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WHERE ARE WE?: EXAMINING POSITIONING, NAVIGATION, AND

TIMING CAPABILITIES IN THE UNITED STATES

THURSDAY, JUNE 4, 2026

House of Representatives,

Subcommittee on Communications and Technology,

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to notice, at 10:14 a.m., in Room 2123, Rayburn House Office Building, Hon. Richard Hudson [chairman of the subcommittee] presiding.

Present: Representatives Hudson, Allen, Latta, Griffith, Bilirakis, Carter of Georgia, Pfluger, Cammack, Obernolte, Houchin, Fry, Goldman, Fedorchak, Guthrie (ex officio), Matsui, Soto, Clarke, Ruiz, Peters, Dingell, Kelly, Barragan, Carter of Louisiana, Menendez, Landsman, McClellan, Castor, and Pallone (ex officio).

Also Present: Representatives Joyce of Pennsylvania, Evans of Colorado, and Mullin.

Staff Present: Jessica Donlon, General Counsel; Michael Essington, Chief Counsel, Communications and Technology; Sydney Greene, Director of Finance and Logistics; Megan Jackson, Staff Director; Noah Jackson, Clerk, Communications and Technology; A.T. Johnson, Special Advisor; Daniel Kelly, Press Secretary, Press Office; John Lin, Senior Counsel, Communications and Technology;

Joel Miller, Deputy Staff Director; Claire Richey, Clerk, Health; Dylan Rogers, Professional Staff Member, Communications and Technology; Hannah Anton, Minority Policy Analyst; Ruth Campos, Minority Intern; Parul Desai, Minority Chief Counsel, Communications and Technology; Tiffany Guarascio, Minority Staff Director; Alyssa Kimura, Minority Intern; Serena Klebba, Minority Staff Assistant; Brendan Lopez, Minority Press Assistant; Jaime McCoy, Minority FCC Detailee; Dan Miller, Minority Professional Staff Member; Andrew Souvall, Minority Director of Communications, Outreach, and Member Services; Johanna Thomas, Minority Counsel; and Hannah Treger, Minority Staff Assistant.

Mr. Hudson. The subcommittee will come to order.

The chair recognizes himself for an opening statement.

Good morning, and welcome to today's subcommittee hearing on positioning, navigation, and timing, PNT.

The Global Positioning System, known as GPS, has been the source of PNT for the United States for decades.

Originally developed for military use, GPS was opened to civilian aviation by President Ronald Reagan following the 1983 shoot-down of a Korean Airlines passenger jet that had strayed into Soviet airspace.

Subsequent Republican and Democrat Presidential administrations further expanded access to GPS for civilian applications. Today, GPS is free for civilian use.

Most Americans now think of the technology as the service behind their favorite navigational devices and apps. However, GPS has many more applications and has been widely integrated into multiple sectors of our economy. This includes communications and energy infrastructure, the financial sector for transaction authentication, and the transportation sector.

GPS is even used to coordinate emergency response and dispatch first responders to incidents more quickly -- something we are working to implement nationwide. In natural disasters, like Hurricane Helene that affected my State of North Carolina and others or wildfires in California, precious seconds can save lives.

Our warfighters also continue to rely on GPS military and civilian signals. As the Representative for Fort Bragg, home of special operations and the airborne, I continue to hear from our military leaders about the need for more resilient PNT.

The military relies on GPS for logistics like battlefield resupply and to synchronize operations. GPS's military signal underpins navigation for military aircraft, vessels, vehicles, and unmanned

systems while also enabling the precise targeting capabilities on which modern military operations depend.

While national security experts have long warned us about the potential for jamming and spoofing, this is now very much a reality. Our adversaries frequently disrupt GPS in contested environments. For instance, just 2 weeks ago, a Royal Air Force jet carrying the United Kingdom's Defense Minister lost its GPS signal as a result of suspected Russian jamming.

Space is also becoming more contested. Russia and China have been working to develop space-based weapons that threaten U.S. and ally satellite constellations and space-based services, including GPS.

Disruptions to this critical technology put our servicemembers at severe risk. And given its broad adoption through our economy, a disruption of GPS also has the potential to halt critical services and commerce. Put simply, a catastrophic failure of GPS as a result of adversary spoofing or jamming would be devastating to our economy.

The development and adoption of complementary PNT services is a bipartisan priority. President Trump has been laser-focused on this challenge. During his first term, President Trump issued an executive order to direct a comprehensive review of the use of PNT services across the Federal Government and critical infrastructure, understand its vulnerabilities, and improve resilience. That executive order stood through the Biden administration and remains in place.

Work is ongoing between Federal agencies, in concert with the private sector, to test PNT alternatives, including terrestrial-based systems. Federal Communications Commission Chair Carr doubled down on this effort by issuing a notice of inquiry last March to explore the development of complementary systems as backups to GPS.

On today's panel, we have a range of experts here to speak on the work that has been done to date to improve GPS resiliency as well as develop and deploy complementary PNT services that can serve as a backup to GPS.

I look forward to also hearing about how this committee can help support these efforts and, after years of work, finally move the ball forward on complementary PNT.

So thank you to the witnesses for being here today. I really look forward to our discussion.

I now recognize the ranking member, the gentlelady from California, for her opening statement.

[The prepared statement of Mr. Hudson follows:]

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Ms. Matsui. Thank you very much, Mr. Chairman.

And I want to welcome the witnesses for being here today.

I am glad we are holding this hearing today on positioning, navigation, and timing solutions, or, as we call it, PNT, and I am encouraged that this remains an area of bipartisan interest.

This is a highly technical topic, but it affects Americans in very real ways.

GPS is the most common PNT system that we use every single day, and most people don't think about it unless they are using a map. But GPS does a lot more than help us with directions. It is working in the background all day, every day.

GPS helps keep your internet running, your payments moving, and your bank account safer from fraud. It helps first responders find you when you call 911. It helps planes and vehicles move safely. And it helps farmers, utilities, and businesses operate with precision.

GPS has transformed our daily life, to the point where it is hard to imagine a world without it. But that success also means we have become deeply reliant.

And that creates real questions for Congress. What happens if GPS is jammed, spoofed, or attacked? What systems are the most vulnerable? What backup solutions are available today? And which are mature, scalable, and ready to support critical infrastructure? And where do we still have gaps?

That is why this hearing matters.

A serious attack on GPS could be catastrophic and cause billions of dollars of damage. It could shut down communications networks, emergency responses, aviation, energy systems, agriculture, and the movement of goods across this country.

And there is no single GPS alternative that can do it all, so we need to understand the full range of PNT technologies available that can help keep essential services operating when GPS is unavailable or unreliable.

Some of that work is already underway. Our Air Force and Space Force are working to modernize GPS to make it more secure, more resistant to jamming, and better prepared for today's threats.

Local broadcasters in cities like Sacramento are already offering a glimpse of what GPS alternatives could look like. Through the rollout of ATSC 3.0 NextGen TV, local TV towers can help determine a user's location if GPS falls short.

We will also hear from NextNav, which has developed a technology that can provide vertical location information, helping identify what floor someone is on in a high-rise building.

And we will hear from witnesses that have thought seriously about how we safely integrate these technologies.

These examples make one thing clear: Reliable backup PNT can strengthen national security, support innovation, and serve the public. But we must vet each technology carefully. It has to be proven, tested, and shown not to harm public safety, consumers, and critical services.

The FCC and other Federal agencies must be the guardrails in this process. They must follow the facts, insist on sound science, and make sure public safety is not treated as an afterthought. The stakes are too high to cut corners.

I look forward to hearing from our witnesses on how we can make GPS more resilient, where our PNT capabilities stand, what risks deserve the most attention, and how Congress can support innovation, reliability, and resilience in this critical space.

And, with that, I yield back.

[The prepared statement of Ms. Matsui follows:]

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Mr. Hudson. Thank you.

I now recognize the chairman of the full committee, the gentleman from Kentucky, for 5 minutes for his opening statement.

The Chair. Thank you, Chairman Hudson. Thank you for holding this hearing on an important topic.

GPS provides positioning, navigation, and timing, PNT, services to most sectors of the economy and is integrated into our daily lives beyond just navigation apps and devices.

While experts have been sounding the alarm about the vulnerabilities of GPS for decades, we are now witnessing the consequences of our delay play out in real-time. Overseas, our adversaries are actively jamming and spoofing GPS in conflict zones, putting our servicemembers at even greater risk.

A disruption to GPS here at home has the potential to be catastrophic for the economy and impact hundreds of millions of Americans. We need to improve the resiliency of GPS.

The good news is that multiple complementary PNT solutions are being tested and deployed by the private sector. I look forward to hearing about some of these solutions today.

PNT systems, including GPS, rely on spectrum to deliver location and time data. That means making sure we have the appropriate spectrum available for these solutions is critical.

As the committee with jurisdiction over the FCC and NTIA, we believe that spectrum management decisions like this should continue to be made by the expert agencies, working in concert with commercial and Federal stakeholders, through the existing mechanisms such as the Interdepartment Radio Advisory Committee, IRAC.

That said, this particular issue is broader than the run-of-the-mill communication networks issues because of the far-reaching consequences for commerce and the entire U.S. economy.

These are engineering problems that can and should be addressed by technical experts and

worked out through transparent, public processes. While Congress absolutely has a role in overseeing the expert agencies and ensuring public and other stakeholder input is considered appropriately, it is important to allow existing processes to proceed without prematurely intervening in favor of certain outcomes while the public record is being developed.

While the record is already well-developed in many ways, I look forward to learning more today and a robust discussion. I thank all the witnesses for being here.

And I yield back.

[The prepared statement of the chair follows:]

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Mr. Hudson. Thank you.

I now recognize the gentleman from New Jersey, the ranking member, for 5 minutes for your opening statement.

Mr. Pallone. Thank you, Chairman Hudson.

Today, we are discussing our Nation's positioning, navigation, and timing, PNT, technology and capabilities. And while most Americans have not heard of PNT, they are likely familiar with our primary source of PNT data and information, and that is the Global Positioning System, or GPS.

And, whether you know it or not, GPS is everywhere, from the Starbucks app knowing where you are to our power grid staying on line and on time. Whatever it is, GPS powers it all, and it is not an exaggeration to say that GPS literally helps keep the lights on.

But GPS also has made it easier to track someone without them knowing, which raises real privacy concerns. So we have to ensure that, going forward, consumer privacy is considered in any future PNT advancements.

So GPS was first created by the military in the 1970s and then extended to civilian and commercial use in the 1980s. Importantly, GPS has remained a free public benefit since that time and now serves billions of users around the world.

Because of this, it is not surprising that we all have GPS embedded into many of our everyday devices, including navigating our cars or ourselves from one location to another. But GPS is also crucial for ensuring our planes, trains, and trucks arrive safely and on time, and it aids in weather monitoring, provides life-saving information to first responders, and supports our national defense system.

So it is critical that we understand how GPS is faring and what mechanisms are in place to complement GPS in the event of an outage or an attack.

As we know, resilient communications networks can be the difference between life and death

when the unexpected strikes. And the reality is that GPS has vulnerabilities. Unfortunately, due to technical constraints, GPS has challenges providing precise location data indoors or underground.

But more concerning is that we have seen our foreign adversaries, including Russia and China, increasingly interfere with GPS by jamming and spoofing the signal. When jamming occurs, a GPS signal is unable to be used because it is blocked entirely. Even more malicious, with spoofing, fake GPS signals send incorrect location and timing information to devices, leading one to believe that they are somewhere where they are not.

In either case, the consequences are significant and put our national security at risk. In fact, any outage or threat to GPS could result in significant threats to public safety, economic loss, transportation service disruptions, and property and environmental damage.

It is critical that we understand how to both enhance the durability of GPS and ensure there are viable alternatives to it. Building resilient and redundant communications networks is always the smart thing to do, especially given the stakes at play.

It also makes sense for the Federal Communications Commission and other Federal agencies to continue to evaluate potential backup technology to GPS. And these initiatives are needed, as we must have a broad selection of GPS alternatives in this country, whether they operate on the ground or in space, because one solution will not work in every geographic terrain or environment.

Now, that said, the FCC's review of any proposals that could complement GPS must be thorough, technically sound, and in the public interest. Given the numerous consumer benefits of GPS, any alternative PNT solutions must also put American consumers first.

And, therefore, I fully expect the FCC to abide by the requirements of the Communications Act and undertake a rigorous technical review of any PNT proposals it receives and ensure that they operate with the public's interest in mind. And, this way, consumers can be sure that they are protected and not burdened by unexpected costs and unnecessary upgrades.

So, finally, while securing GPS and any alternatives to it is critical, I continue to strongly

believe that these network solutions must be designed with robust consumer privacy protections in mind. Americans should not have to sacrifice their privacy for their security.

And, with that, Mr. Chairman, I will yield back. Thank you.

[The prepared statement of Mr. Pallone follows:]

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Mr. Hudson. Thank you.

We have now concluded with member opening statements. The chair reminds members that, pursuant to committee rules, all members' opening statements will be made part of the record.

[The prepared statements follow:]

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Mr. Hudson. We would like to thank our witnesses for being here today to testify before the subcommittee.

Our witnesses will each have 5 minutes to provide an opening statement, which we will then follow with a round of questions from all the members.

The witnesses here before us today are: Lisa Dyer, the executive director of the GPS Innovation Alliance; Sam Matheny, executive vice president for Broadcast Positioning System with the National Association of Broadcasters; Mariam Sorond, the board chair and chief executive officer of NextNav -- and I understand today is your birthday.

Ms. Sorond. Yes, Mr. Chairman. It is an honor to spend my birthday here with all of you.

Mr. Hudson. Well, on behalf of the entire committee, we wish you a very happy birthday. I can't think of a better way to celebrate your birthday than this hearing.

Ms. Sorond. Thank you.

Mr. Hudson. Thank you.

-- and Mr. Harold Feld, senior vice president of Public Knowledge; and J. David Grossman, the vice president for policy and regulatory affairs with the Consumer Technology Association.

Thank you all for joining us today.

Ms. Dyer, you are recognized for 5 minutes for your opening statement.

**STATEMENTS OF LISA DYER, EXECUTIVE DIRECTOR, GPS INNOVATION ALLIANCE (GPSIA); SAM MATHENY, EXECUTIVE VICE PRESIDENT, BROADCAST POSITIONING SYSTEM, NATIONAL ASSOCIATION OF BROADCASTERS; MARIAM SOROND, BOARD CHAIR AND CHIEF EXECUTIVE OFFICER, NEXTNAV; HAROLD FELD, SENIOR VICE PRESIDENT, PUBLIC KNOWLEDGE; AND J. DAVID GROSSMAN, VICE PRESIDENT, POLICY AND REGULATORY AFFAIRS, CONSUMER TECHNOLOGY ASSOCIATION**

**STATEMENT OF LISA DYER**

Ms. Dyer. Chairman Hudson, Ranking Member Matsui, Chairman Guthrie and Ranking Member Pallone, and distinguished members of the subcommittee, thank you for the opportunity to testify today about PNT technologies and services in the United States.

I am the executive director of the GPS Innovation Alliance, as the chair just mentioned. We are a trade association for the PNT industry. Our member companies have built multibillion-dollar businesses and business units that build and rely on GPS and PNT technologies. We also include small-business entrepreneurs who are developing innovative commercial satellite systems.

The timing of this hearing is fitting, as our Nation prepares to celebrate its 250th anniversary and we reflect upon its many achievements. GPS represents one of America's greatest innovations. Nearly every constituent in your district relies on GPS multiple times a year, as your opening statement just said. It has also transformed the way that the military thinks strategically and acts tactically.

Since becoming operational in 1995, GPS has not experienced a single system-wide outage. This unparalleled track record is a testament to American ingenuity, from the thousands of engineers who have designed and built these systems to the Space Force guardians who are operating GPS today.

The GPS constellation consists of 32 satellites, 8 more than are required for the minimum 24 to provide worldwide coverage. They are radiation-hardened, and they offer on-orbit resiliency in the event of an event in space. The FAA reports GPS signal availability at an impressive 99.99 percent. The economic benefits are substantial and far greater than the \$1.4-trillion figure cited in the 2019 NIST report.

While much has been written about GPS vulnerabilities, it is not uniquely vulnerable to threats. Federal law prohibits the operation, marketing, or sale of jamming equipment that interferes with any authorized radio communications.

That said, as you have mentioned, localized jamming and spoofing events, which are much more than just a clever plot device in "Top Gun: Maverick," do real harm to the aviation and maritime industries. The FCC and the whole of government must dedicate resources to resolving these events.

GPS is ripe for rapid modernization. Eight of the 32 satellites are operating on a single string, meaning they are one failure away from becoming nonoperational.

The ground station is undergoing a critical new software upgrade following the Space Force's April 2026 decision to cancel an overdue program. This represents a real opportunity to rapidly modernize GPS and take a comprehensive approach to integrating commercial satellite PNT systems into military operations.

I would like to raise two points that I believe deserve more attention in the "what is next in PNT" discussions.

As previously mentioned, technical rigor is essential. Federal spectrum decisions must be grounded in critical technical detail and protect incumbents from harmful interference. Cost-benefit analyses are essential, and low-cost alternatives, including process changes, should always be considered.

Second, I know this sounds entirely unexciting, but definitions matter. Terms like

"complementary," "alternative," "resilient," and "backup" are used interchangeably. A standard lexicon will help Congress, Federal agencies, and industry determine whether we have a problem and, if so, identify solutions quickly.

GPSIA uses the word "complementary" deliberately. No system truly replaces GPS in the highly unlikely event that 24 or 32 satellites will be unable to transmit signals. The good news is that several complements are already in use, as a 2021 DHS report noted, each with advantages and disadvantages. NTIA also provided a very valuable inventory in the FCC's notice of inquiry on PNT.

Congress has a long history of involvement in PNT, and GPSIA urges your continued engagement. GPS and today's operational complements are real systems that Americans' daily lives and livelihoods depend on.

The space-based PNT industry alone includes more than 850 suppliers across the United States, more than 275 of which are small businesses whose PNT capabilities go unheralded, and they operate in 45 States. They are vital contributors to America's PNT achievements.

I look forward to your questions.

[The prepared statement of Ms. Dyer follows:]

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Mr. Hudson. Thank you.

Mr. Matheny, you are recognized for 5 minutes for your opening statement.

#### **STATEMENT OF SAM MATHENY**

Mr. Matheny. Good morning, Chairman Hudson, Ranking Member Matsui, and members of the subcommittee.

My name is Sam Matheny, and I serve as chief executive officer of Merkheth Solutions. Prior to this new role, I spent 12 years as chief technology officer at the National Association of Broadcasters.

I am grateful for the opportunity to testify today on the urgent need for resilient alternatives and complements to the Global Positioning System.

This week, the NAB announced the launch of Merkheth Solutions, an independent company whose mission is to deploy the Broadcast Positioning System, or BPS, as the primary complementary PNT solution to enhance national and economic security.

BPS is a patented terrestrial timing and positioning technology that leverages existing high-power broadcast infrastructure and licensed spectrum already covering the United States. BPS was first conceived by my team at NAB in 2021, and you can think of it as the terrestrial equivalent of GPS.

Our Nation's economy and national security increasingly depend upon precise timing and positioning services delivered by GPS. Yet the United States has become dangerously overdependent on a single, contested signal from space that remains vulnerable to jamming, spoofing, cyber attacks, and natural disruption.

These risks endanger virtually every American critical infrastructure sector, including energy,

telecommunications, data centers, and financial services, where a disruption to precision time can trigger grid instability, network outages, and lost transactions.

BPS has been designed to address this more-than-a-billion-dollar-a-day economic and national security risk by using our country's extensive existing broadcast infrastructure to serve as a reliable and equally effective terrestrial complement to GPS.

BPS offers several advantages.

First, the infrastructure is already in place. America's local broadcasters currently operate resilient transmission facilities in every corner of the country.

Second, BPS signals are transmitted at high power from tall towers in diverse locations. This makes BPS very difficult to jam or spoof at scale. This is unlike GPS signals, which operate on a relatively narrow band of spectrum and are weak when received on Earth, making local interference easier.

Third, BPS uses existing licensed spectrum.

Fourth, BPS supports unlimited simultaneous users. This means no bottlenecks, which is essential for emergency and critical infrastructure applications.

Finally, BPS is independent of GPS and other global navigation satellite systems, functioning even when GPS is compromised. Beyond serving as a backup, this means BPS can be used to monitor the health of GPS.

BPS has been developed in collaboration with the U.S. Government and critical infrastructure industries to ensure that it can meet the need of critical infrastructure. And it has already moved beyond concept. In 2025, NIST concluded, "BPS time transfer is comparable to or better than GPS, making BPS a viable complementary PNT solution when GPS is unavailable."

Last year, the Department of Transportation awarded NAB a contract to deploy a BPS field trial with critical infrastructure partner Dominion Energy. BPS has been installed at one of the largest substations on the East Coast, and this trial has yielded impressive results thus far.

BPS can strengthen national resilience, but speed and scale will require coordinated policy support. Congress can help in three practical ways.

First, Congress should help accelerate BPS installation and operations through funding for traceable time, station hardware, calibration, ongoing network operations, and monitoring.

Second, Congress should support and work with the administration to help designate a lead agency to expedite the activation of BPS and other complements to GPS.

Finally, Congress should encourage the Federal Communications Commission to complete the important work it has already initiated on ATSC 3.0. In addition to the significant benefits to television viewers, including upgraded picture and sound and better emergency alerting, the full benefits of BPS cannot be harnessed until the FCC completes its work on the ATSC 3.0 transition.

In conclusion, broadcasters have always served communities in moments of need. Through BPS, that public service can extend directly to protecting our critical infrastructure and enhancing our national security.

Thank you again for the opportunity to testify today. I look forward to answering your questions.

[The prepared statement of Mr. Matheny follows:]

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Mr. Hudson. Thank you.

Ms. Sorond, you are recognized for 5 minutes for an opening statement.

## **STATEMENT OF MARIAM SOROND**

Ms. Sorond. Good morning, Chairman Hudson, Ranking Member Matsui, Chairman Guthrie, Ranking Member Pallone, and members of the subcommittee. Thank you for the opportunity to appear today.

My name is Mariam Sorond, and I serve as CEO and board chair of NextNav. I have spent nearly three decades in the wireless industry in senior technology roles at VMware, CableLabs, and Dish Network. I have served on the FCC's Technological Advisory Council, on NTIA's Commerce Spectrum Management Advisory Committee, and I serve on CTIA's Board of Directors.

I am grateful for the subcommittee's attention to PNT resiliency and for framing today's hearing around the question of "where are we?" That is the right question. It gets to the core of why PNT resiliency is a vital national security, economic, and public safety imperative.

PNT is the invisible but essential backbone that much of modern life depends on. Positioning tells you where you are. Navigation tells you how to get there. And timing provides a precise, common clock that lets independent systems agree on when something happened or must happen, down to the billionth of a second.

For most Americans, PNT is just there, like the electricity in our homes. And like electricity, PNT is foundational. When the grid holds through a heat wave and your air conditioning keeps running, PNT keeps the power plants in sync. When a 911 call routes to the nearest dispatcher, PNT locates the caller. When a family on a roadtrip travels this country, PNT is guiding them along their route. Today, nearly all of that depends on one source: GPS satellites.

GPS is one of the great American achievements of the last half-century, a national treasure we built and gave to the world.

It is also a single point of failure.

So what happens if GPS is degraded, jammed, spoofed, or attacked? That is not hypothetical. We have seen many cases of jamming and spoofing in geopolitical hotspots around the world as well as right here in the United States. In 2022, a jamming incident shut down a runway at Dallas Fort Worth, one of the world's busiest airports, and GPS interference has been reported in communities across the United States.

China and Russia have built ground-based backups to GPS. The United States has not. But, together, we can change that.

Every Presidential administration this century and Members of Congress on both sides of the aisle have identified PNT resilience as a critical national imperative, and yet the United States still has no ground-based backups to GPS.

That is a problem NextNav is helping to solve and what we mean when we talk about "PNT resiliency."

NextNav is an American company that has spent two decades focused on strengthening America's PNT infrastructure. Public safety is in our DNA.

Our Pinnacle vertical location service operates in more than 4,400 U.S. cities. Today, it helps first responders locate 911 callers inside high-rises and other places where Z-axis location is critical, where seconds save lives. We are the only commercial vertical location provider serving FirstNet, which has called Z-axis a key capability. And we also serve all three national wireless carriers.

NextNav has developed a commercially viable, ground-based complement and backup to GPS, deployable in the near term on existing 5G infrastructure and at no cost to taxpayers.

NextNav welcomes the engagement of every sector that depends on reliable PNT, including those who have raised potential interference concerns, because we have the shared goal of

improving lives for communities across the country. Our commitment to getting this right is why we have proactively sought opportunities for joint testing with stakeholders across industries.

Ultimately, we have full confidence in the FCC's engineers and technical staff to rigorously evaluate all technical questions and the evidence on the record as it continues to build PNT resilience. I am confident that, through the FCC process, NextNav will demonstrate that our complement and backup to GPS can be an important part of the PNT solution for the country.

We believe that many systems working together are stronger and safer than one. We welcome other technologies into the layered PNT architecture America needs, and I look forward to hearing from the other witnesses today.

Congress has a vital role in ensuring that America builds a resilient PNT architecture. I appreciate this subcommittee's focus on this issue and the opportunity to discuss NextNav's role today.

Thank you. I look forward to your questions.

[The prepared statement of Ms. Sorond follows:]

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Mr. Hudson. Thank you.

Mr. Feld, you are recognized for 5 minutes for your opening statement.

## **STATEMENT OF HAROLD FELD**

Mr. Feld. Thank you.

Few people realize how much we rely on GPS in our daily lives. For example, we all know we use GPS for mapping apps, but how many know that the cell phone system itself depends on the precision timing function of GPS to function?

This is just one example of the billions of dollars in commerce and social activity that rests invisibly on the free availability of GPS.

GPS has become a public good. Like our national road system, like clean water and sanitation, it is essential for our daily lives. And like WiFi supported by unlicensed spectrum, it has penetrated everywhere.

Of course, the private sector still has a major role to play in providing alternate PNT systems and innovation around PNT uses. To take one of the oldest and most familiar examples, GPS did not load street maps onto devices in order to help people navigate. Private companies did that.

Companies with critical needs, such as cell phone systems, use private PNT systems to provide supplements and backups. Redundancy is reliability. But none of this would have happened without open, reliable, and freely available GPS to act as the backbone and support.

Much still depends on it, and innovation continues around it. It must remain a public good that serves the public interest. We must enhance it for the betterment of everyone, not privatize it or allow it to degrade in favor of private systems.

As a public good, PNT requires proper management in the public interest.

First, the U.S.'s free, publicly accessible GPS must remain the global gold standard for PNT. We must prioritize upgrading public GPS to enhance reliability, resiliency, and accuracy. All relevant Federal agencies, including the military, should be directed to work together to achieve this goal. Congress must devote sufficient funding to upgrade GPS as quickly as possible.

Jamming and spoofing are already realities, and we must act to address these threats now. Imagine the chaos and confusion a fleet of jamming drones could create in a crowded city, especially as part of a broader terrorist attack. Less dramatically, a failure of older satellites could throw off sensitive functions on which public safety, businesses, and consumers depend.

Next, the Federal Government must lead a responsible, orderly transition to a more reliable, more resilient next-generation GPS. This will take time and planning, especially for any improvements that are not backward-compatible with existing deployed technology.

Finally, I strongly urge consideration of incorporating privacy by design into future PNT systems. While GPS has been a tremendous boon, it has also converted virtually every mobile device into a digital spy. We tend to think of PNT as an engineering question, with policy layered on after the fact. Instead, we must make our policy goals system-design goals.

We would, of course, continue to need strong privacy laws, but if we build a GPS system designed with privacy in mind, it becomes easier to protect privacy by law. Privacy law works better with a system that cannot violate your privacy in the first place.

While I would like to end here and just talk about the public interest, I need to address the two potential private proprietary PNT providers invited to this hearing.

Unlike other private PNT providers, these systems want something from the government other than money, while claiming to do the taxpayer enormous favors for free. After 25 years in public advocacy, I have learned that the actual scariest words in public policy are: "Hi. I am from the private sector, and I am here to help at absolutely no cost to the taxpayer."

The Broadcast Positioning System is a potentially good product, but anyone familiar with the

FCC ATSC docket will see that the proposed ATSC transition has raised many complicated and contentious questions. We must not short-circuit the careful consideration needed here in order to rush BPS to market.

NextNav offers an even more troubling trade. It wants a multibillion-dollar infusion of new spectrum rights in the 900 megahertz band, combined with a dramatic change in existing rules, and to have the freedom to wipe out billions of dollars in products and services that consumers, power utilities, public safety responders, the security industry, the aviation industry, retailers, and countless others use every day. For something "free," it promises to cost the public a hell of a lot.

To conclude, GPS remains one of the most important contributions to the general public and the world. Congress must continue to develop and enhance it as the crown jewel it is, not look to privatize it or abandon it, even as it does the necessary work of facilitating complementary PNT systems.

Thank you, and I am happy to answer any questions at this time.

[The prepared statement of Mr. Feld follows:]

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Mr. Hudson. Thank you.

Mr. Grossman, you are recognized for 5 minutes for your opening statement.

#### **STATEMENT OF J. DAVID GROSSMAN**

Mr. Grossman. Chairman Hudson, Ranking Member Matsui, Chairman Guthrie, Ranking Member Pallone, and members of the subcommittee, thank you for the opportunity to testify today.

My name is David Grossman. I am the vice president of policy and regulatory affairs at the Consumer Technology Association. As North America's largest technology association, CTA represents over 1,200 companies, more than 80 percent small businesses and startups. We support an industry responsible for more than 17 million American jobs.

We also produce CES, the world's most powerful tech event, which for years has been the launch pad for the latest GPS-enabled technologies -- like this one, released more than 20 years ago -- as well as devices using the lower 900 megahertz band.

GPS remains one of the most important technologies our Nation has ever developed. It underpins trillions of dollars in economic activity, supports critical infrastructure, powers modern commerce, and provides a strategic advantage for the United States. Protecting and strengthening GPS resilience is both an economic and national security imperative.

CTA today offers three recommendations for the subcommittee's consideration.

First, Congress should strengthen GPS resilience and modernization. Successive administrations and Federal agencies, including the FCC, have recognized the need for complementary and backup PNT solutions. At the same time, GPS itself must be modernized.

Second, the United States should pursue a market-driven approach to complementary PNT. No single backup solution will meet every need. Some applications may benefit from terrestrial

systems; others, from satellite-based services; and many will rely on multiple technologies.

Government should establish objectives, not mandate solutions for devices or industries. America's innovation advantage comes from competition and private-sector investment.

Third, policymakers must protect the lower 900 megahertz band. CTA opposes proposals that would disrupt the operating environment for the hundreds of millions of licensed and unlicensed devices already using this spectrum.

It is also worth recognizing current uses for this innovation band. Unlike as some have suggested, the lower 900 megahertz band is not underutilized. First responders use it for critical applications like man-down systems and wildfire sensing. Medical alert pendants help seniors age safely at home. And the band is essential for wireless alarm systems, motion detectors, smoke alarms, and smart locks.

Retailers use RFID systems to manage inventory. Utilities use the band to remotely monitor and manage critical infrastructure. And electronic tolling systems use the band to reduce congestion and provide needed funding for roads.

The lower 900 megahertz band enables farmers to improve yields and conserve water. Even the U.S. military depends on the band for logistics tracking.

These technologies represent decades of investment, hundreds of millions of dollars of deployed devices, and billions of dollars in economic activity.

Many of these systems were specifically designed around the unique characteristics of this spectrum and would be expensive and challenging, if not impossible, to replace. Reconfiguring this band could introduce harmful interference and impose significant costs for the consumers and businesses that depend on these technologies every day.

We do not have to sacrifice the success of the lower 900 megahertz band to improve GPS resilience. Numerous complementary PNT technologies are already available. America can strengthen GPS resilience while preserving the innovation ecosystem that powers so much of our

economy.

Congress should continue supporting GPS modernization, encourage a diverse and competitive marketplace for complementary PNT technologies, and protect existing spectrum users from harmful interference.

The United States became the global leader in GPS by combining technological innovation with smart policy. We should follow that same model today.

Thank you. I look forward to your questions.

[The prepared statement of Mr. Grossman follows:]

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Mr. Hudson. Thank you.

We will now begin questioning, and I will recognize myself for 5 minutes.

Ms. Dyer, can you bring home for us, why should Americans care about complementary PNT? How would a GPS failure without backups impact your everyday American in their daily lives?

Ms. Dyer. Thank you, Congressman, for the question.

I think one point is that the risk of failure of the system writ large is a little bit overstated. We have 32 satellites on orbit, and there are plenty of satellites that would still -- if, God forbid, something happened, would still continue to operate.

The localized jamming and spoofing capabilities that are impacting the aviation and maritime industries and Americans living along the southern border, those are localized events. And the focus should be on the bad actors and stopping the bad actors, as opposed to the focus on GPS.

Why people should care: It is an incredible achievement, as many of us have said up here, just how much ease it brings to our lives. I have a lovely 2009 atlas in my car still; it was given to me by a dear uncle. But it is so amazing to be able to pull out and navigate. I like being able to take transactions on my phone. I like knowing that our military has the top-of-the-line technology to protect us overseas and to protect themselves overseas.

Mr. Hudson. Great. Thank you for that.

So NextNav's proposition before the FCC proposes reorganizing the 902 through 928 megahertz band and bifurcating it into two parts, one for unlicensed and consolidating their license into the other position.

Mr. Grossman, I have heard from stakeholders and heard in your testimony -- but the stakeholders who currently operate in the band -- about their concerns with this proposal.

Could you walk us through how unlicensed users operate in that band? And could you help us understand the technical reasons behind unlicensed users' stated need for access to the full 902

through 928 megahertz band?

Mr. Grossman. Thank you for that great question, Mr. Chairman.

The reason that the lower 900 megahertz band is the incredible innovation story that it is is not an accident. It is the result of deliberate decisions made by the FCC, starting as early as 1989 and 1990, which first authorized that band for unlicensed use. Many of us will remember in the mid-1990s cordless phones using the 900 megahertz band, and in the mid-1990s the LMS band was authorized.

And to, specifically, your question around how unlicensed devices are able to operate with LMS users and licensed users, again, it was a deliberate process around providing protections both to the licensed and unlicensed users in the band.

And, from that, we have seen this incredible innovation ecosystem come about -- many of the stakeholders you heard me speak about in our testimony and now, today, more than hundreds of millions of devices, impacting just about every industry across our economy.

Mr. Hudson. Thank you for that.

And, Ms. Sorond, I would like to give you an opportunity to answer the same question from your perspective.

Ms. Sorond. Thank you, Mr. Chairman, for that question.

NextNav currently holds licenses in the 900 megahertz band that we acquired at auction and also secondary markets. The rules for this band were written in the 1990s, exactly when we used dial-up internet and you heard the phone line when you did that. FCC modernizes its rules as part of this process. And what we are asking for is a modernization of these rules, because if we didn't, then it really hampers technical and innovative advancement.

We fully recognize the use of this band in many other capacities. We really would like to work -- continue to work with the FCC to address any of these concerns through their process. And we have also reached out to all the stakeholders, and we will continue to do that, to make sure that

everybody continues in these very important functions in this band.

Mr. Hudson. Thank you for that.

I am down to 30 seconds, and I have a whole bunch of other questions, so I am going to submit them in writing and make sure not to take the time from my colleagues to ask their questions.

[The information follows:]

\*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

Mr. Hudson. So thank you all so much for your testimony and thank you for your answers today.

I will now recognize the ranking member of the committee, Ms. Matsui, for 5 minutes for your questions.

Ms. Matsui. Thank you very much, Mr. Chairman.

The Broadcast Positioning System, or, as we say, BPS, is an emerging technology that could help back up GPS. By using technology like ATSC 3.0, it could allow broadcast towers to help provide timing and location services when GPS is unavailable or disrupted.

Sacramento was one of the first cities in northern California to launch commercial NextGen TV, and today there are six systems in the region that use ATSC 3.0.

Mr. Matheny, in a region like Sacramento where flood protection and emergency response are major priorities, how could BPS help strengthen public safety and resilience?

Mr. Matheny. Thank you, Ranking Member Matsui.

BPS is a powerful tool that can be used to strengthen emergency response by providing an alternative source of time if GPS were ever compromised.

One of the things that I would call attention to is a study that was done by the Critical Infrastructure Resilience Institute on behalf of the Department of Homeland Security. It studies 5G survivability as well as land mobile radio survivability. And it recommends BPS as a solution to provide time if there were ever a disruption of GPS.

Ms. Matsui. Okay. Thank you.

There has been lots of debate concerning NextNav's proposal to reconfigure the 900 megahertz band. The full FCC record speaks to that.

Mr. Grossman, Mr. Feld, and Ms. Dyer, all your organizations filed comments opposing NextNav's proposal. Could you three please give a quick "yes" or "no" to the following questions:

Does your organization believe that NextNav's proposal raises interference concerns with current users of the 900 megahertz band?

Ms. Dyer?

Ms. Dyer. Yes.

Ms. Matsui. Mr. Feld?

Mr. Feld. Hell yes.

Ms. Matsui. Mr. Grossman?

Mr. Grossman. Yes.

Ms. Matsui. Okay.

Does your organization believe that NextNav has adequately addressed those interference concerns with technical reports at the FCC?

Again, Ms. Dyer?

Ms. Dyer. No.

Ms. Matsui. Mr. Feld and Mr. Grossman?

Mr. Feld. Hell no.

Ms. Matsui. Okay.

Mr. Grossman. No.

Ms. Matsui. Okay.

The FCC needs to demonstrate to the public before it moves forward on any proposal in 900 megahertz that it will not harm public safety, consumers, small businesses, or the flood-warning infrastructure that stands between American communities and disaster.

I have worked for years to strengthen consumer privacy and make sure new technologies are built around people's safety and trust.

Mr. Feld, how do we make sure new PNT systems improve safety and reliability without creating new ways for bad actors to track people without proper safeguards?

Mr. Feld. We need to, first of all, establish that this is a system requirement and not something that is nice to have. The problems with GPS right now are in part a result of nobody thought of consequences when we developed the system in this regard.

The second, I would argue, is, we need to have standards and certifications, whether voluntary or mandatory -- I would prefer mandatory -- developed by NIST and others, for the systems which would guarantee a particular level of privacy by design.

The basic rules for privacy by design: don't collect more information than you have to; don't store it longer than you have to; and do your best to keep it from being traceable back to any particular individual.

Ms. Matsui. Okay. Thank you.

GPS works nationwide and globally, including rural areas, on the water, and in places without nearby cell towers.

Ms. Sorond, NextNav has described its proposal as a complementary and backup system for GPS. Critics have argued that your system will be most effective in areas where sufficient 5G infrastructure already exists while less effective in rural or remote areas. How do you respond to that concern?

Ms. Sorond. Thank you, Ranking Member, for the question.

NextNav's solution is terrestrial based on the 5G footprint, which covers more than 96 percent of the population in the critical areas, for example, where first responders are.

But, also, NextNav has always said that PNT backup needs to be a system of systems, it needs to be a multilayered architecture, it needs to have the other technologies, it needs to have satellite resiliency also for the rural areas that this 96 percent of the population does not cover.

Ms. Matsui. Okay. Thank you very much.

And it looks like I have run out of time, so I yield back.

Mr. Hudson. The gentlelady yields back.

The chair recognizes the chairman of the full committee, Mr. Guthrie, for 5 minutes to ask your questions.

The Chair. Thank you, Mr. Chair.

And thank all of you for being here.

And, you know, this committee has jurisdiction over spectrum policy, and I have personally worked on spectrum policy over the many years, particularly with my good friend from California, Ms. Matsui, and I have seen how spectrum policy has grown more contentious due to the diminishing amount of available bands for both licensed and unlicensed users and the greater density of incumbent users. The task of allocating bands has become even more technically challenging.

And I want to set up -- I think we all agree -- if you could say if you disagree with me on this. I won't go down and make everybody answer, but -- that the FCC and the NTIA are the expert agencies with the technical expertise and statutory authority over spectrum management decisions.

And I also think we all agree that the FCC should consider public commercial stakeholders, including both licensed and unlicensed users, and the Federal agency input as it decides spectrum policy and other items before the Commission.

So I guess my question I would like for each of you to answer, to get to is: With the FCC and the NTIA having the technical ability and having to take all that into account, should Congress make technical decisions about spectrum policy through the appropriations process.

And, Ms. Dyer, if you could go first.

Ms. Dyer. The -- no.

I will say, though, that when you fund a system like GPS through the Appropriations Committee, you are supporting the spectrum that GPS uses.

The Chair. Okay.

Mr. Matheny?

Mr. Matheny. No.

The Chair. No?

Ms. Sorond. No.

Mr. Feld. No.

Mr. Grossman. Chairman Guthrie, the Energy and Commerce Committee in the House has primary oversight of the FCC, and this hearing is an example of the committee's leadership on spectrum policy issues.

The Chair. So you think that through the appropriations process we should regulate spectrum.

The problem is that we have challenges on spectrum in a lot of ways. We had a lot of work on it in the defense act -- I mean, in the One Big Beautiful Bill in defense areas and so forth. And so we sit down and work those things out through the process. And now we are -- and so my question, though: Do you think that should be handled through the appropriations process or, like you said, these hearings and through the technical agencies we delegated the authority to?

Mr. Grossman. Chairman Guthrie, spectrum policy in the House should be handled in this committee, in the House Energy and Commerce.

The Chair. Okay.

So, Mr. Grossman, I will go to you next. What challenges exist in ensuring that existing systems can take advantage of alternative PNT solutions? And what barriers currently exist to the adoption of these backup signals?

Mr. Grossman. Thank you for that question, Mr. Chairman.

By our estimate, there are anywhere in the neighborhood of 40 to 60 complementary PNT technologies either already available or in development. My colleague Ms. Dyer spoke about, in her testimony, 17 complementary PNT solutions that are available.

Our view is that there is no one-size-fits-all approach. The electric grid -- and you heard that in some of the opening statements -- relies on the timing portion of PNT. They are going to have

specific PNT requirements that may be different than wireless networks that also use PNT. Or, similarly, the aviation community also relies on GPS; they are going to have different requirements.

So we want to look at each of these industries and make a determination on which is the best complementary PNT approach.

The Chair. Okay. Thanks.

I am going to go to Ms. Dyer. I want to -- that leads right into my next question.

So how can Congress be constructive in supporting the development of private-sector PNT solutions without picking winners and losers?

Ms. Dyer. You know, we are spending a lot of time focused on one particular solution, but, as my colleagues just mentioned, there are numerous ones out there that have thrived because the marketplace has demanded them.

There are backup systems operating in our electrical grid today. There are a number of other technologies that allow the aviation community -- plus, excellent training of our commercial pilots about what to do when something goes wrong with their navigation systems.

So there are a lot -- it is hard to understate that there is a robust commercial capability already in place in a number of ways, and that is in large part because of the commercial sector making the right moves.

Companies have a lot of reputational risk and a lot of financial incentives to make sure that their customers can maintain the services --

The Chair. Is there something we need to do to help to improve this expansion? Or is it just, "Congress, stay out of the way, and let the commercial market make it happen"?

Ms. Dyer. Having hearings like this, where we can uncover some of the challenges that are facing the companies as they are trying to move forward, uncovering the --

The Chair. You know, I am just out of time, but hopefully we can answer what challenges we are facing and how we can be helpful.

Ms. Dyer. Yeah.

The Chair. So I am out of time. I will yield back. Thank you. Thanks.

Mr. Hudson. Thank you, Chairman Guthrie.

The chair now recognizes the ranking member of the full committee, Mr. Pallone, for 5 minutes for your questions.

Mr. Pallone. Thank you, Mr. Chairman.

Yesterday, I spoke at a hearing on a national privacy regime that the Republicans have put together, you know, that obviously focuses on entities collecting and using data responsibly. And while GPS has been a real benefit to our economic and national security, it was not built with privacy in mind.

And, in your testimony, Mr. Feld, you note that we need to, quote, "bake in" privacy for the next generation of PNT technology.

So my question is -- I have three, actually -- would passing strong, comprehensive Federal data privacy legislation that implements clear rules around data minimization help ensure that privacy is designed into future PNT systems and any technological upgrades? And if so, how?

Mr. Feld. It would --

Mr. Pallone. You have a minute.

Mr. Feld. It would definitely help. Part of this is, if the law is clear that there is no profit in building these privacy-violating capacities into the system, then people won't.

Mr. Pallone. Okay.

And I also stated earlier, we need a broad range of PNT solutions in this country, but any solution must operate in the public's interest.

So now I am going to go to Ms. Sorond.

I understand NextNav has a proposal pending before the FCC for its 5G PNT solution. Does NextNav also have existing PNT services that are operational today?

And if so, does NextNav's 5G solution need to operate in the same spectrum band as this existing PNT services, or could NextNav deploy this new PNT technology in spectrum band where 5G already operates today?

Did you get that?

Ms. Sorond. Thank you, Ranking Member, for those very good questions.

NextNav does currently operate today. In fact, our solution saves lives. In this room today, you have several chiefs and deputy chiefs from several counties -- Fairfax County, Boston -- in this room. That is who we work with. We work with them to understand their needs, to save lives. We work with them to provide a vertical Z-axis solution that tells you what floor of a building you are -- which, actually, you can't do with GPS because the signals don't get indoors. So you need that today, and it is being used commercially.

And I spend a lot of my time listening to these firefighters' stories about people who died from the entrance 40 feet away just because you can't locate them. You need to listen to their dispatches, and that is when you get passionate about what we are doing today.

So that is an incredibly important aspect of what we provide.

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[11:15 a.m.]

Ms. Sorond. We also would like to expand that in the backup form -- meaning, GPS needs complements, because it doesn't work while indoors, but it also needs a backup. And that is where what we call X-Y -- so you hear a lot "Z-axis," which is the vertical solution. X-Y is the horizontal solution. We need to extend it.

So we currently operate -- we own the spectrum licenses, and we operate in this band.

We also have a 5G system up in Santa Clara today in a very extensive coverage that we would love to have you all see on how amazing the current new innovation is on providing you accurate both positioning in a 3D manner and timing solution.

Our proposal at the FCC is to modernize our existing spectrum, and we would like to work with them and you and everyone over here to move forward on this process.

Thank you.

Mr. Pallone. All right.

And I am going to go back to Mr. Feld for about a minute.

Why is it important that we invest in our country's PNT system to ensure that it is both resilient and redundant? And what are the consequences consumers will face if we fail to do so?

You have about a minute left.

Mr. Feld. As every witness here has testified, we depend on it, and we depend on it in ways we even don't know we are depending on it. Because it has been an open, freely available system, it has been plugged into everything.

We cannot allow this to degenerate. We cannot allow this to be shifted to a private-sector approach only. But, as others have also mentioned, because individual industries and individual locations have particular needs, there is tremendous value in having private-sector PNT alternatives

available for backup, for resiliency, and that address the local environment and needs.

Mr. Pallone. All right. Thank you so much.

Thank you to the panel.

And I yield back, Mr. Chairman.

Mr. Hudson. Thank you.

The chair now recognizes the vice chair of the committee, Mr. Allen from Georgia, for 5 minutes for your questions.

Mr. Allen. Thank you, Chairman Hudson, for holding this hearing.

I thank the witnesses for testifying and being here today to share your expertise on this important subject we are talking about today.

Like in Chairman Hudson's home State of North Carolina, Hurricane Helene wreaked havoc in Georgia's 12th District.

Ms. Dyer, could you talk about the importance of GPS and PNT, broadly, to our first responders?

Ms. Dyer. Absolutely. Thank you for the question.

GPS actually has an advantage over terrestrial-based systems in manmade natural disasters such as the tragic hurricane that went through your area as well as the Maui wildfires and the California wildfires. It wiped out the terrestrial infrastructure in those areas, and it has taken a long time to rebuild that.

In the meantime, there are devices that people can carry that are in their pocket that allow people to connect to emergency services. When cellular towers are down, there are capabilities where you can use those devices and connect with a satellite, and it will send your GPS location back to call centers --

Mr. Allen. Uh-huh.

Ms. Dyer. -- who will then dispatch emergency services to where you are locating.

It is an incredible system that relies on satellite only and is essential, as you mentioned, during these types of incidents.

Mr. Allen. Good. Thank you.

Mr. Feld, do you have anything to add to my question on the -- talking about the importance of GPS and PNT, broadly, to our first responders? Anything to add there?

Mr. Feld. Yes.

First, we need to recognize that there are two elements of this problem. One is the consumer side. And that is where next NextNav, back when it used to be Progeny, made its contribution so that cell phones can communicate the correct location to first responders.

Mr. Allen. Uh-huh.

Mr. Feld. The other is for first responders themselves, especially teams that are sent to areas with which they are unfamiliar in response to natural disasters, will need to be able to navigate, and existing GPS may not be adequate, depending upon the environment.

So we need to actually look at both sides of this equation.

Mr. Allen. Mr. Matheny, in your testimony, you mentioned the resiliency of broadcast infrastructure in times of emergency.

Hurricane Helene devastated physical communications infrastructure. Could you speak more about how that will translate to resilience in the Broadcast Positioning System?

Mr. Matheny. Vice Chairman Allen, I am from North Carolina originally and have experienced numerous hurricanes myself growing up, and what I can say is that broadcast infrastructure is some of the most reliable infrastructure there is. It is built to stay on the air 24/7/365. The facilities are hardened such that they have generator backups, and that is currently being used as a source, the backbone, of the Emergency Alert System.

What we are talking about with BPS is extending that resiliency to critical infrastructure so that cell towers can stay operational, so the power grid can stay operational. And we believe that

BPS can be a major contributor to our response in weather emergencies.

Mr. Allen. Thank you.

Mr. Matheny, in addition to my position here on the C&T Subcommittee, I also serve on the Energy Subcommittee. I am proud to represent Plant Vogtle, the first commercial nuclear reactors built in the U.S. in over three decades, housed in my district.

Reliable power is essential for economic growth. In your testimony, you mentioned a National Institute of Standards and Technology project with Dominion Energy. Ensuring our Nation's electrical grids and other critical infrastructure have a reliable backup to GPS is important to our economic and national security.

Can you expound on what we have learned from this pilot program and how the Broadcast Positioning System, or BPS, could be utilized by the energy sector?

Mr. Matheny. Thank you for that question, Vice Chairman Allen.

So what we have learned is that the energy grid uses precision timing in a variety of ways. It uses it to time-align the energy so it can actually flow across the grid and get to its destination. And it is also used in fault-tolerance monitoring. Power lines are really long. If there is an issue somewhere, you need to be able to deploy that crew exactly to where the fault is, and that is one of the ways that precision time is used.

BPS, as an alternative system, has plugged right in and can provide the same or better performance than what is provided by GPS today.

Mr. Allen. Thank you very much.

And I thank all of you for sharing your expertise today.

And, with that, Mr. Chairman, I yield back.

Mr. Hudson. Thank you.

The chair now recognizes the very well-dressed gentlelady from New York -- that is a good-looking jacket you got on there; good choice -- for 5 minutes for your questions.

Ms. Clarke. Good morning. And thank you, Mr. Chairman, and thank our Ranking Member Matsui for holding this important hearing.

And thank you to our panel of witnesses for joining us today.

Positioning, navigation, and timing, or PNT, infrastructure is an essential public utility that impacts almost every aspect of modern American life. As co-chair of the Smart Cities Caucus, I know just how critical reliable PNT data is for technology like the internet of things, connecting medical devices, precision logistics, smart meters, and so much more.

While GPS has long served as our Nation's primary, indispensable source of PNT for decades, we cannot ignore the growing threat signal jamming, spoofing, and severe space weather poses to this system. Building a layered and resilient terrestrial and space-based PNT architecture is a commonsense imperative for both national security and consumer protection.

However, as we evaluate alternative PNT proposals, we must remember that PNT has evolved into a fundamental public good. GPS is free to the public, universally accessible, and deeply embedded in vulnerable consumer networks.

Any effort by the FCC to expand commercial PNT networks must be thoroughly examined to ensure it doesn't result in harmful interference, create costly subscription barriers, threaten public safety, or disrupt the existing spectrum ecosystem that powers much of our everyday lives.

While it is essential that we build resilient systems, we cannot allow the urgent pursuit of technological resiliency to become an avenue for corporate giveaways that leave low-income, minority, or disconnected communities to carry the burden of unexpected costs or predatory digital redlining.

Many industry stakeholders and consumer advocates have argued that if a high-power commercial PNT network is jammed into the 900 megahertz band, the potential for harmful interference is staggering and could knock out home security alarms, baby monitors, consumer medical equipment, and the electric smart meters that families use to keep their utilities running

efficiently.

Forcing everyday Americans to replace perfectly good devices or absorb the cost of sudden hardware upgrades is nothing short of a tech tax on the working class.

I believe, together, Republicans and Democrats, private companies, and the public sector can come together to create a more resilient PNT architecture that does not result in harm to our national security or additional exorbitant costs to American consumers. And I look forward to working with you all to do so.

Ms. Sorond, NextNav's proposal has drawn a lot of opposition from business and consumers that use devices built on the unlicensed spectrum in the 900 megahertz band, who say that adding a high-power licensed operation into the band could be catastrophic to the co-existence framework that has enabled innovation for years.

How do you assess the potential impact on the unlicensed users in the band today? And are there requirements or standards that could provide certainty and continuity without degrading unlicensed services and devices?

Ms. Sorond. Congresswoman, thank you for asking that very important question, and I understand your concern.

NextNav currently holds and operates in these spectrum licenses. In fact, we are reducing power in one portion of it. We have demonstrated through simulations, through lab, and through field that we do not see any impact to the unlicensed operations. We currently have a now-live network in Santa Clara, and we also have existing network across the country, and we have not heard a single complaint of interference.

We will continue to work with the FCC. And I think that is the agency that, for over decades, has listened to concerns on every side. Because we believe these other operations are very important as well.

And the FCC staff and engineers are the experts who will look at our very solid -- and I am an

engineer, by the way -- very solid record that we have put on their fact-based engineering base and operational base, and they will also listen and hear from the other side on their technical data and fact-based arguments, and we believe in their process to make a decision.

Ms. Clarke. Very well.

I yield back, Mr. Chairman. Thank you.

Mr. Hudson. Thank you.

The chair now recognizes the gentleman from Ohio, Representative Latta, for 5 minutes to ask your questions.

Mr. Latta. Well, thanks, Mr. Chairman.

Thanks to our witnesses for being here today.

Ms. Dyer, if I could start my questioning with you, you know, in your testimony -- this is good news -- it says that, since 1995, GPS has not experience a single system-wide outage. That is great news.

But the things I worry about are a little bit later in your testimony. You say, from 2018 to 2020, China launched its entire third-generation satellites in 3 years, and during that time the United States has only launched one.

And then, also, you mention this: China's satellites transmit from two orbits. What is the advantage or disadvantage?

Ms. Dyer. Thank you for that question, Congressman.

We are concerned about that as well, that China in 3 years launched an entire third-generation system that is equivalent, in some ways has some advantages, to GPS.

We are interested in looking at the diversity of orbits. In fact, in our filing to the FCC's notice of inquiry, that was one of our standards for what constitutes a complementary PNT system, is that there is a diversity of orbits.

And the benefits of that is that, if there is a threat in one orbit, you still have PNT systems in

another orbit that can continue to transmit signals that everyone relies upon, including your constituents.

Mr. Latta. Well, let me continue on, because you also say, with the GPS III and the GPS III F satellites -- especially the IIIFs, you say, offer 63-times-greater anti-jamming capabilities for military users, but, at the same time, they don't offer the same anti-jamming or counter-spoofing capabilities for civil, commercial, or scientific uses.

Why not?

Ms. Dyer. That is a great question. We wonder that as well.

Because one of the things about GPS is that there are encrypted signals that come down that are specifically for the military, and the civil and commercial and scientific users use what are called "civil signals." There is a misperception that those are two different paths and they only serve those systems -- each other.

Actually, the Defense Department relies heavily on those civil signals because they outsource so much of their logistics work to the aviation and maritime communities, the rail systems, all kinds of different systems.

So it is a mystery to us.

We submitted recommendations around the jamming and spoofing incident to Secretaries Hegseth and Duffy, and that was one of our recommendations, is that they come up with counter-spoofing capabilities for those civil signals.

Mr. Latta. Well, thank you very much.

Mr. Grossman, I have worked on the Precision Agriculture Satellite Connectivity Act, which passed this House as part of this year's farm bill. And, in your testimony, you mentioned the importance of satellites and GPS systems in order for precision agriculture technologies to work.

How can we ensure that these technologies are seamless and complementary to PNT systems, as backups to GPS are developed and adopted.

Mr. Grossman. Thank you for that question, Congressman. And I know how much of a champion you have been for precision agriculture.

The GPS story in agriculture is really a remarkable one. You think about, for the farmer today, that a GPS-equipped tractor or a combine combined with wireless connectivity can enable the tractor to run semi-autonomously. And, using GPS and a corrective technology, for example, like RTK, they can get down to centimeter-level accuracy. And for the farmer, that means being able to -- for the technology to be able to know the difference between a weed and a plant. So you are, therefore, reducing time, saving money, and -- those are two of the primary -- and also conserving water.

So, clearly, when we talk about complementary PNT, it is another important use case for why we should look at an all-of-the-above approach.

I would also point out that the agriculture community is using the lower 900 megahertz band, including iconic American companies like John Deere. So it is important, while we explore complementary PNT solutions, that we also protect that innovation band.

Mr. Latta. Well, I appreciate that. Because, again, our farmers out there need every benefit that they can get, because, you know, prices haven't been the greatest in the last several years, and when you look at the costs of farming, it is tough out there.

So my time is about ready to expire, so what I will do is, Mr. Chairman, I will submit my other questions for our witnesses.

[The information follows:]

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Mr. Latta. So thank you very much, and I yield back.

Mr. Hudson. Thank you.

The chair now recognizes the Representative from California, Mr. Ruiz, for 5 minutes to ask your questions.

Mr. Ruiz. Thank you, Mr. Chairman.

In emergency medicine, getting to emergencies fast -- to suppress fires, to address a disaster, to transport critically sick patients to emergency rooms -- is a matter of life or death. Whether it is a bush fire near trailer parks or a farm worker suffering heat stroke miles from the nearest paved road, first responders need to find people quickly.

GPS makes all of that possible, but the communities that most depend on precise positioning, navigation, and timing -- what we call "PNT" -- are often the most exposed when those systems fail. Rural areas face GPS jamming and spoofing not as a distant threat but as a practical hazard. In communities like mine, that danger is compounded by proximity to military training corridors and a geographic reality that cannot be wished away. When GPS fails, there may not be backup technology to catch the fall.

Mr. Grossman, my district includes communities that are hours from the nearest major hospital, with limited cellular coverage. How would a GPS outage or the jamming or spoofing of GPS signals harm rural emergency responders? And can current complementary PNT technologies aid in situations like these?

Mr. Grossman. Thank you for that question, Congressman Ruiz.

You have highlighted the inextricable connection between public safety and first responders and having reliable access to PNT. When hospitals are located hours away, as in the example you shared, those ambulances transporting the patient, they are relying on PNT to navigate them to the closest hospital and with the quickest route.

Similarly, the home base for the first responders use GPS and PNT for tracking services to know exactly where that ambulance is and where to route additional emergency vehicles.

I would also point out, many of the largest public safety organizations have weighed in on today's hearing, including the International Association of Fire Chiefs, the International Association of Chiefs of Police, for the very reason that you have described.

We need to have complementary PNT solutions, but we cannot do it to the detriment of many of the use cases relied on by first responders that are located in that lower 900 megahertz band.

Mr. Ruiz. Thank you.

For Tribal nations across California's desert region and the Nation, the gaps in redundant communication infrastructures are real and longstanding. Emergency dispatch, search and rescue, and energy grid management on Tribal lands all depend on GPS being reliable.

Ms. Dyer, Tribal nations in my district manage their own emergency services and utility infrastructure on sovereign lands. How does the GPS community engage Tribal governments in PNT resilience planning? And what barriers exist to deploying backup systems on Tribal and rural land specifically.

Ms. Dyer. Thank you, Congressman, for the question.

You know, the GPS community consists of a lot of folks across the Federal Government as well as industry. One of the programs that is available, as I am sure you probably know, is the Department of Energy's Tribal Nation Transmission Program that provides advice to Tribal nations as they are setting up those electrical grids.

I would be curious to see if their information that they provide emphasizes the importance of a resilient backup in their electric grid capabilities. If not, that is certainly something of a shortfall.

It is fairly standard in every electrical grid to not only rely on GPS as a source for that timing signal but also to implement other protocols, including one cleverly called "White Rabbit" protocol

that first gets a signal, a grandmaster clock signal --

Mr. Ruiz. Yeah.

Ms. Dyer. -- from GPS, and then it relies on ethernet inside of it to help provide a backup so that they can have that.

Tribal nations should be able --

Mr. Ruiz. Thank you.

Ms. Dyer. -- to ask a question and make sure that that is in there.

Mr. Ruiz. Thank you.

The Imperial and Coachella Valleys are among the most productive ag regions in the country. GPS-guided precision farming is central to how our growers manage water and maximize yields under extraordinarily difficult conditions.

Mr. Feld, precision ag is heavily GPS-dependent, and rural farming operations have limited capacity to transition to backup systems. What would a realistic Federal framework look like to help ag and rural users integrate complementary PNT technologies without placing that burden entirely on small operators.

Mr. Feld. I am going to unfortunately have very little time, and I would love to talk to you about the Tribal stuff as well.

But the question is to what extent can we in the United States build into terrestrial, such as the eLoran system, in order to publicly fund alternatives to satellite GPS for those areas that desperately need it and where private systems are unlikely to deploy.

Mr. Ruiz. Thank you.

Mr. Hudson. The gentleman yields back.

The chair now recognizes the Representative from Virginia, Mr. Griffith, for 5 minutes to ask your questions.

Mr. Griffith. Thank you very much, Mr. Chairman.

All right. Maybe you all can help me figure this stuff out.

Ms. Dyer, can you talk about lower-Earth-orbit GPS systems and their differences from traditional GPS systems.

And, as a part of that, I am curious -- because of the conversation you had with Representative Latta a few minutes ago -- I am curious about what the Chinese three levels are, and does that also include -- and I assume it does, but -- does that include low-Earth-orbit satellite?

Ms. Dyer. Thank you for that question.

Low-Earth-orbit PNT systems in the United States are a very healthy economy, actually.

Iridium operates the first commercial PNT system in low Earth orbit. They are an incredible company, and they are providing great services in those areas.

Two other companies are right behind them, two U.S. companies, one named TrustPoint. And it is differentiating itself in this market by transmitting its signals along C-band as opposed to L-band, where GPS is operating. And they expect to start providing services as early as 2027.

Another company is called Xona. And Xona is a company that is putting a signal that is very close to GPS into operation so that it can be easily integrated into existing receivers and devices.

So you have a very nice and healthy LEO PNT system in the commercial space.

China, to my knowledge, has satellite systems both in geostationary -- so ones that are 25- to 30K above the Earth -- as well as medium Earth orbit. I am not aware of them having a very robust low-Earth-orbit PNT capability.

Mr. Griffith. All right.

So, then, that raises this question, which everybody else in the room might know but I don't: Do we have middle Earth, or middle level --

Ms. Dyer. Uh-huh.

Mr. Griffith. We do. Okay.

Ms. Dyer. We do. That is where --

Mr. Griffith. So we have got the geo- -- that I knew about -- and LEO. Okay.

Ms. Dyer. Yep.

Mr. Griffith. Do they have the same -- do the low-Earth-orbit satellites have the same vulnerabilities that the traditional satellites have?

Ms. Dyer. They have a different mix of vulnerabilities.

One, when you are operating in low Earth orbit, the signal that comes down to the Earth is going to be higher powered, purely from physics. It is closer to the Earth, so the signal won't be diluted as much.

But there are instances -- a lot of the orbital debris is residing in low Earth orbit in a way that it is not in medium or geostationary orbits. So it faces some different challenges.

Mr. Griffith. All right. Thank you very much.

I was intrigued with some of the discussion Ms. Sorond brought up about that they are using some more high-powered 900 megahertz in the low things and that there was not interference.

And I understood your testimony correctly, correct? There weren't any complaints about interference. I understood that correctly, did I not?

Ms. Sorond. That is correct, Congressman.

Mr. Griffith. All right.

So now I go to Mr. Grossman, because I want to get, you know, both sides of the story.

Do you have any complaints -- or have you heard of complaints where they were using -- where they are using the higher power, that people are running into problems, whether it be the medical side or something as simple as garage door openers?

Mr. Grossman. Congressman, yes, we have heard concerns.

So the tests that NextNav refers to -- there were two that I am aware of. I have reviewed YouTube videos that the company posted on their site showing what they claim to be co-existence with RFID tags and then another video which showed -- or claimed co-existence with smoke

detectors and I believe one other device.

These were 1-minute-long videos each. We have not seen any accompanying technical data to go along with those tests. Our engineers of our companies would welcome --

Mr. Griffith. So you question their testing, but I guess my question would be: In those areas where they were doing testing or where they used this, have you had any specific complaints?

Mr. Grossman. Well, as I understand, the tests occurred on the rooftop of a building, so they were an isolated test with specific devices. We just don't have a lot of details about the technical parameters by which those tests occurred.

Mr. Griffith. And I am going to probably run out of time, but is there any way to buffer the systems so that if you are using the higher-powered ones, the lower-powered ones can be buffered from interference?

Mr. Grossman. Congressman, we are not aware of that. There have been countless technical tests submitted into the record.

Mr. Griffith. Ms. Sorond?

Ms. Sorond. Thank you for the opportunity to clarify.

We are transmitting live -- what we demo is very different. We have been transmitting live since January on 5G. We have been transmitting for decades on our regular technology. And we have not had any complaints of interference.

In the same --

Mr. Griffith. Buffering? I have 5 seconds. Buffering? Is there any technology for buffering?

Ms. Sorond. The co-existence is possible. Today you don't need any technologies for buffering.

Mr. Griffith. Okay. All right.

I yield back, Mr. Chairman. Thank you very much.

Mr. Hudson. Thank you.

The chair now recognizes the Representative from Michigan, Representative Dingell, for 5 minutes to ask your questions.

Mrs. Dingell. Thank you, Mr. Chair.

And thank you to our witnesses for being here, because this is a really important subject.

Positioning, navigation, and timing systems are foundational to our national security, our economic security, and critical infrastructure. GPS powers everything from aviation to emergency response, to telecommunications, the future of transportation, and much more. And as a car girl, I really -- I don't think people even have maps anymore, just as an aside.

But I am concerned. For decades, the United States has led the world in GPS technology, but as GPS disruption, jamming, and spoofing become more common in modern conflict, we have to ensure that our systems are resilient, secure, and reliable.

We have already seen examples of GPS interference near conflict zones in Eastern Europe and the Middle East, and experts continue to warn that our adversaries are actively developing capabilities to exploit these vulnerabilities. And I have unfortunately actually seen some of the work.

It is not only a defense issue; PNT technologies are increasingly important to the future of innovation and commerce, including autonomous vehicles, connected technologies, wireless communications, and emergency response systems.

We have to lead in the deployment of resilient technologies that strengthen our national security, protect our critical infrastructure, and support economic competitiveness.

It is important to understand the vulnerabilities facing our current PNT system, the role the government can play and the private-sector innovators can play in addressing them, and what does Congress need to do to help ensure we remain the global leader in secure and resilient PNT technologies.

So now I am going to ask -- I have a lot of questions, so will probably do some for the record.

But let me start with you, Mr. Feld. What would be the real-world consequences if the United States experienced a significant GPS disruption without sufficient backup capabilities in place? And which sectors would be the most affected?

Mr. Feld. It would be disastrous. And there would be a chain reaction, because some systems have backups that will allow them to persist for some time, but everything ultimately coordinates back through GPS as a means of synchronizing all these systems.

So, first, you would lose for a lot of consumers the devices that they rely upon. Then, gradually, other systems that have been listed, such as the electrical system, the cell phone networks, would drift off of their existing synchronicity.

So it would be bad. And the longer it went on, the more disastrous it would be.

Mrs. Dingell. So I have another question, but I am only -- you didn't answer my questions about what sectors would be the most impacted.

Mr. Feld. I am sorry, because, in every locality, it is going to depend a great deal --

Mrs. Dingell. Okay.

Mr. Feld. -- on who has backups and what type of backups.

Mrs. Dingell. All right. So I am going to ask you more on specifics.

I am going to go to Mr. Grossman, because I have to get this in before I run out of time.

As autonomous and connected vehicle technologies continue to advance, how important are PNT systems to the future of transportation, infrastructure, and vehicle safety?

Mr. Grossman. Congresswoman, they are incredibly important to PNT.

GPS, though, is just one of a number of technologies that autonomous vehicles rely on. It includes cameras, radar, LIDAR, onboard sensors, and detailed maps all working together to navigate safely.

So GPS is an important input, but it is not the sole basis for driving decisions. But, at the

same time, absolutely, everything that you said is correct. It is another reason why we need to support complementary PNT solutions.

Mrs. Dingell. Okay. I am going to give you more for the record.

Mr. Feld, can you walk us, in 40 seconds, through the different forms of backup PNT systems currently being developed or deployed and how they would improve resilience if GPS is disrupted?

Mr. Feld. So we have a couple of different buckets.

Terrestrial is one that can provide powerful signals that are more resistant to jamming, particularly because NIST has developed a synchronized timing standard that you can import through fiber. So fiber connecting to towers, that is one method.

There are improved satellite approaches, especially now that we are using low-Earth-orbit satellites in addition to the mid-Earth-orbit satellites.

And then there are self-contained awareness of the stuff around you. Essentially, overlay a map on known physical -- you know what your initial location is -- and then you can use technology to tell how far you have gone and at what speed.

Mrs. Dingell. I want to have you expand, but I am out of time.

So I yield back, Mr. Chairman. I have a lot of questions.

[The information follows:]

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Mr. Hudson. Thank you. Those are good questions.

I now recognize the Representative from Florida, Mr. Bilirakis, for 5 minutes to ask your questions.

Mr. Bilirakis. Thank you, Mr. Chairman. I appreciate it.

I have heard from countless businesses and stakeholders over the months about the need for a GPS-redundant system, which everyone seems to agree is necessary for both safety and the most effective use of GPS technology.

Recently, I have been working with a Tampa-based company that is developing precise positioning infrastructure for roads to support autonomous vehicles. Ultimately, their goal is to reduce crashes and save lives with the help of technology, including GPS systems.

We must ensure that the potential of these public safety initiatives are top of mind as we investigate policy changes.

My first question is for Mr. Grossman.

How can we make sure resilient and complementary PNT are integrated into autonomous systems?

Mr. Grossman. Congressman, that is a great question.

And, you know, as I spoke about in our testimony, it is critical, when we are evaluating these complementary PNT solutions, that there is no one-size-fits-all approach. Each use case is going to have different requirements.

The example you referred to of the company in your district, I am not personally familiar with them, but it sounds like one of the many examples available there. That particular technology sounds like it is focused for autonomous vehicles and transportation, and that is very exciting. But there are other complementary solutions that are going to be better suited for the military, others that might be better for agriculture, and yet others that are going to be best for aviation or for a

critical infrastructure sector.

So that would be the criteria on which we would recommend that Congress and you evaluate. But, again, it is important that you don't mandate any one specific technology.

Mr. Bilirakis. Thank you.

Before the FCC reconfigures a band under any FCC application, we should understand its necessity, obviously.

Mr. Matheny, is the Broadcast Positioning System proof that we can build resilience on spectrum already allocated?

Mr. Matheny. Congressman Bilirakis, yes, it is. I think that we have existing licensed spectrum. It is clean; it is clear. And this is a new application that can ride right on top of that spectrum as we deploy the next-generation broadcast standard.

It is also running on top of very resilient infrastructure that broadcasts at a high power and covers large geographies and stays on line during times of challenging weather and other events.

Mr. Bilirakis. Good. Thank you.

Next question for you, Mr. Matheny: With hurricane season starting -- and it has started -- can you discuss the existing resilience for AM radio and how the Broadcast Positioning System plays into that?

Mr. Matheny. Again, I do believe that broadcast infrastructure has shown over the years that it is some of the most resilient infrastructure out there. It stays on the air, providing vital information to people in their times of need, and it also serves as the backbone of the Emergency Alert System. So it is already set up to be there in those times of disaster.

And what we are able to do with BPS is to extend that, not just to provide information to people, but also to provide time to critical infrastructure so that they can stay operational, as well, to keep those cell towers up and operational, to keep those power substations providing energy, to help deploy the teams to repair power lines more quickly.

So there is a very significant role that BPS can play as it relates to those types of weather emergencies.

Mr. Bilirakis. All right. Very good. I appreciate it very much.

I will go ahead and yield back, Mr. Chairman.

Mr. Hudson. I appreciate that.

The chair now recognizes the Representative from California, Mr. Peters, for your 5 minutes for your questions.

Mr. Peters. Thank you, Mr. Chairman, for calling this hearing.

Position, navigation, and timing, or PNT, technology is critical to our way of life, as has been discussed by you all. And it allows easy access to real-time location data, helping not only to operate our vehicles and find our way but also to help operate critical national defense systems.

Currently, we rely on GPS to provide PNT information through our devices via satellite. Since it was launched in the 1970s, the Department of Defense has secured, maintained, and operated GPS, with assistance from the Department of Transportation.

We don't have GPS redundancy technologies in place, and so foreign adversaries are increasingly -- or we have an increasing concern about interference with GPS by interfering or spoofing with the signal.

Ms. Dyer, can you tell us how America is particularly at risk from foreign interference with our GPS system currently and whether Europe is experiencing similar attacks on their Galileo PNT system.

Ms. Dyer. Yes. Thank you for the question, Congressman.

American companies are impacted by the jamming and spoofing that is taking place in Europe, which is occurring not only in conflict zones but outside of conflict zones. And their governments have spoken up about that.

American companies, whether they are maritime or aviation companies, who are flying passengers into areas where that jamming and spoofing is being impacted are being affected. Their

aircraft are being affected. They are needing to reach out to air traffic control to let them know that they have been jammed and spoofed. And that causes problems for them. Sometimes it requires a hard reset, and in some cases some of the receivers and devices have to be taken out and recalibrated.

The good news is, our pilots are well-trained to respond in those scenarios. But it is an impact on those different forms of transportation which Americans and the American economy relies on tremendously.

That jamming and spoofing is impacting not only Europe's Galileo system, it is impacting China's BeiDou and Russia's GLONASS system --

Mr. Peters. Right.

Ms. Dyer. -- their equivalents of GPS.

Mr. Peters. Maybe, on that topic, Mr. Grossman, what types of complementary PNT technologies are Europe and other countries examining that would improve resiliency and protect their nation from foreign adversaries? And what might we learn here for this committee from those efforts?

Mr. Grossman. Thank you for that question, Congressman.

I will give two examples that I am familiar with.

One -- and I believe Ms. Dyer spoke it about earlier -- is Iridium's low-Earth-orbit satellite network -- I believe it is called "STL" -- which has been widely used in Europe and elsewhere in the world for critical infrastructure, and I believe even the European Commission themselves use that as a complementary PNT solution.

While not Europe, another example is South Korea. They are using a terrestrial system called eLoran as a complement.

So, to your question about what are some of the possible solutions, both of those are examples. We are technology-neutral as an association. We are not endorsing any one of them.

But I do think they present good examples of technologies that we should look at when exploring complementary PNT.

Mr. Peters. Good. That is good to know.

I know we are not here to talk about merits of specific solutions, but I know that there is a, kind of, concern about the reconfiguration, potentially, of the lower 900 megahertz band, the spectrum that electric gas and water utilities rely on every day to deliver utilities to our communities and support grid reliability, and whether that could disrupt critical energy infrastructure.

We know that wireless sensors monitoring equipment on that band help managers manage energy use, enable utilities to remotely monitor and manage critical infrastructures, and that the systems' improved efficiency support conservation efforts and enhance essential service reliability.

Mr. Grossman, how can the FCC ensure GPS system reliability while protecting Americans from having to them higher costs, which I think is a concern that everyone is talking about in this building these days.

Mr. Grossman. Congressman, you raised an important point. We can't lose sight of the consumer here.

And you highlighted many of the examples of how the utility sector could be impacted. We don't believe that it is a choice that this subcommittee and Congress has to make between promoting GPS resilience and protecting the lower 900 megahertz band. There are numerous options for complementary PNT that don't pose those forms of interference to those critical utility services that you have referenced.

Mr. Peters. Okay. Well, I hope we pursue that. I hope that the FCC is able to balance these priorities to, you know, give consideration to national security, operational security here on shore, and cost.

And, Mr. Chairman, I yield back. Thank you.

Mr. Latta. [Presiding.] Thank you very much.

The gentleman's time has expired, and he yields back.

The chair now recognizes the gentleman from Georgia's First District for 5 minutes for questions.

Mr. Carter of Georgia. Thank you, Mr. Chairman.

And thank all of you for being here. This is obviously a very important subject matter that we need to be paying particular attention to for a number of different reasons, not the least of which is our national security. We all understand that.

Positioning, navigation, and timing, it is more, as I say, than just a technical issue. It is an issue about national security and about our financial systems, everything -- you name it -- electrical grid, agriculture ports, emergency response. It touches all facets of our society and of our lives.

So, you know, we have to make sure that the jamming, that spoofing, the cyber threats, and the growing concerns of adversaries and the capabilities of adversaries like China and Russia are under control, and that is extremely important.

And that is why I believe that we need a layered approach. We need to modernize GPS. We need to protect it from interference. We need to examine complementary technologies, including terrestrial systems and the Broadcast Positioning System, without prematurely picking winners or forcing consumers into a rushed transition.

Ms. Dyer, I want to ask you, from a national security perspective, what is the most urgent -- tell me what the most urgent PNT vulnerability Congress should be focused on right now is. What might it be?

Ms. Dyer. Thank you, Congressman, for the question.

I believe addressing the jamming and spoofing issue is an important element.

One element of that is enforcing existing laws that Congress put in place to prevent harmful interference to authorized radio communications. The FCC could use additional resources to focus on that.

When a jammer was inadvertently transmitting in Westminster, Colorado, it took the FCC and the FBI 7 days to locate this jammer. It should not take them that long to shut down that type of jamming activity.

The other one that I think --

Mr. Carter of Georgia. Seven days?

Ms. Dyer. Seven days, yes.

Mr. Carter of Georgia. Gosh.

Ms. Dyer. The other --

Mr. Carter of Georgia. Imagine the damage that could be done during that period of time.

Ms. Dyer. Absolutely. Absolutely.

I would also say that Congress could also -- they have an opportunity to review the interagency processes that the executive-branch agencies have in the counter-UAS and UAS technologies to make sure that any sort of different technologies that are being used to counter UASes, that there is a really robust process so that it does not interfere with all of the various services that we rely on using GPS and the other complementary PNT systems that are already in place and operating with.

Those are two areas where I think those would be my top two areas --

Mr. Carter of Georgia. Great.

Ms. Dyer. -- for Congress to focus on.

Mr. Carter of Georgia. Great. Thank you.

Mr. Matheny, let me ask you, how could ATSC 3.0 and the Broadcast Positioning System help provide a backup or a complement to GPS during a disruption, particularly from a national security or emergency response situation?

Mr. Matheny. Thank you, Congressman.

BPS can be there as a terrestrial solution.

One of the things we have spent a lot of time talking about is different space-based solutions, but we can't really solve a problem in space by putting more stuff in space. We believe that there needs to be a terrestrial solution.

And our idea is that BPS be the primary terrestrial solution, and that is because we operate on resilient infrastructure with high-power signals that can cover the full continental U.S. and provide an alternative or backup to GPS such that there is a signal always available if GPS becomes compromised.

Mr. Carter of Georgia. Well, in your testimony, you mentioned that BPS is covering approximately 75 percent of the country today.

Can the Broadcast Positioning System be used today as a layer of PNT resilience?

Mr. Matheny. So, yes, ATSC 3.0 stations are now on the air reaching over 75 percent of the U.S. population.

BPS can be that layer. We want to be the primary terrestrial layer, and we believe that we can provide signals to other layers of a layered-approach system.

But we want to be the foundational one, and we believe that we are well-positioned to do that because of our existing infrastructure, because it is high-power, because it has such great coverage. So that is really our goal.

Mr. Carter of Georgia. If you were to do this, what kind of timeframe are you talking about? How soon could you --

Mr. Matheny. So, right now, we are on the air in three markets, and we are covering over 150,000 square kilometers today with BPS signals.

We have, again, those 80 markets reaching 75 percent of the U.S. population with ATSC 3.0. We think those could be on within a year. And then what we would do is have BPS be a part of the standard rollout of ATSC 3.0 for all other stations.

Mr. Carter of Georgia. Great.

Thank you all very much. This is extremely important, and we appreciate you all being here today.

And I yield back.

Mr. Latta. Thank you very much.

The gentleman's time has expired, and he yields back.

The chair now recognizes the gentlelady from Virginia for 5 minutes for questions.

Ms. McClellan. Thank you, Mr. Chair and Ranking Member Matsui, for holding this hearing and for our witnesses for being here today.

As the Congresswoman from Virginia's Fourth District, I have to acknowledge, we wouldn't be having this hearing without the pioneering work of "Hidden Figures" mathematician, Virginia State University alumna, and Dinwiddie native Dr. Gladys West, who passed away earlier this year.

Her mathematical models for the Earth's shape and gravity laid the foundational framework allowing satellites to capture and calculate position, navigation, and timing data with extreme accuracy. So I think we all owe this "hidden figure" our gratitude.

And, today, as the only publicly available civilian positioning, navigation, and timing solution, GPS not only provides direction and an ETA for drivers but, as we have heard, is essential to operating and supporting critical infrastructure, financial transaction authentications, air traffic control, communications network, precision agriculture, the electric grid. It literally underpins all modern technology.

And as that technology has advanced, so, too, have malign actors' tactics to disrupt, jam, and spoof GPS signals, underscoring the need for a more resilient and redundant PNT capability.

And while I appreciate the steps the Federal Government has taken to bolster competition in this space, which will lead to more resilient, accessible, and affordable solutions that strengthen customer protection and national security, we must ensure that the FCC, under Chairman Carr's leadership, upholds the public interest, as mandated by Congress, in evaluating any complements to

GPS. And given the high stakes, any evaluation of PNT backups must be done in a transparent, technically sound, and fair manner.

So, Mr. Feld, first responders, as we have heard, need more accurate, resilient, and secure alternatives to GPS. So what, specifically, should the FCC consider during its review of alternative PNT solutions to ensure first responders can locate, assess, and respond more quickly in emergency situations?

Mr. Feld. I would say the FCC needs to consider the following factors.

One, existence in the marketplace and speed of deployment. Is this something that is here today, or is this something that is going to take a while to actually develop standards for and deploy somehow?

Two, is the issue here that of public safety navigating to places, or is this finding the individuals who are in danger? These require separate solutions. The FCC has primarily focused on one in its Next Generation 911 proceeding, but we must give consideration to how public safety can navigate successfully and rely on PNT.

Three, frequency operation and how it interacts with existing deployment. Particularly, if there is not sufficient deployment in an area for a terrestrial solution, it is not going to work. If you are in a high dense forest area, satellite may not work.

These are factors that the FCC needs to consider. It needs to make sure that any approved PNTs meet the appropriate standards, and it needs to make sure that PNT systems disclose where they do not operate and what their weaknesses are.

Ms. McClellan. Okay.

And, Ms. Dyer and Mr. Grossman, as threats to the GPS system continued to evolve, ensuring resilience cannot not be solely a government responsibility but requires meaningful private-sector investment and coordination.

And you may need to provide fuller answers on the record, but can you discuss the

investments the industry has already made to harden GPS and related PNT systems against growing cybersecurity threats and specifically where you have seen the greatest progress in areas such as signal authentication, redundancy, anti-jamming, and where are there still gaps?

Ms. Dyer. Yes. Thank you for that question.

I think some of the many device and receiver manufacturers in the United States are very aware and very concerned about the cybersecurity vulnerabilities of the receivers and devices and have taken extraordinary steps to really reinforce their capabilities so that they are not vulnerable. They regularly issue patches to make sure that their systems are up to date.

They are also integrating integrity-monitoring types of capabilities to detect when a different signal is coming in and when that signal looks bad.

They also pull in a number of different signals from different complementary PNT systems to also help them discern when a signal doesn't look like it is working well. Sometimes it is just a malfunction of whatever system the signal is coming from. Sometimes it is nefarious; sometimes it is not nefarious. But the more signals you have, the more availability you have to figure out when something is going wrong and discard those signals so that it doesn't affect the user.

Ms. McClellan. Okay.

Unfortunately, my time is up, so if the rest of you want to answer on the record, I would appreciate it.

[The information follows:]

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Ms. McClellan. And I yield back.

Mr. Latta. Thank you very much.

The gentlelady's time has expired, and she yields back.

The chair now recognizes the gentleman from the Seventh District of South Carolina for 5 minutes.

Mr. Fry. Thank you, Mr. Chairman.

Thank you to the witnesses for being here today.

PNT is a hugely important issue but one that maybe most Americans don't understand, comprehend, but it is integrated in our daily lives in such a robust way, and that is why I think this hearing is incredibly important.

GPS remains one of America's greatest technological achievements. We also know that our adversaries obviously are investing heavily in counterspace capabilities, jamming, spoofing, and alternative PNT systems of their own, and so we cannot afford to fall behind.

At the same time, I think Congress has an obligation to be careful. We should support a more resilient, layered PNT architecture, but we don't necessarily need to pick winners and losers, disrupt existing technologies, or impose new costs on consumers, businesses, utilities, and the constituents that we represent.

Ms. Dyer, your testimony notes that a robust commercial PNT industry already exists and that multiple complementary systems are either operational or being developed, including space-based and terrestrial.

From your perspective, what is the most important thing Congress can do to support the development and adoption of PNT alternatives without undermining GPS or creating a one-size-fits-all mandate?

Ms. Dyer. There have been a few activities that Congress has already done. They have

provided funding to an organization in Los Angeles, California, a Space Force base called SpaceWERX, and SpaceWERX has provided seed funding to a number of different technologies in what they are calling an "AltPNT Challenge." So they are helping some of these small businesses, these innovative groups, to really start to develop and enhance their existing work so that they can try to bring new technologies forward to us.

I think there is also a lot that can be done, as I mentioned earlier, about enforcement of existing laws. The interference with GPS and other radio communications authorized by the FCC is illegal. And so making sure that the FCC has enough resources to address the bad actors that are causing these problems is a vitally important role that Congress can play here.

Mr. Fry. Thank you for that.

Ms. Sorond, my understanding is that NextNav currently has a pending petition before the FCC seeking a rulemaking on the lower 900 MHz band. Is that correct?

Ms. Sorond. Thank you, Congressman.

It is correct. And I wanted to just point out --

Mr. Fry. What is the -- just curious, what is the reasoning behind the petition and why NextNav is asking the FCC for that specific band?

Ms. Sorond. I appreciate the question and the opportunity to tell you.

We have licenses currently in the lower 900 megahertz band, so we are an existing licensee. And we are asking for modernization of those rules, something the FCC does all the time, where they have two sides, they listen to multiple sides, and have shown over decades that they make the right decision.

I wanted to also acknowledge what you mentioned about national security, which is where I would like to point out to you: Admiral Mike Rogers, former NSA Director and head of Cyber Command, summed it up really well, saying, "The U.S. needs a ground-based backup that leverages existing infrastructure to provide the speed and scale the problem requires."

Mr. Fry. And maybe we do. I mean, forgive my ignorance. I am just trying to make sure that I understand this, because I think the sheer amount of opposition that you have is alarming. You know, we walk into this hearing and there are a ton of organizations, entities, everything from utilities to small companies, that say that this is too much.

And so why is it that carving this lane out of exclusivity would be appropriate and these other companies or these other utilities, if you will, are wrong? Why are they wrong?

Ms. Sorond. Congressman, sometimes, when you ask for change, people don't like change. But that is why we have a process. FCC has solved many more complex problems --

Mr. Fry. But isn't there a less -- so, all right, I am a layman here. This is not my field of expertise. But if I am a road and I am, say, the South Carolina Department of Transportation, I have a few options, right? I can plow through somebody's neighborhood, or I could go around it.

So why could we not do something else that is less disruptive?

Ms. Sorond. We could have everyone co-exist with their very important operations. You do not have to choose between them.

That is why the FCC will make sure not only we have solid, multilayer PNT resiliences but these other very important operations continue to co-exist. We must trust their engineers and staff. They will be able to figure it out. They have done it for decades over much more complex, much higher-level opposition than what we have faced. I fully trust their process, and --

Mr. Fry. Well, I look forward to learning more, because it -- obviously we are running out of time, but would certainly welcome the opportunity to speak with you about how we could do that.

Ms. Sorond. Thank you.

Mr. Fry. Thank you so much, Mr. Chairman. I yield back.

Mr. Latta. Thank you very much.

The gentleman's time has expired, and he yields back.

The chair now recognizes the gentleman from New Jersey's Eighth District for 5 minutes for

questions.

Mr. Menendez. Thank you, Chairman.

GPS underpins almost all the critical systems we use to keep our communities safe, connected, and moving. In New Jersey's Eighth District, this is mission-critical. Our district includes Newark Airport, NJ Transit, PATH, ports, and major highways, tunnels, and bridges. Families and businesses rely on this infrastructure every day, and it all requires a secure, reliable GPS system to function.

That is why resilient and reliable PNT alternatives to GPS are so important. Any GPS disruption could threaten safety, slow commerce, and raise costs for American families. Communities like ours can't afford a single point of failure for systems that protect lives, move goods, and keep essential services running.

Mr. Feld, just briefly, what risk do districts like ours face if GPS is disrupted? And why are backup GPS capabilities so important for supporting transportation, emergency response, and communication systems?

RPTR MOLNAR

EDTR ZAMORA

[12:14 p.m.]

Mr. Feld. Critical functions at the consumer level, everybody driving around using their apps, to banking and electricity would be disrupted. This makes the need for backup systems critical as well.

Mr. Menendez. Appreciate that.

Investing in resilient PNT is critical, but as we explore viable GPS backups, we must ensure we are not solving one problem while creating new ones for the essential services our constituents rely on. That is especially true for systems operating in the lower 900 megahertz band, including tolling technologies used across the country.

New Jersey tolling revenue supports the infrastructure families rely on by helping to maintain the roads, bridges, and other critical infrastructure projects that keep our communities moving. If tolling is disrupted, commuters can face congestion and added costs, and our community could experience significant losses in revenue needed to support our transportation systems.

Mr. Grossman, just briefly, what would harmful interference in the lower 900 megahertz band mean for commuters and port operations in New Jersey?

Mr. Grossman. Congressman, it would be devastating. I have seen estimates anywhere from at least \$5 billion to \$7.2 billion to RFID systems that are utilized throughout ports and throughout the logistics process.

Mr. Menendez. Appreciate that.

And, Mr. Feld, as the government considers alternatives to GPS, how should policymakers ensure that efforts to enhance PNT resiliency also serve the public interest by protecting critical systems Americans rely on?

Mr. Feld. As an initial matter, we need to preserve rules that NextNav has asked to have

eliminated which prohibit interference with these unlicensed devices in the lower 700 and require them to demonstrate, before turning on their system, that it will not create unacceptable levels of interference. This is not a modernization of rules. This is a land grab, and we must prevent it.

Mr. Menendez. Can you speak more about the land grab concept -- critique, I should say, briefly? Mr. Feld?

Mr. Feld. I am sorry?

Mr. Menendez. Can you speak more about the land grab critique briefly?

Mr. Feld. Yes. First, they want vastly increased spectrum access rights that would be valued at billions of dollars if they needed to buy it at auction. They do not offer any public interest obligations in exchange. I don't require that we get paid in cash, but we should get something back for use of the public airwaves.

Second, they are required right now by rules not to -- that devices that meet safe harbors are not considered points of interference with their licensed service. They are structured to operate at low power. They are not allowed to activate the system.

Mr. Menendez. Thank you. I appreciate it. I wish I had more time.

Ms. Sorond, has NextNav's current core portfolio of assets changed significantly since November 2024? Just yes or no.

Ms. Sorond. I am sorry. Can you repeat that?

Mr. Menendez. The core portfolio of assets, has it changed significantly since November 2024? Just yes or no.

It is the same -- has your portfolio of assets changed?

Ms. Sorond. We have acquired more spectrum through secondary auction -- I am sorry -- secondary markets. Our existing spectrum was through existing licenses, and we acquired more spectrum through secondary markets.

Mr. Menendez. Generally, they are the same pool of assets since November 2024, because

prior -- I ask because prior to Trump's election, November 2024, NextNav's stock was trading well below its current 52-week low. But in the lead-up to the election and after, NextNav stock saw a significant jump.

Brendan Carr in Project 2025 discusses the importance of FCC taking a more aggressive approach to GPS resilience, and now Carr is in a position to pick winners and losers through petitions at the FCC. And despite concerns from all of the other witnesses here today and several Members of Congress regarding NextNav's pending proposal before the FCC, NextNav stock is currently trading near its 52-week high. So it seems the market is responding favorably to the potential success of NextNav's proposal. Is that fair to say?

Ms. Sorond. Congressman, NextNav has put a vision forward 3 years ago, and that vision is a solid PNT backup and complement to GPS. Our path and mission is very clear to the market, and I am happy to --

Mr. Menendez. But 3 years ago -- 3 years ago, the stock was trading at a fundamentally different place, about a third of the current value that it is currently trading at. So it seems that there is different market sentiment than 3 years ago, and I think it is in connection with Brendan Carr now being the chair of the FCC.

With that, I yield back.

Mr. Latta. [Presiding.] The gentleman's time has expired and yields back.

The chair now recognizes the gentlelady from Indiana's Ninth District for 5 minutes of questions.

Mrs. Houchin. Thank you, Mr. Chairman, and thank you to the witnesses.

GPS is one of the great American success stories. It is the invisible infrastructure underneath our entire economy: the financial transactions that clear every morning, the air traffic control that keeps us safe, moving millions of packages every day, and the precision agriculture that helps farmers keep up with increasing demand.

I also remember a time before GPS, and the amount of improvement to daily life that it provides is substantial.

But the last piece, about precision agriculture, is personal for me. Back in the Indiana State senate, I worked to get broadband access to the unserved corners of the State of Indiana. And I am still working on that today. I appreciate the support for the Data BRIDGE Act, Ms. Dyer. And as I have worked to connect rural Indiana, one thing that has become impossible to miss is that the same farmers we are trying to get online are already completely dependent upon GPS, and right now that signal has no backup.

As GPS outages cost our economy more than a billion dollars a day, a 30-day disruption during planting season could run past \$45 billion. This is at risk every day that we continue to rely on this single point.

Now, I do want us to be clear-eyed about the right way to address it. The Federal Government's record on building big, complicated technology programs on time and on budget does not inspire a lot of confidence. The good news is that the private sector is not standing still. American companies are already fielding complementary position, navigation, and timing systems in low Earth orbit over broadcast infrastructure and across 5G networks.

So the question for Congress is not which company wins. How do we get out of the way and let companies compete and make sure we enforce rules that are already present?

My first question is for Mr. Matheny. What are the risks if the United States does not diversify beyond GPS?

Mr. Matheny. Thank you for the question, Congresswoman. The risks are severe, and they touch everything from our energy grid to our cellular communications to data centers, but also first responders and, as you mentioned, our agriculture.

In 2024, there was a solar storm. Lots of people took lots of pictures of the beautiful aurora borealis, but what got less attention was the fact that there was an edict that was put out that said,

hey, let's put a pause on planting right now. And so planting was paused for 2 to 3 days because there was concern about the ability for precision agriculture. And so with BPS as an alternative system, you would have the ability to withstand something like that in the future.

Mrs. Houchin. Thank you.

And, Mr. Grossman, you made a point that DOT has studied this issue for years and concluded there is no single system that meets every need. Could you walk us through the tradeoffs that Congress should consider before favoring any one technology or spectrum approach over others?

Mr. Grossman. Thank you for that question, Congresswoman.

You really have to look at it on a per-use-case basis. So whether you are talking about the aviation industry and what they need for complementary PNT is going to be different than what the agriculture community and farmers need, just as it will be different for critical infrastructure providers like the electric grid and wireless networks. So that would be my recommendation for how the Congress should approach it.

Mrs. Houchin. Thank you.

I mentioned in my opening that farmers who are working to connect with broadband are at the same time some of the most GPS-dependent users in the country. They also happen to be the furthest from the dense terrestrial infrastructure many of these complementary systems rely on.

Ms. Dyer, which complementary PNT technologies can realistically reach these rural areas? What can Congress do to help bring those solutions along?

Ms. Dyer. Absolutely. The best examples that I can think of are in space. And that would be three companies, they are small businesses -- Iridium, Xona, and TrustPoint -- that are developing their systems right now.

That is the advantage of space. It can reach those rural areas and get them what they need. There is a lot of great work that is going on there, and encouraging their work would be really valuable.

Mrs. Houchin. Thank you.

This is one of those issues that doesn't make headlines until it fails. On that day, it is going to be too late for us to start.

So we have built an economy, a transportation system, our national defense, that all lean on this single signal with no backup. The good news is that American innovators and companies are ready to step up if we give them room to compete. I want to make sure that we do that before a crisis forces our hand.

I want to thank the witnesses for your input, and I yield back.

Mr. Latta. Well, thank you very much. The gentlelady yields back the balance of her time.

And the chair now recognizes the gentleman from Ohio's First District for 5 minutes of questions.

Mr. Landsman. Thank you, Mr. Chair, and thank you all for being here and, you know, answering questions for us. This is obviously hugely important.

I am a big movie guy, and there are so many movies that -- where the plot really is something apocalyptic happens because of a data hack, right. There is a genre of movies where it is like, you know, some sort of virus and that kind of thing, but the data hacks are the ones that terrify me. I mean, I still watch them, they are still good, but they -- you know, the -- the one I was thinking about the other day was the "Leave the World Behind." It is a Julia -- yeah, it is a good one.

Did you know they are not making a second one? I thought they were going to make a second one.

Anyways, point is, there is this catastrophic cyber attack, and there is a scene -- it is not funny because -- there is a scene where all the cars are just, like, heading in one direction, and then they keep crashing into each other. And you realize very quickly this could happen, right. So -- and because we are all so online and we are plugged in and we got all the technology, and so it is not so far-fetched that these events could take place, and that is why we are having hearings like this.

That is why we invest in the redundancy and so on and so forth.

So I want to ask Ms. Dyer, and then Matheny, what -- you know, how important is the redundancy piece here and these investments? I mean, you know, how would you describe the importance of getting this right?

Ms. Dyer. I don't think I can understate the importance of getting this right. I think there is a lot that GPS offers. A single system serves military, civil, commercial, and scientific users, what a tremendous investment in the U.S. Congress to doing that.

Mr. Landsman. And the redundancy, having layer upon layer, I can't imagine the American people saying, there is too much redundancy, right, you know, on these things.

Ms. Dyer. And I think that is where the commercial market has really stepped up and said, I see an opportunity here --

Mr. Landsman. Yeah.

Ms. Dyer. -- that we are lacking that redundancy, and we are here, and we can provide some really tremendous opportunities, and there is a lot of great space-based alternatives out there.

Mr. Landsman. Thank you.

Mr. Matheny. And I would add to that that we really do need a terrestrial component to it, and that is going to be very important, because when you talk about layers upon layers upon layers, you know, we need a terrestrial component because it provides a very reliable, high-power signal that can deliver the timing that is needed. Because those cybersecurity issues, you have got authentications, you have got encryption protocols, you have got all sorts of time synchronization servers, routers, clouds, systems that need precision time to operate, and so with BPS, we can offer a reliable system.

Mr. Landsman. And it is -- the challenge, as I understand it, is, you know, it could interfere -- these things can interfere with all kinds of different aspects of our lives as we are adding more and more. And the NextNav piece is -- you know, that is the big question.

But the answer is that we do have this -- you know, the FCC comes in and they can look at all of it and say, you know, there is no interference here, there is some interference here, and then we problem-solve that interference. Is that a fair assessment? Ms. Sorond?

Ms. Sorond. That is a very fair assessment, Congressman. And I just wanted to highlight, as a company with 20 years of PNT experience, I would love to have also an opportunity to talk about that.

We are currently operational, only commercial provider --

Mr. Landsman. Yeah.

Ms. Sorond. -- sitting here today, and also future expansion, and absolutely we should trust the FCC process for any other concerns.

Mr. Landsman. And so, Mr. Feld and Mr. Grossman, you agree, like, this is -- this is something the FCC could do, that when we find interference, we work it, we solve the problem, and that we sort of all work together to try to solve this?

Mr. Feld. I have been in a lot of spectrum fights in the last 20-something years. I have never seen anything like this. This is a fundamental restructuring of the service. These are 10 pages of modifications to the actual functioning of the rules. That is not an interference question. That is a structural rule question.

What we are talking about is extraordinary. I am usually a big proponent, and, last time, their previous company, Prodigy, came in looking for a waiver, I was sympathetic, because the question was, How do you get out of testing hell to get everybody satisfied? But not this time.

Mr. Landsman. Got it.

Mr. Grossman, I have got to get your opinions -- I ran out of time. I am so sorry. Thank you all very much.

Mr. Grossman. I agree with the comments Mr. Feld made.

Mr. Landsman. Okay. Got it. Thank you.

I yield back.

Mr. Latta. Thank you very much. The gentleman's time has expired and yields back.

The chair now recognizes the gentleman from Florida's Ninth District -- oh, I am sorry. I didn't see the gentlelady come in.

The chair now recognizes the at-large member, the gentlelady from North Dakota, for 5 minutes for questions.

Mrs. Fedorchak. Sorry. Good afternoon, everyone. Thank you for being here and focusing on such an important discussion today, and it is such an important issue.

I am curious to address some things that I feel like, at least in the time that I have been able to be here, I wasn't able to hear a lot about, or enough discussion, compared to what I think we should be, in terms of exploring all available options.

So as it relates to the -- some of the technology that you have, Mr. Matheny, could you speak a little bit about the timeline to bring -- that your technology would face to bring to public availability some of the benefits of it, and if it has some of the same conflicts out there with other technologies or other existing applications, how you might address those?

Mr. Matheny. Thank you so much, Congresswoman. We are on the air today with BPS in three markets. ATSC 3 is live in 80 markets, reaching over 75 percent of the U.S. population. We believe we can have those online within a year. And then ATSC 3 -- BPS can be deployed as part of a standard ATSC 3 deployment going forward, bringing us to nationwide coverage.

I think that one of the real benefits of ATSC 3 and the broadcast infrastructure is the fact that it can reach every corner of the country, and it provides a really reliable signal coming from a high-powered broadcast from tall towers. And so with that type of signal, you are going to be able to really service many different sectors of critical infrastructure, whether it is energy or cellular or the financial as well as the data centers.

Mrs. Fedorchak. Are there commercially available receivers capable of using BPS today or

would new hardware be required?

Mr. Matheny. Yes, we have a variety of different receivers that are available today. They range from single-channel, small, field-mount receivers to rack-mounted receivers that would go in to critical infrastructure facilities. We even have four-channel receivers that can receive multiple channels and do time combination and positioning.

Mrs. Fedorchak. And what would be required for BPS capability to be incorporated into, like, smartphones, vehicles, ag equipment, critical infrastructure systems?

Mr. Matheny. Yeah. So I think really what is -- that is the long arc of innovation that we really want to work on. Right now we are very focused on providing the timing to lifeline critical infrastructure sectors. But with further work and effort, we believe we can get all the way into all of those things that you mentioned: cars, phones, drones, et cetera.

Mrs. Fedorchak. So, realistically, what kind of a timeline are we looking at?

Mr. Matheny. I think the timeline for the deployment on BPS is going to be really in phases. Phase 1 would be in the next year, we could deploy with the existing ATSC 3 stations. After that, the phase would be in alignment with the rollout, and that is the important work that is happening at the FCC, and we are delighted with the progress that they are making.

Mrs. Fedorchak. Okay. Then, I am from North Dakota, a very rural State. Talk about the coverage you have in rural parts of the country.

Mr. Matheny. Yeah. We believe that that coverage is really one of our greatest strengths, and it is that we can use this existing infrastructure, the high-power signals coming off of very tall towers, to reach full CONUS, including continental U.S., including out into international waters.

I would give an example. The station that we are working with at NIST in Denver, that one tower covers over 75,000 square kilometers and reaches into three States. Here in D.C. and Baltimore, we have a two-tower system that is reaching close to 82,000 square kilometers of coverage.

Mrs. Fedorchak. All right. Wow. What are the vulnerabilities of BPS versus GPS?

Mr. Matheny. So one of the great strengths of -- that we have is we are working on existing licensed spectrum, and so what that means is that we have a very clean ability to transmit. There is going to be no interference. We are not going to be having challenges in that regard.

And so I think that that puts us in a very good position, as opposed to GPS, which operates on a very narrow band and when it reaches Earth is a weak signal.

Mrs. Fedorchak. Okay. Very good. Thank you, sir.

My time is up, but I would offer that I have a few more questions that we would like to submit for all of your's response. Thank you very much.

Mr. Latta. Thank you very much. The gentlelady yields back.

And the chair now recognizes the gentleman from Florida's Ninth District for 5 minutes for questions.

Mr. Soto. Thank you, Chairman.

The spectrum known as 900 megahertz band has been used in our daily lives for quite a while, and we see it throughout Central Florida aviation, in places like Orlando International Airport, to track customer baggage and inventory; and the huge amount of retail opportunities in Central Florida -- those of you who have been on vacation there know -- to prevent theft and track inventory; for our utilities with smart meters, which especially during the summertime, people are very interested in energy efficiency; for our agriculture, our ranches, and our orange groves; for toll collection, like SunPass -- although many Floridians wouldn't be sad if that wasn't charged all the time; rail operations; defense; and our aerospace industry; public safety; military. You name it, they are using the 900 megahertz band.

You know, I recognize GPS has its vulnerabilities -- we have heard it already multiple times -- jamming, spoofing. Especially right now, we are seeing it in the Middle East, in areas near Europe. And so having GPS alternative proposals are important, but they need to be thoroughly

vetted, and so this is an important discussion here today.

We have to protect existing uses, though, so very important that that is where we start from. And if we could effectively do that, then we can consider some of this sharing.

And this committee is critical in the oversight as the FCC reviews this technology. We have seen a lot of political decisions at the FCC lately, and so we need to make sure that that is not permeating into some of the staff decisions that I know are going to be important to this.

You know, we talked about redundancy, about layering it. It would be great to hear from you all -- we will start with Mr. Feld -- what do you think your ideal redundancy mix is for navigation? I know you said improving GPS, but if you had to have other things included in it, what would that system look like?

Mr. Feld. Well, I think it needs some of all because we can't deal with maritime and other issues that are not part of the terrestrial United States without satellite. We just can't. But satellite will face its own set of restrictions.

We are going to need terrestrial. I think that there are a lot of good options out there, and I think that -- frankly, I think AI is going to help us out quite a bit on a number of these things as it is capable of recognizing the patterns, and actually geographically locating is based on immediate feedback of the area.

Mr. Soto. Thank you, Mr. Feld.

Ms. Dyer, you know, it was just mentioned about space-based. We launch those rockets in Central Florida at the Cape. What is your ideal redundancy mix for navigation?

Ms. Dyer. Thank you for the question. I think that, one, modernizing GPS is my number one priority. I think that is -- it should also be the Nation's number one priority because of all of the various contributions that we have outlaid today.

Mr. Soto. Let's say we do that. What else would be added to the mix if we had to create these redundancies?

Ms. Dyer. To GPS, I would add the low Earth orbit satellites because they can provide that global coverage in a way that terrestrial does not. There are a number of terrific terrestrial systems that are already operating. There is internet-assisted smartphones that are using hangover information that allows it to stick with the phone. Even if GPS were to go over, they can hold for about 7 days' worth of information.

Mr. Soto. Thank you. Thank you, Ms. Dyer, because my time is limited.

Mr. Matheny, what do you think your ideal mix would be?

Mr. Matheny. So I think, first and foremost, GPS is a wonderful technology, and I think that -- I agree that LEO could be a nice complement. But I am really focused on the terrestrial solution, and I believe that we need at least two terrestrial solutions and that BPS can be the primary terrestrial solution, given its coverage and given its performance.

Again, our National Institute of Standards and Technology, part of the Department of Commerce, has said that BPS is comparable to or better than GPS. And that is what we want to bring to market.

Mr. Soto. Thank you, Mr. Matheny.

Mr. Grossman, what would be your ideal mix?

Mr. Grossman. Congressman, it would be a combination of technologies similar to what Mr. Feld said, a combination of terrestrial and satellite-based solutions.

I do think two key questions to ask as you are evaluating: Are there receivers readily available to utilize that service? If there are not, that is a process that could take a couple years.

The second factor I would say is, is that technology going to cause harmful interference to other users? We believe that you can choose options that do -- that meet both of those tests.

Mr. Soto. Thanks.

And, Ms. Sorond, I assume adding your technology to the mix is your suggestion, right?

Ms. Sorond. Thank you, Congressman --

Mr. Latta. I am sorry. The gentleman's time is expired, so if you would like to submit that in writing, that would be great.

The chair now recognizes the gentleman from California's 23rd District for 5 minutes of questions.

Mr. Oberholte. Well, thank you, Mr. Chair, and thank you very much to our witnesses. I find this to be a critically important topic.

I think it has become abundantly clear that we need to develop and support a reliable, alternative solution to GPS given some of the limitations that we face. And I don't think that most Americans realize just how important GPS is to their daily lives and how important it is to our economy, and I will give you an example from my own personal life.

Recreationally, I am a pilot, I still like to fly, and the aircraft that I fly relies on GPS not only for just navigation, but also to air-correct what we call the AHRS, the Attitude and Heading Reference System. So if you experience a GPS outage -- and I have -- when flying, after a few minutes, you will lose not only your position, but also your knowledge of your direction, and even your knowledge of what direction is up if you can't see. So it is really a scary situation when that happens. So that is the lens that I look at this through.

So you have presented some very interesting and compelling different approaches, and I would like to talk to you about them.

Mr. Matheny, one of the concerns that I have about BPS is looking at through the aviation lens and -- I mean, I will give you an example. One route that I fly is D.C. down to Florida. Quite often I will get an offshore routing, which I like because it gets me away from the congestion routes over the Northeast. But it is not uncommon to be 50 miles offshore. And my understanding is that ATSC 3.0 only has a range of about like 35 to 80 miles, and you would need obviously to be able to receive multiple signals from multiple transmitters to triangulate. In fact, I think you would need, under your BPS' technical specifications, you would need at least four, and I don't see any way that

you would get that 50 miles offshore.

Is that a use that it just -- BPS just couldn't be utilized for?

Mr. Matheny. So I too am a pilot, and I too have lost GPS coverage and been told I was 40 miles away from where I actually was. So I can appreciate your concern.

So our first application is really providing time to critical infrastructure, and so that is really where we are focused first and foremost. Looking longer range, we do, absolutely, have propagation maps that show that our signals do extend out probably a hundred miles into international waters.

And so given, if you are flying the coastline, you should be able to receive a number of different signals to be able to potentially, you know, apply in that sort of circumstance. That is work that still has to be done, though. That is definitely work that has to be done.

But airplanes use VHF radios, and we operate in the VHF and UHF bands, and so these are things where we are already having conversations with folks that we are involved in designing the Wide Area Augmentation System, or WAAS.

Mr. Oberholte. Ms. Sorond, I had a similar concern about NextNav. I mean, relying as it does on 5G, I think the range concerns are even exacerbated because even low-band 5G signals might peter out after 10 miles or so. And modern aircraft can fly above 40,000 feet. That is 7 miles up. So you would have to be almost straight over an antenna to be able to get a location signal, or am I looking at that the wrong way?

Ms. Sorond. Congressman, you are absolutely right. First of all, let me just talk about the fact that 5G networks are very dense. We do not have a multilateration problem, right. At any given point during their coverage, you actually get perfect positioning. So we just don't --

Mr. Oberholte. As long as you can receive it?

Ms. Sorond. Well, you have to have multiple receivers, like you said, absolutely.

We also need a layered infrastructure. From what you said, you need to have satellite

resiliency in the areas that is all terrestrial. As far as airlines go, there is only a certain elevation. Beyond that, you still need satellite elevation. So, yes, we only solve part of the problem. You need the layered architecture for the rest of it.

But if you look at Gogo, you know, you do get up to a certain level of being able to multilaterate. In fact, in the sky, you see a lot more signals down on the ground. So you can do the multilateration through the terrestrial networks up to a certain height. But after that, you absolutely need to rely on satellites.

Mr. Obernolte. So, I mean, I love the idea of having a terrestrial backup solution just because, you know, I think that relying exclusively on satellite solutions is too one-dimensional. But, you know, I do have these concerns.

A terrestrial solution to be utilized for aviation and maritime would have to be low frequency with a long bandwidth -- long wavelength so that, you know, you got the range that you would need for those applications, so -- but I appreciate everyone's testimony.

I yield back.

Mr. Latta. Thank you very much. The gentleman's time has expired and yields back.

The chair now recognizes the gentlelady from Illinois' Second District for 5 minutes for questions.

Ms. Kelly. Thank you, Mr. Chair and Ranking Member Matsui, for holding this morning's -- or afternoon's hearing, and thanks to our witnesses for participating.

Farmers in my district and across rural America are relying on GPS-guided equipment. A GPS outage stops the guided tractors, the field mapping, and the precision spraying. The EO really takes a hit, and that is why we must have backups to GPS in the event the worst happens.

However, the path matters as much as the goal, and right now the FCC is considering a complement to GPS that would reconfigure the lower 900 MHz band. This band is used by hundreds of millions of unlicensed devices every day, including the agricultural sensors farmers

depend on -- and I have 4,500 farms in my district. I am urban, suburban, and rural.

As the FCC evaluates this proposal and others, I want to make sure that any backup that is approved has to reach rural communities and protect the equipment they run already.

Ms. Sorond -- and happy birthday to you -- your testimony makes the case that a GPS outage would hit agriculture hard, and NextNav proposes to fill that gap. But some warn that reconfiguring the lower MHz band would interfere with the agricultural sensors and unlicensed devices farmers already run on that band.

Given the potential interference concerns, how would NextNav work with farmers and the agricultural sector to protect existing farm equipment, and how does the system built on 5G infrastructure reach farmers in rural areas that 5G does not cover today?

Ms. Sorond. Thank you so much, Congresswoman, for highlighting that really important issue, as many have pointed to the solar impact that there was on farming in 2024, was extremely significant, and it had very large consequences for farmers.

We intend to be the backup and complement to make sure that the farmers do not suffer this \$500 million loss on a terrestrial level.

As far as our modernization of the lower 900 megahertz band, we have done 2 years of simulation field tests. We are operating currently on the network today. We do not see an impact through our engineering -- I back my engineering as an engineer -- but that is why we have the FCC, that if -- you know, nobody needs to take our word for it. That is why they have to go over there, present their facts, present their data, and the FCC will absolutely prioritize something as important as farming to make sure it is not impacted equal to having a PNT backup and complement. They have incredibly smart engineers and staff.

Ms. Kelly. All righty. Thank you so much.

Mr. Feld, the NextNav proposal will put a high-power 5G network in the lower 900 MHz band that farmers' sensors and monitors already rely upon.

What happens to that equipment if the FCC grants the NextNav proposal, and are there any guardrails the FCC should impose or could impose on NextNav before approving its proposal so rural communities are not disadvantaged and the devices already in the band are protected?

Mr. Feld. So a couple of things. One is, I feel constrained to point out that NextNav has not agreed to accept any build-out obligations or other things to ensure serving rural America.

Two, it is very hard to cure this stuff after the fact. There is a nightmare that -- if you recall, tell people about the 800 megahertz rebanding where the FCC, based on its lab results and based on the best technology was available, approved Nextel's operation in the 800 megahertz band, expecting that it could resolve interference with public safety systems. That turned out to be a disaster that took a decade and billions of dollars straighten out.

The issue here is the enormous amount of power, the fact that they have called for the elimination of rules that currently protect the operation of unlicensed in the system.

Now, there are some things that might conceivably be done. We have, in CBRS and other places, a database system that allows you to deactivate the use of spectrum if it turns out it is creating too much interference. But it is going to be really hard, based on what they are trying to do here, to preserve operation in the 900 megahertz band, not just for the unlicensed, but for neighboring services as well.

Ms. Kelly. Thank you so much for your response.

Precision agriculture is so important to the economy of our country and keeping us all fed, and it must be protected at all costs. That is why I was proud to work with my colleague -- oh, he is not is there -- but Rep. Latta on the Precision Agriculture Satellite Connectivity Act. This legislation directs the FCC to review its satellite rules so precision agriculture can reach the farmers who depend on it.

And thank you to the witnesses, and I yield back.

Mr. Joyce. [Presiding.] The gentlelady yields.

The chair now recognizes the gentlewoman from California, Ms. Barragan, for her 5 minutes of questioning.

Ms. Barragan. Thank you, Mr. Chairman.

Ms. Dyer, most Americans think of GPS as the app that helps them get from point A to point B, but this technology plays a much larger role in our daily lives.

Tell us how important GPS is to maintaining a reliable energy infrastructure and what risks we face if the system is disrupted?

Ms. Dyer. Thank you for the question. GPS synchronizes all of the transmissions across the energy infrastructure. Its timing signals are absolutely vital to that energy infrastructure. The good news is that most of those energy infrastructure folks have installed complementary capabilities because they are very well aware of those limitations and the potential for an outage and the seriousness of that outage.

The Department of Homeland Security actually issued a document called Best Practices for Critical Infrastructure, and that helped guide a number of the critical infrastructure, the 16 different critical infrastructure sectors, in looking at what they should be considering as they are considering complements. And a large number of them have actually been implemented.

Ms. Barragan. Great. Thank you.

Mr. Grossman, as we modernize our energy systems, what steps should Congress take to help ensure that our energy infrastructure has access to reliable and resilient positioning and timing services?

Mr. Grossman. Congresswoman, given utilities' reliance on PNT for everything from grid synchronization to monitoring, fault detection, and communications across wide geographic areas, it is very clear that we need to have a resilient PNT solution.

Complementary PNT capabilities can provide independent timing and position information. And so we would encourage you and the committee and the broader government to think about

what are those solutions that are best suited for critical infrastructure.

Ms. Barragan. Well, speaking of critical infrastructure, my district is home to the Port of Los Angeles, and it is one of the Nation's most important logistics and trade corridors. Workers, businesses, and consumers all depend on goods moving efficiently through our supply chains.

As supply chains become more connected, how important will resilient positioning and timing services be to keep goods moving and avoid disruptions that raise cause for consumers?

Mr. Grossman. Congresswoman, very important. If a GPS signal at a port such as in Los Angeles were jammed or spoofed, companies could lose visibility into the location of vehicles and cargo. So, again, similar to the example use case you brought up before, absolutely, we need to have resilient PNT.

I would also point out again that the lower 900 megahertz is used for RFID tags which are found throughout ports and throughout the supply chain process. So if those are disrupted by a complementary PNT service, it would also be devastating.

So we need to make sure we find a complementary PNT technology that does not cause that harmful interference to our Nation's ports.

Ms. Barragan. For those watching, what is an RFID tag?

Mr. Grossman. Radio frequency identification. So --

Ms. Barragan. And why is that important?

Mr. Grossman. So it allows retailers -- there are over 50-some billion of these tags. It is for major retailers, how they manage inventory and logistics. It is how they know where the goods are.

Ms. Barragan. Great. Thank you.

Mr. Feld, your testimony raises concerns about maintaining broad public access to position and timing services. As new technologies emerge, how do we ensure that innovative and resilient positioning and timing technology benefits everyone, including communities that may not be early adopters of new technologies?

Mr. Feld. Yeah. I would like to point out that all the applications we are talking about -- for the electric grid, precision agriculture -- all of these things were made possible by open GPS, because no one would have paid lots of money for a service they didn't know about or that was reserved exclusively for the military or for a small handful of users. But because it was there, they were able to experiment and were able to develop all of these use cases that we rely upon.

So maintaining that openness is critical. It is critical for individuals who rely on these services even if they don't know they are relying on it. It is critical for the development of new services.

We cannot have a K-shaped GPS system where we move to a premium for some and let others rest at the bottom. The network depends on its universality to deliver the maximum benefit, and we don't know what innovation we will be losing by screening out people who would otherwise not have access.

Ms. Barragan. Great. Thank you to all our witnesses.

I yield back.

Mr. Joyce. The gentlelady yields.

The chair now recognizes the gentleman from Texas, Mr. Pfluger, for his 5 minutes of questioning.

Mr. Pfluger. Thank you, Mr. Chairman.

Can anybody speak to any of the nefarious activity that is going on maybe in the Middle East or around on the GPS systems there, how that affects -- yeah, please, Ms. Dyer?

Ms. Dyer. Hello, and congratulations on your recent retirement from the Air Force.

Mr. Pfluger. Thank you.

Ms. Dyer. I -- there is -- jamming and spoofing is taking place throughout the Middle East right now. Some of that is -- there is some speculation that some countries are actually jamming and spoofing as a defensive mechanism, so that when drones are heading in their direction, the

drones will lose contact, lose their navigation heading, and then drop down out of the sky. Some of it has been done to try to prevent some other activities that governments are conducting in that area that are using GPS to be reliant upon.

Mr. Pfluger. So kind of going off of that theme, when we are prioritizing and evaluating the technologies, you know, what are some of the criteria and interoperability or resilience standards that we should be looking at?

I know you guys have discussed this already, but just to reiterate, I mean, what are the most important standards that we need to be considering?

Ms. Dyer. First of all, for the military, I would really encourage that we invest heavily in GPS III-F satellites. There are some being built. There are 10 additional ones to be purchased at this point. It will provide a 63-times improvement in GP- -- resilience to jamming for the military. So that would be my top priority for our forces who are trying to operate in some of those denied areas.

The next step I would say is to add another signal to -- we are almost there. It is called the L5 signal. It was developed specifically for aviation. We need three more satellites up in space to be transmitting this to complete the constellation of L5 signals being transmitted from GPS, plus some ground-station improvements that are starting to get under way but could be accelerated so that that signal could be integrated into all of the aviation and maritime industries that are currently facing some of the biggest challenges as they are trying to transit through the Middle East and other areas.

So those would be my top two. I also think that looking at the commercial PNT systems that are almost there and ready to go would be my other priorities. They are going to offer much more resilience to jamming.

Ms. Sorond. Congressman, may I also add? Admiral Mike Rogers, former NSA director and head of Cyber Command, says things with speed and scale, you need those kinds of systems. So multi-layered, satellite, terrestrial, but on the terrestrial, ground-based, he calls that speed and scale.

So meaning that solutions that can be in many different devices, solutions that are fast to market, and I completely agree with him.

Mr. Pfluger. Okay. I will take one more, and then I have another question.

Mr. Matheny. Yeah. I would just point out that we, with BPS, have been working with the National Institute of Standards and Technology, part of the Department of Commerce, the keeper of weights and measures for our government. And so we have been working with them to meet all of the relevant standards as it relates to the various different critical infrastructures, and not only are we meeting them, in many cases, we are far exceeding.

Mr. Pfluger. Thank you.

Mr. Grossman, are the consumer devices that we have today capable of receiving both GPS and maybe alternative PNT signals?

Mr. Grossman. Yes, Congressman. So if we are talking about smart -- let's use smartphones, for example, since at this point they are probably the largest number of consumer-enabled devices with GPS.

There are a number of other PNT technologies that are incorporated in most modern smartphones: a barometer, accelerometer, Wi-Fi, Bluetooth. These are all happening behind the scenes of the device, combined with GPS, to improve accuracy. Most consumers may not realize it, but they are all there in helping to improve the accuracy of the device.

Mr. Pfluger. Is there a -- because we are hearing a lot of different things from, you know, the different stakeholders, and obviously this is really important that we get it right.

In the same way that we see spoofing, jamming, or some other interference with aircraft, is that also possible with personal devices?

Mr. Grossman. Absolutely. GPS jamming and spoofing is a real threat, and I think we need to go about it through a two-prong process. There is one Ms. Dyer's talked about, the modernization of GPS, which is going to improve the accuracy and resiliency of the constellation

making GPS better, but then we should also continue to explore these complementary PNT solutions.

Mr. Pfluger. Thank you for helping us as we consider these very important criteria moving forward.

And with that, Mr. Chairman, I yield back.

Mr. Joyce. The gentleman yields.

I now yield 5 minutes to myself for questioning.

Thank you to our witnesses for being here today. The topic of this hearing is one that impacts Americans across countless industries, including, as mentioned by Representative Kelly, agriculture.

GPS technology is a critical component of precision agriculture. Farmers rely on this infrastructure each and every day to improve farming efficiency, to track important environmental factors that may impact their crop yield, and maximize profitability.

The use of precision agriculture, it has truly revolutionized the industry. Advancements in technology have vastly improved farmers' approach to their livelihoods, giving them opportunities to innovate, to focus on efficient strategies, to increase crop yield, and to contribute even more to the agriculture economy.

In the district that I represent, in south central and southwestern Pennsylvania, the precision and presence of that technology benefits the farmers and the fruit growers. In Bedford County, drone technology is used to check crops by monitoring growth and ultimately saves farmers valuable time. In Blair and Cambria Counties, West Central Equipment brings precision agriculture machinery to my constituents and actually comes back into the fields and offers services for repair when necessary. In Cumberland County, Swift Aeroseed services farms with aerial seeding, utilizing unmanned aircraft system, again, saving money and saving time.

It is clear that rural communities in my district rely on these technologies that bring optimization and innovation to countless farming families. But that doesn't come without its

challenges, as you all know.

In Pennsylvania's 13th Congressional District, the resilience of these technologies that rely on a strong GPS signal is a real concern for many of my constituents, including the farmers.

As this subcommittee engages in the conversation around modernizing our GPS infrastructure, it is important that we bring the hardworking farmers that we rely on every day into this conversation.

Mr. Grossman, in your written testimony, you discuss the importance of the United States focusing on developing GPS resilience. The impact of inadequate GPS signal would be felt throughout my district.

Imagine a farmer spraying fertilizer when that connection is disrupted. This could cause wasted fertilizer, tractor steering failure, and actually even lead to crop loss.

Mr. Grossman, without alternative technology in place, can you speak to the impact on precision agriculture and how that should exist with these severe disruptions?

Mr. Grossman. Thank you for that question, Congressman. Agriculture presents one of the perfect examples of why complementary PNT is so important. You have described it perfectly in terms of how farmers today are using GPS and PNT. There are a number of other technologies that are already in operation today that augment that connection via GPS, including an example I provided earlier called RTK, which gives that centimeter-level accuracy. It is still using GPS, but --

Mr. Joyce. We need that centimeter accuracy that you referenced earlier, and I wanted you to reference that again. That is important for agriculture. It is important to have that backup system available, correct?

Mr. Grossman. Yes, sir.

Mr. Joyce. Mr. Matheny, in your written testimony, you described an alternative PNT system. How does the Broadcast Positioning System perform in rural areas? Are you aware of any application in precision agriculture?

Mr. Matheny. So we believe one of the great strengths of the Broadcast Positioning System is its coverage and the fact that it operates from tall towers at very high power, and it can actually get a signal into those rural areas.

The deployments that we have thus far cover, from a single tower in Denver, we are reaching 75,000 square kilometers, and so there is -- we know that it can play that.

We do not have precision agriculture today, but a recent NIST study that was published a month ago said that BPS can offer 3.38 meters of accuracy. That is before -- for navigation, that is before you add RTK. That is before you add other fusion technologies to get down to the centimeter level. We know that we can build BPS into these applications and make it part of the fabric of the PNT.

Mr. Joyce. Thank you for your incredible testimony here today. I think we all recognize that GPS resilience and modernization will impact all Americans. And that is no exaggeration. My constituents rely on this technology every day, including, as I mentioned, these hardworking farmers that put food on tables throughout America. We know that food security is, indeed, national security. We have to make sure that any solutions considered are also effective for rural areas.

As we continue this important conversation, I look forward to continuing to advocate for rural areas that are so often left behind as technology advances. Being a personal member of the Pennsylvania Farm Bureau, I stand ready to work with farmers and with fruit growers that I serve and the constituents who benefit from their hard work. We cannot leave agriculture out of this discussion.

Thank you, and I yield back my time.

I now yield for 5 minutes of questioning to Mr. Mullin.

Mr. Mullin. Thank you, Mr. Chair. Thank you to our witnesses for your testimony. Very educational morning.

So PNT technology has become indispensable infrastructure in our daily lives, despite the fact

that most of us never see it or even know the extent to which we are relying on it.

GPS is the most well-known PNT technology. GPS is what has made it possible for us to use our cell phones, to get turn-by-turn directions while we drive, and for search-and-rescue teams to find survivors. It helps the U.S. military keep us safe.

In one very personal example, it helps my family and I keep track of our Husky dog Storm and make sure he doesn't get lost in the neighborhood when he inevitably escapes.

We know that GPS, as it stands today, is far too vulnerable and inadequate to meet modern needs. As we have heard, it is too easy to spoof, jam, and take offline. This is also a 38-year-old technology, and newer solutions have shown to address these issues and provide even more precision.

Innovative companies have been working on this for years now. I am proud to have at least one of them in my district in California 15, Xona Space Systems. I recently visited its headquarters in Burlingame, California, and was extremely impressed by what I saw.

I have also authored H.R. 4344, the Resilient LEO Act -- low Earth orbit -- PNT Act, which calls for a demonstration project of this kind of technology in low Earth orbit, which could potentially provide a more powerful signal to Earth-based devices that GPS currently provides with cybersecurity built in.

I want to specifically highlight something, Mr. Feld, you said at the beginning of your testimony, that GPS ranks beside the internet as one of the most important contributions of the United States to the world of the 20th century. I think that highlights the important role the U.S. can play in developing essential technology for the entire globe.

But it doesn't happen by accident. The GPS revolution was the result of intentional and sustained investment by Congress.

So, Mr. Feld, I am particularly interested in your views on ensuring the next generation of PNT remains a public good. Your analogy to the Federal Highway System is useful. It is hard to imagine

our national infrastructure without it. Now, we are wholly turning this responsibility over to private entities solely, although there is certainly a major role for companies to play.

So can you talk more about what the risks are to consumers, public safety, and the broader economy if the country moves toward only proprietary PNT systems, and what should Congress do to make sure advanced PNT systems remain accessible to everyone?

Mr. Feld. So, first, I am going to agree with Ms. Dyer that our highest priority should be to upgrade GPS, that it should be -- continue to be the gold standard for global PNT and one of America's crown jewels.

The danger of creating a tiered system where we are just pay-to-play or we have pay-to-play and we allow everything else to degenerate, it will, first of all, impose significant costs. The farmers that he was referring to right now have GPS available to them for free. If it is only a private solution, they will have new costs at a time when farmers cannot bear new costs easily. In all of our homes where we are reliant on the timing function for electricity, if it is only a private solution, that is another add-on to the electric bill. And with regard to our individual uses, you are going to see in your cell phone, okay, unless you pay premium, you will get the bad GPS, the legacy GPS, and you will get lost.

Mr. Mullin. I just want to turn to emergency alerts which play an important role in keeping communities safe from natural disasters, but their effectiveness depends on precise geo-targeting.

During last year's fires in Los Angeles, over 10 million people were accidentally sent an evacuation warning intended for a single neighborhood, triggering panic and hindering emergency-response efforts. A 2022 wireless emergency alert test by the FCC found that the needed geo-targeting precision only worked for one-third of the devices that supported it. So clearly we have work to do here.

So Mr. Feld again, focusing on the role GPS plays in this, how might we strengthen our national PNT infrastructure to help improve the precision and reliability of emergency alerts? And

you have 20 seconds.

Mr. Feld. I am almost tempted to say, let me answer in the QFRs. I was on the FCC CSRIC when we discussed how we can enhance geo-fencing with regard to the emergency alerts, and it is a complicated question that I would be happier to answer in writing.

Mr. Mullin. Very good. Appreciate it. Thank you.

With that, I yield back.

Mr. Allen. [Presiding.] The gentleman yields.

Now call on Mr. Goldman from Texas for his 5 minutes of questioning.

Mr. Goldman. Thank you, Mr. Chairman. Thank you, panelists, for being here today.

Ms. Dyer, over the last few years, the Dallas-Fort Worth Airport has experienced several GPS disruptions that caused widespread flight delays, and in at least one case, caused an aircraft to lose GPS signal for the remainder of the flight.

What do incidents like this tell us about the need for backup systems when GPS is disrupted or unavailable?

Ms. Dyer. Thank you, Congressman, for the question. I think in that case, I think there would be two angles to take a look at. One, I would suggest, repeating a suggestion I made earlier, that Congress might have an opportunity here to look at the interagency coordination processes among Federal agencies when they are taking a look at testing other types of technologies that might impact those flights coming in and out of Dallas-Fort Worth.

It is very valuable as everybody starts descending on the United States for World Cup, for instance. They are going to be -- almost every element of the World Cup event -- transportation as well as the games -- are going to rely on GPS.

The second is that I think the new aviation signal for GPS L5 is really important to start getting moving forward. It is going to provide additional resiliency once it is integrated into the aviation receivers.

RPTR SINKFIELD

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[1:15 p.m.]

Ms. Dyer. A key point about new technologies, they have to get integrated into receivers. And in the aviation space, there are a series of standards that have to be developed and promulgated and then integrated into those receivers and installed into the aircraft. So it is not a quick turnaround time to get any new signal installed in any receiver but particularly in aviation receivers.

So the fastest route to improving that is, one, looking at those interagency procedures; and two, focusing on the L5 signal.

Mr. Goldman. Thank you very much.

Ms. Sorond, as you know may, the 900 megawatts band is critically important for electrical and natural gas companies in Texas and across the country, enabling them to operate their equipment and respond effectively in emergency situations. How has NextNav assessed the total number of critical infrastructure devices currently operating in this frequency range? And if so, what would be the cost and feasibility of replacing, relocating, or modifying those devices?

Ms. Sorond. Thank you, Congressman, for highlighting that important question.

NextNav has assessed every publicly available data on the stakeholders in the 900 megahertz band that are consistent of licensed and unlicensed operations. Our studies, our rigorous technical data, with lab, field, and a current live operational network that has no reports of interference, demonstrate that there will be no impact of the unlicensed operations. We continue to stand by our engineering. And we are happy to reach out to more stakeholders because we have reached out to many of them to actually discuss this and address our concerns. We do not see an impact. But that is why we have the FCC, so that they could actually look at everybody's technical data.

I do have a map here of our Santa Clara market that we are transmitting live on 5G today in this area. Many of the operations you just mentioned -- retailers, airports -- they all exist here.

They are all within this map, and not a single one has reported interference.

Mr. Goldman. Thank you very much.

That is all the questions I have, Mr. Chairman. I yield back the balance of my time. Thank you.

Mr. Allen. The gentleman yields.

And now I recognize Mrs. Cammack from Florida for her 5 minutes of questioning.

Mrs. Cammack. Thank you, Mr. Chairman. And thank you to our witnesses for being here today. Lots of committee activity today. So I have been working it across Capitol Hill.

I am going to jump right into my questions, but before I do I want to just highlight. I think we have all come to an agreement that a redundancy system for GPS is absolutely a matter of national security. I don't think you will find a single member on this panel who does not think that that is important. But I think it is a question of how we do that in a way that doesn't create new problems in addressing this current one.

So I will start with you. Now -- is it Sorond? Did I say that right?

Ms. Sorond. Yes, Congresswoman. That is perfect.

Mrs. Cammack. Perfect. All right. I never want to get a name wrong, but I often do. So thank you.

So, again, agree -- I believe we both agree that we need a resilient backup to GPS, especially given the number of jamming threats and other issues. But we have numerous public safety organizations, including fire chiefs, police chiefs, sheriff's associations, et cetera, that have raised concerns about the proposal and the impact it would have on existing operations in and around the 900 megahertz band.

As a wife of a first responder, I can say this issue is very personal. So can you explain specifically what independent testing, which you were just alluding to with my colleague, has been conducted to demonstrate that the first responder communication and public safety systems will not

experience harmful interference under your proposal? And to add to that, have you communicated with all of the stakeholder organizations, and what have those conversations been?

Ms. Sorond. Thank you, Congresswoman. We share the same passion. And thank you to your husband for his service.

Until just a few minutes ago, there was the deputy chief of Fairfax County, Chief Cox, right here. There was former commissioner and fire chief of Boston, Joe Finn; Ron Kuley, Captain Kuley. So I am just not going to name all of them, but we need to give importance and significance to these folks. They are putting their lives on the line for us.

There is also organiza- -- the organizations you mentioned are highly respected. We are in dialogue with them. We would work with them with whatever their requirement is, because what we do today in our product serves public safety. That is why you got a letter from IAFF today. That is why you had 6 out of 10 of the largest U.S. cities public safety officials write to this committee, which includes Houston, Dallas, San Antonio, Phoenix, Philly, Forth Worth, Boston -- a lot of them -- to say why they need this, because it saves lives.

We give vertical Z-axis commercial today to these fire fighters. It saves their life. When a 9-1-1 caller that is dispatched, our technology is being used.

Mrs. Cammack. Well, and not to cut you off here, but I represent a very rural district, and communications in rural America today is vastly different than communications, particularly public safety communications, in the urban setting. And when we have one single prime tower for communications and multiple departments that can't communicate with each other because they are on different bands, I think that is a unique challenge that you will have to overcome.

So I would love to know, have you communicated with any of the rural sheriff's associations, any of the first responder associations? I know IAFF, I love them, they are great, but there is a huge rural component that I think needs to be addressed specifically.

Ms. Sorond. Congresswoman, you are absolutely right, yes. We go to summits, events,

talk to them all the time. Because if we don't, we cannot build products that serve their needs. We absolutely -- and we will make sure we protect them. We will make sure we address their concerns. And you are absolutely right, the rule becomes very important, and we intend to make sure that they continue to do their jobs so without being concerned about being found.

Mrs. Cammack. Now, I am going to hold you to that. Everyone in this room, especially on this panel, knows that I am a bit of bulldog. So I am going to hold you to it, in a nice way. But I look forward to continuing that conversation, particularly with our rural public safety officials.

I am going to jump into the existing users that are currently in this band. So a number of witnesses have noted that the lower 900 band is already heavily utilized and licensed and is being used by users that are unlicensed. This is in utilities, as was mentioned, security technologies, other critical infrastructure.

Now, CTA testified that hundreds of millions of devices rely on the current operating environment, and while public knowledge cited widespread opposition from public safety, utilities, aviation, and security stakeholders. So why should Congress or the FCC accept the risk of disrupting existing critical infrastructure users when alternative technologies are being developed that do not require such a significant restructuring of spectrum rights?

Ms. Sorond. Congresswoman, I appreciate you asking that important question.

Let me just say, first of all, we currently have the licenses. We are currently transmitting -- we are transmitting 5G in Santa Clara with no reported interference. We have also, in addition to that, put 2 years of live simulation data testing that shows that fact-based engineering is important. And I as an engineer stand behind all of that. But that is why exactly we have the FCC. Because when there are disagreements and there are concerns from others, the FCC should actually handle it, right.

I can assure you -- the same assurance I gave you last time -- that our engineering is fact-based and valid. And our operations in the field are a testament to the fact that we could all

coexist with these very important operations. We have no intention of disrupting any of it.

Mrs. Cammack. Okay. I am going to, again, follow up with you. I think we have some work to do in order to get this down the line a little bit further. But my time is well expired, so I will submit the rest of my questions for the record. Thank you all so much. And I appreciate a rapid response.

I yield.

Mr. Allen. The gentlelady yields.

I ask unanimous consent to insert in the record the documents included on the staff hearing documents list. Without objection, so ordered.

Seeing there are no further members wishing to be recognized, I would like to thank our witnesses for being here today.

I remind members that they have 10 business days to submit questions for the record, and I ask the witnesses to respond to those questions promptly. Members should submit their questions by the close of business on June 18, 2026.

Without objection, the subcommittee is adjourned.

[The information follows:]

\*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

[Whereupon, at 1:23 p.m., the subcommittee was adjourned.]