

NOFO Oil spill response “The way we train”

Paper IOOSC 2017 Ivar Kristoffersen, Operation Advisor Plans and Policy, NOFO

ABSTRACT

In a situation where oil is spilled on the Norwegian Continental Shelf (NCS) the operator is responsible for the oil spill response. To do this in a robust and efficient way Norwegian Clean Seas Association for Operating Companies (NOFO) handles the oil spill response on behalf of all member companies.

Handling an oil spill response situation in all its forms from offshore incident to beach restoration involves many different resources, skills and people. Introducing Incident Command System (ICS) as the command system for this task even increases the amount of training we need to do. How can NOFO achieve the optimal training of our common and shared response resources in a time where focus is on an effective and robust response?

Having an overview of the different response needs and response plans NOFO coordinates activity, training and exercises in an efficient way. This is done with the aid of NOFO's operative plan. The plan describes every resource with a performance requirement and puts it in to a response context. This gives NOFO a foundation to build a response that is structured and cost efficient for our members. Furthermore, this enables NOFO to tailor our training and exercises from the individual responder/resource to the complex large-scale field exercise which involves typically 250-350 people from numerous different operating companies, municipalities, governmental and private responders.

This paper will describe how we plan, train and exercise on the NCS in order to be prepared for response in an efficient and robust way.

INTRODUCTION

NOFO handles the oil spill response on behalf of NOFO's members, 27 operating companies on the NCS. Every operating company with production or exploration drilling on the NCS are members of NOFO. This is partly to have an efficient and cost-effective oil spill response and partly through Norwegian legislation which encourages cooperation in oil spill response. NOFO owns and maintain all its equipment, train all operators of the equipment, train all vessels with crew that serves as platform for our equipment and train all personnel for our operation room.

Resources available at NOFO are many and wide-ranging. In Norway we define four consequence mitigating barriers in case of an oil spill. Definition of a barrier is to limit or prevent damage or disadvantages as a result of oil escaping beyond the barrier. As described in Figure 1. Barrier 0 is handled by the operator and consists typically of drilling mud and a Blow Out Preventer (BOP). Barrier 1 to 4 is handled by NOFO. Barrier 1 being close to the source of the spill. Barrier 2 being between the leaking point and the coast. Barrier 3 being along the coastline and in the fjords and barrier 4 the beach zone. In each of these zones we have different technical, operational and organisational elements we can use as barriers mitigating the impact of a spill.

Barrier 1 and 2. For use as close as possible to the source NOFO has access to a fleet of 27 modern platform supply vessels (PSV) serving as platforms for our 27 offshore mechanical recovery systems. There is also an agreement in place to ensure shuttle tankers serve as temporary storage. A towing vessel fleet of 33 vessels from the Norwegian Sea Rescue service (NSSR) supported by fishing vessels (FV) are available too. Additionally, there are ship based dispersant systems available.

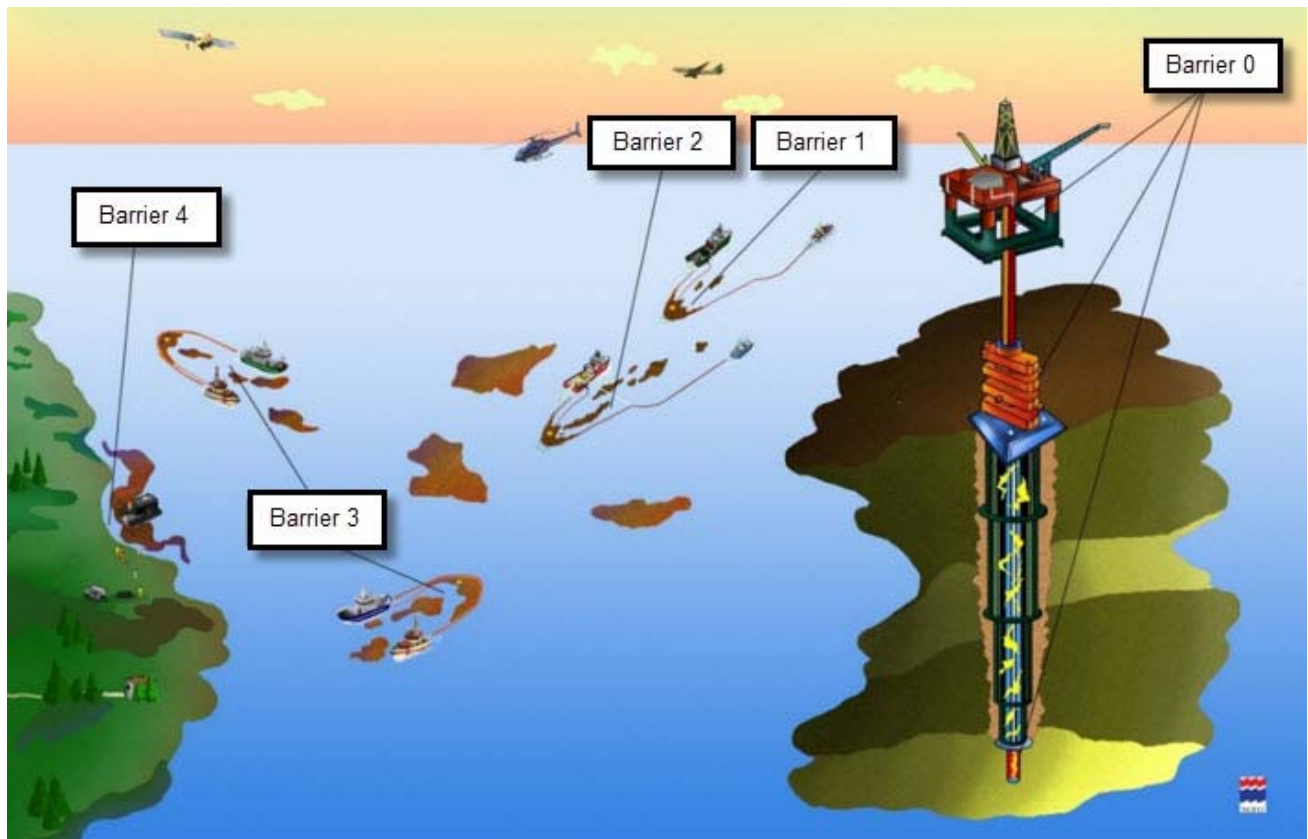


Figure 1 NOFO barriers [PTIL-2013] This figure is an illustration of the multiple barriers that are used to reduce the risk of an oil spill, prevent the oil from reaching far in case of an oil spill and mitigate the effect of an oil spill.

Barrier 3. Closer to shore we have 100 vessels of opportunity (VOOs) and 25 speed-sweep alongside conventional booming systems for mechanical recovery. NOFO also has agreements with the oil terminals in Norway for use of their equipment. In addition, we have mutual agreement plans with the Norwegian Coastal Administration (NCA) giving access to requests for trained personnel, vessels and equipment.

Barrier 4. There is Shoreline Task Force (IGSA) that is a fast, highly mobile response group set up to respond on oil at beaches, with particular focus on oil that is likely to remobilise. We have agreements with World Wildlife Fund (WWF) which has a resource pool of volunteers and also the different inter-municipality oil spill response organisations (IUA) along the coast that might be in an

affected area. There are also private oil spill responders we can draw on. On top of that we can also draw on the mutual agreement with NCA.

Surveillance systems and sensors are available in all barriers. These are comprised of aerostats, surveillance planes, helicopters, satellites and ship based surveillance systems. Different sensors include infrared camera, Side Looking Airborne Radar, oil spill detection radars or visual pictures.

We also have 24/7 response team for manning of the command post in Sandnes. There are a total of 6 teams consisting of 8 persons each. Adding to this is the implementation of ICS as our incident command system but also being adaptive allowing for NOFO to work with our members that do not operate within the ICS structure. Here we have to train according to the requirements of member response teams, handling everything from the biggest volume producers to our smallest quantity members.

WHY DO WE HAVE TO TRAIN AND EXCERSICE?

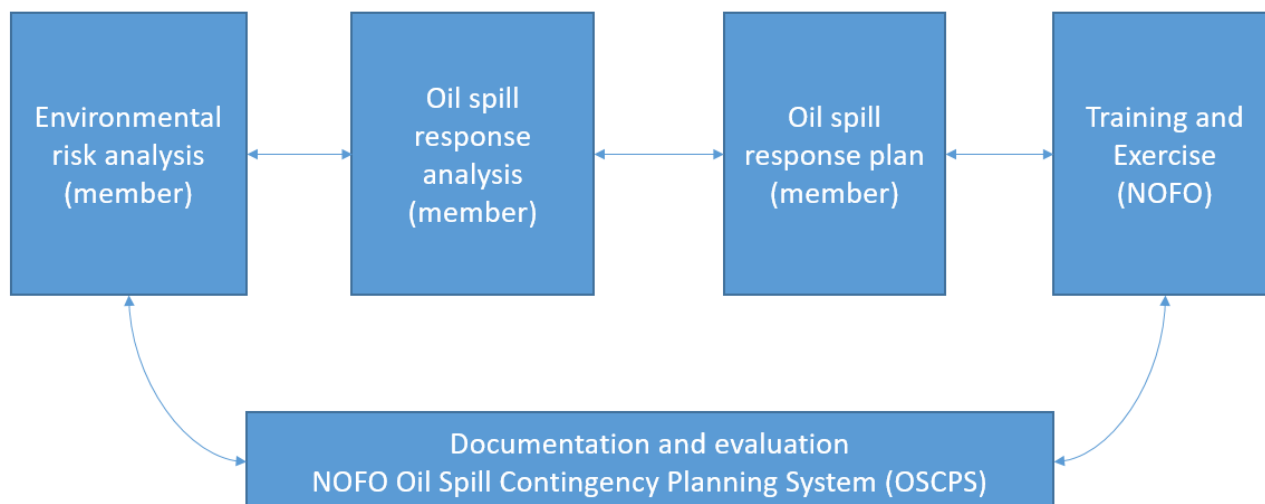


Figure 2 Norwegian risk based approach [Norsok Z-013]

In Norway the training and exercise regime within oil spill response in the oil industry has its foundation in the above illustrated process. Every activity with the potential of environmental impact, either as exploration drilling or production of oil, has to undertake an environmental risk analysis. For offshore operations this is done by simulating thousands of different oil trajectories based on 30 years of historical weather, with either a known oil, or a best guess, and a blowout rate reasonably assumed to be representative. Two simulations are then set as dimensioning, or performance requirements: the highest simulated rate limited to the 95 percentile and the shortest drift time to land limited to the 95 percentile. This would then be used to make a verdict on what could be a possible environmental impact from an oil spill and how this correlates with accepted environmental risk. Then there is an emergency preparedness analysis which dictates the performance requirements and recommendations on how to dimension for an environmental preparedness. For example, if there is a spill of 2000 m³ a day, then you need to dimension your response to handle that amount of oil each day in the different barriers. Finally, an oil spill response plan is made, with detailed lists of what is available, including trained personnel, equipped vessels

and equipment to handle the dimensioned spill. This will be a list of actual resources available all the way from tier 1 to tier 4.

HOW DO WE LEARN IN EMERGENCY PREPAREDNESS? (General)

In classic learning-theory there are two ways of learning [Sommer 2013]: Cognitive learning, often referred to as learning by doing, and socio-cultural learning. Cognitive means learning as doing something and observing/experiencing what happens as response/consequences, both in a positive and negative sense. For example, pushing a button and experiencing what happens as a result of that action. The other learning method is socio-cultural learning, or learning by observation or from a role model. For example, firemen observing the more experienced colleagues over time.

According to Sommer, Braut and Njå, there are three ways of learning outcome in emergency preparedness as shown in figure 2. [Sommer 2013]

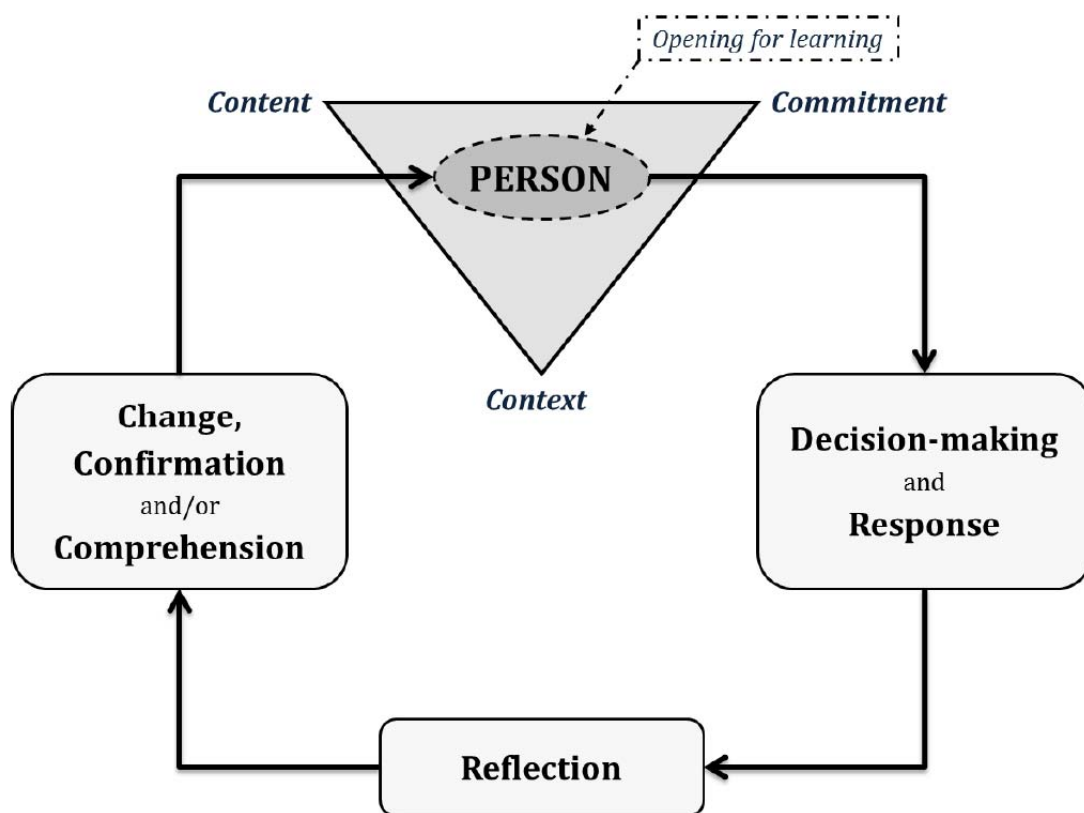


Figure 3 Theory on learning in emergency preparedness

In the centre is the **Person** as an opening for learning. The three C's have an impact on the level of learning. **Content**: a specific skill, how to interpret situations or how to use equipment. **Context**: the learning environment or where in the learning takes place, not only as the physical place of training, but could also be understood as the learning situation or input from fellow responders or as a part of both. **Commitment**: the involvement in learning activities both in cognitive approach and as involvement in participation of training activities.

Decision-making and response. Decision-making in this context is to filter out the relevant cues/information of a situation, decide on appropriate action based on relevant experience (identifying from earlier training and response) in order to have the best outcome of the situation.

Reflection is for response workers to actively interpret situations/experience on how their behaviour affects/interacts both positively, and negatively.

Learning is widely known as **change**, for example as a change in procedure, communications or buying/disposing of equipment. But learning as confirmation and comprehension are also important. **Confirmation** can be to learn that our practises and skills are also adaptive for a new situation (example new well, other companies) or to just get some feedback that existing methods are appropriate for handling of the response. **Comprehension** is to obtain a better understanding, or insight, to why existing methods work or don't work, to raise the total knowledge of our response and enable one to attain a broader perspective.

For example, in 2015 we took our boom and skimmer along with remote sensing equipment along for an exercise up to Svalbard. The aim was to gain experience for handling of oil spill equipment in cold and icy waters. An outcome of learning as change was that we need glycol for our skimmer not to freeze. An outcome of learning as confirmation was that our heavy oil skimmer with thruster can skim in the ice. And outcome as comprehension is that we can work our systems in areas with patchy ice when there is a possibility to manoeuvre between them.

NOFO OPERATIVE PLAN NOFO (OIL SPILL CONTINGENCY PLANNING SYSTEM)

With a clear object of improving NOFO and improving our international relevance, NOFO Board of directors ratified the Strategic Plan for the period 2016 – 2020 in October 2016. The main target of the strategic plan is for NOFO to ensure that our Oil Spill Response at any given time is dimensioned according to the needs of our members and their respective plans for contingency and Emergency Preparedness. This is described in more detail by Environmental Advisor Ståle Jensen. [Jensen 2017]

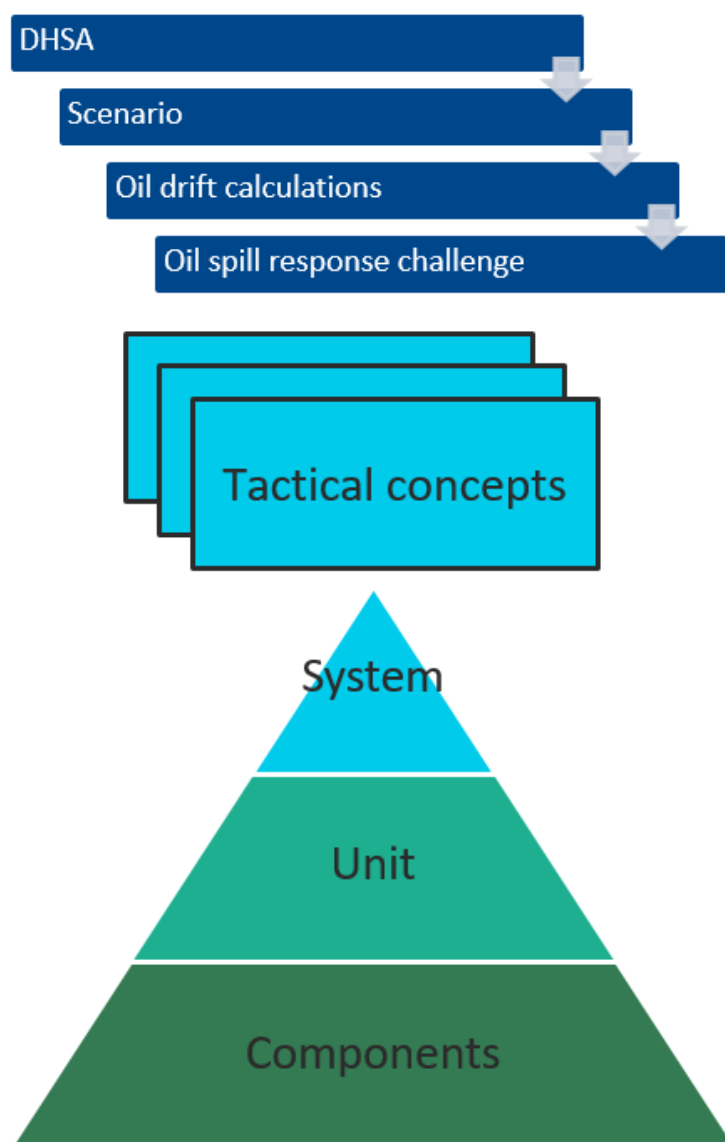


Figure 4 Tactical concepts

Definitions:

- **Defined Situation of Hazard and Accident(DSHA):** basis for dimensioning the emergency preparedness
- **Scenario:** possible outcomes of the DSHA.
- **Oil drift calculations:** simulated possible oil spill trajectories indicating potential impact of an oil spill
- **Oil spill objectives:** the problem NOFO must address with tactics
- **Tactical concepts:** as found in ICS
- **System** is a set of **units** and **Components** that gives the system an autonomous ability to operate with a credible oil spill response capacity

As previously described NOFO is the oil response organisation handling the tactics and operative control of the response whereas NOFO's members handle objectives and strategies. Based on that understanding, NOFO conducts training of resources with the aim to achieve the tactics that will be set during an oil spill response. This not only means that we must train for the use of the dispersant system but we also need to make sure that we train in such a way that we prepare our systems to act optimally in the different tactics solving the desired set strategies and objectives. One example is our training of operators of ship based dispersants. Operators of the system, compromising the vessel with its onboard dispersants equipment, are trained to ensure that the systems work. The training has to involve the elements so that we make sure we can set the system properly, manoeuvre in accordance with efficient dispersing, and have the knowledge of how and when to disperse. At the same time, we're verifying that the piping is ready, pumps works, hydraulics are in place and operational procedures works for the system to work. Looking further one must know that operators of the systems must train as a part of a wider response for example working together with other systems conducting the same tactic. This includes making sure that the

systems are keeping safe distances but also so that they are working optimally among each other. Furthermore, we know that if the spill is big enough we may have to use different tactics at the same time which means that we should broaden the knowledge so that each system operator is effective for the specific tactic they are involved in but also in conjunction with other, similar systems conducting the same or other tactics. This is also to make sure that NOFO is able to meet the requirements set by the member's objectives for an effective oil spill response.

The capacity listed for each system is used directly in the emergency preparedness plan and is evidence off the ability to handle a certain amount of oil each day.

NOFO also participates in the Global Response Network (GRN). This allows for knowledge and experience being circulated among members giving NOFO useful insights in how things are done in other response organisations and enabling participation on others training and exercises.

NOFO PLAN FOR TRAINING AND EXERCISES

Training and exercises are important for NOFO. Focus on time and resources are key, especially in times where we want to have more efficiency and effectiveness. To be able to boost cost efficiency and to maximize the use of time during training and exercises one needs to be able to have a consistent approach so that we meet the objectives from our members with our tactics [see figure 4].

Overall NOFO likes to think of training as a staircase. Start off with learning the basics, move on to the next level when you are ready and then progress further along in company with others. The background for this is based on the notion that you just can't walk in to a full scale exercise if you haven't learnt the basics. One other thing is that in NOFO we consider there is a difference between training for the individual and exercise for multiple players. We furthermore describe the following different types of exercises with either functional, table top, role play exercises and full scale

exercise. A functional training can then be to have deployment of boom from a vessel or a have a table top training with NOFO response team at the command post on writing orders to response personnel. Or an exercise combining the response team training on writing orders for NOFO on-scene commanders, sending the orders out and having the on-scene commanders acting on those orders, that may be orders to deploy their booms. So now we have both trained and exercised the same elements allowing for a broader perspective of learning.

In Norway, we are fortunate to have a National curriculum for oil spill training. [National Curriculum]. This curriculum is overseen by the NCA but with vital input from among others at NOFO. This is to provide uniform training in oil spill response and quality in training. In addition, due to legislation dictating cooperation in oil spill response, we draw on many of the same resources.

NOFO offers a variety of courses based on the described curriculum. There is a web based course acting as an introduction in the basics of oil spill response. And at our facilities at NOFO we arrange courses directed towards operational personnel onboard vessels and aircrafts. For our members, courses focus more on how NOFO is organized, what equipment we have and how we cooperate with our members in oil spill response. There are also courses that focus on interaction between NOFOs operation room and our member response organisations. Courses in meteorology, remote sensing/surveillance and use of dispersants are also available.

Courses at The Norwegian Fire Academy (NBSK) includes basic courses in oil spill response in barrier 4. These courses are to senior level management in the field, courses in material training, cold weather response and towards shoreline response through the IGSA.

For every emergency preparedness position within NOFO oil response there is an individual description for what qualification that person should hold. Listed here we find the qualifications one needs to have for that position, what courses/training the oil spill response branch need to give and what level of participation one needs to retain their designated role through a training period.

This participation includes attending the command post training, learning one's individual role within ICS, training that role within the appropriate section and with other sections. Full scale training includes participation of our member response organisations including resources in the field with deployment of equipment. This is a way to train through the system building from learning the role and tools for each position through working the role in a section and to other sections thus in the end being a part of exercises for the whole response organisation either as an internal role play or as an exercise towards one of our member response organisations.

DIFFERENT FORMS OF TRAINING AND EXERCISES

In order to train an oil spill response system, we have to look in to the following. What are the described capacities of that system, and off what unit/components does it consist. Units and components of a system can be type of boom, type of skimmer, type of vessels and type of storage. Then one needs to establish what the level of training each system should have, including that of the personnel to operate the system. Should we then just train the operators of that system to handle the system and give them competence and confidence for that, as learning by change? Or should we furthermore prepare them for working within one or more tactics, in command elements and in other systems configurations, as learning by confirmation and comprehension?

For each response system, we have a matrix (Figure 5) describing the number of training and exercises that each system shall have during a training period. The matrix lists the elements that the training should incorporate with report as a summary for further training. So for each system to be able to perform in all tactics all the necessary training elements are listed. For example, dispersant system training may comprise testing the nozzles and the pump, rigging the equipment and checking that it works properly, from rigging the dispersants equipment and spraying water, through further training with aid from a surveillance plane practising hitting fixed targets on sea.

Date	Exercise nr.	Base	Vessel	Towing vessel	Type of exercise	Operator	NOFO Standard
02.06.2017	2017-01	Stavanger	Esvagt Bergen		Verification mechanical/dispersation	Statoil	2005
17.02.2017	2017-02	Mongstad	Stril Merkur		Verification mechanical/dispersation	Statoil	2005
03.02.2017	2017-03	Mongstad	Stril Herkules	Ankerfisk	Verification mechanical/dispersation	Statoil	2005
03.03.2017	2017-04	Mongstad	Esvagt Stavanger	RS Bergen Kreds	Verification mechanical/dispersation	Statoil	2005
06.03.2017	2017-05	Stavanger	Skandi Hugon	Esvagt Celeste	Verification mechanical/dispersation	CoPNo	2009
08.03.2017	2017-06	Mongstad	Havila Troll		Verification mechanical/dispersation	Statoil	2005
	2017-07	Stavanger	Stril Mariner		Verification mechanical/dispersation	AkerBP	2009
21-22.02.2017	2017-08	Stavanger	Ocean Response	Bøen	First training/boom/dispersants	Statoil	2009

Figure 5 Example of Training Matrix

Furthermore, for each system we have a description of each system (See figure 6). In this description we list the following;

- Name of the resource.
- Documenting the need of this resource.
- Role at NOFO for this resource.
- A description is given in terms of deliverables including endurance, training period, limitations if any and costs of this system.
- Description of what equipment the vessel can operate.
- Level of training.
- NOFO internal evaluation.

This allows for NOFO to keep track of all our exercises in one system. The advantage is that it is easy to maintain our resources. The information about the resource is ready available giving us a live status of that resource. We can plan for resources who have trained to join in to exercises along with others or to train with other equipment.

Resource	Platform Supply Vessel (PSV)
Department in NOFO	Preparedness dept.
Section	Main office Sandnes
Pursuant	Legislation NOFO working group recommendation NOFO general assembly Oil spill response plan
Delivery	Available to NOFO as platform for offshore equipment. Vessel ready for conventional boom system, speed-sweep system, dispersant system or as command vessel. Needs to be delivered to NOFO in accordance with agreed NOFO standard
Training	Yearly training of all crews and relevant equipment.
Training frequency	Twice each year.
Cost	Budget of exercise
Evaluation of resource	NOFO internally.

Figure 6 Example of description of resource. Sharepoint list translated to English on this occasion.

All training and exercises are then documented through either a diploma for completed courses, and/or registered in the response person's training log for attending system training or exercises. In addition, a training report is made for each training of a system or big exercise. These reports are available for later use, either as information to future use or as documentation of what happened. It is also listed in the training matrix making it easy for NOFO to keep track of where the overall training level is.

CONCLUSION

Achieving optimal training of our response resources in a time where focus is on an effective and robust response is more important than ever. If you're going to be cost effective in your training and exercises, establishing a good overall plan is paramount.

NOFO's primary goal is to establish, administrate and maintain an oil spill response on the NCS. To achieve this, we need high quality courses combined with proper training objectives. We need to administrate it in such a way that we can solve the challenges of today as well as the ones of tomorrow.

We have a system in place for training the whole spectrum of our portfolio on a regular basis, and we have processes in place to constantly improve our own training.

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