

## 900 MHZ Radios

The ability to effectively communicate with loved ones and team members is vital. Whether it's being able to talk to each other at opposite ends of a house without yelling, between cars on a road trip, while out in the woods camping or hunting, or dozens of other situations, good comms are important.

For most situations, simple FRS or GMRS family radios that are typified by Motorola Talkabout radios that you see in every sporting goods store in America work. They're cheap, easy to use, most take AA batteries, you can use them with headphones, and they've got decent range. That being said, there are so many people using them that it can be frustrating finding a frequency that nobody else is using.

Even when you do find a frequency that nobody else is using, you don't want to say anything on an FRS or GMRS radio that you wouldn't want to shout across a crowded restaurant.

Enter frequency skipping radios. Specifically, a relatively new class of frequency skipping radios that operate in the 900 mhz range. They change frequencies several times a second, so if someone gets on one of the frequencies you're using, they're only going to hear a fraction of a second of your conversation. I read about this new class of radios a few months ago, liked what I heard, and decided to buy a few sets to test out. My experiences were SIGNIFICANTLY different than what I had read previously, so I decided to share them with you. Here's what I learned:

The three sets that I purchased were the TriSquare TSX300-2VP, the Motorola DTR 410 and the Motorola Direct Talk i576 phones from Nextel/Sprint.

Overall, I spent about \$800, so this wasn't exactly a cheap test to run. \$50 for 2 TriSquares, \$550 for 2 Motorolas, and \$250 for 5 of the Nextels. We used the 3 models to communicate between vehicles during a 7 day road trip as well as in residential, commercial, and wooded areas since then.

Before I get to the specifics on these, I need to go into a little about what kind of performance you can expect from handheld radios in general.

When you see manufacturers that claim they have super-duper turbo extended range of 20-30 miles, they're blowing smoke. They may be able to get that kind of range between hang-gliders isolated from electronic interference, but it's just not realistic to expect those ranges. To begin with, the curvature of the earth limits straight line communication to roughly 6 miles. The frequencies that hand held radios with short antennas operate on aren't going to bounce off the atmosphere or penetrate the ground and you're not normally going to be talking from hilltop to hilltop or hilltop to valley that would allow you to get past that 6 mile upper limit.

Next, you're not going to even get that 6 mile range unless you're on open water, open desert, or on a VERY long straight and level stretch of highway. And actually the heat coming off of all three of these surfaces will shorten your range. In every other instance, you're going to be communicating through barriers of some kind...walls, wires, metal, concrete, trees, windows, etc. You'll also have interference from other electronic devices. In urban areas, this includes cell phones, power lines, cordless phones, baby monitors, and more. Something as simple as getting out of your car or holding your radio out the open window of a stopped vehicle can increase your range by as much as 50%. Having cell phones turned on nearby can reduce range, as well as vehicle electronics including brake controllers for trailers.

What all of this means is that no two people will get the same range on their radios because of all of the variables involved. The maximum range that you should expect to reliably get in the real world with short antenna radios is .5-3 miles. You will be able to get longer ranges when one or more parties are on rooftops, hilltops, or have an elevated antenna, but otherwise you're looking at that .5-3 mile range regardless of whether you buy the \$500 Motorolas or a \$10 FRS set off of Craigslist.

You're probably asking yourself at this point why, if I know that, would I go out and spend money on these radios?

There are a few big reasons. First is the added privacy that comes with having built-in frequency hopping. Second is the ability to communicate with a single person on a channel in addition to being able to communicate with everyone on the channel. Third, the simple fact that there are fewer people using the frequencies makes it easier to find an empty channel that nobody else will be listening on. And fourth, the ability to do short text messaging. Fourth, as anyone who's used cheap radios can tell you, quality microphones and quality speakers are worth their weight in gold.

When I was guiding, we used UHF radios to communicate with our base and Motorola FRS radios to communicate with each other. The FRS radios were handy, but it always sounded like people were alternating between talking directly into the radio and through a pillow, so they only supported VERY simple communication. I discovered, on accident, that when I used my Garmin Rhino combination GPS/radio that voices became almost perfectly clear. As a result, I started using the Rhino and as long as I used very simple phrases, my communication with others improved dramatically, regardless of what radios they used.

The radios I'm going to tell you about all have higher quality microphones and speakers than the entry level FRS/GMRS radios. This makes a huge difference, especially if you're dealing with background noise, have to whisper, or have compromised hearing.

The first one I want to talk about is the TriSquare TSX300-2VP. It's the easiest one to find. You can get them in Best Buy as well as online and local outdoor retailers. Despite MANY positive reviews online, it also happens to be my least favorite radio of the ones I tested.

Here are some of the high points:

- 1 Watt
- Allows you to text message between units
- 10 Billion available channels (actually, it picks 50 frequencies out of a possible 700 and alternates between them in one of 10 billion different combinations, or channels.)
- Comes with headsets
- VOX for hands-free voice activated transmission
- Can use rechargeable or AA batteries
- NOAA weather receiver
- Allows you to talk to a group or to individual radios
- \$50-\$100 for a set of two with batteries and headsets
- Analog allows a fuzzy signal to get through instead of cutting off (more on this in a second)

Here are some of the drawbacks:

- Kind of cheap feeling, because they are, but the electronics seem to be solid
- No positive feedback that your message is getting through (more on this in a second)
- Despite being called digital, it's an analog signal
- It only hops frequencies 2.5 times per second.
- Supposedly, you can figure out the frequency set with a "signal stalker" and listen in with consumer grade scanners. This would require specialized skills, knowledge, and equipment, so it's still a significant improvement over Talkabouts.
- Non-standard connection for charging

Motorola DTR 410

High Points:

- 1 full watt of power
- 1050-1200 mAh Lithium ION batteries (Reported 14.5 hours per charge)
- Rechargeable Lithium ION batteries are \$5-15 apiece.
- Can upgrade to 1800 mAh batteries, which are \$30 apiece
- TOUGH for industrial and military use. Designed to Milspec 810 standards
- Unit notifies you when you're connected with another radio. Also notifies you if it can't locate another radio to communicate with. (this is IMPORTANT...more in a second)
- Very high quality microphone and speaker
- Compatible with Motorola 2-plug headsets.
- Call forwarding option
- Can talk to your group or to individuals
- Digital frequency hopping, spread spectrum.
- 20 pre-programmed channels that cycle through a set of 50 frequencies at 11 times per second using Vector Sum Excited Linear Prediction (VSELP) which makes a brute force scan next to impossible. Someone wanting to listen in must have the same radio listening to the same frequencies in the same sequence or have the ability to demodulate the signal incredibly fast. In other words, it's safe from most civilians and all but well equipped and educated militaries.
- Additional channels (sequences of frequencies) available with a \$30 Motorola programming cable for increased privacy.
- Pre-defined text messages between units
- Additional pre-defined messages can be programmed

Drawbacks:

Price-\$250 apiece.

Size—Fits in radio holders and in the included belt holder, but not in pockets.

Non-standard battery. Replacements are inexpensive, but not standard.

Non-standard connection for charging

## Motorola Nextel/Sprint Direct Talk (Specifically the i576)

Nextel became famous, in part, for their “Push to Talk” phones that used the Nextel network like a radio repeater and use their phones like walkie talkies in addition to using them like phones. “Direct Talk” is another technology that turns cell phones into short range walkie talkies that work independently from the Sprint/Nextel network. They are Motorola phones and share a lot of the same technology as the DTR radios. There are several Direct Talk models...I decided on the i576 because of it's rugged design and the price/availability when I bought mine.

- .7 watt digital
- Frequency Hopping Spread Spectrum (Like DTR)
- 10 Channels and 15 sub-codes
- VERY high quality microphone and speaker
- Manufactured to meet or exceed military specs for toughness and durability (Milspec 810)
- Can buy used in bulk for \$20 apiece
- Unit notifies you when you're connected with another radio. Also notifies you if it can't locate another radio to communicate with.
- TINY
- Great battery life. Replacement 1800 mAh batteries cost \$5-10.
- High quality microphone and speaker
- Doesn't look like a walkie talkie
- Uses a standard micro-usb connection to charge

### Drawbacks:

- Doesn't fit into walkie talkie holders
- No clip
- Anyone with a Direct Talk phone can scroll through their channels/codes and listen in.
- Uses the same technology as DTR radios, but are not cross-compatible
- Only works in speaker mode. (not headset compatible)
- No private (phone to phone) conversations unless the phones have a PTN from Sprint/Nextel.
- Need separate blank SIM cards (available on Ebay for around \$1 apiece) to make them work, but they don't need to be on the Sprint/Nextel network.

One of my favorite features on the DTR 410s and i576s is the positive feedback that you get that your message is getting through to SOMEONE. When you press the button to talk, there is a slight delay and you get a visual and audible signal that you have either 1. Connected to another unit or 2. Have not connected to another unit.

This is a great feature because it prevents the situation where you're saying, “Can you hear me?” For the most part, you're either connected and have a clear, digital signal, or you've got nothing—and you know which it is before you start talking. Every once and awhile, we've had thready connections on the digital radios, but for the most part they've either been switched on or switched off.

One place where this was beneficial was towing a trailer over a particularly white-knuckle narrow mountain pass with LOTS of tight switchbacks with my wife following in another vehicle. She was able to tell me things and know that her message was getting through, even though I wasn't about to

take a hand off of the wheel to respond.

One thing we did notice when communicating between my truck and our house with the DTR410s and the i576s is that there were times when I could transmit and my wife could hear me, but she was not able to transmit to me. In these cases, I'd either get out of the truck or hold the radio out the window.

Battery life was impressive in all 3 units. The TriSquares still had juice left at the end of a full day of driving, but the DTR410s and i576s both lasted through 2 days...which is longer than what's advertised.

How about range? Well, as I mentioned before, range is a tricky bugger. In one case, we extended the range on the i576s from a house to me on foot from .23 miles to 1.1 miles by moving from the first floor to the second floor. This isn't rocket science, but worth mentioning.

On the open road, from vehicle to vehicle with a trailer and multiple vehicles in between, we saw decent performance from all 3 radios out to 2 miles with the DTR 410s and i576s having better quality than the TriSquare radios.

Dirt kills signals in the 900 mhz range, but we got slightly more range going through hills with the DTR 410s than the others. At 70mph, it worked out to being able to talk 5-10 second sooner with the DTRs.

Since the TriSquares don't broadcast a digital signal, they've got a certain amount of static at almost any range.

In a subdivision/heavily wooded environment, the TriSquares maxed out at about .57 miles when transmitting from the second story in a neighborhood with roughly 75% 2 story homes. The Nextel i573s maxed out at .73 miles and the DTR410s stopped working between 1 and 1.1 miles.

If you were to ask me which ones I'd recommend, my answer would be, "it depends." The i576 looks like it wouldn't fare as well since it has .7 Watts of power vs. 1 Watt for the TriSquare and the DTR410, but it consistently outperformed the TriSquare and did respectfully well against the DTR410.

The full-size DTR410 does feel nice and rugged in my hands, I like the ability to use the headset, the private talk/text functionality IS great, and it's the clear winner for tactical or hunting use, but it's hard for us to justify when we can buy 5-12 of the Direct Talk phones for the same price.

Since I bought and started using these radios almost 5 months ago, we've bought several more of the Direct Talk models. You can find them used for little more than the cost of a spare battery and we've found them to be incredibly useful.

If you decide to go the Direct Talk route and run into questions on SIM cards, setting them up, or anything else, shoot me an email at [David@SurviveInPlace.com](mailto:David@SurviveInPlace.com) and I'll try to help you out.