**AYC Ecology North**

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**Out of sight: GPS jamming**

**Satellite positioning data are vital -- but the signal is surprisingly easy to disrupt**

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EVERY day for up to ten minutes near the London Stock Exchange, someone blocks signals from the global positioning system (GPS) network of satellites. Navigation systems in cars stop working and timestamps on trades made in financial institutions can be affected. The incidents are not a cyber-attack by a foreign power, though. The most likely culprit, according to Charles Curry, whose firm Chronos Technology covertly monitors such events, is a delivery driver dodging his bosses’ attempts to track him.

The signals are weak. Mr Curry likens them to a 20-watt light bulb viewed from 12,000 miles (19,300 km). And the jammers are cheap: a driver can buy a dashboard model for about £50 ($78). They are a growing menace. The bubbles of electromagnetic noise they create interfere with legitimate GPS users. They can disrupt civil aviation and kill mobile-phone signals, too. In America their sale and use is banned. In Britain they are illegal for civilians to use deliberately, but not, yet, to buy: Ofcom, a regulator, is mulling a ban. In recent years Australian officials have destroyed hundreds of jammers.

In the right (or wrong) hands, they are potential weapons. Britain’s armed services test the devices in the Brecon Beacons in Wales, a military training area. North Korea uses big lorry-mounted versions to block GPS signals in South Korea. Starting with a four-day burst in August 2010, the attacks, which come from three positions inside the North, have lengthened. In early 2012 they ran for 16 days, causing 1,016 aircraft and 254 ships to report disruption.

Mr Curry worries that criminals or terrorists could knock out GPS for an entire city or shipping lane anywhere in a flash. Even without North Korean-sized contraptions, the jamming can be substantial. Suitcase-sized devices on sale on the internet claim a range of 300-1,000 metres.

Malfunctioning satellites and natural interference from solar activity have hit GPS signals and sent ships off course. David Last, a navigation expert, says an accidental power cut, perhaps caused by a jammer taken on board a car ferry, could cause a shipwreck. Generating a false signal—spoofing—is another threat. In December 2011 Iran said it had spoofed an American drone before capturing it (most experts dismiss the claim). So far effective spoofing seems confined to laboratories, but Mr Last says some governments are already taking countermeasures.

One solution is a different means of navigation. In April South Korea announced plans for a network of 43 eLoran (enhanced long-range navigation) ground-based radio towers, based on technology first used in the second world war. It uses a far stronger signal than GPS, and should give pilots and ships’ captains a safer alternative by 2016. With Chinese and Russian help, South Korea hopes to expand coverage across the region.

Britain’s General Lighthouse Authorities (GLA) are following suit with seven new eLoran stations. Martin Bransby, an engineer with the GLA, says this will replace visual navigation as the main backup for GPS. It will be working by mid-2014, and cost less than £700,000; receivers cost £2,000 per vessel. By 2019 coverage should reach all big British ports.

America’s military-research agency DARPA has an experimental “single-chip timing and inertial measurement unit” (TIMU). When finished, according to the project’s boss, Andrei Shkel, it will use tiny gyroscopes and accelerometers to track its position without using satellites or radio towers. America’s White Sands missile range in New Mexico is installing a “Non-GPS Based Positioning System”, using ground-based antennae to provide centimetre-level positioning over 2,500 square miles. In May the Canadian government said it would splash out on anti-jam upgrades for military aircraft.

A new version of the US air force’s bunker-busting bomb, designed in part to destroy Iranian nuclear facilities, includes technology to prevent defenders from blocking its satellite-based guidance systems. MBDA, a European missile firm, is working on similar lines.

But for many users, GPS and other space-based navigation systems—which include Russia’s GLONASS, China’s partly complete Beidou, and an as-yet unfinished project by the European Union—remain indispensable and ubiquitous. They are also vulnerable. For those whose lives or livelihoods depend on knowing where they are, more resilient substitutes cannot come fast enough.