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AN INTEGRATED MARITIME PROTECTION CONCEPT

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1 EXECUTIVE SUMMARY

Increased commercial activity along the coast and ocean areas of Norway increases the risk of having incidents or fatal accidents. The environmental fragility also increases as the activity moves further north and into the Arctic areas. To limit the effect of incidents it is imperative to establish emergency response systems that can handle the various situations and to ensure that these systems can be employed rapidly.

The responsibility for the general emergency response systems rests with different public authorities introducing a bureaucratic challenge the establishment and operation of the systems. In addition, some commercial actors (i.e. the oil companies) in the various areas are bound by provisions in their licence terms to establish emergency preparedness systems and procedures to reduce the risks and environmental effects of their activities. In general it is demonstrated that the different bodies could all benefit from co-operation in the process of establishing improved emergency response systems.

A new vessel concept called “Area Field Surveillance” has been adopted for two designated areas of Norwegian waters. The concept has been developed by the major operating oil company (Statoil) and industrial partners. The vessel is equipped with oil spill equipment and booms, emergency towing capacity, fire fighting equipment, rescue crafts, helicopter facilities, a (on-site) response centre and a hospital. It can operate in rough weather situations and top speed is in excess of 20 knots. The vessel can be modified to cover most needs of modern emergency response systems and procedures.

2 BACKGROUND

The Norwegian Coastline is about 83.000 km and hence one of the longest in the world. About 40% of this is located north of the Polar circle which is a fragile area from an environmental aspect. From a sea area point of view the picture is different. The areas controlled by Norway is much larger north of the Polar Circle. Commercial activities that will effect the environment are performed in all these areas today, but more important is the plans for up-scaling of the activities in northern areas, especially in the petroleum sector. Plans are available for extensive developments on Norwegian sector and not the least, in the Russian sector.

Needless to say increased activities increase the risks of having incidents that can be disastrous for the environment and for other traditional commercial activities like fishery. Fishery has traditionally been the main commercial activity in the northern parts of Norway and the political signals are that no other activities will be allowed at the expense of the traditional activities.

Norway has adopted the "Polluter-shall-pay" principle. This is the basis for NoFo (Norwegian Clean Seas Association for Operating Companies) established by the oil companies. It is also the legal foundation of the CO_2 tax and other "green" taxes imposed by the authorities. When it comes to ocean areas it will not be efficient to have one system for oil pollution incidents, one systems for vessels in distress etc. However, to integrate various forms of emergency responses is complicated because it involves national and international authorities and regulations as well as commercial actors.

Safety for the marine environment, personnel and installations has for a long time been given the highest priority for all activities on the Norwegian Continental Shelf (NCS). The activities are controlled by :

- Department of Fishery (incl. Coastal directorate)
- Norwegian Petroleum Directorate (NPD)
- Norwegian Maritime Directorate (NMD)
- SFT

All these bodies have different duties, but all have a link to activities in ocean areas.

3 CHALLENGES

3.1 ACTIVITIES MOVING NORTH

In the southern areas of the NCS there is about 60 installations (including mobile drilling rigs) of various kinds and most of them are integrated in some safety system governed by the operator. Thirty years ago the activities were concentrating on shallow water (<100 m) using fixed structures positioned on the seabed. As promising structures were located on deeper waters, the next drive to challenge technology was to go "deeper". Now, the drive is to go north and we see that the operators are pushing to get licensees further north and into the Arctic areas. There are additional challenges attached to these areas:

- Cold climate, icing challenges during winter season

- The area is large. The undisputed area of the Norwegian Sector of the Barents Sea is about 650.000 km^2. [See Figure 1]. Compared to the North Sea area, this area is much larger and the density of human activity is much lower.
- Polar nights. North of the Polar Circle there are polar nights meaning that the sun will be below the horizon for parts of the year. In this period visual detection of oil spills or doing rescue work faces the additional challenge of dark.
- Low temperature means low break-down rate of contaminants
- Low temperature means low viscosity and thereof poor pumping conditions of an oil spill (depending on quality of the spilled oil)
- Seabirds are especially volatile to environmental changes.
- The North is an important growth area for important pelagic fish

Any operator has to substantiate that his activities will handle these challenges in a satisfactory way.

3.2 TIME ELEMENT

The best way to stop or limit the consequences of an oil spill is to be on site as soon as possible with right equipment. Since the distances are large, it is a challenge to find systems that will give reasonable detection and response times. In addition, fog may make it difficult to locate eventual spills.

In the Norwegian Sea there is quite a lot of installations having various kind of rescue and oil pollution equipment. Quite a few vessels are fitted with so-called OR equipment that enable them to collect oil spills using skimmers etc. These vessels will generally have about 1000 cubic meters available of tank capacity. This is about 3 per mille of the cargo of a VLCC so if such a vessels comes into a distress situation, it is important to limit the area affected. The best only way to do this is rapid response.

When it comes to available oil booms, these are stored at various stock points along the coast [See figure 1]. If an oil spill occurs, offshore vessels capable of picking these up will pick up the booms and employ them where needed. Needless to say, crucial time may be lost in this process. Some vessels have booms and/or skimmer systems permanently installed, but these are of low capacity type.

Dispergants are another means of reducing the environmental impact of an oil spill. Basically the dispergants are sprayed over an area and helps the spilled oil to dissolve more easily in the sea water. The effect of this method is depends heavily on two parameters; time until deployment and the quality of the oil. And again, the sooner the better.

3.3 OIL TRANSPORT

An area that has brought a lot concern in Norway is the increasing transport of crude and fuel oil that is passing the sensitive areas on its way from Russia to the refineries on the continent or elsewhere in the world. Russian interests back large scale oil field developments in North Russia both on and offshore. The Barents Sea, being ice-free during winter time, offers an efficient way of transport of oil products. The challenge for Norway is that all these vessels will inevitably have to pass the North Cape on their way to their destination. The route closest to the coast will be the shortest and Norway has no legal right to force the vessels out to more than 12 nautical miles. So the challenges is: What to do when these vessels loose their power or lose their direction and run ashore?

The increase of the "Russian Transport" is estimated to about 50 shipments in 2003 to about 700 per year in 2007 (each shipment 100.000 tons and more). This equals about two vessels per day and hence constitutes an increased incident potential. Traditionally, the term "Russian Tanker Traffic" used for this transport has been linked to use of substandard vessels. Combined with IMO phase out regulations for single hull tonnage and the oil companies vetting procedures the standard of the fleet has increased considerably. However, still substandard vessels exist and unfortunately their cargo is fuel oil or fuel oil equivalents. This type of cargo is not so attractive to tanker owners due their "dirty" nature. Oil spills of these types of oil is more damaging than conventional crude spills because the cleaning process is more difficult and expensive. This is clearly demonstrated by the Prestige incident.

The oil transport in question here is operating in international waters. The activity is perfectly legal according to international regulations. In this case Norway have no means of forcing the tanker further from land. The common perception is that this tanker traffic represents maybe the largest threat to the environment in the North Cape area. To reduce the risks, Norway will have to employ other means of reducing the risk i.e. establish emergency preparedness systems. The Ministry of Fisheries has enforced a preliminary emergency preparedness system by chartering some older towing vessels.

3.4 COLLABORATION

Today along the Norwegian Coast several bodies have different responsibilities in an oil spill or emergency response situation.

The oil companies' "tool" against oil pollution is the so-called NoFo co-operation. They have 14 sets of 400 meter booms and skimmers (Transrec 350) spread around the coast. The Norwegian Coast Authority have booms on places along the coast and these are operated by local communities in agreement with the SFT. The Coastal directorate operates 8 smaller vessels that are equipped with skimmer and ocean booms. In addition to this 21 inter-municipal groups co-ordinates the oil spill clean-up operation locally. These are set-up with personnel (local fire squads, resource groups and employees from the local communities).

When it comes to vessels in distress (tankers or other vessels which all have bunkers) the responsibility is with the Ministry of Fisheries. So if a tanker has lost its power, it shall first the responsibility of this department and their systems and then, when the situation grows worse, the vessel runs ashore and an oil spill threatens, the responsibility is moved to SFT.

To establish an efficient system for maritime protection in a wide sense will inevitably involve quite a lot of actors. These have different needs and perception of the challenge. If it is decided to scale-up activities, these will have to work together. Separate system will be more expensive.

Actors with different roles in protecting the maritime environment are:

- Norwegian Authorities
  - NPD
  - Ministry of Fisheries / Coastal directorate
  - Environmental dept
  - Local communities / Inter municipalities
- Operators
  - Oil companies

  - NOFO
  - Sub-contractors
- International Maritime Organisation
- Shipping interest
- Product development companies
- Environmental organisations

To get all these bodies to co-operate is challenge. They have different goals and different time horizon for their activities.

4 CONCEPT

4.1 TRADITIONAL STANDBY AND RESCUE SERVICES

In the North sea, the installations have a system of using stand-by vessels that at all times are in position in the neighbourhood of the installations. The vessels have emergency pick-up vessel and other equipment to save people. Some have fire fighting equipment and some oil recovery systems. The fleet consists generally of older offshore vessels, re-fitted fishing vessels, whalers and other types of merchant vessels. The average age is quite high.

4.2 HALTENBANKEN AND TROLL AREA SOLUTIONS

In a attempt to modernise the duties of the stand-by vessels, the operators entered a project call Area Field Surveillance. This concept is to replace a set of stand-by vessels with larger purpose made vessels that could reach each installation it should serve within 4 hours. This was made possible by increasing the response time 30 minutes and compensate this by having better equipment onboard. This has been done and today two vessels operate in the Haltenbanken area and the Troll Area. The reason for that these areas were chosen is twofold. Firstly, geographical reasons made it sensible for the operator and secondly, in both these areas there are large operators that reduce the bureaucracy of the process.

4.3 CONCEPTUAL IDEA

The conceptual idea is to divide the international areas in to sub-areas where a special purpose surveillance vessel is placed. The vessels are equipped to accommodate the needs of all the parties have responsibilities in the area.

- Oil spill equipment
- Towing capability
- High speed (20+ knots)
- Fire Fighting equipment
- General Rescue equipment incl. Daughter craft
- Equipped with oil spill booms
- A highly equipped emergency control centre
- Advanced equipment for modern emergency response
- Helicopter pad

The number of vessels will be a function on requirements of response time to all locations. This will increase the safety level in the areas substantially.

4.4 FINANCING AND OPERATIONAL COSTS

The cost for operation of on vessel is in the region of 50 mNOK per year plus bunkers. The number of required vessels will be a function of response time required. Compared to a major incidents, this cost will be rather low.

Since the vessel is capable of serving for different parties simultaneously, it would be fair that the cost for the operation is shared among these parties. The oil companies need stand-by or field surveillance in addition to oil spill equipment. The Ministry of Fishery needs vessels capable of emergency towing of vessels in distress to prevent them and the environment from further damages. The SFT and NoFo organisations need to get oil spill booms and equipment on site as soon as possible. With a vessel like described in this paper, these needs could be combined. A proposal could be to share the cost between the commercial activities (operators) and the public activities. The funding distribution formula could be altered in areas where some needs are lower than elsewhere.

Another source of funds for field survey system could involve passing ship traffic, like having a tariff system for the passing tankers off the Finnmark Coast. International regulations of free travel on seas will make such a system hard to implement and if possible at all, be time consuming. However, likewise the "Polluter-Shell-Pay" principle, a similar principle "Risk increaser shall pay" should be adopted.

5 AREA FIELD SURVEILLANCE VESSEL – "THE SAFETY MACHINE"

As discussed before, in two specific areas in the North Sea special purpose area field surveillance vessel are deployed. They are quite similar in intended use, but differs somewhat in design. Below is a description of the Stril Poseidon operated by Simon Møkster Shipping in Stavanger and is employed by Statoil for the Haltenbanken area. This vessel was the first of its kind and has operated for about one year.

5.1 VESSEL INTENTIONS

In the Haltenbanken Area, a few installation are positioned close to each other (Draugen, Norne, Njord, Heidrun, Åsgard fields). Traditionally all these installations had a stand-by vessel positioned on its side. These were either old re-fitted fishing vessels or modern anchor handlers with rescue and oil spill equipment. To rationalise the stand-by and emergency preparedness system for these installations, it was decided to replace the bulk of these vessel with a single purpose vessel that more or less permanently could be used on the field.

5.2 VESSEL MODES

Stril Poseidon has various modes. Below is a description of the main emergency preparedness modes, which is developed through a co-operation between Vik-Sandvik Ship designers, Aker Yards, Statoil and Simon Møkster Shipping.

5.2.1 OIL SPILL

When an spill occurs, it will be recorded on a shipboard display which provides its exact position. The ship can then sail at its full speed in excess of 20 knots to the polluted area and initiate clean-up measures.

Oil recovery equipment is stored under cover, protecting it from icing, extreme heat and other tough climate conditions. It can thereby be deployed easily and quickly.

This equipment comprises:

- 400 m of oil spill booms (similar to the ones stored in ashore depots)
- a local buoy for gathering important oceanographic, meteorological and environmental data
- different types of oil booms for oil spill recovery, deployed from a dedicated pickup boat
- oil skimmers outfitted to collect heavy and light oil
- dispersing agents (chemicals to dissolve oil)

Stril Poseidon can receive real-time signals from a radar satellite able to monitor wide sea areas for oil spills, even in total darkness.

Stril Poseidon is designed so that a helicopter can pick up dispersing agents from the ship, and work simultaneously with and independently of oil booms and skimmers.

A heated storage tank for recovered oil has a capacity of 1.000 cubic metres. The ship can also pump recovered oil directly into a tanker or other reception vessel.

5.2.2 RESCUE

Designed to operate in rough seas, Stril Poseidon's high speed in excess of 21 knots allows it to cover wider areas with shorter response times. The ship has one Daughter craft and two more rescue boats able to operate in rough seas at wind speeds up to 40 knots.

A unique feature of the vessel design is a patented slip-way, which allows free-fall lifeboats to be winched abroad much more safe than conventional rescuing systems. This construction results from much research and modelling, and means that people can be rescued safely even in very rough weather. The conventional way of take-up of personnel from lifeboats is alongside and this may be a quite hazardous operation if the weather conditions are poor.

Lifeboats and Daugher Crafts can dock easily and safely with the slip-way even in wave heights up to 10 metres significant. Once a lifeboat has been winched into the protected area, the gate is closed and survivors can safely leave. The Daughter Craft can be launched in same conditions for new rescue misson. The efficiency of this system is unique.

Survivors will be moved from the lifeboat to the shipboard hospital for any necessary first-aid. A lift also connects the hospital with the helideck, making it easy for survivors to be transferred for air transport to shore. The Stril Poseidon can accommodate 370 people in extreme circumstances.

5.2.3 EMERGENCY TOWING

Stril Poseidon's towing capabilities allow it to prevent drifting vessels or objects from going aground or hitting offshore installations. With 150 tonnes of bollard pull, a VLCC tanker loaded with 300.000-tons of crude can be towed into a safe area or at least prevent it from running aground. Various countries are planning designated emergency harbours which can be utilised to limit the spread of oil pollution. The vessel concept is perfectly suited for maintaining a stable situation until further tug assistance can be obtained for safe manoeuvring into the designated area.

The ship is also equipped with a rescue gun, which fires a grapnel able to penetrate 16 mm of steel. This gun can be used when a vessel in distress or other steel object is drifting towards an installation and threatening to cause a disaster. All tankers are today fitted with emergency towing systems aft and forward that increase the chances of securing a towing line.

A pickup boat is carried to provide assistance when a tanker or another vessel is in trouble. This boat can deliver experts or other assistance, assist in emergencies, and dock easily with the slip-way.

5.2.4 FIRE FIGHTING

Stril Poseidon has two fire-fighting monitors with following capacities:

- length: 180 metres
- height: 110 metres
- capacity: 7 200 cubic metres per hour [FIFI class II]
- sprinkler system

This equipment has sufficient capacity in terms of volume, length and height to cover the most extreme cases, including platform cooling in the event of blow-outs.

5.2.5 RESPONSE CENTRE

The vessel serves as a floating control room, with internal co-ordination between bridge, engine room, work stations, hospital, pickup boat and conference room. It also has excellent communications via satellite, VHF or fax with land, helicopters or other ships.

5.3 UNIQUE TECHNOLOGY /IMPROVEMENTS

Based on the experience with the Stril Poseidon, the owners have identified several areas of improvement. The main topics are:

- Improvement in the oil boom handling by using smaller boom that that can be deployed using a small tug type mob-boat with 5-7 tons of bollard pull. Today's system require assistance from other vessel
- Arrangement of the mob-vessels should be re-arranged to optimise the onboard handling.

5.4 ENVIRONMENTAL APPROACH

The vessel is equipped with state of the art systems for reduction of emission of climate gases. The vessel has class notation "clean class" from DnV. This means that the vessel has low emissions (per kW used) than vessel that not has this notation. A "urea" type of system is employed to reduce the NOx emission. The experience so far is that about 5-6 tons of marine diesel is needed to power the vessel in general operation. This include all presents activities.

6 CONCLUSIONS

The message from this paper is that use of an area field surveillance vessel as described will increase the safe level of the various activities near shore and offshore by offering on-site safety systems of high quality.

The various actors (national authorities and commercial operators) should work together to establish systems based on the available technology.

The concept involves state-of-the-art technology and can be adapted to other coast and offshore areas.

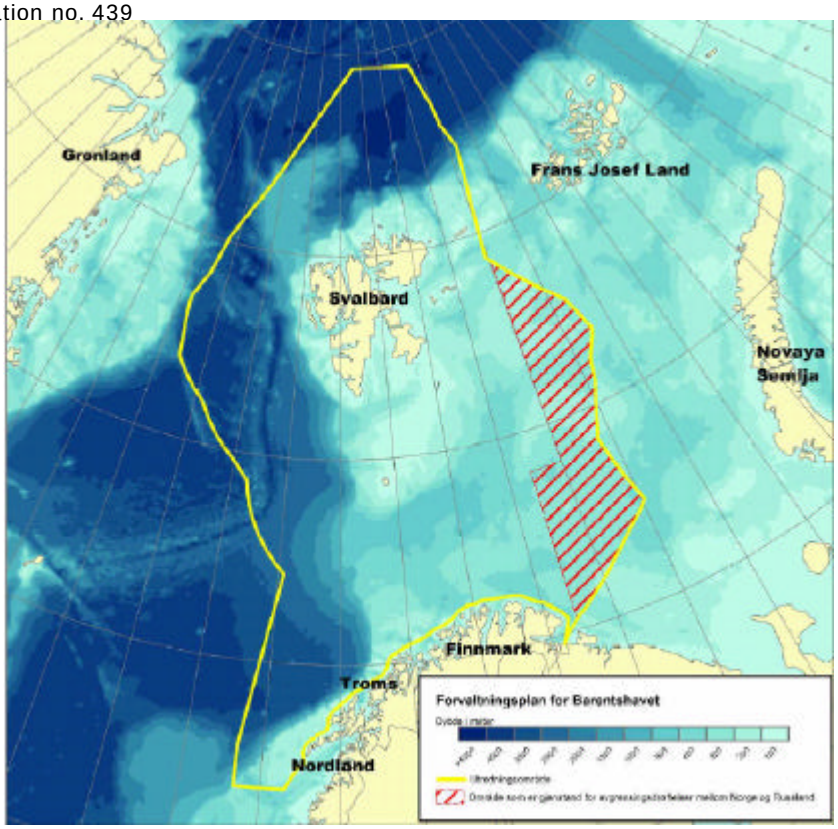

Figure 1, Barents Sea

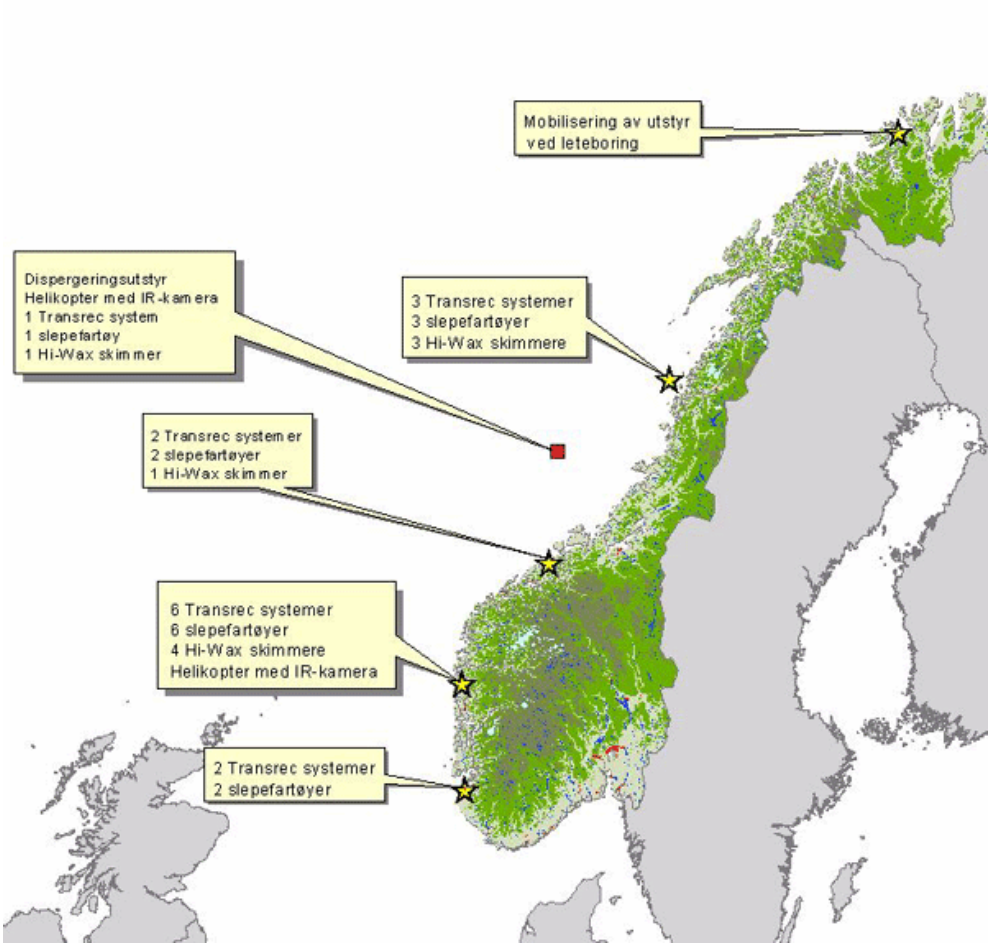

Figure 2, NoFo Depots