

SMERAS Support Services

DISSUB Survival Support Services

Providing test and evaluation of distressed submarine (DISSUB) survival equipment to maximise probability of survival.

QinetiQ has extensive experience in providing test and evaluation of DISSUB survival equipment and in the design and use of computer models to predict and optimise use of survival equipment, stores and resources. We can provide evidence based assurance that survival equipment will function according to manufacturer's claims.

Guardbook Development and Review

The crew of a distressed submarine need information and guidance in order to make the best decisions to maximise their opportunity for survival. Advice for the crew is typically contained in a set of instruction cards referred to as the Guardbook.

The Guardbook informs the crew of the immediate actions to perform in the event of a DISSUB scenario, how to assess, monitor and control the situation and how to plan for tower escape or rescue where appropriate. The Guardbook must be designed as a bespoke item for a given submarine class or individual submarine, since it will contain tables of waiting limits based on atmosphere maintainability which are specific to parameters such as crew size, internal dimension and specific submarine equipment fit.

QinetiQ has extensive experience in the calculation and authoring of such tables, having created and supplied tables for all current classes of UK Royal Navy submarines and the Canadian VICTORIA class. QinetiQ also advised in the calculation of tables for the Australian Navy.

QinetiQ is able to give the best available advice on:



SEIE under test in the Hyperbaric Trials Unit

- Independent test and evaluation of DISSUB survival equipment
- Guardbook development and review
- Decision making guidance and advice
- Escape resource modelling to maximise crew survival
- Hyperbaric Trials Unit (HTU) for Submarine Escape Immersion Equipment (SEIE) component testing

- Carbon dioxide waiting limits for level of carbon dioxide at which escape must start
- Optimal selection of tower escape venting method based on crew size, escape compartment breathable volumes, hood inflation system air usage and probability of survival
- Decision making for whether to attempt escape or await rescue based on probability of decompression illness and probability of survival

QinetiQ can help any navy in both the design and creation of a new Guardbook or in the review of current Guardbooks to ensure the submarine crew receives the best and most up to date advice.

Equipment Advice and Testing

Survival in a distressed submarine may require the use of any of several technologies including carbon dioxide

removal, oxygen generation, seawater purification and heat generation.

Understanding the DISSUB environment and the physiological requirements of the crew means that QinetiQ are able to offer advice on suitable equipment for ensuring their survival. Manufacturers make claims for their equipment but customers must assure themselves that this equipment will function correctly in the harsh environment of the distressed submarine, where there may be exposure to ionizing radiation, raised pressure and to extremes of temperature. Additionally there may be seawater ingress and an altered atmosphere, which may contain smoke and by-products of fire and other gases such as chlorine which may be released from the submarine's battery. QinetiQ design and carry out trials to simulate elements of this environment and expose equipment for testing in a controlled manner.

QinetiQ offers:

- Advice on equipment necessary for survival in a distressed submarine
- Advice on suitability for purpose of proposed or currently installed equipment
- Trials design for equipment performance testing
- Test and evaluation of survival equipment in a simulated DISSUB environment

QinetiQ experience and expertise in equipment testing led to trials which showed that customer equipment installed for atmosphere contaminant removal was less effective in extreme environmental conditions. We went on to test and prove new equipment to provide the solution to this problem. We can provide assurance that DISSUB survival equipment will function as required when it is really needed.

Emergency Atmosphere Control Optimisation

When trapped aboard a distressed submarine, the crew must ensure maintenance of a breathable atmosphere in order to survive. QinetiQ provides accurate simulation and prediction of atmospheric composition in the DISSUB which can be tailored to the crew size and internal volumes of individual submarines or submarine classes. Our models are calibrated against data from extensive trials that we have conducted for the UK Ministry of Defence.

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We are able to predict the rate of use of resources such as carbon dioxide absorbents and chemical based oxygen generators, allowing accurate calculation of the optimal levels of supplies needed on board to support the crew for the requisite period until time of first rescue.

We are able to predict the rate of increase of atmospheric carbon dioxide and the decrease in oxygen partial pressures (levels) in the DISSUB and how these are affected by the use of carbon dioxide absorption and oxygen generation equipment. Balancing the levels of stocking of the different consumable resources such as soda lime canisters or lithium hydroxide curtains ensures maximum survival time for the crew. We have extensive experience in the modelling of the use

of these resources and how their efficiency is affected by harsh conditions such as low temperature and raised pressure.

In particular, we provide expertise in the modelling of passive (non-powered) technologies such as:

- Soda lime filled Battelle® curtains
- Loose lithium hydroxide granules
- Lithium hydroxide granules held in Battelle® curtains or deployed as Micropore™ Lithium Hydroxide Reactive Polymer curtains
- Sodium chlorate based oxygen generators

We provide advice on where and when to use equipment in order to maximise effectiveness whilst considering the necessary simplicity of deployment required in the DISSUB scenario.

About QinetiQ SMERAS Support Services

Submarine Escape, Rescue, Abandonment & Survival (SMERAS) Support Services

QinetiQ provides a range of tried and tested SMERAS Support Services that have been delivered to many of the world's submarine fleets, including fully instrumented tower trials (FITT) and Guardbook advice for the UK Royal Navy, Italian, Dutch, Norwegian and Canadian Navies. QinetiQ is the long established partner for SMERAS research, test and evaluation for the UK Royal Navy and are world leaders in research into physiological effects in the SMERAS environment.

QinetiQ SMERAS Support Services cover:

- Concept Design & Development
- Tower Escape Systems
- Surface Abandonment
- DISSUB Survival
- Submersible Rescue
- Audit and Assessment

QinetiQ SMERAS Support Services are supported by a unique range of world class facilities including the QinetiQ Hyperbaric Trials Unit. QinetiQ also provides a rapid response team of Submarine Escape Training Tank (SETT) qualified personnel, ready to go to sea and conduct trials at any time.

Most importantly QinetiQ delivers advice independent of any supplier.

Delivering world class SMERAS Support Services to Navies around the world