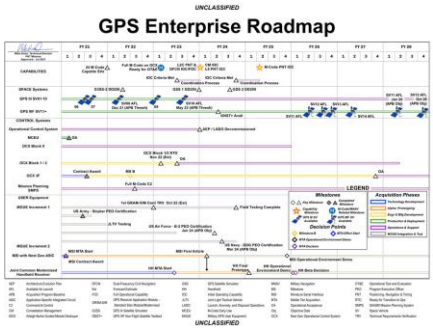
Space Force Releases New GPS Roadmap, Doc Changes

The U.S. Space Force has released a graph illustrating the GPS Enterprise Roadmap. The roadmap provides timelines for all the different elements of the GPS enterprise through the end of fiscal year 2028. The agency has also released proposed change notices for several GPS-related public documents.

Read more in *GPS World* article. https://www.gpsworld.com/space-force-releases-new-gps-roadmap-doc-changes/?utm_source=Navigate%21+Weekly+GNSS+News&utm_medium=Newsletter&utm_campaign=NCMCD220119002&oly_enc_id=1784A2382467C6V

2022-01-20



Providing GPS-quality Timing Accuracy Without GPS

Synchronising time in modern warfare - down to billionths and trillionths of a second - is critical for mission success. High-tech missiles, sensors, aircraft, ships, and artillery all rely on atomic clocks on GPS satellites for nanosecond timing accuracy. A timing error of just a few billionths of a second can translate to positioning being off by a metre or more. If GPS were jammed by an adversary, time synchronisation would rapidly deteriorate and threaten military operations.

To address this scenario, DARPA has announced the Robust Optical Clock Network (ROCkN) program, which aims to create optical atomic clocks with low size, weight, and power (SWaP) that yield timing accuracy and holdover better than GPS atomic clocks and can be used outside a laboratory. ROCkN will leverage DARPA-funded research over the past couple decades that has led to lab demonstration of the world's most precise optical atomic clocks.

Read more in *GPS Daily* article.
https://www.gpsdaily.com/reports/Providing_GPS_quality_timing_accuracy_without_GPS_999.html

2022-01-21

Directions 2022: BDS Enters New Era of Global Services

Construction of the BeiDou Navigation Satellite System (BDS-3) has been completed. The system was formally commissioned on July 31, 2020. In 2021, BDS continued to improve performance, expand applications and deepen cooperation, and has achieved sustained, stable and rapid development.

Currently, 45 BDS satellites are operational in orbit — 15 BDS-2 satellites and 30 BDS-3 satellites jointly provide seven types of services to users. Specifically, for the entire planet, the system provides three services:

- Positioning, navigation and timing (PNT).
- Global short-message communication.
- International search-and-rescue (SAR) services.

For the Asia-Pacific region, the system provides four additional services:

- Satellite-based augmentation.
- Ground-based augmentation.
- Precise point positioning.
- Regional short-message communication services.

Read more in *GPS World* article. https://www.gpsworld.com/directions-2022-bds-enters-new-era-of-global-services/?utm_source=Navigate%21+Weekly+GNSS+News&utm_medium=Newsletter&utm_campaign=NCMCD220112003&oly_enc_id=1784A2382467C6V

2022-01-14

Directions 2022: A New Epoch for GLONASS

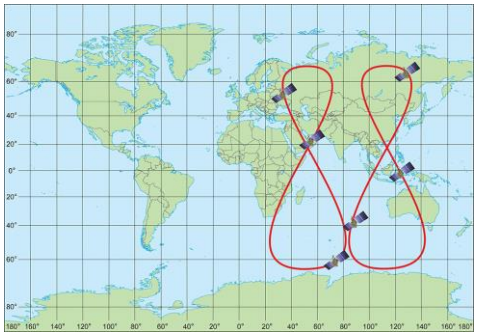
The digital transformation of the global economy requires precise time synchronisation and valid object position information. Global navigation satellite systems (GNSS) are the most accurate tool for such tasks.

This year will be 40th anniversary of the launch of the first GLONASS satellite, and we see that the quality of navigation services is driven by the characteristics of today's satellite navigation signals.

The first fourth-generation Glonass-K2 #13L satellite is scheduled for launch in 2022. It will broadcast a full ensemble of navigation signals — both Frequency Division Multiple Access (FDMA) signals in the L1 and L2 bands and Code Division Multiple Access (CDMA) signals in the L1, L2 and L3 bands. This long-awaited launch will cap a 10-year effort and begin to provide a new platform by broadcasting all the CDMA signals through a single antenna array on the satellite's geometric axis.

Read more in *GPS World* article. https://www.gpsworld.com/directions-2022-a-new-epoch-for-glonass/?utm_source=Navigate%21+Weekly+GNSS+News&utm_medium=Newsletter&utm_campaign=NCMCD220112003&oly_enc_id=1784A2382467C6V

2022-01-18



Directions 2022: Galileo FOC, G2 on the Horizon

Galileo is Europe's civil global satellite navigation constellation and a major success, being the world's most precise satnav system and offering metre-scale accuracy to more than two billion users around the globe.

Galileo continues to deliver excellent service performance every month in a safe, secure and seamless manner. Delivery of Galileo services is managed by EUSPA, as the Galileo service provider, with industrial partner SpaceOpal, the Galileo service operator prime contractor. The performance of Galileo services is independently monitored by the Galileo Reference Center (GRC) and regularly published on the GNSS Service Center (GSC) web portal at www.gsc-europa.eu — both agencies were developed by GMV. The security of the Galileo System is monitored by the Galileo Security Monitoring Centers (GSMC), operated by EUSPA.

With 22 satellites in service, the open service is already delivering more than 99% availability of PDOP <= 6 worldwide. This, together with the excellent ranging accuracy, suggests that most Galileo dual-frequency users are typically experiencing positioning accuracy in the order of only 2 to 3 metres.

Read more in *GPS World* article. https://www.gpsworld.com/directions-2022-galileo-foc-g2-on-the-horizon/?utm_source=Navigate%21+Weekly+GNSS+News&utm_medium=Newsletter&utm_campaign=NCMCD220112003&oly_enc_id=1784A2382467C6V

2022-01-18

North Korea Using Russian Satellite Navigation System Instead of GPS for Missile Launches

North Korea has been launching missiles without the support of America's global positioning system, instead turning to Russia's satellite navigation network, according to observers.

In its fourth test this month, Pyongyang on Monday January 17 fired what appeared to be two short-range ballistic missiles into the sea off the east coast of the Korean peninsula, South Korea's Joint Chiefs of Staff said.

Pyongyang also conducted tests of hypersonic missiles on January 5 and 11 and fired ballistic missiles on Friday, according to the state-run Korean Central News Agency.

Read more in *article*…

https://sg.news.yahoo.com/north-korea-using-russian-satellite-131042836.html

2022-01-18

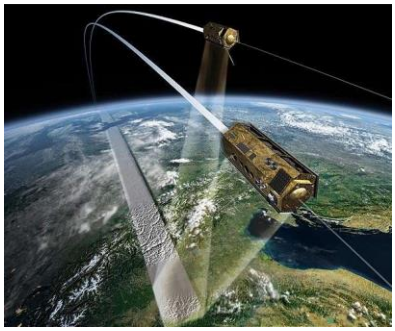
Manufacturing Revenues for Earth Observation to Grow to $76.1 Billion by 2030

Euroconsult, the leading space consulting and market intelligence firm, has released its eagerly awaited "Earth Observation Satellite Systems Market" report, providing a sweeping review analysis of the Earth Observation (EO) upstream ecosystem and breaking down government and commercial programs in exhaustive details.

With the Earth Observation manufacturing market gearing up for another decade of growth to an estimated $76.1 billion in revenue, the latest study reflects profound changes in the market structure driven by the diversification of payloads and multiplication of commercial constellation projects.

Read more in *Space Daily* article.
https://www.spacedaily.com/reports/Manufacturing_revenues_for_Earth_observation_to_grow_to_76_1_billion_by_2030_999.html

2022-01-13



Revised Galileo Open Service Document Published

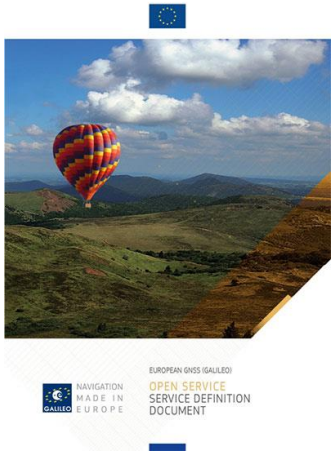
The European Union Agency for the Space Programme (EUSPA), together with the European Commission, have published the latest version of the Galileo Open Service Definition Document (OS SDD).

The Galileo Open Service Definition Document (OS SDD) was updated to reflect upgrades in the Galileo system since the publication of the previous version in May 2019. The latest version, 1.2, can be found on the GSC web portal.

This is the last update foreseen before Galileo Open Service reaches Full Operational Capability (FOC).

Read more in *GPS World* article. https://www.gpsworld.com/revised-galileo-open-service-document-published/?utm_source=Navigate%21+Weekly+GNSS+News&utm_medium=Newsletter&utm_campaign=NCMCD220105002&oly_enc_id=1784A2382467C6V

2022-01-05

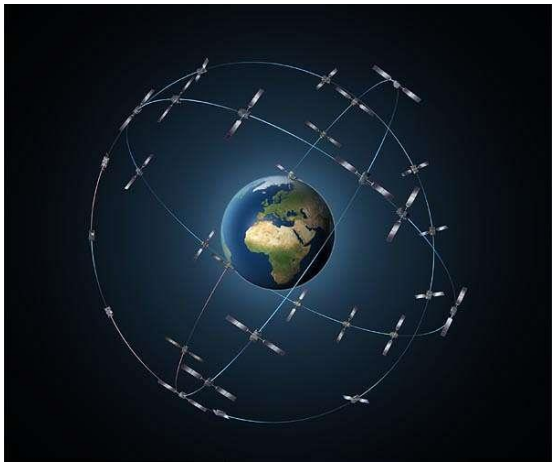


Arianespace to Launch Eight New Galileo Satellites

Arianespace will launch the first two satellites in 2022, leading to the Full Operational Capability of Galileo open service. Then, three successive launches on Ariane 62 in 2023, 2024 and 2025, will finalise the launch of the first generation of Galileo satellites and will increase the constellation resilience.

These will be the 13th to 16th Galileo missions by Arianespace, which has orbited all satellites in the constellation.

Read more in *GPS Daily* article.
https://www.gpsdaily.com/reports/Arianespace_to_launch_eight_new_Galileo_satellites_999.html
2022-01-10



Reading a Pacific Navigator's Mysterious Map May Require a Shift in Perspective

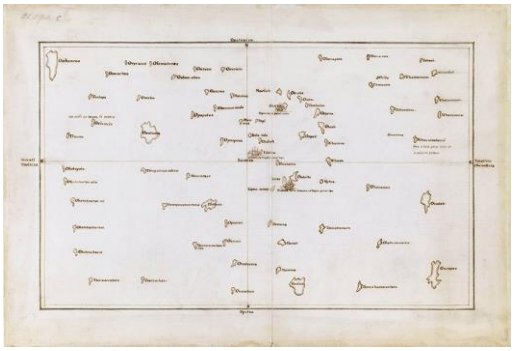
Sailing the southern Pacific Ocean in 1769, two of history's greatest navigators drafted a remarkable map. One was the British explorer Captain James Cook. The other was Tupaia, an aristocratic high priest from the island of Ra'iātea, who had joined Cook's expedition in Tahiti. Tupaia was a master navigator who had long voyaged through regions still blank on Cook's charts.

Tupaia had allied himself with the British, in part to defeat his enemies and bring home guns from England. The British, for their part, were keen to get advice from a local expert, and so Tupaia became Cook's guide and negotiator.

During the roughly 17 months he travelled with the British, Tupaia impressed the crew as a man of deep learning. He amazed the sailors by correctly pointing in the direction of Tahiti, even after they had sailed around New Zealand and up the east coast of Australia to

Indonesia. Cook was particularly intrigued by Tupaia's claim to know the way to some 130 islands. If Cook could capture the priest's knowledge on a chart, the British would gain a huge advantage in their Pacific voyages.

Read more in *article*…
https://knowablemagazine.org/article/society/2021/reading-pacific-navigators-mysterious-map?fbclid=IwAR10XSU7ZFRn2gyIzM7dQtkkYwe1UtqxLADuSGmPkGQFtSjoXqrbP7Y1XLo
2021-12-23



Right on Time: Protecting Critical Infrastructure Against Threats

Critical public infrastructure systems that rely on GNSS for reception of positioning, navigation and timing (PNT) data have been identified by national security agencies across the globe as potential cybersecurity attack vectors. Late in 2020, the U.S. Department of Homeland Security (DHS) published the "Resilient PNT Conformance Framework" guidelines, providing a common reference point to help critical infrastructures become more resilient to PNT attack threats. Within the framework, a cybersecurity approach has been proposed.

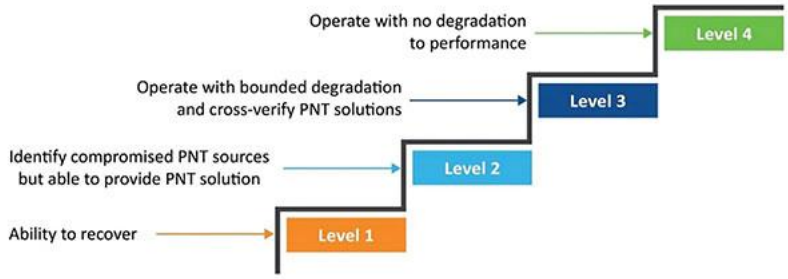
Prevent. In this first layer of defence, threats are prevented from entering a system. However, it must be assumed that it is not possible to stop all threats.

Respond. Atypical errors or anomalies are detected and action taken, such as mitigation, containment and reporting. The system should ensure an adequate response to externally induced, atypical errors before recovery is needed.

Recover. The last line of defence is returning to a proper working state and defined performance.

Read more in *GPS World* article. https://www.gpsworld.com/right-on-time-protecting-critical-infrastructure-against-threats/?utm_source=Navigate%21+Weekly+GNSS+News&utm_medium=Newsletter&utm_campaign=NCMCD211229003&oly_enc_id=1784A2382467C6V

2022-01-01



Goldfish Drives Car On Land and Knows Its Way Around

In a novel investigation of animal behaviour, a goldfish has learnt to drive a robotic car – and was able to navigate a room toward a treat. The fish beat all attempts by research to stymie its efforts.

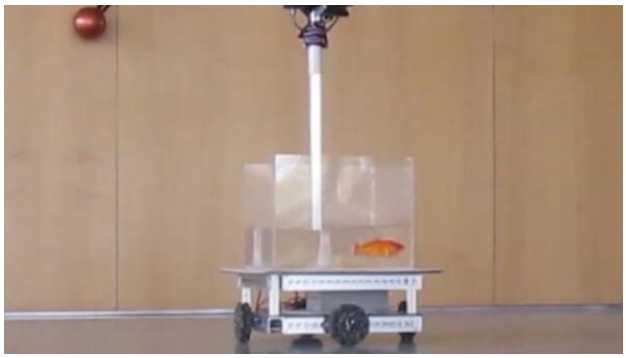
The study, from Ben-Gurion University of the Negev, asked a simple yet intriguing question: Is an animal's innate navigational abilities universal (it can take them anywhere) or are they restricted to their home environments?

The short answer: Yes.

Read more in *article*…

https://thenewdaily.com.au/life/science/2022/01/06/goldfish-drives-a-car-on-land/

2022-01-06



The Messy History of Our Modern, Western Calendar

For something that's meant to lend order to our lives, the modern Western calendar has a messy history. The mess, in part, comes about because of the difficulty of co-ordinating the orbits of celestial bodies with the cycles of day and night, and the passage of the seasons.

Ancient calendars from Mesopotamia, for example, co-ordinated months and seasons by adding extra months every now and then, a process called intercalation. In some lunar systems, though, the months can wander through the seasons – this is the case for the Islamic Hijri calendar.

The solar calendar of ancient Rome gives rise to our modern Western calendar. The Julian calendar, named after Julius Caesar's reforms of 46/45 BCE, approximated the solar year to 365.25 days and inserted an extra day each four years. That left a rather annoying 11 and a bit minutes unaccounted for. More on those minutes later.

The Julian calendar also left us a legacy of months in strange positions. Our eleventh month, November, derives from the Latin for the number nine, a result of moving the start of the year from March to January.

Read more in *article*…

https://theconversation.com/the-messy-history-of-our-modern-western-calendar-170780?utm_medium=email&utm_campaign=Latest%20from%20The%20Conversation%20for%20December%2031%202021%20-%202163221419&utm_content=Latest%20from%20The%20Conversation%20for%20December%2031%202021%20-%202163221419+CID_0bb96da6a48653499d0afd8560918e8a&utm_source=campaign_monitor&utm_term=The%20messy%20history%20of%20our%20modern%20Western%20calendar

2021-12-31

NSC Director: GPS ‘Still a Single Point of Failure’

The Global Positioning System (GPS) is “still a significant single point of failure in our country,” said Caitlin Durkovich, National Security Council director for Response and Resilience.

Her remarks were made at the Dec. 9 meeting of the president’s National Space-based Positioning, Navigation and Timing (PNT) Advisory Board.

The meeting was held shortly after Russia’s successful anti-satellite test and threat to “blind NATO and the U.S.” by shooting down all GPS satellites.

Durkovich’s remarks were made in the context of a larger national resilience message. She cited recent incidents such as Hurricane Ida, the Colonial Pipeline hack, the winter failure of the Texas electrical grid, and disrupted supply chains. She said everyone is responsible to ensure they, their systems and the nation are able to safely weather adverse events and bounce back better than before.

Read more in *GPS World* article. https://www.gpsworld.com/nsc-director-gps-still-a-single-point-of-failure/?fbclid=IwAR1-rGnxuZS8v2dIX51FQn6kvB9Ti5D6Wz-hwnagnundi9xrca5Tn-EI1Yk

2022-01-04