Q-Band Sleep & Fatigue Monitoring System

Smart Stim for Pilot Fatigue Mitigation

The Q-Band is a flight-compatible, wearable system for cognitive fatigue detection and mitigation in aviators and other high-demand operators. It integrates dry electrooculography (EOG), SpO2, temperature, and motion sensors into a helmet-compatible headband that works seamlessly under flight gear. Q-Band incorporates a closed-loop transcutaneous vagus nerve stimulation (tVNS) module triggered by validated fatigue algorithms based on saccade dynamics, enabling real-time fatigue mitigation without increasing pilot workload. Designed to meet aviation safety and EMI standards, Q-Band delivers a rugged and operationally ready solution for mission-critical performance monitoring.

Q-Band in Use

Q-Band Benefits

- **Mission-ready fatigue mitigation** – Detects fatigue early and delivers tVNS stimulation to sustain operational performance.
- **Helmet-compatible design** – Engineered to fit under standard HGU-68/P flight helmets without interfering with oxygen masks or communications.
- **High-fidelity sensing** – Dry sensors for EOG provide artifact-resistant data in-flight, validated through flight testing with Embry-Riddle Aeronautical University.
- **Closed-loop operation** – Automated fatigue detection and stimulation reduce cognitive workload while improving mission safety.

Your Applications

QUASAR, an experienced DoD contractor, developed the Q-Band under Air Force SBIR funding. Q-Band is ready for transition and is projected to achieve TRL 6. Applications include:

- Fatigue detection and mitigation for pilots and aircrew
- Integration into simulators for performance training
- OSM for cognitive workload assessment
- Sleep monitoring and neuromodulation

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