

## Swarm Yields New Insight Into Animal Migration

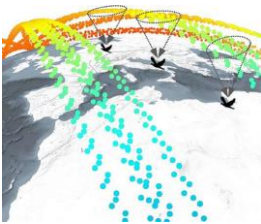
Using measurements from ESA's Earth Explorer Swarm mission, scientists have developed a new tool that links the strength and direction of the magnetic field to the flight paths of migrating birds. This is a huge step forward to understanding how animals use Earth's magnetic field to navigate vast distances.

These days, it is almost unimaginable for us to set off on a long journey without being equipped with some form of satellite navigation, or at least a map. Migratory animals, however, manage to cross entire oceans and continents, navigating with exceptional skills of their own. In spite of decades of research, we still do not understand fully how these remarkable animals are able to find their way - although it has been suspected that Earth's magnetic field lines are among the cues that guide them.

Read more in *Space Daily* article.

[https://www.spacedaily.com/reports/Swarm\\_yields\\_new\\_insight\\_into\\_animal\\_migration\\_999.html](https://www.spacedaily.com/reports/Swarm_yields_new_insight_into_animal_migration_999.html)

2021-07-12



## Galileo Authentication and High-Accuracy Service: Coming on Fast

The Galileo program brings together three principal collaborators. The European Space Agency (ESA) carries out satellite and ground system design and development, while the European Union Agency for the Space Program (EUSPA) is in charge of service provision, operational security and market development. The third crucial partner is the European Commission, which oversees and manages the program as a whole. The Commission also plays a limited technical role that is sometimes overlooked, that of defining Galileo services.

Ignacio Fernández Hernández is Galileo Authentication and High Accuracy Service Manager, European Commission. "Our efforts in recent years have produced very

encouraging results,” he told *Inside GNSS*, “and will make Galileo the first GNSS to provide authentication and high-accuracy data.” The European Commission, he said, expects both the Open Service Navigation Message Authentication (OSNMA) and the High-Accuracy Service (HAS) to be available soon.

“The OSNMA signal in space was transmitted by Galileo satellites between November 2020 and April 2021,” Hernández said. “The results of testing have been thoroughly analysed and we see no degradation of accuracy or availability of the standard Open Service (OS) position fix due to OSNMA. Regarding HAS, testing of the signal-in-space started in May 2021, and has demonstrated a remarkable few-centimetre-level accuracy in the orbit and clock corrections, for both Galileo and GPS.”

Read more in *Inside GNSS* article. <https://insidegnss.com/galileo-authentication-and-high-accuracy-service-coming-on-fast/>

2021-07-08



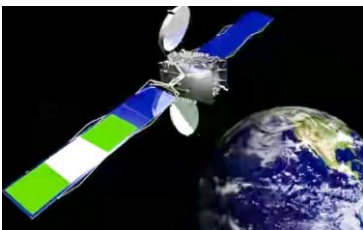
## **GPS and Galileo Corrections via Nigerian GEO Sat Bring Centimetre Accuracy to Africa**

The French company Geoflex demonstrated GNSS corrections-driven centimetric positioning in Brazzaville, Republic of Congo on July 8, at the national Stadium Alphonse Massamba-Debat. The demo employed a dual-frequency GNSS chipset receiving GPS and Galileo signals and the Geoflex corrections service via the Nigerian NIGCOMSAT-1R satellite on L Band, a frequency directly received by the chipset without any cellular connectivity.

The Geoflex corrections increased the accuracy of the position from the GPS/Galileo chipset from 3-10 metres to centimetric level: 5 cm (East), 6.1 cm (North) and 14.4 cm (Up) with 68% confidence level.

Read more in *Inside GNSS* article. <https://insidegnss.com/gps-and-galileo-corrections-via-nigerian-geo-sat-bring-centimeter-accuracy-to-africa/>

2021-07-09



## Fortescue Celebrates Driverless Truck Milestone

Fortescue Metals Group is celebrating the transport of its two billionth tonne of iron ore using driverless haul trucks at its Pilbara mines. The 2Bt milestone comes after the Andrew Forrest-controlled company reached 1Bt of haulage using its autonomous haulage system in September 2019.

Fortescue was the first in the world to deploy Caterpillar's autonomous haulage technology on a commercial scale at its Solomon Hub operations in 2012. AHS has since expanded across the company's Pilbara operations with a total of 193 autonomous trucks now in operation.

Chief executive Elizabeth Gaines said Fortescue's AHS fleet represented one of the biggest in the world, with 79 trucks operating at Solomon, 74 at Christmas Creek and 40 at Cloudbreak.

Read more in *article...*

[https://thewest.com.au/business/mining/fortescue-celebrates-driverless-truck-milestone-ng-b881929353z?utm\\_source=csp&utm\\_medium=portal&utm\\_campaign=Meltwater&token=TN8qCXo67JIUYpAu4gwGeSVIO28xKy2TwxI9uEN274VYxDIS%2BKpUlr5FRQjRwFPsic3jAfzSBvylgRC2ZKwpWw%3D%3D](https://thewest.com.au/business/mining/fortescue-celebrates-driverless-truck-milestone-ng-b881929353z?utm_source=csp&utm_medium=portal&utm_campaign=Meltwater&token=TN8qCXo67JIUYpAu4gwGeSVIO28xKy2TwxI9uEN274VYxDIS%2BKpUlr5FRQjRwFPsic3jAfzSBvylgRC2ZKwpWw%3D%3D)

2021-07-14



### **Deep Space Atomic Clock Moves Toward Increased Spacecraft Autonomy**

Designed to improve navigation for robotic explorers and the operation of GPS satellites, the technology demonstration reports a significant milestone.

Spacecraft that venture beyond our Moon rely on communication with ground stations on Earth to figure out where they are and where they're going. NASA's Deep Space Atomic Clock is working toward giving those far-flung explorers more autonomy when navigating. In a new paper published in the journal *Nature*, the mission reports progress in their work to improve the ability of space-based atomic clocks to measure time consistently over long periods.

Known as stability, this feature also impacts the operation of GPS satellites that help people navigate on Earth, so this work also has the potential to increase the autonomy of next-generation GPS spacecraft.

Read more in *Space Daily* article.

[https://www.spacedaily.com/reports/Deep\\_Space\\_Atomic\\_Clock\\_moves\\_toward\\_increased\\_spacecraft\\_autonomy\\_999.html?mc\\_cid=788caca28b&mc\\_eid=1f9a2840cb](https://www.spacedaily.com/reports/Deep_Space_Atomic_Clock_moves_toward_increased_spacecraft_autonomy_999.html?mc_cid=788caca28b&mc_eid=1f9a2840cb)

2021-07-01



## **DARPA Puts Navigation for Deep Dives to the Test**

The U.S. Defense Advanced Research Projects Agency (DARPA) is looking for novel approaches to rapidly map, navigate and search underground environments during time-sensitive combat operations or disaster-response scenarios.

Eight teams have qualified for the DARPA Subterranean (SubT) Challenge Systems Competition Final Event. On Sept. 21–23, the teams' robots will have to quickly navigate unfamiliar underground environments at the Louisville Mega Cavern in search of common items including backpacks, cell phones, trapped survivors and even invisible gas.

Those who find and identify the most items will win prizes of \$2 million for first place, \$1 million for second place and \$500,000 for third place. DARPA-funded and self-funded teams have an equal chance to win prize money in the final event, DARPA states.

Read more in *GPS World* article. [https://www.gpsworld.com/navigation-for-deep-dives-put-to-the-test/?utm\\_source=Navigate%21+Weekly+GNSS+News&utm\\_medium=Newsletter&utm\\_campaign=NCMCD210630003&oly\\_enc\\_id=1784A2382467C6V](https://www.gpsworld.com/navigation-for-deep-dives-put-to-the-test/?utm_source=Navigate%21+Weekly+GNSS+News&utm_medium=Newsletter&utm_campaign=NCMCD210630003&oly_enc_id=1784A2382467C6V)

2021-06-30



## **EUSPA Launches a Consultation on the Galileo Public Regulated Service**

The European Union Agency for the Space Programme (EUSPA) invited Competent Public Regulated Service Authorities (CPAs) from each Member State and their main industries to the consultation about the development of the user segment composed

by all the receivers and devices able to collect the Galileo signals and PRS (Public Regulated Service) market uptake until 2027.

The Galileo Public Regulated Service (PRS) will be a distinctive feature of Galileo, providing authorised users such as emergency services providers and national authorities with a more robust and secure signal for critical applications. PRS utilises encrypted signals to be more resistant to jamming, involuntary interference, and spoofing.

EUSPA, which already will launch different market development initiatives under the Horizon Europe Framework Programme (2021-2027), expects this consultation to provide an overview of the industry and institutional priorities for PRS.

Read more in *article*...

<https://gnss.asia/new/euspa-launches-a-consultation-on-the-galileo-public-regulated-service/>  
2021-06-23



## **GPS at Risk: Those Signals Are More Vulnerable Than You Realise**

GPS is all too susceptible to jamming and its trickster cousin, spoofing. The signals used by aircraft, ships, farm tractors and your smartphone originate from satellites 19,300 kilometres out in space. By the time they reach Earth, they're vanishingly weak and easily overwhelmed. A satellite launched in June to the GPS constellation represents a tiny step in making the service more secure. But satellites themselves face dangers. All those threats have lots of people worried. Just about everything, you see, relies on GPS.

The highly precise signals from the Global Positioning System have worked their way into nearly every fabric of modern life, from recording bank transactions to synchronising electrical grids to helping you find the nearest Starbucks. Businesses and individuals can use the system's PNT -- positioning, navigation and timing -- capabilities for next to nothing. In the US, GPS has about \$1 billion a day in economic impact, according to the National Institute of Standards and Technology. It's also vital to the operations of the US military.

Read more in *article*...

[https://www.gwprime.geospatialworld.net/case-study/how-location-technology-helps-real-madrid-improve-team-performance/?utm\\_source=GW+Subscribers&utm\\_campaign=9863e91716-gwprime-mailer-24june2021&utm\\_medium=email&utm\\_term=0\\_3b0a203c48-9863e91716-139613109](https://www.gwprime.geospatialworld.net/case-study/how-location-technology-helps-real-madrid-improve-team-performance/?utm_source=GW+Subscribers&utm_campaign=9863e91716-gwprime-mailer-24june2021&utm_medium=email&utm_term=0_3b0a203c48-9863e91716-139613109)

2021-07-09



## Fifty Years of the AHD in NSW

In an increasingly digitised world, applications for the Australian Height Datum (AHD) are growing rapidly and reaching a wider audience with an insatiable appetite for three-dimensional digital twins of the real world. Vertical datums define a reference for elevation and are essential for many applications relying on the flow of fluids.

As the AHD marks its 50th anniversary this year, it remains Australia's first and only legal vertical datum. For most spatial professionals, the AHD has been ubiquitous for the entire duration of their careers, being the vertical datum of choice because it was the only one..

Surveyors typically work with two types of heights: ellipsoidal heights referred to the Geocentric Datum of Australia (GDA2020) and physical heights referred to the AHD. Both are available through the NSW Survey Control Information Management System (SCIMS), the state's database containing approximately 250,000 survey marks on public record.

In NSW, the AHD replaced the Standard Datum, which had been in use for some 80 years and defined by the value of mean sea level (MSL) at the Fort Denison tide gauge, located on an island in Sydney Harbour and accessible via a survey plug that was installed in 1882 (and still exists) on the external wall of the former Department of Lands building in Sydney.

Read more in *Spatial Source* article. [https://www.spatialsource.com.au/surveying/fifty-years-of-the-ahd-in-nsw?utm\\_medium=email&utm\\_campaign=SS%20Newsletter%2007072021&utm\\_content=SS%20Newsletter%2007072021+CID\\_e5cb9041a1d4b65b191685f3199b6778&utm\\_source=Campaign%20Monitor&utm\\_term=READ%20MORE](https://www.spatialsource.com.au/surveying/fifty-years-of-the-ahd-in-nsw?utm_medium=email&utm_campaign=SS%20Newsletter%2007072021&utm_content=SS%20Newsletter%2007072021+CID_e5cb9041a1d4b65b191685f3199b6778&utm_source=Campaign%20Monitor&utm_term=READ%20MORE)

2021-07-07



### More Precise Positioning For LEO Satellites

Loft Orbital's small YAM-2 satellite is carrying Fugro's SpaceStar GNSS Precise Point Positioning system, which receives precise GNSS real-time orbit and clock corrections from geostationary satellites. According to Fugro, highly accurate positioning in LEO is becoming more important for earth observation applications, satellite constellation management and debris collision avoidance.

"We're especially excited to demonstrate this new functionality," said Loft Orbital CTO, Pieter van Duijn.

"Fugro's SpaceStar service is something that can really help not only Loft Orbital's missions but also be of interest to the wider application of space situational awareness and safety."

Read more in *Spatial Source* article. [https://www.spatialsource.com.au/space/more-precise-positioning-for-leo-](https://www.spatialsource.com.au/space/more-precise-positioning-for-leo-satellites?utm_medium=email&utm_campaign=SS%20Newsletter%2007072021&utm_content=SS%20Newsletter%2007072021+CID_e5cb9041a1d4b65b191685f3199b6778&utm_source=Campaign%20Monitor&utm_term=READ%20MORE)

[satellites?utm\\_medium=email&utm\\_campaign=SS%20Newsletter%2007072021&utm\\_content=SS%20Newsletter%2007072021+CID\\_e5cb9041a1d4b65b191685f3199b6778&utm\\_source=Campaign%20Monitor&utm\\_term=READ%20MORE](https://www.spatialsource.com.au/space/more-precise-positioning-for-leo-satellites?utm_medium=email&utm_campaign=SS%20Newsletter%2007072021&utm_content=SS%20Newsletter%2007072021+CID_e5cb9041a1d4b65b191685f3199b6778&utm_source=Campaign%20Monitor&utm_term=READ%20MORE)

2021-07-02





### **Dr. Gladys West, A Hidden Figure Important to Early GPS Development, Awarded the Prince Philip Medal for Engineering**

The UK's Royal Academy of Engineering presented its highest individual award to Dr Gladys West, whose mathematical modelling paved the way for the engineering innovation of GPS. Dr West is the first woman to win the Prince Philip Medal. As a pioneer in the use of complex mathematics and efficient programming to process early satellite data to generate accurate, repeatable and global models of the Earth's geoid, her work underpinned the mapping functions of GPS and the study of global mean sea level.

Now aged 90, Dr West was born in Dinwiddie County, Virginia, and started her career as a maths and science teacher after graduating from Virginia State University in 1952. Four years later she was hired to work at the Naval Proving Ground in Dahlgren, Virginia, (now called the Naval Surface Warfare Center), where she was the second black woman ever hired and one of only four black employees. West was a programmer in the Naval Surface Warfare Center Dahlgren Division for large-scale computers and a project manager for data-processing systems used in the analysis of satellite data.

Read more in *Inside GNSS* article. <https://insidegnss.com/dr-gladys-west-a-hidden-figure-important-to-early-gps-development-awarded-the-prince-philip-medal-for-engineering/>  
2021-06-11



### **UK Sees a Way Back into Galileo through the LEO Door**

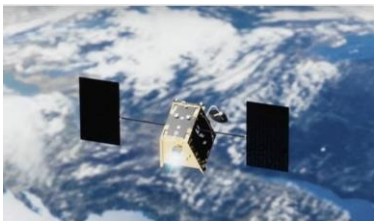
The UK Chair of the Parliamentary Space Committee David Morris reportedly sees a path back into Galileo participation for his country, thanks to a major investment from Europe into the OneWeb system, which the UK controls.

Morris reportedly told the *Daily Express* that the £550 million (\$779 million) investment from Eutelsat of France, a major global satellite operator, in the OneWeb low-Earth orbit satellite communications constellation could be the key. “OneWeb has 182 satellites already, has the spectrum and orbital slots EU doesn’t and comprises leading European aerospace – Ariane and Airbus – in its technology. The UK can work through ESA to provide an immediate and complementary pathway to Europe for global capacity. The EU can readmit the UK to full Galileo membership and its resilience can be enhanced on OneWeb generation 2 satellites.”

In July 2020, Britain signed a £900 million (\$1.135 billion) deal to buy a part share of satellite operator OneWeb, a low-Earth orbit constellation in the process of upgrading itself while it had simultaneously gone bankrupt.

Read more in *Inside GNSS* article. <https://insidegnss.com/uk-sees-a-way-back-into-galileo-through-the-leo-door/>

2021-06-08



### **Many Technologies Can Help GNSS, but Few Can Replace It**

Alternative. Complementary. Backup. Co-primary. These are some of the terms used to refer to sources of positioning, navigation and timing (PNT) data other than GNSS satellites.

The four current GNSS constellations — supplemented by two regional ones and by public and private augmentation systems — have firmly established themselves as the primary source of PNT data by virtue of their accuracy, reliability, global coverage and ubiquitous use. Yet, this widespread dependency on them — especially on GPS — coupled with their well-known vulnerabilities to jamming, spoofing, other RF interference, multipath, solar flares and space debris — make the development of alternative sources of PNT data imperative. In fact, the U.S. Congress has repeatedly mandated it.

Typically, when talking about alternative PNT, we are referring to sources of PNT data that either were not originally developed for navigation purposes — such as television broadcast towers used as “beacons of opportunity” — or that use a higher broadcast power or a different frequency band than GNSS. They include legacy systems and new versions of legacy systems, such as eLoran.

Read more in *GPS World* article. <https://www.gpsworld.com/many-technologies-can-help-gnss-but-few-can-replace-it/>

2021-06-30



Field Code Changed

## Next-Gen TV Technology Demonstrates High-Precision Positioning

In a demonstration of new services that NextGen TV can offer, BitPath, CAST.ERA and ONE Media publicly trialed “Enhanced GPS” broadcasts that could provide a tool for autonomous vehicle navigation and other applications.

The demo broadcast of “Enhanced GPS” (eGPS) data using ATSC 3.0, a next-generation digital broadcast standard, showed it could deliver positional accuracy within a few centimetres, according to the companies. Additionally, a drone incorporating eGPS and a 5G radio was used to show the potential of “Beyond Visual Line of Sight” observation and live imagery with near real-time broadcast of gathered live images, paving the way for multiple new use cases including news and first responder applications.

Using the high-power data transmission capacity of terrestrial broadcast stations, the reliability of eGPS positioning can be broadcast to an unlimited number of vehicles inside of the range of a licensed broadcast television station, overcoming many encumbrances. Enhanced GPS accuracy using NextGen Broadcast from multiple broadcast towers can improve real-time positioning for the millions of unmanned, autonomous vehicles of the future that are ground or aerial based because of broadcasting’s higher power and one-to-infinite architecture.

Read more in *Inside GNSS* article. <https://insidegnss.com/186566-2/>  
2021-06-09

