whereabouts, and a common point of reference around which the communications are framed.

Coordinate systems: The mutually-accepted way to communicate whereabouts is usually a coordinate system. Modern coordinate systems usually involve drawing a scaled grid (cris-crossed lines) over the map. Location is then expressed in reference to numbers or letters assigned to the primary grid lines on the map. Latitude and longitude is probably the grid system with which most laymen are familiar. A series of uniform north-south (longitude) and east-west (latitude) lines are drawn on the map. These are drawn in reference to primary north-south and east-west lines (the prime meridian and the equator). Location is expressed in terms of how many "lines" you are north or south of the equator and how many

lines east or west you are of the prime meridian. Almost all later systems are variations of that.

Datums - common points of reference: Again, over time the need grew for people to precisely express the whereabouts of anything. The prime meridian and the equator were useful reference points in aiming for distant shores or friendly ports. It didn't serve very well, though, as a reference tool for defining the boundaries of a property owner's land holdings. Surveyors improvised to solve the problem. America's earliest surveyors, including George Washington, would express property lines in terms of a common, permanent object. Everyone in the neighborhood might know the whereabouts of a prominent boulder. Washington, then might draw up a property description that said, "start at the big rock and go 5000 feet on a bearing of 0 degrees, then west on a bearing of 270 degrees for 4000 feet, then south...", well, you get the point. Surveyors used a reference point other than the equator and the prime meridian.

At some point the lat-long/meridian-equator system had to be tied into something that was useful on a local level. Someone had to nail down the coordinate system in terms of a single common point of reference - like Washington's boulder. What geographers decided was to designate a datum, or an officially-recognized central point of reference for map-making. A major one in the U.S. was the North American Datum 1927 (NAD 27), which fixed the US government mapping around a point in Meades Ranch, Kansas. Employment of NAD 27 was a piece-meal process. Technology eventually revealed that NAD 27 wasn't sufficiently precise. In 1986, the US officially adopted North American Datum 1983 (NAD 83) to to capitalize on improved surveying and mapping tools. The World Geodetic Survey adopted substantially the same datum with WGS 84.

Opportunities for confusion; opportunities for failure: In the late 20th century, conflicts in datums and coordinate systems demanded a mutually-accepted solution.

- The need for geo-referencing - America faced several catastrophic incidents in which the mechanism (hurricane, earthquake, etc.) wiped out street signs, structural numbering, and other clues needed for local navigation. These incidents were also so large that they required the ability to direct resources from around the U.S. to very specific locations in the affected areas. This demanded a fall-back to some sort of addressing/coordinate system on the order of lat-long;
- Responders have a tough time staying proficient at determining tight lat-long coordinates without regular practice;
- Responders often have a tough time picking out of a GPS receiver display the the correct "truncated" eight-digit UTM grid coordinates:
- Confusion in expressing whereabouts in terms of lat-long - latitude and longitude, for example, doesn't lend itself to simple, unambiguous emergency communication of whereabouts. In lat-long there are too many ways to explain precise whereabouts - -10 degrees, 30 minutes, 30 seconds; -10 degrees, 30.5 minutes; -10.55 degrees. If responders aren't all fully briefed on the exact means of expressing lat-long (and everyone doesn't switch their GPS receivers, aircraft navigation systems, and PC mapping software to the right one), it's possible to screw up;
- Conflicts between users of different coordinate systems - air resources used lat-long. The military used the Military Grid Reference System (MGRS). Civilian responders used a mis-mash of lat-long in different units along with the Universal Transverse Mercator System, a version of MGRS; and
- Conflicts between users and datums. So long as a single coordinating agency handed out paper maps, the differences in datums weren't a problem. With the advent of the Global Positioning System (GPS), everyone started bringing their own maps - even if those "maps" were only images on an LCD screen - that may not be set to an incident-wide datum. Worse, some

responders didn't know how to adjust the GPS receiver's datum.

The fall-out from all this was that there was no common means of communicating whereabouts. Without it, resources were often severely hindered in reaching the right place.

The US National Grid (USNG) System: The US National SAR Committee wanted to resolve this. Its solution is the US National Grid (USNG). Specifically, USNG -

- Adapted the Military Grid Reference System (MGRS) and Universal Transverse Mercator System (UTM) to civilian use; and
- Incorporated the NAD 83/WGS 84 datum as the standard datum for all responders.

This fixed several problems:

- It adopted an easily-taught coordinate system that was already in use by the military and many SAR responders;
- It eliminated ambiguity in explaining location. USNG/MGRS/UTM doesn't have the degrees/minutes/seconds vs degrees/decimal degrees minutes issue. An USNG/UTM/MGRS coordinate can be "truncated," or shortened, to an eight-digit coordinate; however, truncation doesn't inject more problems;
- It eliminated ambiguity about datums. If you're told to use USNG, you know that you're switching any electronic navigational aids to NAD 83 (assuming that they don't automatically do so when switching the coordinate system);
- Units of distance tie together better with units of location in USNG. Miles and feet don't translate to anything in lat-long. Meters and kilometers, however, are also ways of measuring USNG coordinates. They "talk" to each other. A plastic tool for determining USNG coordinates on a paper map can also be used to measure distances on the same map.
- Users can easily remember how to work in USNG even if they haven't recently practiced it; and
- A GPS received, when set correctly to USNG, will automatically display the correct eight-digit grid coordinates without the need for the user to determine which digits to use and which to drop in order to "truncate" the address.

Back in Georgia: Here, we have to -

- Use a coordinate system that works well for us outside of a Federally-driven incident
- Use a system that's easily-taught and easy to stay proficient in even without regular practice
- Allows us to seamlessly integrate with Federal and out-of-state resources in a Federally-drive catastrophic incident
- Hews as closely as possible to what's already being taught and used.

USNG does just that:

- UTM (the basis for USNG) works well enough for us that we already teach it in the GEMA Rescue Specialist classes. It's also taught in the SAR courses offered by the National Association for Search and Rescue, and tested in NASAR's SARTECH responder evaluations. After the GEMA course, the NASAR training is the predominant vehicle for SAR training in Georgia and the US
- USNG has no meaningful differences to UTM for the field responder
- Teaching the 10000-meter coordinate system in USNG and UTM is easy enough that it apparently presents no problems in either the GEMA Rescue Specialist class or the NASAR classes
- Federal and out-of-state resources already use it

- USNG is not functionally different from what we're already teaching/using.

Tools for implementing USNG in your organization: There is a ton of useful training material out there for getting your organization to start "thinking USNG".

- Skagit County (WA) USNG "poster" - ninety percent of what the average field/command staff responder needs to know about USNG is incorporated into this single-sheet handout. It's so good that the Federal agencies involved are including it in their training material webpages
- US Coast Guard USNG webpage - Those NASAR graduates out there are aware of USCG's role in the National SAR Plan. The USCG Office of Search and Rescue website includes a great USNG webpage that includes links to training material as well as "freeware" to use to convert lat-long coordinates to USNG
- Federal Geographic Data Committee (FGDC) USNG page - FGDC is the Federal inter-agency group that sets standards for mapping and GIS. As a linch-pin in Federal GIS, this organization maintains a lot of training/discussion material. It includes free grid readers and maps for printing.
- Delta State University has really stepped up since its Geographic Information Systems (GIS) Department assisted in the Hurricane Katrina response. It has created a lot of training material. It is also doing a "road show" to train out-of-state resources in USNG. I've emailed them to see if they will participate in Georgia next SARCON
- The US Geological Survey's Emergency Operations Portal - The EOP is adding local 8.5x11" USNG-based atlases of major metropolitan areas
- NASAR "Response" article on the US National Grid system

Who has adopted USNG for Georgia SAR response: I don't know where GEMA/OHS stands on this issue. I've inquired, and and GEMA has yet to reply after three months. GEMA/OHS incorporated UTM into the Rescue Specialist Course at least 25 years ago, so GEMA planted the seed for USNG. The Department of Natural Resources Search and Rescue Team (SART) appears to have adopted the essence of USNG by default. It uses UTM for ground search and lat-long in dealing with its aviation resources. The informal convention seems to be to use NAD 83/WGS 84 in mapping/GPS work.

Arguments against USNG for Georgia SAR response: well...

- "We're a local/state/volunteer agency. USNG isn't required from us by the Federal government." That's technically correct, but it's not a valid argument. The many articles and Powerpoint presentations addressing USNG point out that the Federal government doesn't impose USNG on local, state, or volunteer agencies. However, the current philosophy of emergency response includes two tenets: 1) "all response is local", and 2) "if you want a smooth Federal intervention into a catastrophe, then you need to prepare to integrate with out-of-area resources." This is no different than any other element of Homeland Presidential Security Directive (HSPD) - 5, which includes NIMS and ICS. We all train and rehearse around them, even if 99 percent of our responses never call for their full and formal use. In short, if you want to play with the big guys, then learn to play like the big guys
- "Our agency uses lat-long because our resources revolve around aviation" - this is, to my knowledge, the position of the Georgia Body Recovery Team (GBRT). That's fine. It's a local agency. That works so long as you stay local. However, almost any SAR (including recovery)organization is subject to be swept into a catastrophic incident response driven by the Federal government. With that expectation, virtually every organization prepares by doing things that will allow it to better integrate with a Federally-coordinated, multi-agency response. That includes use of NIMS and ICS. The standards being written into the National Response Plan and the National SAR

Supplement call for US National Grid use for ground searchers. Aviation resources use lat-long among themselves. When aviation resources integrate with ground resources, then the plan calls for aviation resources to bear the burden of switching between USNG and lat-long

- "Other states haven't adopted US National Grid; why should we?" - Some, including Florida and North Carolina, have. And these are probably two of the most progressive states contiguous to Georgia in terms of strengthening their land SAR response capabilities
- "USNG is too hard." Get real. If you're in Georgia, then you're going through GEMA Rescue Specialist training, which teaches essentially the same thing for your purposes. Learn how to switch your GPS receiver's coordinate system to "US National Grid" and your datum to "NAD 83 CONUS" or "WGS 84." Be prepared so that, if you absolutely have to, you can switch the receiver to DD MM.MM (degrees/minutes/decimal minutes). Sheesh....

Summary: US National Grid is the way to go for Georgia SAR. It's simple. It's part of what we're already doing. If Georgia is going to prepare for the influx of Federal resources and the out-of-state resources marshalled by the Federal government for a catastrophe, then we need to be prepared to ask for those resources to go to locations described in terms of the US National Grid system.

I always welcome discussion and constructive criticism. Please feel free to email me with your thoughts on this topic or anything else you see at Mountainpathfinder.com.

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