I love GPS, but let me tell you about my friend Joe, the independent long-haul trucker. He loves GPS even more than I do.
GPS helps him find the shortest and most efficient routes, and it powers programs like WAZE that help him avoid traffic jams. He drives about 110,000 miles each year and he figures GPS makes his driving at least 10% more efficient than it would be otherwise.
That means he saves 1,700 gallons of fuel and has $6,800 more in his pocket at the end of the year. That's another month and half's pay for him! He also figures he gets another 100 hours at year at home that he would have otherwise spent on the road.
Joe really loves GPS. But if he knew how many other things it does for him, he would love it even more.

GPS timing signal help synchronize traffic lights in urban and suburban areas making his deliveries quicker. The signal also synchronizes cell towers so he can easily talk with his family and customers while he is on the road.

He can get money from ATMs at fuel stops and use his credit cards because GPS timing powers applications and sequences financial transactions.

And if Joe were to ever have an accident, GPS would help first responders get there as quickly as possible. It also enables their land mobile radios and helps them coordinate operations on scene.

Well, I could go on and on about Joe and GPS, but you get the idea. And you get more of an idea of the benefits to all of us when you realize there are 3.5 million truck drivers, and 230 million folks in the U.S. driving passenger vehicles.

Then there are aviation, maritime, rail, tractors in precision farming, and yes, even pipelines, bicyclists, and hikers, that use and benefit from GPS.

Can you imagine, can anyone really conceive, how much fuel is saved each year around the globe, or how much worse climate change would be, if we hadn't been using GPS for the last four decades?

Can you imagine life in the United States today without GPS?

We have transformed our society based on highly precise, free timing and location information from GPS. Delivery services require fewer vehicles and employees, agriculture is more automated and precise using less fuel and fertilizer. Surveying became much, much easier and construction more accurate. New technologies like cell phones were enabled and whole businesses like Uber and Lyft were created.

All of that would be undone if GPS were to be unavailable for some period of time, or God forbid, not available at all. We would be back in the 70's with not enough equipment or trained people to keep essential parts of the economy going.

But what are the chances?

Unfortunately, they are much higher than any of us would like.

Scientists tell us the sun will eventually produce a coronal mass ejection strong enough to block GPS signals for days, if not destroy satellites outright. It could be tomorrow as we progress to solar maximum next year. It could be 100 years from now. No one really knows.

Then there is space junk. 19% of all space debris is in Medium Earth Orbit where GPS satellites live. If you saw the movie "Gravity" then you have seen a depiction of a Kessler Event where a cascading series of collisions in space make more and more debris causing more and more collisions, which make more and more debris.

And there are those who would do us harm. GPS signals are very, very weak so they can be easily jammed. And because we wanted everyone to use GPS as much as possible, the signal specifications are public knowledge and reasonably competent amateurs can now imitate them making a user think they are far from their actual location.

But have these things ever really happened? Absolutely. We see minor disruptions of GPS reception all the time.

In 2019 we almost lost a commercial passenger aircraft in Sun Valley Idaho when GPS interference brought it dangerously close to impacting a mountain. The actions of a sharp eyed radar controller averted tragedy at the last minute.

In two different 2022 incidents operations at the Denver and Dallas-Fort Worth International airports were disrupted for more than a day by interference with GPS signals. We are still trying to calculate the economic cost of those events.

And overseas the dangers are even more obvious.

The government of Mexico says that GPS disruption is used in 80% of cargo thefts in that country.

The European Union did a sampling study several years ago and found 500,000 signals that could interfere with reception of GPS and other satnav signals. Interestingly only about 50,000 of those seem to have been intentional and from a device specifically designed to block GPS. In that group, they identified 300 different jammer families.

Civilian drones large enough to injure or kill have fallen from the sky because of GPS interruptions. Ships have collided when their GPS receivers showed them passing safely.
In conflict zones GPS signals are being jammed continually. Spoofed ships and aircraft have reported their positions hundreds of miles from their actual locations. Missiles and drones are being jammed as defensive measures and spoofed in an attempt to turn them back on attackers.

GPS was originally developed as a weapons system with the goal of putting five bombs in the same hole. It became a silent utility crucial to everyday life in America, but it continues to be used as a weapon.

So, what do we do? We have to do something pretty hard for most folks – we have to think differently.

First off, we must stop thinking about GPS. We don't rely on GPS, we rely on positioning, navigation, and timing (PNT) services. It just so happens that we overwhelmingly rely on GPS to get those services. To the point, by the way, that a director at the National Security Council has said GPS is a single point of failure for America.

Secondly, we need to realize that transportation infrastructure is more than concrete and asphalt.

Reliable and resilient PNT is more important to today's and tomorrow's transportation than another mile of highway, or a parallel runway. How are we going to get to Advanced Air Mobility or autonomous vehicles without a reliable and robust PNT infrastructure?

And finally, as a nation we need to actively manage and lead development, implementation, and adoption of systems that will protect the GPS services we have and supplement them to make our overall national PNT architecture more reliable and resilient. We like to talk about PTA – Protect the frequencies, Toughen users, and provide Augmenting or alternative systems. Our adversaries and economic competitors are doing, and in some cases have already done, this. We have fallen behind to our great peril.

Now I can tell you that the good Dr Hampshire, his staff, and the good folks up here on the dais already understand this. But it strikes me that the majority of folks in the transportation community do not. Neither do most of the folks in government.

So I urge you to give Dr. Hampshire and his team all the support you can give. And when you talk to others, especially those in government, tell them about our hidden GPS PNT utility, how it is a single point of failure, and how we have to do better protecting, toughening, and augmenting it.