Norwegian Armed Forces Forum

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GPS error halted demolition

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When 15 of the 31 GPS satellites failed in January, the plan to demolish Loran-C stations was abruptly cancelled.

It was at the last minute that the Ministry halted the demolition of a total of four stations in January this year. The reason was that the nation’s security was in danger if the same GPS error happened again. All of Norway could actually lose both navigation and some critical computer systems.

Nano Seconds Loran-C was for many years a maritime navigation system. However, the number of users had fallen so low that Norwegian authorities decided to close the four Norwegian stations as of January 1 this year. GPS had taken over. On the 25th January this a GPS satellite failed and caused errors in 15 of the 31 GPS satellites in orbit over our heads. These errors had different impacts for different users, including knocking the BBC and a Norwegian DAB based local radio off the air.

Our entire digital world is based on precise time measured in nanoseconds, and for 14 hours GPS time signals were wrong by 13.7

microseconds. Loran-C signals could serve as a backup for precise time and positioning if there is a GPS outage.

After an assessment in several quarters, Norway has postponed demolition of Loran-C. One reason is a change in view of the importance of its importance.

Also, we received an inquiry from the British authorities with a view to the continued operation of a modernized Loran system, confirms Deputy Petter Meier in the Ministry of Transport.

Civil-military. The Ministry of Transport, and before the Ministry of Fisheries, funded the operation Loran C, while Cyber Force has been responsible for technical operations. Briefly, the navigation system works by sending very low frequency signals from at least three transmitters at a precision measured in millionths of seconds. This allows users to determine their positions. GPS works in a similar way as Loran C, because the satellites also use atomic clock for the correct time stamp. But it takes a lot of GPS satellites for as accurate positioning as Loran-C.

The GPS satellite that failed was already overdue, and its failure influenced the "timing" of the other satellites. The BBC was among those users that had no timing backup. Norwegian North Kring had equipment to use a Loran-C transmitter in England that was not turned off.

Future problems with GPS could spell disaster because all digital transmissions are dependent upon proper time, and now that Loran-C is off air we are without a fallback. Even our new emergency network relies on GPS to function, explains engineer Odd-Tore Jacobsen at the now shuttered Loran-C station in Bø.

Will Survive. Jacobsen is civilian employee of Cyber Defence and probably the one that understands the Loran system best. Together with a colleague he was going in February to start the demolition of Loran-C transmitting stationon Værlandet in Sor-Trondelag, but then came the stop order.

“After what happened in the winter, I think that the system will survive the modernized version. Norway is one of the world's most digitized countries and if GPS fails, none of the systems, radio and TV or phones or internet will work. Norway will come to a standstill without fallback,” says Jacobsen.

Today, only Saudi Arabia and South Korea have Loran-C. Japan has suspended its closure. USA closed Loran-C in 2010 but is now in the process of establishing eLoran as backup for GPS. Russia has Chayka. There are several other satellite systems in addition to GPS, but all are in the same frequency range and are impacted by solar storms and are relatively easy to jam.

Private operation? British Chronos Technology and American UrsaNav, experts on time and navigation, have joined forces and started Taviga. This firm wants to take over

the operation of Loran stations in Europe on a commercial basis. This is now part of the review the Ministry must do: “The British inquiry can be connected to this company. But then there is also an aspect that if there should be commercial operations, it must be put out to tender. I do not know how we pursuing this matter, but we must initiate a dialogue with the British. What will it cost? I dare not promise how quickly we can get a clarification and will see this in the context of what is happening in other countries, such as France. They closed the also Loran C in winter,” says Meier. He stressed that when the Norwegian authorities had a broad process about the future of the Loran-C system, no one showed interest, including defense. However, the life of Loran-C has been extended several times in the past.

Military vulnerability. Commander Captain Steinar Nyhamn, head of the Navy's competence center for navigation, has on several occasions warned of what could happen if there is not a backup for GPS.

“The Armed Forces are at least as vulnerable as the rest of society in time synchronization ; link systems could be put out. The important thing for the defense is that Loran C signals go into the sea, the ground and into buildings. It is therefore no wonder that countries that are debating about Loran-C. It takes little to jam the weak GPS signals. A ground-based system would be a good option to pursue,” says Nyhamn.

Reduced vulnerability The Brighten Committee considered Norway's digital vulnerability in November 2015. They believe an upgraded Loran-C may help to reduce the country's digital vulnerability significantly.

Loran-C Originally a maritime navigation system, the operation cost 20 to 30 million annually, depending on how one calculates. Two employees at each of the three stations on the mainland, Berlevåg, Bo and Værlandet, plus some jobs at Kolsås. On Jan Mayen maintenance is divided among a larger workforce. Demolition is estimated to cost at least 100 million.