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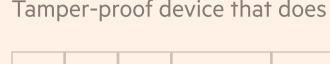
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## Tamper-proof device that does not rely on GPS is result of extensive defence funding

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the UK Ministry of Defence (MoD).

not rely on external satellites.

Madhumita Murgia, European Technology Correspondent NOVEMBER 9, 2018 □ 63 ■ British scientists have built the world's first quantum 'compass' — a tamper-proof

The device, the first commercial instrument of its kind, can help pinpoint the exact location of anything on Earth in a way that cannot be interfered with, because it does

navigation device that does not rely on GPS, after millions of pounds of funding from

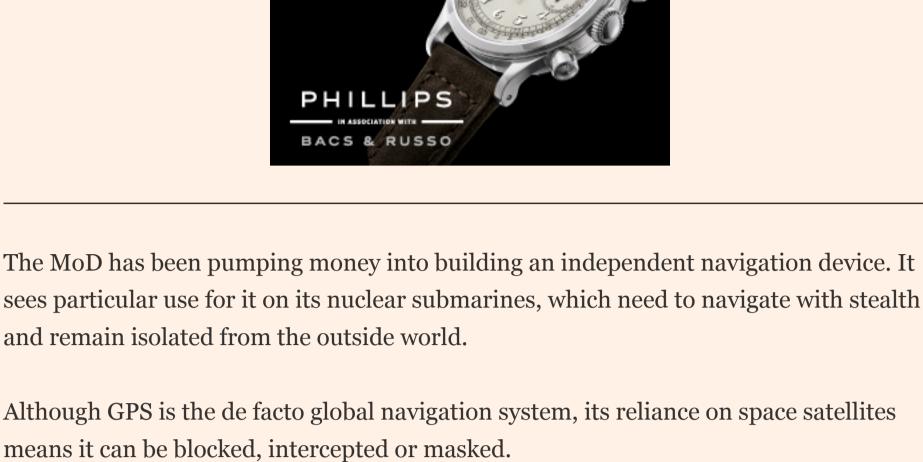
"It's completely self-contained," said Joseph Cotter, a researcher at the Centre for Cold Matter at Imperial College, which built the device. "It's particularly useful if you want to

to send or receive any other signals to know where you are."

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In particular, it is extremely vulnerable to deliberate disruption or attack. "Satellites can lose signal sometimes due to the space environment or tall buildings, or they can be taken down maliciously, if someone tries to turn them off or they can be spoofed so you

think you're somewhere you're not," Mr Cotter said. "It's not possible to get a GPS

The new system, known as a quantum accelerometer, works by measuring how an

object's velocity changes over time. Although precise accelerometers exist in devices

signal everywhere on earth," he added.

Research Council and Innovate UK.

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such as mobile phones and laptops, they must be recalibrated frequently and can only be used to navigate for up to a few hours at a time. The quantum device measures the movement of supercooled atoms at extremely low

temperatures — close to absolute zero; in this hyper-cold state, a custom-made powerful

laser is used to manipulate and control them. The laser, designed by Glasgow-based

company MSquared, took nearly three years to develop.

"Pirates are now sophisticated enough to cause disruptions to ships, and lure them to rocks or take over and board them, by disrupting GPS," said Graeme Malcolm, founder and CEO of M Squared. "They can be an even bigger issue in areas of defence and security, where the resilience and security of cities, countries are impacted. This new device is an absolute reference that goes down to the level of atoms."

Funding for the navigation device came from the MoD's research arm — the Defence

Quantum research was identified by the UK government as a priority in 2013, with a

focus on military technologies. Since then, through the UK National Quantum

Science and Technology Laboratory — along with the Engineering and Physical Sciences

Technologies Programme, it has invested £270m into projects in this area over five years.

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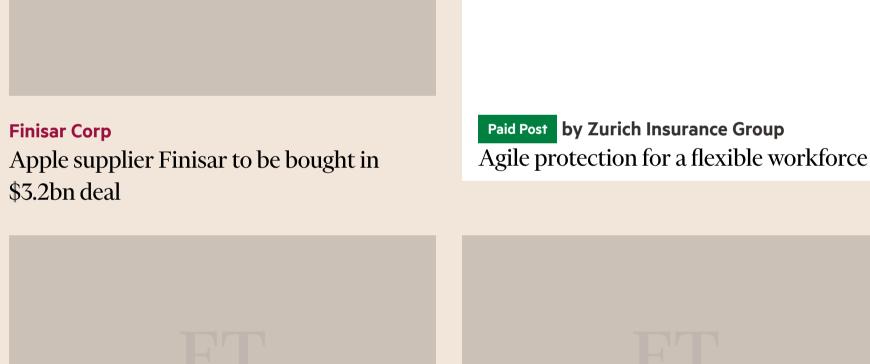
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