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OPERATIONAL RESPONSE TO THE INCREASED ENVIRONMENTAL THREAT TO THE NORTHERN COAST OF NORWAY

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LIST OF CONTENT

1. ABSTRACT

An increase in transport of crude oil in large tankers from northern Russia to the western markets has dramatically increased the risk of ship accidents along the coastline of northern Norway, with serious threats to the local environment, the coastline and related fishing interests.

To counter this threat the Norwegian Authorities have initiated several actions, including the establishment of an enhanced emergency cargo offloading capability and the stationing of emergency towing vessels (ETV's) to ensure timely aid to damaged tankers. The Norwegian Tug and Salvage company Buksér og Berging AS has recently been awarded contracts to increase the provision of such services in the area.

This paper describes the risks arising from these crude oil transportations and looks into the prognosis for future development. Further the paper identifies and establishes a concept to encounter the threat, taking into account commercial and government factors including:

- Description of the new environmental threat.
- Prognosis for future development in the area.
- Identification and establishment of a concept of operations with a pre-positioned and dedicated quick response capability within the higher risk areas.
- Identification of special requirements for future emergency towing services (ETV).
- Evaluation of onboard equipment including emergency offloading equipment, first aid hull repair facilities and recent development in towing techniques.
- Implementation of 90 years of salvage-experience based on the philosophy "when safety counts".

2 THE THREATS – PRESENT AND FUTURE

The threat posed by a dramatic increase in the amount of crude oil transported by tankers from northwest Russia along the Norwegian coastline to the western markets over the last years is of great concern to the authorities. For the southern and western Norwegian coastline adequate and timely response by towing vessels can be relied on from tugs and salvage vessels normally employed by private enterprises. However, such private activities are not sufficiently present in the northern areas of Norway and this fact has highlighted the need for establishing of a government support of oil spill and salvage response capacity in this area. Since there is some uncertainty of the plans and prognoses related to the magnitude of the oil production in northwest Russia, the figures, which follow, should be regarded only as an indication.

Based on information from the Norwegian Coastal Directorate (Kystverket) (Ref /2/) the area graph below, Fig 1, can be used for illustration of annual oil transport from Russia to Europe / USA market.

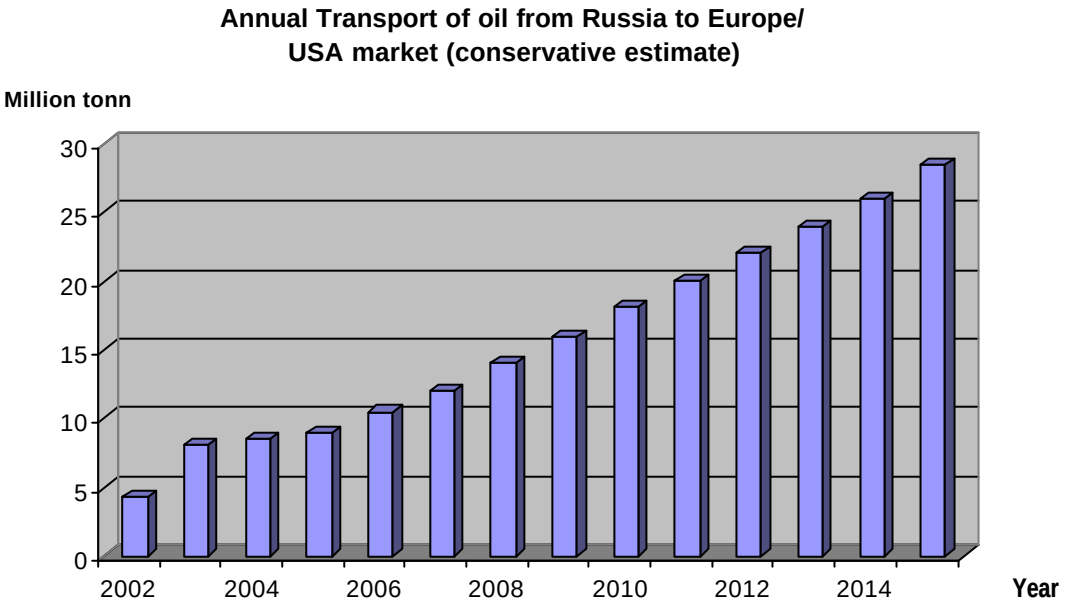

Fig. 1

For the year 2002, the figures collected by the Norwegian Navy verified one shipment of oil every second day along the Norwegian coast (168 tankers, approx. 3 mill tonnes). Ref /4/. This frequency and amount of oil transported by tankers has been achieved much sooner than earlier estimated. The origin of this oil is Siberia and the oil is transported by rail to harbours in northwest Russia. The vessels vary in size from 20.000 to 100.000 DWT and were in 2002 normally sailing 6 – 12 NM off the coast of Finnmark and Troms in northern Norway on their way to destinations in Europe or the US.

There is also a significant increase in oil - and gas production activity offshore NW Russia and the Barents Sea. Estimates of up to 40 mill tonnes/year in 2010 have been made. Ref /4/. Transport of crude oil from these fields may be performed by 20.000 – 60.000 DWT Shuttle Tankers with Ice Class to ice-free Russian harbours and from there on by larger tankers to final destinations. Russian authorities and oil companies are also aiming to

transfer oil cargos from smaller Ice classed ships to larger non-ice classed tankers by ship-to-ship transfer, (STS) outside Kirkenes in northern Norway. Such practices have already started.

The Ministry of Fisheries is the responsible body for environmental protection of the Norwegian coastline. The ministry have estimated one 30.000 DWT in northern Norwegian waters every day in 2005. Dependant on whether and when the above pipeline will be in operation a forecast of between one (1) and ten (10) 100.000 DWT will be sailing in northern Norwegian waters to or from Murmansk every day by the year 2015. Ref /6/.

Other threats include the ore shipments from Narvik in vessels up to 80.000 DWT with substantial amounts of bunker fuel onboard.

The Norwegian gas field, Snøhvit in the Barents Sea, will start production in 2006 when there will be approx. 90 gas shipments on 145.000 cubic LNG-carriers pr. year.

Eventhough the estimates are uncertain, they show a clear trend and a strong increase in risk, mainly related to;

- the increase in crude oil transport from northern Russia
- the increase in oil/gas production activity in the area

Accordingly, break down of rudder, main engine, navigational error will imply environmental threat of very great magnitude. Especially so in this geographical area with harsh weather conditions are predominant. Sufficient resources are normally not available to prevent the vessel from grounding.

3 CONCEPT OF OPERATIONS

The responsibility for the protection of the environment lies within the Norwegian and/or Russian governmental authorities. In practice there was an agreement between the countries of mutual assistance in case of an oil spill before the break-up of former Soviet Union. Since the early 90's, a formalised agreement in terms of assistance between Norway and Russia has been established.

Only a few years ago, this was one of the most sensitive areas and "point of touch" between NATO and the WARSAW pact. The recent oil development in Russia has been fast and there is a significant amount of uncertainty within the area.

Before the establishment of long term plans, there is need to establish the acceptable risk level and the probability of accidents due to engine failure, rudder failure, collision, fire, material failure or navigational failures. This must be related to the type of preventative measures. The main component of these measures is to increase the timely access of relevant vessels, equipment and competent personnel.

For illustration purpose, the figure below (Fig. 2) indicates the level of relative risk versus various oil spill response measurers by means of availability of different type of vessels being in position to assist a tanker in distress.

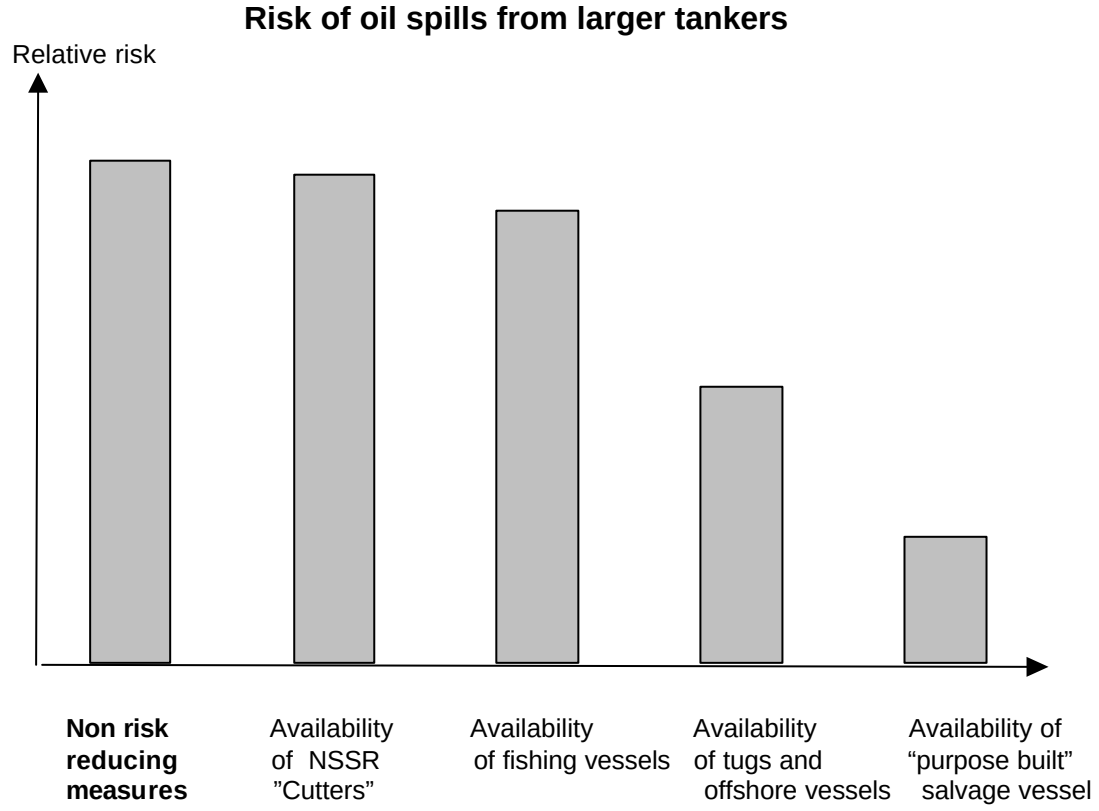

Fig. 2

Some characteristics of these very different types are mentioned below:

"Cutters" are smaller lifeboats or rescue vessels. These are mainly used to rescue personnel, and save the lives of seamen in danger at sea. "Cutters" of the larger size may also assist vessels for a shorter period until more relevant vessels are mobilized. They are often available on short notice and can be used to assist for various operations including the handling of towing lines, oil spill prevention and others.

Nobody now seriously consider the fishing vessels as a main salvage vessel of the ETV service in northern Norway. Having said that, it is agreed that fishing vessels might play a useful role in assisting, supporting and complementing other resources.

The ability to connect and tow a drifting ship is of course the prime response, but special Emergency Towing Vessels (ETVs) are costly. Therefore, it is important to seek a solution where the vessels and equipment can be used for other activities than just patrolling and standing by for possible emergency towing. Further it is important to give crew and equipment the opportunity to practice in real life to ensure proper handling when needed in an accident.

Obviously attractive combinations involve the use of both tugs and salvage vessels, fishing and offshore vessels that already are in the area and engaged in their prime activities.

In addition to the capabilities of oil response vessels and experienced operators of same, there are other relevant factors for risk reduction, such as specified sailing routes and notice routines. Such factors also relate to the overall cost benefit judgement on how to apply the best resources to form an acceptable risk level to protect our vulnerable coastline.

The main challenge is to be able to establish measures to ensure significant risk reduction measures by sharing the costs of resource provision and training with other commercial interests and the authorities should seek long-term solutions to reach the optimum cost – benefit result.

4 RESPONSE FACTORS

There are mainly three factors affecting the result of an emergency operation:

a) Response time
b) The availability and utilisation of resources
c) Chain of commands and lines of responsibility

a) Response time

Experience has proved that the response initiated immediately after the first alert / alarm has been given is of the greatest importance for the successful result of the operation.

b) Availability and utilisation of recourses

The salvage industry has over the last couple of years entered into several arrangements to ensure access to local material and equipment when needed. As an example Buksér og Berging AS (BB) was a main sub supplier of vessels, equipment and personnel when the Rocknes so tragically capsized earlier this year. BB enters similar arrangements with smaller and more local suppliers for supply of resources and equipment often needed during salvage operations. Such resources might include provision of local divers or vessels already in the area. As always there is a balance to be struck between response time and the availability of recourses.

c) Chain of commands and lines of responsibility.

Evaluation of previous accidents has shown that lack of chain of command and responsibility often results in an already difficult situation to worsen. In the aftermath of the "Sea Empress" accident, great efforts were put into investigation of this matter in the UK. The investigation lead by Lord Donaldson resulted in the well-known Lord Donaldson report, which in turn lead to significant changes to the response organisation, chains of command and communications. The single and most significant change was the introduction of the Secretary of State Representative (SOSREP) who was given the necessary means and tools and the total responsibility to respond and act on behalf of the government. This model has been recognised and recommended by the ISU (International Salvage Union), which today represents more that 90 % of all salvage operations carried out world-wide. Clearly the model implies that

- the Salvage-master has the full responsibility for the Salvage operation

- the representative from the Government (SOSREP) has the controlling responsibility and authority to direct the Salvage Master

The above division of responsibility has lead to clear lines of communication and responsibility. It does not mean that the UK is the only country having an acceptable chain of command, but is used mainly as an example on an efficient organisation.

5 CURRENT RESOURCES AND CAPABILITIES

So far the Norwegian authorities have strengthened the oil spill response capacity in the northern areas by providing:

- Emergency Towing Capacity (ETV) 3 vessels
- Emergency Offloading Capacity (4 stations)
- AIS - Automatic Identification System (Anti Collision-fully developed in 2007)
- Predetermined sailings route preferably min. 12 NM off the Norwegian Coastline

The current coverage by Emergency Towing Vessels patrolling outside the Norwegian coast line is achieved by one navy vessel – ("KNM Valkyrien"), one coast guard vessel, (UT512), (KV "Normann Trym") and one anchor handling tug supply vessel MS "Skandi Beta" (UT708), all working in cooperation.

Prior to engaging these three vessels The Coast-Directorate (Kystverket) requested the Classification society, Det Norske Veritas (DNV) to determine the size and Tonn Bollard Pull (TBP) required to hold and control tankers drifting under the following conditions, also illustrated in figure 3 on the next page. Ref /4/.

20 m/s wind, 1 m/s current, 5 m - significant wave height

DNV's conclusion was that a tug with minimum of 100 TBP was required to hold and manoeuvre a 100.000 DWT tanker in drift under such weather criteria. Ref /4/

Further the drift speed was evaluated in order to determine a sufficient response time. The time a drifting tanker takes to reach shoreline varied from approximately 10 to 12 hours, depending on distance, wind and current.

DNV's requirements with respect to min. TBP for various ship sizes are calculated and shown in the diagram below. This figure shows that 150 TBP are required to "hold" the largest 300.000 TDW under such condition.

Accordingly the Coast Guard vessel UT512 and UT708 "Skandi Beta" would not have sufficient TBP to hold ships larger than 217.000 and 175.000 TDW respectively, whereas the largest fishing vessels would theoretically have a similar holding force for ships up to approx. 80.000 DWT.

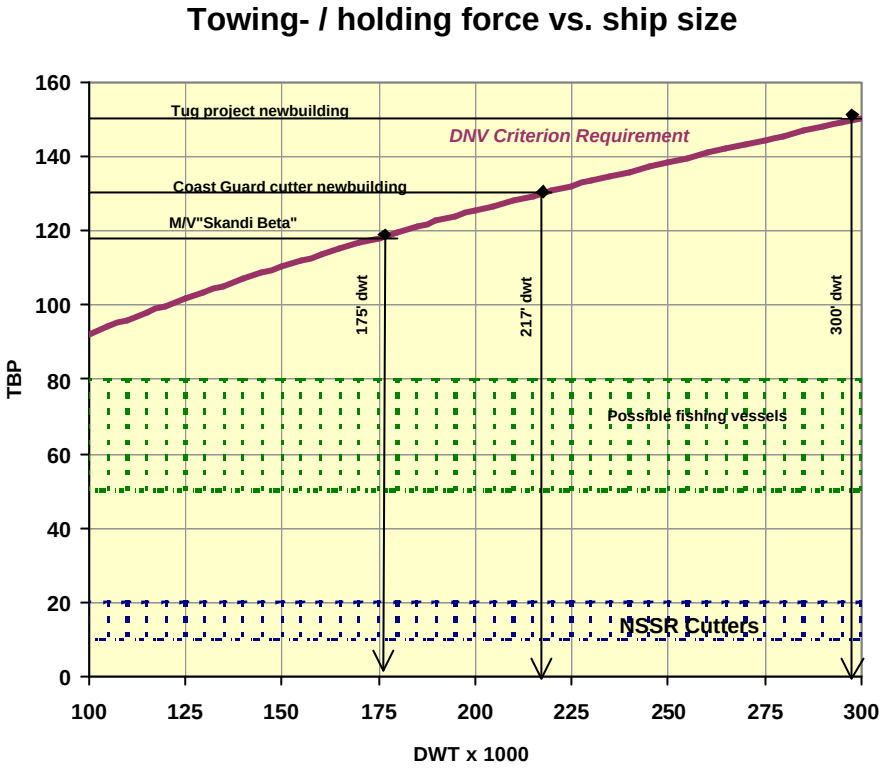

Fig. 3

In order to evaluate the suitability of various types of vessels, the following characteristics must be considered.

- Tonnes Bollard Pull
- Oil Recovery capacity /-suitability
- Manoeuvrability during coupling, holding and towing ”modus”
- FiFi-capacity and other relevant equipment
- Crewmembers opportunity to practice and maintain their competence.

There will always be compromises in the evaluation of cost–benefit. The table below (Fig. 4) indicates (for illustration purpose only), how various factors may compare between a purpose built “ideal” response vessel and existing vessels. The factors are established based on multi purpose, long time experience for various tug operations of various tug types. The relative numbers apply to an index of 100 as reference for best practical case.

Relative contribution to reduction of risk for accidents

Vessel-type / Factor	”Purpose built oil response vessels”	Offshore “UT708”	Coast Guard “UT 512”	Larger Fishing-vessels	“Scutters” (present size)
Tonnes Bollard Pull	Index 100	80	85	50	10
Oil recovery capacity	100	100	100	30	N/A
Manoeuvring capacity	100	70	50	40	100
Firefighting and other equipment	100	70	100	N/A	N/A
Salvage crew experience	100	70	50	50	50

Fig. 4

6 CASE FOR PURPOSE BUILT VESSEL

An offshore-vessel like the UT708 ”Skandi Beta” of 118 TBP is designed for other purposes than connecting, holding, and towage of larger tankers in distress. A large displacement results in large force on towing wire, winch, foundations, pullers and towing brackets. In addition the operation is critical in heavy seas under the coupling and holding phase. The figure below (Fig. 5) illustrates how tension in the towing gear is reduced for the smaller purpose built vessel, but at the same time with the higher 150 TBP.

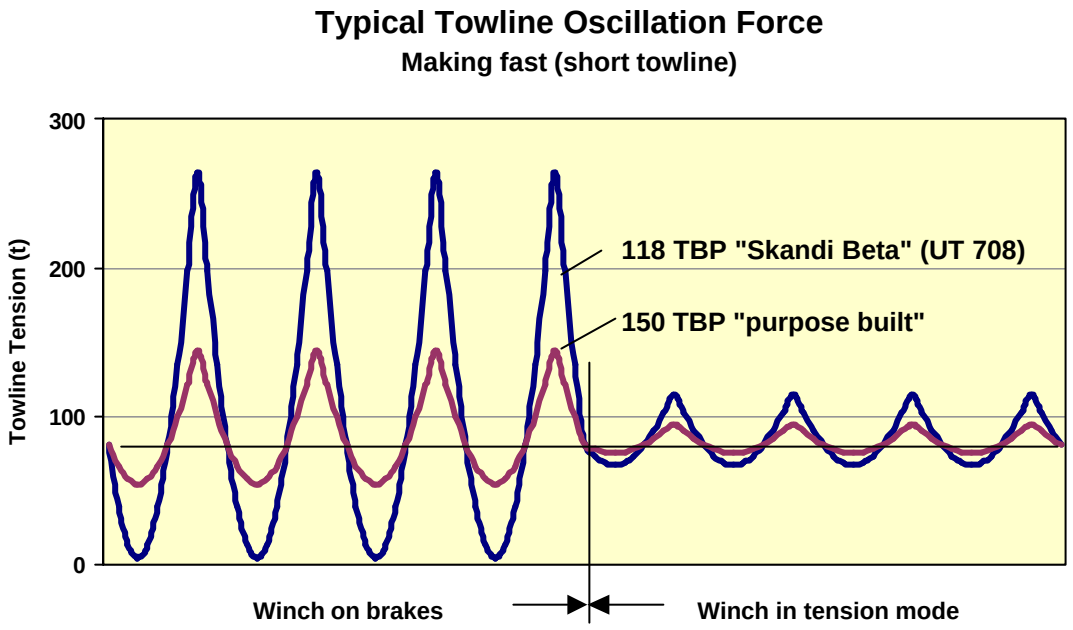

Fig. 5

A ”purpose built” ETV will have outstanding manoeuvrability characteristics for the task of manoeuvring a tanker out of control. The response from the propulsion systems to physical positioning of vessel is approximately twice as fast as the conventional offshore vessel. A ”purpose built” vessel would after coupling to the aft of the tanker be able to steer and manoeuvre the tanker from side to side (the equivalent to escort tugs at an oil / gas terminal). The UT512- and UT708-vessel would be of little use for such applications. It is a most interesting fact that the total costs for such superior ”purpose built” vessel would be lower than for offshore vessels.

7 SPECIAL EQUIPMENT AND PREVIOUS EXPERIENCE

7.1 ESCORT SERVICES

Tug escorting of ships requires Tonnes of Steering Pull - **TSP** - at higher speeds for emergency steering. Every year our tugs escort thousands crude oil and gas-carriers at terminals in Norway, which may prove useful also for salvaging and towing tankers in distress.

Fig. 6

7.2 EMERGENCY OFFLOADING SYSTEM

Buksér og Berging has recently prolonged the emergency offloading agreement with the Norwegian authorities. Equipment is stored at four various locations along the coastline and the service includes stock-keeping, maintenance, freight, provision of 24 hrs service to provide personnel. The service also includes a continuous training ensuring the provision of properly trained personnel. The Emergency Offloading system consists of a containerised pump system with power pack. The system is prepared for helicopter transport and offers a great flexibility of tools used for emergency offloading purposes of ships in difficulties. The systems have been successfully used, last time during the " John R" incident off the coast of Tromsø in year 2000.

Together with the Emergency Offloading system is other salvage equipment stored onboard MS "Skandi Beta". This includes Yokohama-fenders, gas-indicators, inert gas systems etc.

7.4 THE NEPCON SYSTEM

Buksér og Berging has vast experience with various salvage challenges, amongst others the problem of establishing a towing connection between a salvage tug and a tanker in drift. Also sudden sinking of a damaged vessel is a lurking nightmare for the salvers.

Buksér og Berging has developed different towing arrangements for various situations and the so-called NEPCON (Neptun Connector) - is a simple solution to a serious problem; it is a helicopter drop of the NEPCON on the abandoned vessel.

A sturdy chain dropped around the windlass or another strong point aboard. The towing line complete with forerunner and super fibre hawser is then stretched out by the helicopter and ends in a Sea Anchor and/or floating buoy to be picked up by the tug.

NEPCON implies the highest standards for the salvors safety and permits emergency salvage connection under – up till now – prohibitive conditions. The figure below (Fig. 7) shows some pictures from testing out the system.

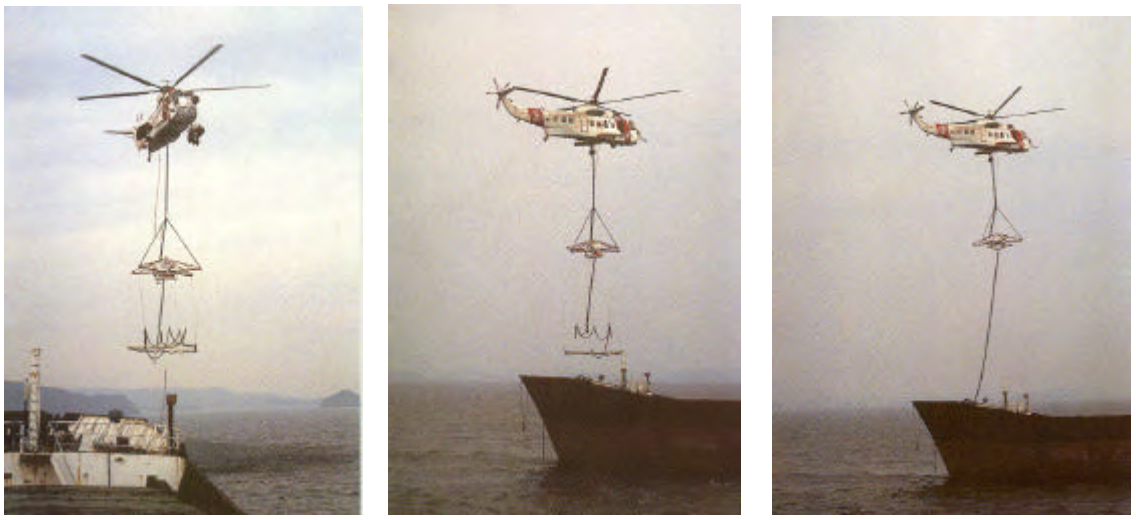

Fig. 7

7.5 THE MIKO SEA ANCHOR

As a stand-alone product – or in combination with the NEPCON arrangement, Miko Marine has developed a self-inflated Sea Anchor, which is activated when reaching a pre-determined depth. Before deployment a "pilot anchor" drags the anchor away from the vessel. The anchor reduces the drift speed by up to 80 %. Also the bow of the tanker in drift will be heading towards wind and wave loads, - hence reducing the exposed area and subsequently the drift speed and motions of the vessel.

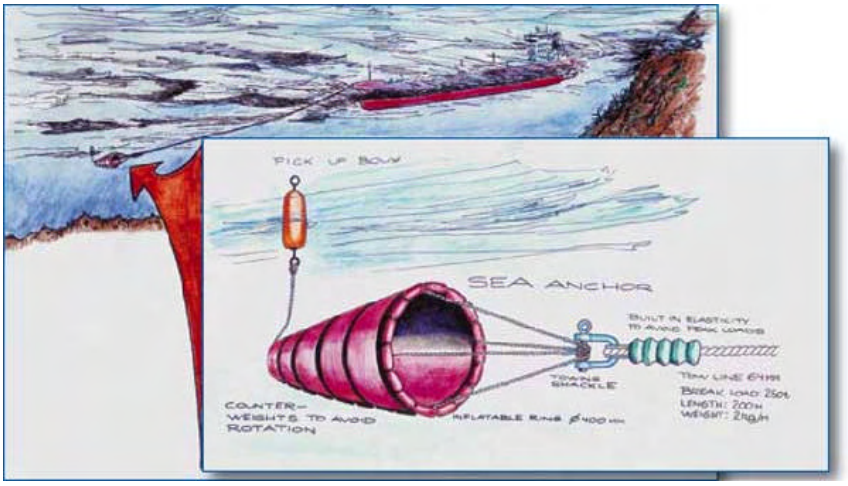

Fig. 8

This system may triple the time it takes before grounding of a drifting vessel.

7.6 FIRE FIGHTING EQUIPMENT

Vessels with adequate Fire Fighting capacity are frequently used to extinguish fires at sea as well as fire onshore. The photograph below (Fig. 9) illustrates the fire fighting capacity during a large fire in Norway's capital a few years ago.

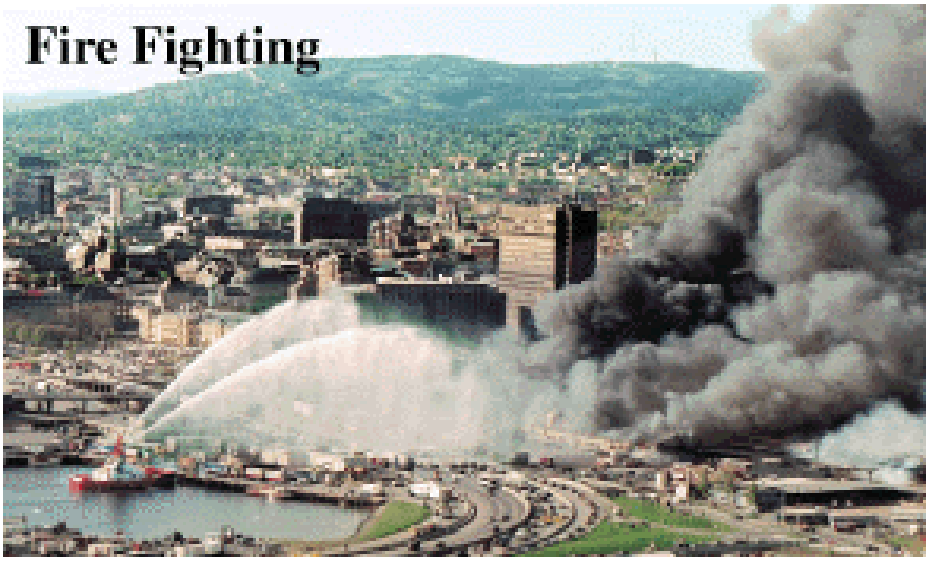

Fig. 9

7.7 FIRST AID HULL REPAIR CAPACITY

The ETV's are equipped with various salvage equipment including hull repair plugs and Miko Plasters – Heavy Duty Magnetic Patches. The plasters are simply placed over the damaged area and secured to the hull by using additional magnets and/or bolts.

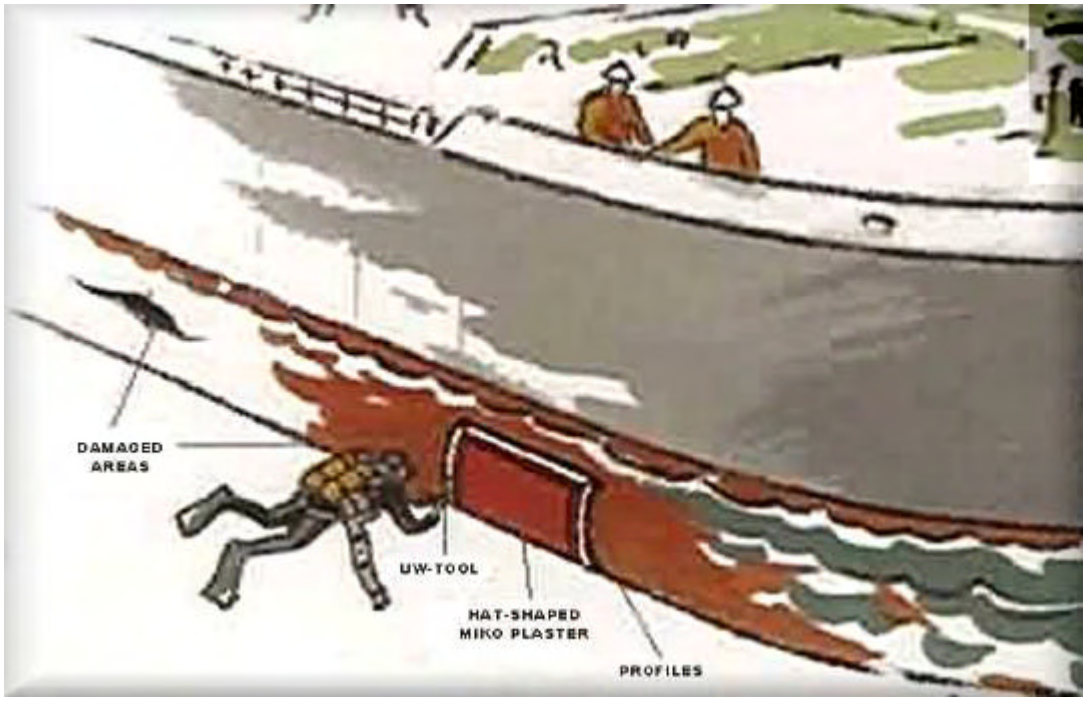

Fig. 10

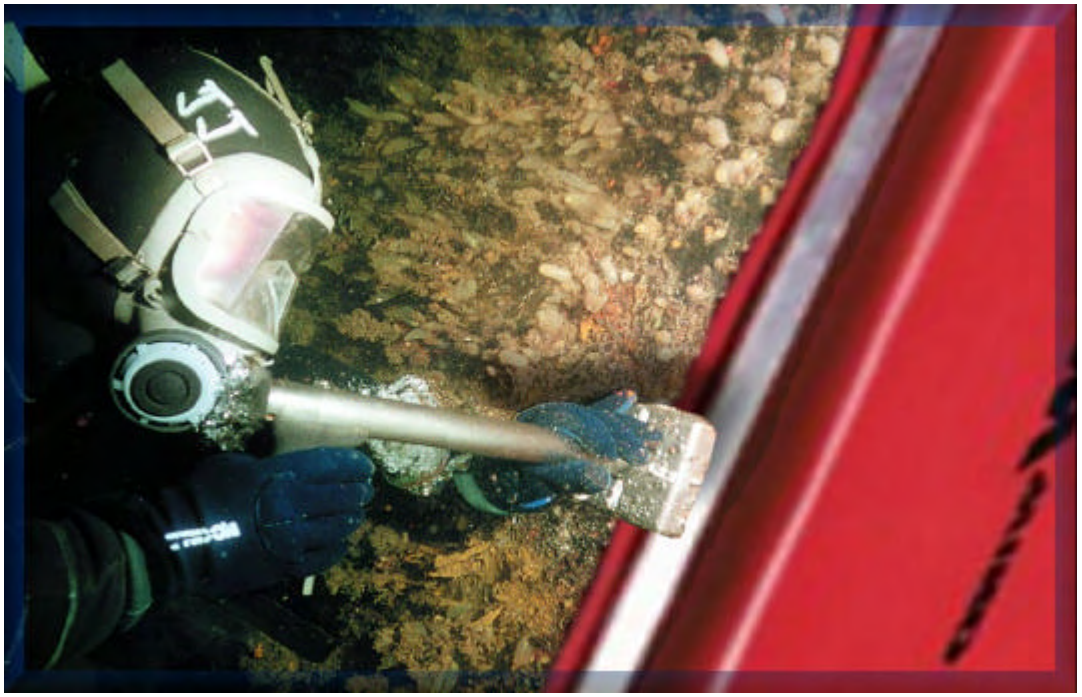

Fig. 11

8 RELATION BETWEEN GOVERNMENT AND COMMERCIAL SALVAGE OPERATORS

Although significant measures has been taken, our population, and especially people in northern Norway living at and by the sea, are increasingly worried about the insufficient preparedness to meet with major accidents and subsequent oil spills.

The Norwegian government has as part of a more comprehensive program prepared to meet the new threat to our fisheries, wildlife, tourism, nature and environment as a whole, by engaging three non purpose built vessels from the Coast Guard, the Navy and a private salvage company, - Bukser og Berging AS. Coastal nations like for instance France and the U.K. have engaged privately owned and to some extend purpose-built or modified vessels on long term contracts to protect their coasts.

The Norwegian towage and salvage industry is pleased to register the improved preparedness, although they still register areas for further improvements. The industry recommends that the government is considering advice and support from other countries and the International Salvage Union, (ISU) for establishment of longer term solutions.

One could question the criteria for type of vessels selected and the salvage competence of the crew onboard of the vessels not being operated by professional salvors, if a larger salvage incident should occur.

Competent salvage management and the ability of the crew to adapt and use its previous experience and operational HSE is of crucial importance for such operation. In critical operations, - such as salvage of vessels in distress-, the weakest link in the chain is often determining the result.

Right type of salvage and preparedness equipment relative to the type of vessel and related to the vessel in question and its mission is important to achieve a good result without unnecessary damage to equipment and with risk to personnel**.**

9 CONCLUSIONS

This paper has specially evaluated and looked into the following points

- Analysed the current threat and tried to quantify the potential risks
- Reviewed the prognoses and established a trend for future development in the area
- Reviewed the current oil spill response capability especially with respect to ETV and Emergency Offloading capability
- A purpose built vessel is focused
- Various oil spill – and salvage equipment and previous experience is analysed
- The importance of the protection of the criteria motivating the private salvage industry has been established.
- Looked to other countries on how an ETV service has been established and organised. (eg. UK and France)
- Clear and distinct management responsibilities between Salvage Master and representative from the authorities (SOSREP)
- Training and formal qualification of crew

It is of vital importance that essential parts of the salvage industry remains on national hands and is working under conditions motivating crew and owners.

Privately and government resources may be co-ordinated effectively for most efficient use for the purpose and responsible use of the taxpayers money.

Thank you for your attention.

ACKNOWLEDGEMENTS

The Author wish to express his thanks and appreciation to Rear Admiral Michael Stacey

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