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Navigating the Future

UrsaNav is globally known and respected as the expert, industry leader, and top producer of low-frequency PNT solutions. We speak to the firm's CEO, Charles Schue, as he is recognized in the CEO of the Year Awards and aptly named PNT Solutions CEO of the Year 2022 - USA.

It's a long road from climbing 1350-foot towers and replacing transmitter tubes to the CEO's office. Forty-seven years of in-depth experience with everything from the details of signal propagation to international radionavigation policy have made UrsaNav CEO Charles Schue the world's leading authority on low frequency (LF) positioning, navigation, and timing (PNT).

Headquartered in Billerica, MA, UrsaNav is the world's leading supplier of Loran-C/D, Enhanced Loran (eLoran), and LFPhoenix™ products and services.

The firm provides design, development, replacement, installation, and operations support. Clients include civil government agencies, military, and commercial organizations across the globe.

Company staff, starting with CEO Charles Schue, have been involved in nearly every Loran-C and eLoran project in the world since the mid-1970s. These include the current Loran systems in the Kingdom of Saudi Arabia and South Korea, and former/current Loran/eLoran systems in the US, UK, Canada, Japan, India, Norway, Germany, France, Italy, Spain, Denmark, and Turkey.

It is hard to overstate Schue's depth of experience and expertise in the field. Starting as a hands-on technician in the US Coast Guard, he rose to leading R&D and life-cycle support of the entire North American Loran system, which supported the national airspace system, maritime operations, and timing and frequency synchronization for telecommunications and financial institutions. His duties included representing the US at international coordination meetings and technical conferences.

LF PNT is a highly specialized field and UrsaNav is the dominant player. As the only company with a proven track record in the technology, UrsaNav's expertise is in high demand around the world. The company equipped and supported the UK's eLoran Initial Operating Capability demonstrations. It is a key supplier and consultant for South Korea's Loran-C to eLoran transition, providing a less expensive, more accurate, and fully independent solution. UrsaNav is also working with two other countries to upgrade or install systems.

The most common sources of PNT signals are those from Global Navigation Satellite Systems (GNSS), such as the Global Positioning System (GPS). But these satellite signals are very weak and easy to block and/or imitate. Strong, extremely difficult to disrupt and hack eLoran signals have easily survived jamming and spoofing trials in both the US and UK.

"Unless you work in the field of PNT, you are probably unaware of how important these 'invisible utilities' are to everyday life," he explains. "In our modern world, we are connected more than ever in space and time. Think telecommunications; financial services; aviation, maritime, rail, and vehicle transportation systems; information technology; gas, electric, and water delivery; even dams and traffic lights," Schue elaborates. "All depend upon weak space-based signals that are easily interrupted."

Starting with GPS, other GNSS, such as Europe's Galileo, and several Regional Navigation Satellite Systems, have enabled widespread adoption of PNT services in many applications across modern society. "These

are superb systems, and we should ensure they are 'protected, toughened, and augmented' in every way possible. The issue at hand is assurance of safety, security, operational continuity, and economic viability when space-based signals are not available or not trustworthy."

Many independent government and commercial organizations in the US and UK have documented our overreliance on space and the vulnerabilities that result when no national backup or alternative solutions are provided. "Disruption of, or interference with, PNT systems can adversely impact individuals, businesses, national economies, and military security. The existence and nature of threats to PNT services are well known, and governments and industry globally have recognized the need for resilient PNT services that can mitigate intentional and unintentional threats."

Schue recommends searching online for UK and US government reports detailing the consequences of overreliance on space, or for jamming events. Disruptions that happen frequently are those affecting transportation sectors: aviation, maritime, and land mobile. When air traffic is disrupted or endangered, such as happened recently at Dallas-Fort Worth or Denver, it impacts the safety, security, and economics of the country, the airlines, and – most importantly – the passengers.

Schue has advocated for "sky-free" PNT solutions to space-based systems since GPS first became operational in 1994. This idea became a cornerstone of what is now commonly called the System-of-Systems approach, which includes a mix of space-based, terrestrial eLoran, and wired solutions. Nations can mitigate their overreliance on

sole-means PNT by providing alternative PNT solutions "that are readily available; provide easy and seamless transition to/from the primary or other alternatives; allow continuity of operations at a possibly degraded, yet usable, accuracy, availability, and integrity; and are dissimilar enough from other alternatives to withstand the effects that might be affecting the primary solution." Governments around the world have concluded that eLoran easily meets these requirements.

Schue continues to champion LF terrestrial augmentations to enhance the PNT and frequency resilience so important to national infrastructure. He helped found the Resilient Navigation and Timing Foundation, a non-profit organization that is instrumental in obtaining support for developing national PNT architectures that incorporate diverse elements to reduce overdependence on GNSS.

In addition to advocating policy and strategies, Schue leads UrsaNav's pioneering contributions to the technical development of LF radio navigation systems. Their LFPhoenix™ solutions include patented ideas for nations seeking sovereign control of their PNT infrastructure via terrestrial means, even those who operate space-based solutions.

The founder of nine businesses ranging from providing key components of ion plasma rocket engines to making the world's best crispy beef jerky, Schue is the quintessential entrepreneur. His roots are firmly in radionavigation, though. The most recent evidence of this was his selection as a Fellow of the US Institute of Navigation, and recognition as PNT Solutions CEO of the Year 2022 – USA at the CEO of the Year Awards. A very well-deserved and fitting accolade indeed!