



# Submarine Rescue

Products and Services





# Submarine Rescue



## Introduction

JFD offers a portfolio of submarine rescue products and services and has been an integral part of submarine rescue projects around the world since 1983.

Our capabilities extend to design, manufacture, operations and support.



DSAR Class Submarine Rescue Vehicle



Launch & Recovery Systems



Multi-Role Launch and Recovery System



Atmosphere Sampler & DSVDS



Intervention ROV



Intervention & Rescue Targets



ELSS Pods & Bags



Inflatable Freeboard Extender (IFE)



Offshore Operations Training



Vessel of Opportunity Database

Contact us to discuss your requirements: [enquiries@jfdglobal.com](mailto:enquiries@jfdglobal.com)



# Atmosphere Sampler & DSVDS



## Introduction

Atmosphere Sampler and Distressed Submarine Ventilation & Decompression System (DSVDS) are both important components of a comprehensive intervention spread.

Where an intervention vessel is able to reach a DISSUB in advance of a rescue vessel, these two pieces of equipment may be utilised to prepare the submarine for rescue and to augment the onboard life support for as long as it is required.

Both interface with the DISSUB's High Salvage Point (HSP) or nation-specific ventilation interface.

JFD's Atmosphere Sampler is a simple, reliable, and compact intervention tool for sampling the atmosphere and pressure parameters within a Distressed Submarine (DISSUB). It is used prior to mating with a rescue vehicle, or attempting salvage, in situations where communications cannot be established with the DISSUB and the atmosphere cannot be verified.

JFD's DSVDS provides breathable air from the surface to the DISSUB to maintain safe O<sub>2</sub> and CO<sub>2</sub> levels, flush contaminated atmosphere, or to manage internal pressure.

By monitoring, controlling and maintaining a DISSUB's atmosphere parameters using these systems, prior to rescue, the likelihood of a safe and successful rescue is significantly increased.



JFD's Atmosphere Sampling System operating with NSRS IROV



JFD's UK-type High Salvage Point adapter kit

## Atmosphere Sampler

The air quality of a DISSUB may be noxious and communication with the crew may not be possible. In this situation, prior to mating with a rescue vehicle or attempting salvage, a sample of the internal atmosphere may be taken via the DISSUB's High Salvage Point and used to inform Command decision making.

- Lightweight universal mounting for many ROVs.
- Simple in operation.
- Connects to a DISSUB's High Salvage Point or ventilation connection.
- Flushes pipework system prior to collection of sample.
- Maintains a safe pressure boundary upon completion.
- Retains ability to connect further equipment without compromising hull integrity.

## DSVDS

JFD's DSVDS system can be used to perform the following tasks:

- Stabilise conditions on the DISSUB prior to rescue.
- Begin decompression within DISSUB.
- Control and reduce DISSUB internal pressure to enable escape.
- Provide additional air to evacuate water prior to salvage or recovery.

## Key Particulars

- Fully containerised and optimised for deployment by land, air and sea.
- Designed for rapid deployment to Vessels of Opportunity.
- Suited to use with DP2 capable vessels, or in three or four-point mooring configurations.
- Operable in conditions upto Sea State 5.

## Interface Packs

JFD can provide interface adapter kits for STANAG 1450 compliant and nation-specific ventilation connections or High Salvage Points enabling the equipment described above to be used with submarines from most nations. For maximum compatibility, JFD can provide a set of adapters in a single self-contained Peli case for ease of transportation.

JFD is the sole-supplier of UK-type HSP connectors which have the advantage of being operable by ROV.



# DSAR Class Submarine Rescue Vehicle



## Introduction

The Deep Search & Rescue (DSAR) Class submarine rescue vehicle is the latest rescue submersible from JFD. The SRV design builds upon more than 25 years of submarine rescue operations.

JFD's submarine rescue vehicles are currently in operation with:

- The Republic of Singapore Navy
- The Republic of Korea Navy
- The Royal Australian Navy

Key features include:

- Integrated skirt
- Lightest in Class at 22.5 tonnes
- Optimised for transportability
- 60° mating capability



ROKS-DSRV-II in operation onboard the Republic of Korea's Cheong Hae Jin



DSAR-6 in operation onboard Singapore's Swift Rescue



DSAR Class Rescue Vehicle demonstrates ability to mate at 60°



## Specification

### Rescue Capability

Operational Endurance	> 12 hours
Emergency Life Support	> 96 hours
Maximum Mating Angle	60°
Rescue Payload	1,200 kg
Air Transportability	C17 or similar

DSAR Class submarine rescue vehicles have a typical maximum dive depth of 500m. If required this can be increased to 700m.

### Principle Particulars

Length	9.6m
Beam	3.2m
Depth	2.7m
In Air Weight	22.5 tonnes, in 500m configuration
Main Propulsion	2 x 10kW electric
Auxiliary Propulsion	4 x 3kW hydraulic

### Electrical System

Battery System	Fully-redundant Lithium Polymer
System Voltage	120V / 24V with 24V emergency supply
Navigation	Integrated Navigation Suite
Automation	Autopilot, Autodepth, Altitude & Heading Hold
Communications	Through-water audio & data
Logging	Video, comms and data logging for review and training

### Design Standards

Classification	Classed to Lloyd's Register Rules and Regulations for Classification of Submersibles
Pressure Vessel Code	PD5500:2009 Specification for Unfired Fusion Welded Pressure Vessels
Mating Skirt	NATO ANEP/MNEP 85 compliant



# ELSS Pods & Bags



## Introduction

JFD's Emergency Life Support Stores Pods are used to transfer supplies to a DISSUB, in order to augment the onboard life support provision until a rescue can be effected. JFD's machined aluminium pods are designed, manufactured and tested to ANEP/MNEP 85, and fully Lloyd's Register certified for peace of mind.

They are utilised in the escape hatch of a DISSUB to safely receive ELSS Pods posted by an ROV or diver without the risk of obstructing the hatch. JFD's Pod Bags are in operation worldwide on an array of different submarine classes. While the principal design remains consistent, the fitment of each is tailored for each specific hatch type.

JFD also provides specialist tooling for ROVs, and support containers which facilitate the safe handling of ELSS assets.

## ELSS Pod Posting Bags

JFD's Pod Posting Bags allow the safe delivery and recovery of ELSS assets to and from a DISSUB's escape tower. Once posted, and with hatches shut and drained, ELSS pods can be securely lowered into the submarine using the provided lowering mechanism, without the risk of flooding the tower.

Each Pod Bag is designed and built in compliance with ANEP/MNEP 85, and has been load-tested and certified for the receipt of a fully-flooded ELSS Pod. Safety is further enhanced by the design's dual-redundant load path.

For ease of stowage each Pod Posting bag is packaged within its own case.

## ROV Tooling

In order to safely handle ELSS Pods, JFD provides specialist tooling for Intervention ROV's. The Pod grab has been designed for simple, reliable operation and can be fitted to most work-class ROVs.

## ELSS Containerisation

JFD provides ELSS containers that allow a complete ELSS support package to be easily transported by land, sea and air. JFD's containers are certified for air transportation and optimised for rapid mobilisation to a Vessel of Opportunity.

## Specification

Length	970mm inc. handle
Min. Internal Diameter	300mm
Max. Internal Diameter	350mm
In Air Weight	<60kg
Certified Operating Depth	610 msw
Test Pressure	960 msw
Pressure Hull Material	Aluminium 6082/5083
ELSS Payload	25 kg
STANAG	ANEP/MNEP 85
Classification Society	Lloyd's Regulations for Classification of Submersibles
Pressure Vessel Code	PD5500:2009 Specification for Unfired Fusion Welded Pressure Vessels

## Case Study: Spanish Navy ROV Upgrade

In 2007, JFD carried out a major upgrade to the Spanish Navy's Scorpion 3 Intervention ROV onboard the submarine support vessel Neptuno. The ROV was outfitted with an array of JFD's bespoke Intervention tooling, including a new ELSS Pod Handling arm and wire cutter. In order to achieve this, the hydraulic system was substantially updated to include a new, dedicated auxiliary valve pack for driving the tooling, along with corresponding controls. The entire scope was carried out onboard a ship in Cartagena in order to ensure that the ROV's operational readiness remained unaffected.



A set of JFD Pods ready to be delivered to the Brazilian Navy



JFD's Pod Bag shown onboard a UK Vanguard class submarine



# Inflatable Freeboard Extender (IFE)



## Introduction

The IFE is an easy to operate, cost effective, and reliable escape system.

Developed in partnership with Survitech, JFD's IFE is designed to assist submariners in rapidly escaping from a distressed submarine in high sea states. IFE allows the use of all casing hatches for surface abandonment in increased sea states. It provides increased evacuee safety whilst preventing flooding of the submarine through the open escape hatches. IFE is available in two configurations:

- External IFE; for new-build submarine classes
- Internal IFE; for existing submarine classes

## Benefits

- Enables use of casing hatches in adverse conditions
- Increases number of usable escape routes
- Prevents water ingress during surface abandonment
- Re-usable
- Proven technology
- Improves safety at sea

## External IFE

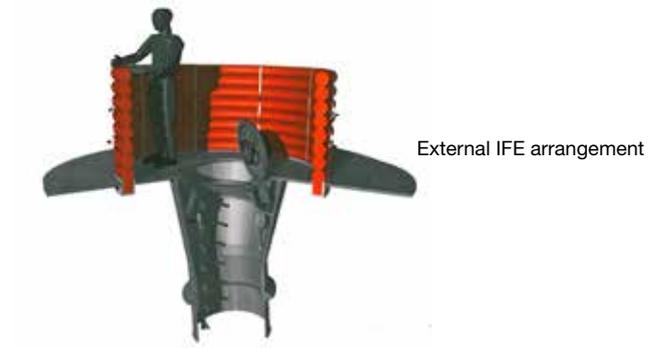
The externally fitted IFE is designed as a permanent, reusable escape option, fitted between the rescue seat and the escape hatch of a submarine. Stored in a deflated state within a GRP housing, the external IFE is fitted beneath the lip of the rescue seat under the casing. When stowed for transit in normal use, the IFE is stored in a free-flooding compartment. The benefits over the internal IFE is that it inflates before opening the hatch, has a larger safe haven and is readily reusable.

## Internal IFE

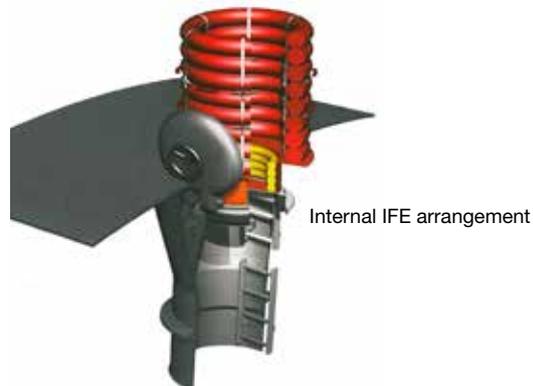
The Internal IFE option is designed to be deployed, when required, to the inside of the submarine escape tower or casing escape hatch. Testing has confirmed that utilising the IFE will enable submariners to use a casing hatch, previously unusable in such circumstances, to escape from a submarine in a surface abandonment or emergency situation. An escape rate of 2-3 submariners a minute has been achieved during testing of IFE. No modification is required to the existing trunk or hatch opening to retro-fit the IFE, making it suitable for use across a wide range of existing submarine types.

## Integration & Operation

All IFE options are inflated by the operation of a single valve on a panel, outside the escape tower. This interface has been designed to enable fast and simple operation during pre-abandonment. Once inflated the tower forms a rigid freeboard structure, sealing the escape hatch and preventing sea-water ingress. The IFE is inflated either by air taken directly from the host submarine gas supply or via a separately stowed charged gas cylinder, enabling fast, even and controlled inflation of the IFE in a series of stages. Deflation is the reverse of this procedure, all controlled through a single valve. The IFE is drawn back into its GRP housing and when fully deflated secures itself in place ready for immediate re-use.



External IFE arrangement



Internal IFE arrangement



JFD's Inflatable Freeboard Extender - trials on RUBIS Class Submarine



JFD's Internal IFE fully inflated



# Launch & Recovery Systems



## Introduction

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The handling of payloads in high sea-states is a difficult and potentially hazardous operation. Specialist knowledge of the design, manufacture and operation of launch and recovery systems is essential when procuring a new LARS.

JFD offers a range of both off-the-shelf and bespoke systems to handle submersibles, unmanned vehicles and other equipment. We work with clients to identify solutions for particular requirements, however unique.

We are able to provide clients with:

- Complete Launch & Recovery Systems
- Interface Adapters
- Modifications and Upgrades
- Through Life Support

JFD can provide Launch & Recovery Systems in a number of configurations, including: fully integrated, fly-away and diverless. Each carefully balances cost, simplicity of maintenance and operation, and mobilisation time.

## Fully Integrated Launch & Recovery Systems

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- Permanently installed, yet transferable.
- Optimised for reliability and maintainability.
- Certified for submersible operations.
- Includes dual-redundant portable hydraulic power pack.
- Includes rail and trolley system with self-alignment functionality.
- Includes tow winch.
- 30 tonne Safe Working Load.
- Operable in Sea State 5.
- 60 tonne total weight (excluding power pack).
- Integrated Diverless Launch & Recovery System.
- Designed and manufactured in accordance with Lloyd's Register rules.

## Fly-Away Portable Handling Systems

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- Modular transportable system.
- Optimised for rapid redeployment by air and road.
- Certified for submersible operations.
- Includes dual-redundant portable hydraulic power pack.
- Includes deck cradle.
- Includes tow winch.
- 25 tonne Safe Working Load.
- Operable in 5m significant wave height.
- 40 tonne total weight (excluding power pack).
- Optional diverless Launch & Recovery System.
- Designed and manufactured in accordance with Lloyd's Register rules.

## Diverless Launch & Recovery Systems

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- Improved safety by eliminating the most dangerous part of the recovery process by removing the need to have personnel in the water.
- Can be operated in higher sea states than alternative systems.
- Provides an increased operating window.
- Must be integrated into both the submarine rescue vehicle and ship recovery systems.
- System currently in operation in Singapore.



Swift Rescue's Launch & Recovery System



Portable Handling System



Diverless Launch & Recovery System, in service in Singapore



# Multi-Role Launch & Recovery System



## Introduction

The provision of a submarine rescue mothership by a Nation can provide mutual benefits; via a Government to Government Agreement a Nation can secure submarine rescue coverage, without the expense or complexity of operating a dedicated system. In exchange, NSRS (NATO Submarine Rescue System) and SRDRS (Submarine Rescue Diving and Recompression System) can obtain low risk 'gold standard' pre-engineered MOSHIPs pre-positioned around the world, greatly reducing deployment risk and time.

The key to success is developing a fully integrated solution, minimising the amount of equipment which must be flown in during a deployment. The reduction in mobilisation time, afforded by having a compatible, certified Launch and Recovery System, can considerably offset the transportation time associated with deploying a large fly-away system.

JFD provides a unique 'Multi-Role' LARS capable of handling a wide variety of submarine rescue vehicles, both tethered and free-swimming.

The Multi-Role LARS is developed directly from proven, certified Launch and Recovery Systems installed on Belos, Cheong Hae Jin and Swift Rescue, with interface adapters enabling the operation of SRDRS and NSRS, as well as a wide variety of other submarine rescue vehicles, including the DSAR 500 Class and LR5.

- SRDRS
- NSRS
- DSAR-6
- ROKS DSRV II
- LR5
- SRV300

## Key Features

- Operates with both free-swimming and tethered SRVs, NSRS, SRDRS and others.
- IACS certified for use with manned submersibles.
- Based on proven, in-service, certified equipment, approved by the relevant technical authorities within both the UK and US Navies.
- Can provide full Transfer Under Pressure to an onboard decompression system in conjunction with a dual use Deck Transfer Lock (DTL) and trolley.
- Permanently installed, but transferable between vessels.
- Optimised for reliability and maintainability.

## Specification

Safe Working Load	35 tonnes
Operating Sea State	Sea State 5
Overboard Reach	7.9m (MOSHIP stern to SRV lift line)
Max Outboard Angle	48°
Design Standards	Lloyd's Register American Bureau of Shipping
Key Features	Developed from proven, certified equipment Multiple redundancies - Dual winch and power supply Constant / variable tension Emergency brake override

## Track Record

JFD is the leading integrator of submarine rescue systems into MOSHIPs. Recent projects have included:

- Delivery and integration of the complete intervention and rescue payloads onto Swift Rescue - Singaporean Navy.
- Modifications to the Republic of Korea Navy's Cheong Hae Jin to allow the operation, TUP and resupply of DSRV ROKS II.
- Bespoke TUP, LARS and Trolley modifications to enable the operation of NSRS and LR5 from the Swedish Navy's HMS Belos.





# Offshore Operations Training





# Offshore Operations Training



## Introduction

From our training facility in Bibra Lake, Australia, JFD provides training for operators and maintainers of Submarine Rescue Vehicles, Launch & Recovery Systems and Remotely Operated Vehicles.

JFD is uniquely able to combine comprehensive theory with practical hands-on activities, delivering realistic and enduring training.

Trainees will work alongside JFD's operations team, following their lead through time-proven practices and procedures.

Ultimately, newly-qualified personnel will understand how the application of their new skills contributes to the sustained, and safe, operation of their host-system.

JFD operators and maintainers have, for more than 25 years, been responsible for the safe operation of submarinerescue vehicles and their associated rescue systems. Personnel from the Australian, Brazilian, British, Chinese, French, Indian, Indonesian, Korean, Malaysian, Norwegian, Singaporean, Swedish, Thai and United States Navies have benefited from participating in training provided by JFD's world-class team.



Rescue Chamber Operator during check-out dive



Newly qualified First Pilot conducts pre-dive checks



Image taken during Launch & Recovery training



JFD's Training Facility - Bibra Lake, Australia

## Submersible Operations Training

JFD offers the following submersible training courses:

- SRV Pilots
- Rescue Chamber Operator
- Launch & Recovery System Operator
- System Maintainer

## ROV Operations Training

Remotely Operated Vehicles, in their many associated roles, are a key component of an effective submarine intervention and rescue capability. In a multi-use environment Navies will often task ROVs with further duties such as search, recovery or salvage operations.

- Search, Survey and Location Tracking
- Emergency Life Support Stores Delivery
- Submarine Intervention via High Salvage Point
- Salvage and Recovery of assets

## Offshore Operations Management

JFD provides training for those personnel concerned with the command and control, co-ordination, and management aspects of offshore operations. These courses include: Offshore Management, Submarine Rescue Co-ordination, Vessel Selection & Management, Rescue Asset Mobilisation, and more.



# Intervention ROV



## Introduction

Remotely Operated Vehicle (ROV) systems are capable of carrying out a wide variety of tasks, but they require very specialist tooling and support arrangements in order to provide the level of capability and flexibility required to carry out submarine intervention.

Our bespoke Intervention ROV differs from the majority of off-the-shelf ROV systems in its optimisation for rapid deployment and ease of installation to a variety of vessel types.

Ultimately, a dedicated Intervention ROV is designed to maximise the opportunity of reaching the crew of a Distressed Submarine in as short a time as possible; maximising the possibility of a successful rescue.

JFD can provide both Fly-Away and Permanently Installed Intervention ROV solutions.

## Fly-Away Intervention ROV System

- Mobile and versatile, the system is entirely integrated onto a single 20' ISO base.
- Core system fits comfortably within 17m<sup>2</sup> deck space.
- Total weight: less than 12 tonnes.
- System centre of gravity arranged to minimise welding.
- With optional power supply, can be mobilised with minimal welding and fully independent of ship's services.
- Optimised for rapid deployment by road and air.
- Complete life-support supplies store available as an optimised 10' ISO container.
- Integrated crane, sheaves and towing winches.
- Packaged in short-height ISO containers suitable for transportation in a C130 Hercules

## Permanently Installed ROV System

- Inherently simpler to operate and maintain than a fully-portable system.
- Allows for the use of a heavier or more powerful ROV than possible with a fly-away system.

## Specialist Tooling

- ELSS Delivery: Pod Grabs
- Atmosphere Sampling Equipment
- Cable Cutters
- Mud-pump
- Specialist Manipulators
- Sub-sea instrumentation including Geiger counter
- Debris clearance tools
- High Salvage Point adapters & DSDS fittings
- Hot-tap oil sampling

## Specialist Tooling

Configuration	Footprint
Core Intervention ROV System	17m <sup>2</sup>
Core System + optional ELSS container	35m <sup>2</sup>



JFD's Fly-Away Intervention ROV in operation with JFSRS in Australia



JFD's permanently installed ROV System in operation with Swift Rescue



JFD's compact Fly-Away Intervention ROV System with optional ELSS container

# Intervention & Rescue Targets



## Introduction

Regular submarine intervention and rescue exercises are essential for ensuring equipment and personnel are able to respond effectively in the event of a submarine accident. However, the ability to exercise with live submarine assets is often limited.

JFD can supply a wide variety of subsea targets that allow submarine rescue, intervention and ventilation activities to be rehearsed without the need for a host submarine.

JFD's mating targets are in service with:

- NATO Submarine Rescue System
- Republic of Singapore Navy
- Royal Australian Navy

JFD understands that requirements for subsea targets vary significantly between nations and for differing operation types. Key design-drivers are depth-rating, mating angle and portability.

## SRV Mating Targets

JFD's mating target for rescue submersibles is used primarily for the repeated rehearsal of locating and mating with a target at depths of up to 650m, and at angles of up to 60°. JFD's mating targets are certified by Lloyd's Register for both hard- and soft-mates, allowing full-skirt de-watering and hatch-openings at maximum depth.

Features of JFD's mating targets:

- Interchangeable top-plates
- ANEP/MNEP 85 compliant
- Pressure tested under Lloyd's Register witness and certified

JFD is able to provide targets based on bespoke specifications, taking into account customer requirements for:

- Maximum hard-mate depth
- Long or short-term deployment
- Transport arrangements

## Intervention Targets

Replicating a submarine's escape hatch, JFD's ELSS Intervention Targets allow ROV Pilots to train for the delivery and recovery of Emergency Life Support Stores. The various targets may be set at angles of up to 60° in depths up to 650m, replicating possible bottoming scenarios, and may also be customised to take into account Class-specific configurations.

Submarine Ventilation and Atmosphere Sampling systems each require connection to a submarine's ventilation connection or High Salvage Point, a process requiring skill and precision to carry-out safely. JFD's Intervention targets may be configured to allow training for these operations.



Highly portable lightweight and angle selectable in 10° increments



500m rated 60° capable mating target. Transportable in 10' ISO container

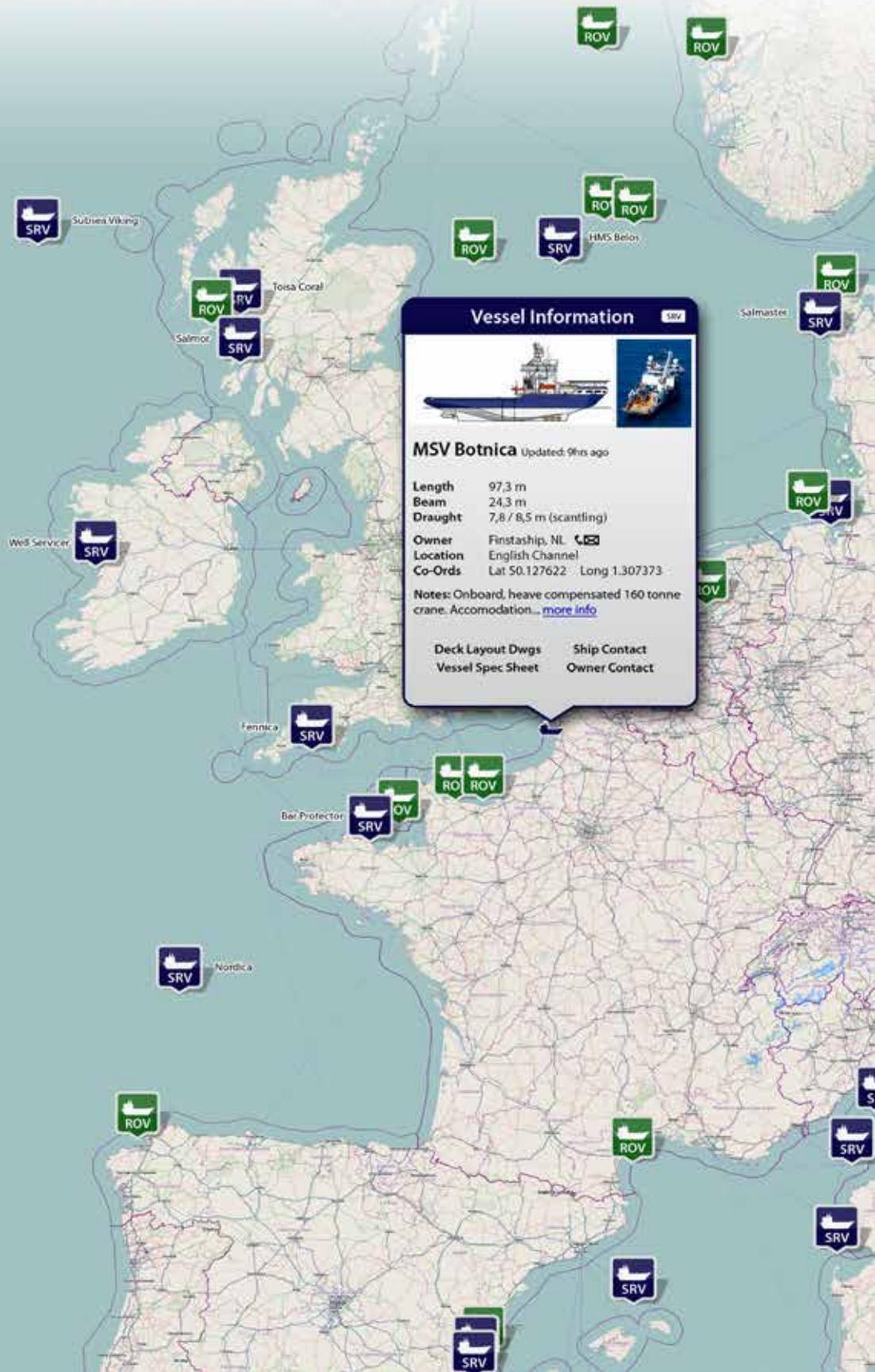


610m rated Pod Posting and Atmosphere Sampling Target for NSRS. Adjustable to 60° subsea.



Lightweight, portable Pod Posting Target capable of deployment by ROV

# Vessel of Opportunity Database





# Vessel of Opportunity Database



## Introduction

JFD tracks Vessels of Opportunity (VOO's) globally using a custom database. Updated continuously, the database lists the last-known position of thousands of Platform Supply Vessels, Ocean Tugs or other suitable candidate vessels.

This is linked to a comprehensive encyclopaedia, which provides rapid access to important information such as working deck area, onboard cranes and handling systems, dynamic positioning and contact details for vessel operators. In the event of an incident this allows suitable vessels to be rapidly identified 24 hours a day, anywhere in the world.

Since 1990 JFD has operated and maintained an active database of potential Vessels Of Opportunity for the purpose of supporting its global Submarine Rescue Service operations. The current version of the database is the culmination of many years of experience planning for and carrying out the mobilisation of submarine rescue assets.

Updated frequently via AIS (Automatic Identification System), the database combines ship location data from multiple sources and augments it with a library of technical information required to affect a mobilisation. On-screen, vessels which have been pre-qualified by JFD are colour coded, identifying their known suitability for the mobilisation of either rescue or intervention systems.

In total, more than 5000 vessels are actively tracked and the number of pre-qualified vessels increases regularly.

JFD's VOO Database may be used to support submarine rescue, search & salvage and emergency offshore operations.

## Database Operator

In keeping with the rescue philosophy of reducing the Time To First Rescue the Database Operator needs to be involved at the earliest possible stage of any rescue mission. Digesting mission-specific data provided by the Navy's Rescue Coordinator, he will immediately commence his search for a potential VOO using the database.

The Database Operator bases his MOSHIP decision on factors communicated by the Rescue Coordinator, the location of the DISSUB, information from the database, and transit times between airport and mobilisation port.

## Database Access Options

Recognising the differing needs of Navies around the world, JFD provides access to the VOO Database through a number of methods:

### Software & Training for Customer Database Operator

The database viewer software is provided to the customer for installation onto an existing or JFD-supplied PC, for operation by the customer. Weekly ship position data is provided automatically via automatic software updates, included within the monthly service charge. Familiarisation training is also included, as is a complete operations manual and a second follow-up day's training.

### JFD On-Call Database Operator

JFD's trained Database Operators will be made available on-call year round to respond to requests from the customer for MOSHIP data. JFD's Database Operator will be in direct contact throughout the process of identifying and tasking the MOSHIP. Database operation and management remain the responsibility of JFD.



Database screenshot showing North Sea Vessels of Opportunity



Database screenshot showing two pre-qualified VOOs in port



JFD offers full VOO mobilisation support