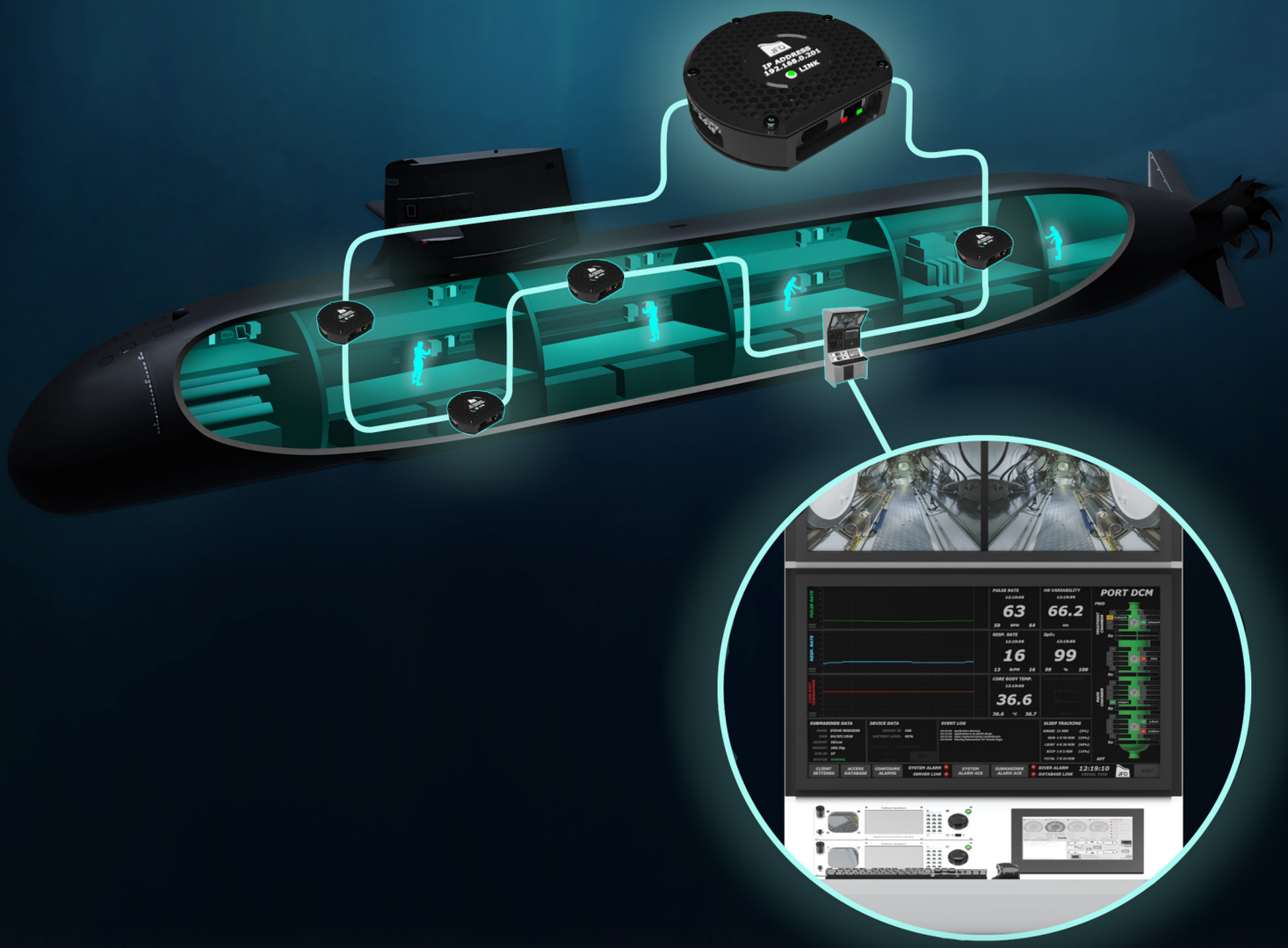

Submarine Platforms iMMS

Intelligent Medical Monitoring System

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Intelligent Medical Monitoring System

ISSUE

Isolated environments are a common surrounding for submariners to work for extended durations and due to the nature of the missions, medical related issues that occur must be dealt with locally, as MEDEVAC may not be possible.

On a submarine complement, there is a limited number of trained medical personnel, typically 1-2. It is therefore easy for medical personnel to become overburdened, especially if a submariner enters a critical state.

Rapid localisation of a submariner should a medical emergency occur is vital, especially for isolated or lone working crew. Furthermore, submariner localisation during submarine rescue events enables the rescue team to pinpoint submariners and understand their medical condition rapidly, enabling medical triage and reducing rescue time.

Navies globally have reported issues with submariner retention and mental health. Technologies to capture data to investigate this and steer solutions is desirable.

SOLUTION

Using cutting edge technology commonplace in medical settings, JFD is pleased to provide its Intelligent Medical Monitoring System (iMMS).

JFD's iMMS is modular and configurable to the requirements of different submarine classes. The medical devices are split into two tiers:

- **Initial Tier:**
  - All submariners provided wearable medical device.
  - Wearable device records following metrics:
    - Pulse Rate and Heart Rate Variability
    - Respiration Rate
    - Blood Oxygen Level / SpO2
    - Core Body and Skin Temperatures
    - Cuffless Non-Invasive Blood Pressure
    - Energy Expenditure and Activity
    - Stress and Sleep Tracking
    - Wearable device also reports submariner location
- **Advanced Tier:**
  - Comprehensive monitoring provided by Corpuls3 patient monitor and defibrillator.
  - Elevated level of monitoring.
  - Limited number of submariners, suggested 1-2.

Wearable Device
Vital sign monitoring

Corpuls3
Patient Monitor
& Defibrillator

The iMMS platform consists of the following:

- **Data Hubs:**
  - Wireless communication with medical devices.
  - Up to 20 devices per data hub.
  - At least one data hub fitted to each compartment, dependent on compartment size and population.
  - Data hubs connected via hardwired network to system server.

Data Hub
Small form factor
100mm x 30mm

- **System Interfaces:**
  - Medical console designed to submarine requirements, consisting of server, client, and electronic health record software.
  - Electronic health record software stores pseudonymised medical information.
  - Tablet computers enable portable access to system software.
  - Alarms interface alerts medics to submariner deterioration.

BENEFITS

- Modular platform configurable to submarine requirements.
- Two-tiered medical and location monitoring.
- Earlier detection of medical conditions, reducing likelihood of MEDEVAC.
- Reduced burden on onboard medical personnel.
- Rapid localisation of submariners during deployment, training exercises, and rescue missions.
- Alarms interface alerting deterioration of condition.
- Electronic health records enabling future analysis, diagnosis/therapy, and potentially research.
- Reduced obsolescence concerns: future devices implemented by software update.
- System expandability to add further capability.

ENHANCEMENT OPTIONS

iMMS can be enhanced with the following options:

- Submariner Performance Monitoring.
- Intermediate Medical Tier (e.g. Spirometry).
- Environmental Data Fusion.
- Integrated Radiation Monitoring.
- Diver Monitoring.
- Intelligent Senior Survivor Panel (iSSP) Integration.
- Remote Telehealth Functionality.

LEGISLATION AND STANDARDS

JFD's iMMS platform is tested and certified to:

- Gas and Environmental Testing
- Mil-STD-461F: EMC
- Mil-STD-167/1: Vibration Testing
- Pressure Tested
- EU-MDR Certified Medical Devices