Emergency preparedness and support functions - challenges in the South-East Barents Sea

Background study to Stortingsmelding for the opening of the South-East Barents Sea Meld.St.36 (2012-2013)

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The work / Acknowledgement

• Task commissioned by Ministry of Oil and Energy (OED) June 2012
• Completed late 2012
• Participants in Proactima
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  • Bjørn Hoff
  • Espen Hoell (project manager)
• Two reports produced; South East Barents Sea and Jan Mayen

• Presentation constrained to challenges related to Emergency Preparedness in areas opened for petroleum activities
Work description

• Assess the needed level of Emergency Preparedness (EP) for petroleum operations in the South East Barents Sea for Defined Situations of Hazard and Accident (DSHA)
• Evaluate suitability of normally used Escape, Evacuation and Rescue (EER) solutions
• Assess specific challenges related to distance, infrastructure, communications, light conditions, temperature, ice conditions etc.
• Consider alternative EER solutions in view of the specific challenges and evaluate development needs to secure an adequate level of EP
• Consider possible offshore solutions for medical aid and their availability
EP requirements - NCS

• PSA regulations
  • Framework; section IV
  • Management; section V
  • Technical and operational; section VI
  • Activities; section XIII
• NORSOK standard Z-013, U-100N, S-001
• DNV guideline DNV-OS-E406, DNV-OS-C101,
• Norsk Olje og Gass Guideline 064
  • Applies to fields with area specific emergency preparedness established
• PSA ambitions; Safety and emergency preparedness shall be at least as good in the Barents Sea as in other areas of NCS
"Established level" of EP on NCS

- In practice the "EP level" on the NCS is defined by guideline 064
  - DSHA 1 Man over board when working over sea
    - Shall be rescued within 8 minutes after notification
  - DSHA 2 Personnel in sea after helicopter accident in the safety zone
    - 21 persons rescued within 120 minutes
  - DSHA 3 Personnel in sea after emergency evacuation
    - Number of personnel in sea according to risk analysis rescued within 120 minutes
  - DSHA 4 Collision danger
    - Evacuation of facility personnel started 25 min before collision
  - DSHA 5 Acute oil spill
    - Covered other places
  - DSHA 6 Fire with need for external assistance
    - Usually handled with facility internal resources
  - DSHA 7 Personal injury / illness with need for external assistance
    - Acute medical aid within 1 hour
    - Transport of 2 injuries to hospital within 3 hours after decision
  - DSHA 8 helicopter accident on the facility
    - First aid capacity: 1 fatality, 3 hard injured and 4 light injured
    - Transport of 3 hard injured to hospital within 3 hours after decision
Specific challenges; part of area / year

Northern parts of the area:

• Climatic / geographic conditions
  • Low temperature in air and sea, polar lows, wind-chill, sea ice, icing, fog, visibility, darkness

• Communication
  • Solar storms, lack of satellite coverage, geomagnetic positioning

• Remoteness / position / lack of infrastructure
  • Up to 500 km (270 nM) from mainland and possible emergency aid locations, more to present airports, emergency bases and major hospitals

Note: For southern parts of the Barents Sea, conditions do not differ significant from other parts of NCS
Challenges due to climate conditions

- Low temperatures / wind chill
  - Reduced survival time for personnel in sea and unheated rafts
  - Rapid frost injuries
- Sea ice
  - Difficult to rescue personnel in sea
    - Hidden between / behind ice floes
    - Could be crushed by ice
  - Reduced maneuverability for life boats and MOB boats between ice floes
  - Safe launch of (free fall) life boats and rafts hampered
    - Danger for damage on boat and personnel
    - Reduced maneuverability
    - Ice collision damage
Challenges due to climate conditions

• Ising
  • Northern parts of Barents Sea: strong icing (2-4 cm/h) likely during winter storms
    • Sea spray icing; vessels
    • Atmospheric icing; facilities
• Operation
  • Outdoor equipment not operable
• Escape
  • Doors frozen
  • Escape ways blocked
• Rescue
  • Reduced efficiency or inaccessible rescue means
  • AWSAR helicopters with deicing
  • Stability of life boats and MOB boats reduced
Challenges due to climate conditions

• Polar lows
  • Difficult to predict, rapid changes (minutes – hour) in wind force and wave heights, low visibility and strong icing
    • 3-4 per year
  • May occur rapidly and unpredicted during an EP situation
  • Beyond normal operational limitations of helicopters
    • Reduced availability for rescue and evacuation
  • Rough seas a challenge for rafts, lifeboats and personnel in sea
    • Demanding rescue operations
    • Risk of icing
    • Possibly for longer time in life boats

• Reduced visibility
  • Darkness (~3 months), driving snow, fog (summer)
    • Frequency of period with visibility < 0,5 nm larger than in other areas
  • Reduced availability of helicopters
  • Reduced possibility to find personnel in the sea
    • Both due to the reduced sight and improved isolation of rescue suits (heat sensing cameras)
    • Need for emergency beacons and –lights (also infrared specter) on rescue suits
Implications of climate challenges

• New requirements?
  • Rescue suits
  • Working suits
  • Working over sea
  • Rescue time
    • DSHA 1, man over board rescued within 8 min

• Facility design requirements?
  • Winterization
    • Over sea work areas
    • Wind shields
    • Escape ways and evacuation areas
    • Life boat muster areas
    • DNV OS A201

• Lifeboats
  • Alternatives to free fall life boats
  • Heating / ventilation / deicing

• Alternative evacuation means and solutions
• Fixed sea ice a temporary evacuation platform?
Challenges related to communication

- Radio and satellite communication unreliable, holes or lack in coverage, loss of GPS positioning
  - affected by magnetic storms (Northern lights)
  - Increasing challenges northward
- Communication between various EP resources hampered
- Reduced possibility for GPS positioning and recovery of personnel in sea, rafts and life boats
- Need for polar high elliptic (HEO) communication satellites
Challenges related to remoteness (DSHA 8)

• North Eastern parts of Barents Sea, approx. distances:
  • Tromsø ~775 km, Kirkenes ~575 km, Hammerfest ~545 km, Berlevåg ~450 km, Vardø ~465 km
  • Similar distances to Bear Island and Hopen

• DSHA 8; 3 hard damaged to adequate medical aid within 3 hours, DSHA 8

• Rescue range, using today's helicopters
  • AWSAR helicopter (Eurocopter EC225) Hammerfest; ~340 km
  • AWSAR helicopter 330 skvadron (Sea King), Bandak; ~370 km
  • Assumptions: Applicable mobilization time, cruising speed, 3 min/pax, adequate acute medical aid provided at heliport
  • Shorter rescue range if transport to hospital in Tromsø (longer flight distance)

• New AWSAR Agusta Westland AW 101 will have a rescue range of ~395 km
Rescue range (DSHA 8)

- Not achievable in large parts of area before fields are developed with AWSAR helicopter in hangar on facilities

Achievable with:
- New helicopters in place with much larger speed
- Bases and acute medical aid functions in northern Finnmark
- Acute medical aid functions available at facility, combined with Telemedicine support
- Time, not reach, the critical factor
Rescue - DSHA 2

- DSHA 2 Personnel in sea after helicopter accident in the safety zone (21 persons rescued within 120 minutes)
  - Assumptions: Cruising speed from base, flight one way, personnel rescued from sea to helicopter within 120 min, 3 min/pax.
  - Rescue range ~ 260 km depending on helicopter type
- Rescue by helicopter not achievable in large parts of area before fields are developed with AWSAR helicopter in hangar on facility
  - Time, not reach, the critical actor
  - Helicopter base in northern Finnmark could improve situation
- Rescue by on site emergency vessel / MOB boat the only realistic alternative
Acute medical aid - DSHA 7

- DSHA 7 Personal injury / illness with need for external assistance
  - Acute medical aid within 1 hour
    - Only possible with acute medical aid function established at facility or emergency vessel
    - Combined with Telemedicine support?
  - Transport of 2 injuries to hospital within 3 hours after decision
    - Limitations similar to DSHA 8
Possible evacuation solutions

- Mid distance evacuation stations
  - Helicopter in hangar, acute medical aid, telemedicine
- Parallel drilling operations
- Dedicated emergency preparedness facilities
- Steerable walking bridges to vessels
- Davit lifeboats
- Water and ice going life vessels
- Heated lifeboats and escape ways
- Etc.
Industry aware of the challenges

• Significant experience exist from operations in other arctic areas (Alaska, Canada, Russian sector)
• Significant research efforts ongoing in the industry
• Development work ongoing related to Goliat and Johan Castberg fields
• Significant standardization efforts ongoing
  • Result of Barents 2020
  • Design, EER, Human health and work environment, Ice management, Logistics, Risk management
• Alternative solutions available or under development
  • Faster helicopters with long reach
  • Ice- and watergoing life saving vessels
  • New evacuation methods
• Norsk Olje og Gass project ongoing
  • HSE challenges in Northern areas
Conclusions

- Extensive challenges to Oil & Gas operations in northern areas
- The challenges are not showstoppers, but requires
  - technology development
  - regulation development
  - Standards development
  - new solutions
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Prepared.