The Smart Way To Use A Cell Phone To Contact 911

By Joseph Elfelt, https://mappingsupport.com

(See a mistake? Have relevant information to share? Please send me an email via this contact page: https://mappingsupport.com/p/gmap4_contact.html)

In an emergency there are four things that everyone should know about using a cell phone to communicate with 911. These tips could save a life - maybe yours.

1. Be able to tell 911 your coordinates.

<mark>Critical:</mark>   If you give 911 your coordinates then also give the accuracy value.

When you call 911 with a cell phone the wireless carrier will often be able to provide the call taker with coordinates for your location that have reasonably good accuracy. <mark>**But for a variety of reasons this does not always work!**</mark> The burden is then on you to tell 911 your location. If you can provide a street address or useful description of your location (i.e. south end of Home Depot parking lot), great. Now think about how often you are at a place where you do not know the address or a place that has no address. What now? How are first responders going to easily find you?

Everyone needs an app on their phone that will:
* Display their latitude longitude in decimal degrees (example: 47.313296, -121.161776)
* Display the accuracy value for those coordinates
* Work offline
* Minimize the possibility of user error

FindMeSAR is a browser app I wrote that meets these requirements and does not have extraneous features that could result in user error. The first time you open FindMeSAR your browser must be online but then the app will work offline by using a coding technique called appcache. To give the app a try:
1. Make sure your location services are turned on.
2. Browse to https://findmesar.com and give permission.
3. Tap the "Next format" button until the yellow screen appears.
4. Wait a few seconds for the accuracy value to get to 10 meters or less.

The app includes an icon you can save on your home screen. For more information you can start FindMeSAR and then tap the <mark>"Tips" button</mark>.

The important point here is not which app you use but rather that everyone have an app on their phone that is easy to find in an emergency and meets the requirements listed above.

<mark>Critical Android tip:</mark> If you open settings and go to the screen where you turn location services on/off, then you will see an additional setting for location mode (might be called "method"). There are three choices which are often called:

1. High accuracy
This name is misleading. It should really be called ==medium accuracy== since it allows data from cell towers, bluetooth, etc to degrade the more accurate data produced by the GPS and GLONASS satellites.

2. GPS only (also called "Device only") <== **Use this setting!**
This setting only uses data from the satellites and produces coordinates with the **==best accuracy==** values. Most phones produced within the last ~6 years use data from both the USA satellites (GPS) and Russian satellites (GLONASS) and produce coordinates with good accuracy.

3. Power saving
This setting ignores the GPS chip in the phone and will produce the ==worst accuracy== values. If someone with an Android phone is using FindMeSAR and not getting an accuracy value under 10 meters in few seconds then they likely have their phone on this setting.

Would you like to know some details about why Uber can find you to give you a ride but sometimes 911 cannot find you to save your life? Spoiler alert: Blame the FCC.

Most smartphones produced within the last ~6 years get data from both the USA satellites ("GPS") and the Russian satellites ("GLONASS"). ==More satellites = more data = better accuracy==. Uber gets your coordinates directly from your phone. And unless your phone is an antique, your phone produced those coordinates using both GPS and GLONASS data.

When you call 911 the wireless carrier *does not* get your location directly from your phone. **FCC regulations prohibit the use of Russian (GLONASS) data to help determine your location for the purpose of 911.** To read about this, see pages 14-15, paragraphs 39 and 40 of this 2015 FCC document. https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-9A1.pdf.
See also footnote 47 at the bottom of p.9 of this March 2018 FCC document.
https://transition.fcc.gov/Daily_Releases/Daily_Business/2018/db0301/DOC-349523A1.pdf
Instead, the FCC allows only data from USA satellites (GPS) to determine your location for 911.
==Fewer satellites = less data = poorer accuracy==. In heavy forest or urban canyons this GPS-only data might not produce any coordinates for your location or produce coordinates with very poor accuracy.

When a smartphone calls 911, here is what happens:
1. If location services are 'off', they are turned 'on'.
2. The phone transmits the raw GPS-only data to a black box on the cell tower.
3. That black box processes the GPS-only data and produces coordinates and an accuracy value. This is the "phase 2" data.
4. That coordinate and accuracy value go into a database.
5. The 911 call-taker can query or 'bid' to get the coordinate and accuracy value from the database.

Verizon, Sprint, U.S. Cellular, AT&T, T-Mobile and various smaller carriers attempt to determine your location as described above. Some smaller wireless carriers use various technologies related to cell tower triangulation in order to produce coordinates and an accuracy value for your location. This 'triangulation' method is generally considered less accurate than the GPS-only method used by the large carriers.

If you would like to dig deeper into this topic then here is a link to a report I produced about a year ago. This earlier report includes links to various documents on the FCC's website.
https://mappingsupport.com/p/sar/call-911-with-a-cell-phone.pdf

2. Always try making a voice call to 911 even if your phone says there is no service.

Critical: Wait 30-45 seconds for the call to go through before hanging up.

The reason to wait at least 30 seconds before hanging up is because the call routing technology might try for first 17 seconds to connect to a cell tower for your phone's carrier before trying to connect to any other compatible cell tower. For some background on this 17 second rule see:
https://transition.fcc.gov/Bureaus/Wireless/Orders/1999/fcc99096.txt at paragraph 41
https://apps.fcc.gov/edocs_public/attachmatch/FCC-08-171A1.pdf

All wireless carriers are required by FCC regulations to carry all 911 voice calls as long as the tower and phone have compatible technology. You do not have to turn on any roaming for this to work. If your phone can 'see' a compatible tower for which your carrier does not have a roaming agreement then the **phone will claim there is no service but you will still be able to call 911**.

Even if you cannot make a voice call to 911 a text message might still work.

3. Try texting to 911.

Critical: Include your location in your text.

When you text to 911 the wireless carrier *does not* provide your coordinates to 911! The only way 911 will know your location is if you tell them! If you send coordinates then use latitude longitude in decimal degrees and also send the accuracy value for those coordinates. First responders might be skeptical of coordinates that do not have an accuracy value included.

In your initial message only send text. Do not send pictures, video, etc. If you establish communications and want to send a picture then you can ask if their text system lets them receive that type of data.

There are over 6,000 PSAPs (Public Safety Answering Points) in the USA. Over 1,000 PSAPs are now accepting text to 911. Here is a link to a spreadsheet (updated monthly by the FCC) showing the PSAPs that accept text. https://www.fcc.gov/file/12285/download

A weak connection to a cell tower might still be good enough to transmit a text message while a voice call would fail to connect. But note that text to 911 *does not* use roaming. For this to work your phone must have a good enough connection with a cell tower owned by your carrier for the text to go through.

4. Try texting to someone that can relay your message to 911.

<mark>Critical:</mark> Be certain to turn on voice roaming before trying this step.

Normal texting *does* use voice roaming. (You do not need to turn on data roaming.) If your phone only has a weak connection with a 'roaming' cell tower then you might be able to communicate by text but not voice. Of course this will not work unless you first make sure that voice roaming is 'on'.

Tip: Do not send text to a group. Instead, each text should only go to a single phone number. Texting to a group might use a data channel instead of a voice channel. To have the best chance of success it is important that your text message use a voice channel.

Tip for iPhone: Turn off iMessage. This is a data service and requires more resources and signal strength. Turning off iMessage will ensure your text message is handled as a standard text using a voice channel.

But what if none of the above suggestions seem to work?

When the signal connection between your phone and a cell tower is extremely weak, the tower will 'see' your phone but not be able to connect a voice call or send a text due to the extremely weak signal. The good news is that the cell network will still make one or more **data records** for each of your attempts. No, these data records do not show your exact location. Instead, these data records can be analyzed by someone trained to do so and that information gets combined with other clues which then results in a "mostly likely" area for first responders to check. When you attempt to communicate as described above you just might be creating the data records that will be a crucial clue in helping the search team finding you.

If you have been unable to establish communications with anyone then one option, depending on your situation, might be to try moving to higher terrain. Maybe by doing so you could find a weak cell signal that is still good enough to send/receive text messages.   However, search managers caution that if you move then you might be leaving a "mostly likely" area that searchers will examine first. Also, you might move into an area that has already been searched.

Tip for 911 dispatchers

Many 911 dispatchers can likely describe times when someone called on a cell phone and the wireless carrier either did not provide any "phase 2" coordinates for the caller's location or only provided "phase 2" coordinates with a terrible accuracy value. What if the caller is not able to accurately describe their location in some manner (address, coordinates, landmarks)? How does the dispatcher know where to send help?

Here is an idea that might help. No, this will not work for all 911 calls where there is a problem getting a good location for the caller. But this idea will work for some calls. When other methods for accurately locating a wireless caller fail, the 911 call taker can ask the caller to:

1. Browse to findmesar.com
2. Tap the "Next format" button until the yellow screen appears. This screen shows the caller's location in decimal degrees which is the same format the wireless carriers use to send location data to PSAPs.
3. Wait a few seconds for the accuracy to get to 50 feet or smaller.
4. Tap "Stop"
5. Read off the coordinates, accuracy, timestamp and (optionally) elevation.

Note that FindMeSAR will not work on flip phones since they do not have a browser. Also the first time someone uses FindMeSAR their browser must be online.

Here is a short report from a SAR team in New Mexico that used FindMeSAR to locate lost hikers. The story seems to indicate that "phase 2" coordinates from the wireless carrier were also available but they were not accurate. http://atalayasar.org/node/478

Also FindMeSAR has been reviewed and added to the APCO app page at http://appcomm.org/. APCO is an international organization for public safety communication professionals.