

Exploring the power of thought

As programmes move forward to “digitise” the soldier, then it is reasonable to expect their cognitive burden to increase, as more information, flowing in real time will need to be processed by the individual during increasing stressful missions.

The ability for a soldier to self-regulate their emotional states can impact their immediate well being as well as providing long-term health benefits. Increasing a soldier's capacity for situational awareness, whilst staying on task in highly stressed situations, is key to optimising their performance and improving the impact on their physical and mental health.

UltraNIMBUS provides the means to harness the signals from the brain to measure a true state of well-being. Alpha waves indicate creative thinking, high beta waves indicate stressful situations, mid beta waves are typical when the brain is attentive and low beta waves are seen when the brain is absorbing information. Hosted on an UltraLYNX hub, Artificial Intelligence algorithms create meaningful information from the raw brainwave signals.

UltraNIMBUS provides both local and remote monitoring of the soldier's well being and can present the information on any type of End User Device via its underlying open architecture.

Monitoring

An electroencephalogram (EEG) is a technique that detects electrical activity in the brain using small electrodes attached to the scalp. The brain cells communicate via electrical impulses which the electrodes detect.

In UltraNIMBUS, the EEG electrodes can be embedded into the helmets internal cradle and provide a comfortable electrical connection to the soldier's scalp. The electrodes are located in specific places to allow various low-level

brainwave signals to be detected. Smart algorithms convert the raw data to meaningful, timestamped feeds including indications of stress, interest, focus and engagement.

By adding a device to measure Heart Rate Variability (HRV) and combining this with the brainwave signals, we can compose an indication of the soldier's cognitive burden.

When soldiers are multi-tasking under stress, our research shows that the “overwhelm” is created as they try to process information from their external environment. The brain begins to activate different associative neurological networks and produces incoherent high beta brain wave patterns. That is when performance reduces, energy in the brain is lost, concentration is diminished, and they make mistakes and wrong decisions.

Training

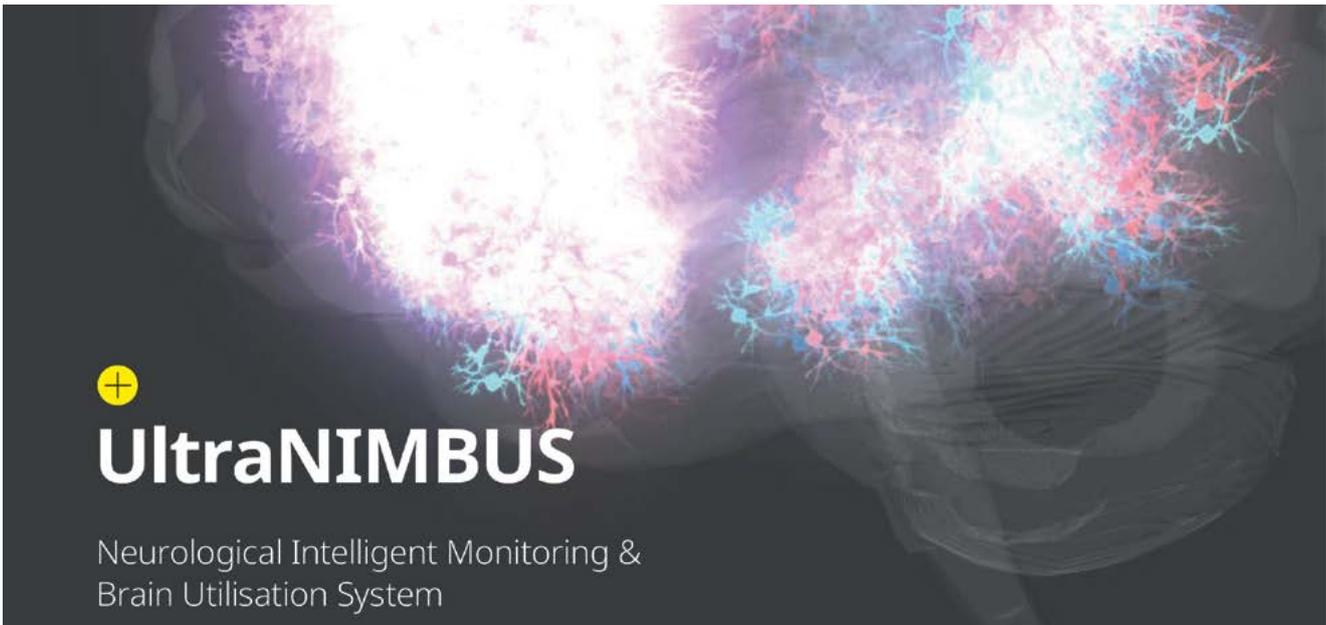
Ultra is working with a neuro-specialist to provide the necessary training to help soldiers understand and reduce the effects of cognitive burden. Our training techniques involve teaching the soldier how to move from a “narrow thought focus” to a more divergent or “open thought focus”. In doing so, the brain's stress mechanisms are reset, helping to reduce cognitive burden and increase mental performance.

Control

UltraNIMBUS can also be used to provide a novel Human Machine Interface, providing the means to control any connected device using the power of thought alone!

By learning a variety of thought patterns, the UltraLYNX hub can be used to control any of the devices connected to it. This makes it possible to control the radio, a camera or even an unmanned platform by the soldiers specific thought commands.





UltraNIMBUS has also been integrated with another brain sensor that uses stimulation of the visual cortex to provide control signals. This sensor has been specifically designed to work with Augmented/Virtual Reality goggles. As before, the UltraLynx hub is used to map these control signals to the specific commands for any of the connected devices.

Having recently demonstrated a drone control concept at a UK defence expo, Ultra are now working with Nordic Unmanned* to mature the idea with a defined use case and a set of agreed CONOPs (Concept Of Operations). We hope to demonstrate UltraNIMBUS controlling an in-service Nordic Unmanned UAS later this year. ■

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*Nordic Unmanned was formed in Sandnes near Stavanger in 2014. The company has grown rapidly, driven by a combination of its strategic partnerships, long-term framework agreements and its unique competence in applying the mature culture and approach of conventional aviation to the rapidly expanding

market in unmanned platforms and services. Nordic Unmanned's customer base is wide ranging and includes the European Maritime Safety Agency (EMSA), the Norwegian Ministry of Defence, the UK Ministry of Defence and Equinor. In 2021 Equinor awarded Nordic Unmanned a contract for EUR 2.7 million to demonstrate the role of UAS to provide logistic support to the offshore oil and gas industry. This will include carrying out cargo flights between a supply base and the Gullfaks field, located 170 km offshore, as well as establishing daily flights between offshore installations and vessels in the Tampen area.

Nordic Unmanned operates a range of fixed wing and rotary platforms across four business segments Maritime, Security, Logistics and Infrastructure. The company was certified as an operator with European LUC (Light Unmanned Air System Operator Certificate) by the Norwegian CAA and in 2021 Nordic Unmanned made a total of 1896 flights and generated more than EUR 10m revenue from 1466 flight hours, consulting, system integration and development on behalf of its clients.

