ARCSAR

Arctic and North Atlantic Security and Emergency Preparedness Network

ARCSAR

@arcsarnetwork

www.ARCSAR.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 786571

Photo credit: Håkon Kjøllmoen

FACTS:

Funded/Call: EU Horizon 2020 SEC 21

Coordinator: JRCC North-Norway

Budget: 3,5 mill EUR

Period: 2018 – 2024 (5,5Y)

ARCSAR is the **first** formal EU funded **Arctic and North Atlantic Security and Emergency Preparedness Network.**

The **ARCSAR** network is primarily for **professional security and emergency response practitioners** operating in the **Arctic and the North-Atlantic region.**

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ARCSAR
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20 partners from 12 countries

The ARCSAR network

addresses cross-border cooperation between emergency preparedness and response authorities, industry groups and companies, academia, voluntary organizations, and local communities.

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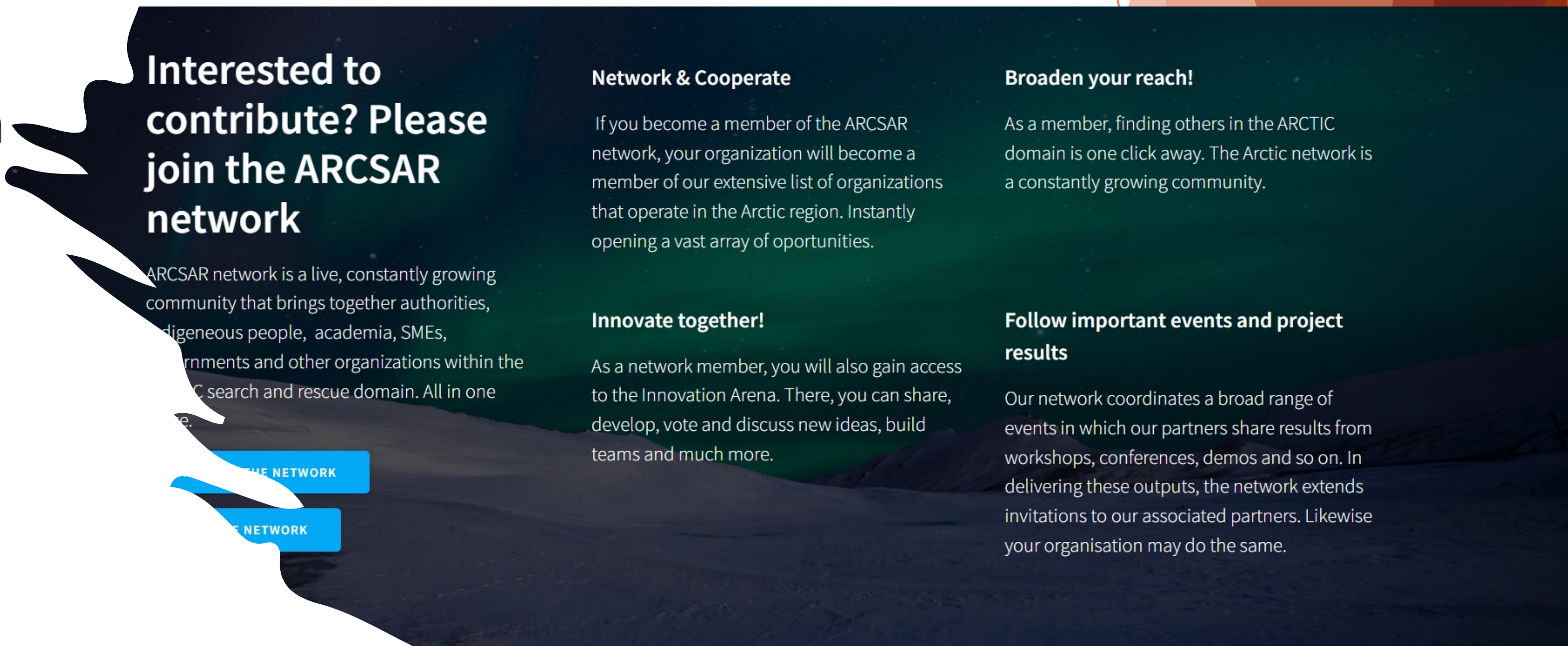
Associated partners

- + 90 Associated partners
- Academic institutions, practitioners, industry and government
- ARCSAR Newsletter and other notifications
- Access to the ARCSAR Innovation Arena
- Invitation to all open events



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ARCSAR'S AIM IS TO ADDRESS AND ENHANCE PREPAREDNESS TOWARDS SAFETY THREATS EMERGING FROM THE INCREASED COMMERCIAL ACTIVITY IN THE ARCTIC AND NORTH ATLANTIC REGION

- *CREATING A NETWORK OF STAKEHOLDERS AND SUPPORTING NETWORKING*
- *FACILITATING TRAINING AND KNOWLEDGE EXCHANGE*
- *UNCOVERING NEEDS AND MAPPING SOLUTIONS*
- *ENHANCING SAFETY IN THE ANA REGION*

Photo credit: Brede Valanes, AECO

ARCSAR workflow in a nutshell

1. Establishing ARCSAR network and Innovation Arena
2. Mapping of practitioner needs for innovation and knowledge exchange
3. Knowledge exchange and competence building events, i.e. exercises and workshops
4. Mapping and indentifying uptake and barriers for innovations
5. Recommendations for standardization and policy on innovation in technology, methods and procedures

Building trust and increasing collaboration

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Brief scenario for LIVEX, MRO 31st August

- An expedition cruise vessel in remote areas north of Nordaustlandet (played in Isfjorden for safety reasons)
- MS Quest, 54 pax and 25 crew. Fire in engine room, they were able to extinguish the fire, but the vessel engine is destroyed, and emergency generator failed to start. Therefore, no power onboard and a lot of smoke in the superstructure.

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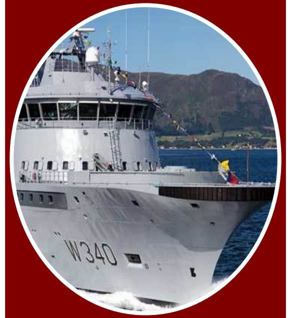
ARCSAR Arctic Security and Emergency Preparedness Network

Main players involved in the exercise

JRCC North Norway

Governor of Svalbard



Norwegian Coast Guard, NOCG vessel BArentshav

330 Squadron, AW101 SAR Queen

M/S Quest

Polar Quest home office

Association of Arctic Expedition Cruise Operators

UAS Norway

Cooperation effort

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 786571

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PolarQuest

The lectures on board the M/S Quest

- Safety and behavior
- Guide lectures
- How to act as an observer and evaluate in a SAR exercise
- Thermal protection in life rafts
- Moderated panel discussion on evacuation methods
- O-VRAT Risk – assessment tool for landings
- AI-ARC solution for Arctic Exercises and incidents
- Satellite technology testing by e-Geos and Norwegian Space Agency
- EPPR/ACGF Casualty tracking project

Example topics during the outings

- Polar bear safety
- Safety equipment ashore
- Polar Code equipment
- How to act if someone gets injured
- Safety and glacier fronts
- Steep terrain challenges
- Zodiac as shelter
- Survival camp


mashroom




WINCH ONLY

Mapping of practitioners' need for innovation and knowledge exchange in the ANA region

Ensuring accessibility of lifeboats/rafts at all times

Technologies to combat heat loss

Communication technology to ensure satellite data is accessible within required timescale

V – Vessel Structure & Equipment

L – LSA & Sea Cold Survival

C – Communication & Infrastructure

P– Pollution & incident control

N– Navigation & Voyage planning

P – Personal Training & Education

Standardised regulations for prevention of oil spill

Technology to ensure systems are not weather affected

Enhanced liaison with hospitals for emergency incident planning

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PICK methodology

$$Min\ a = \frac{w_1 n_1}{I^*} + \frac{w_2(n_2 + p_2)}{B^*} + \frac{w_3 \sum_{i=1}^{6} \sum_{j=1, j>i}^{6} (n_{ij} + p_{ij})}{C^*}$$

Subject to,

$$\sum_{t=1}^{6} i_{ts} x_{ts} + n_1 - p_1 = I^*$$

$$\sum_{t=1}^{6} \sum_{s=1}^{N_t} (\alpha_{ts} + \beta_{ts} - \gamma_{ts}) x_{ts} + n_2 - p_2 = 0$$

$$\sum_{s=1}^{N_i} x_{is} - \sum_{s=1}^{N_j} x_{js} + n_{ij} - p_{ij} = 0 \quad i, j = 1, \ldots, 6, \quad j > i$$

$$\sum_{t=1}^{6} \sum_{s=1}^{N_t} d_{ts} x_{ts} \leq D$$

$$x_{ts}\ binary\ t = 1, \ldots, 6; s = 1, \ldots, N_t; \quad n_1, p_1, n_2, p_2 \geq 0; \quad n_{ij}, \quad p_{ij} \geq 0\ i, j = 1, \ldots, 6, \quad j > i$$

Sub-Need Title	Category	Description of Sub-Need
Collaboration on how to meet "5 day" requirement of polar code	**Possible**	The International Maritime Organization (IMO) based regulation, the International Code for Ships Operating in Polar Waters, also known as the Polar Code, was implemented in January 2017. The code enforces various requirements in respect of search and rescue equipment including 'those evacuating from a vessel in distress in polar waters should be able to survive a minimum of five days in the rescue equipment, be it in a lifeboat, a life raft or in equipment arranged on the ice'. In cooperation with several universities and institutions, the Norwegian Coast Guard conducted a search and rescue exercise in 2016 in Svalbard, in order to evaluate this requirement and the usability of the standard survival equipment. The exercise report (Solberg, Gudmestad, Kvamme & Spitzbergen, 2016) concluded that, if the expected five-day rescue period utilizing the standard SOLAR approved equipment required by the Polar Code is to be fulfilled, the related technology must be developed in order for the equipment to be realistically functional. As the Polar Code is open to interpretation by each vessel operator performing their own assessments, the assessment on is suitable and required may differ across the industries. (Ikonen, 2017; Solberg et al., 2016) There is a need for collaboration between Arctic SAR stakeholders to collaborate and develop protocols to ensure this requirement is fulfilled in all circumstances and territories, and map what the barriers are for why it could not be fulfilled (Kruke & Auestad, 2021).
Ensuring sufficient satellite coverage of ANA region	**Challenge**	The Arctic satellite connections, broadband, radio coverage and other means of communication are limited due to remoteness and the lack of relevant infrastructure, however satellite coverage around the Arctic areas is increasing rapidly, as more satellites are sent to cover the whole Arctic during the next few years. There is a need to map which satellite services are currently available to Arctic operations and what is still needed, especially from the viewpoint of a smaller operator that is still lacking needed coverage for High North operations.
Communication Technology to ensure satellite data is accessible within required timescale	**Challenge**	Due to the satellite passings and lack of 24/4 coverage of satellite in the Arctic, there are latencies in receiving satellite data for i.e. navigation, situational awareness, up-to-date ice charts, and ice drift and wind data. Some private operators may be able to provide real-time satellite data however the cost may be a barrier.
Need for enhanced batteries with longer life for usage in ANA region	**Challenge**	Due to the conditions in the Arctic, which may especially during winter time be very harsh, freezing temperatures affect battery life in various applications i.e. radio communications equipment, phones, drones and other equipment that may be necessary in an emergency situation or for navigation.
Standardised regulations for prevention of oil spill	**Implement**	More experience is needed to fully understand the limitations in current MER procedures and what plans exist for future standardised procedures in the High Arctic. The Arctic Council also already has the MOSPA agreement, with preventative measures. As part of MOSPA, Arctic States have agreed to (i) maintain a national system to promptly and effectively respond to oil pollution incidents, including a minimum level of available oil spill response equipment, training procedures, and communication capabilities; (ii) share information about national authorities to facilitate effective communication across borders in case of an emergency and (iii) assess oil pollution incidents in the Arctic and immediately inform all Parties to the agreement whose interests could be affected.

Developing SOPs for maritime SAR operations in RN environments

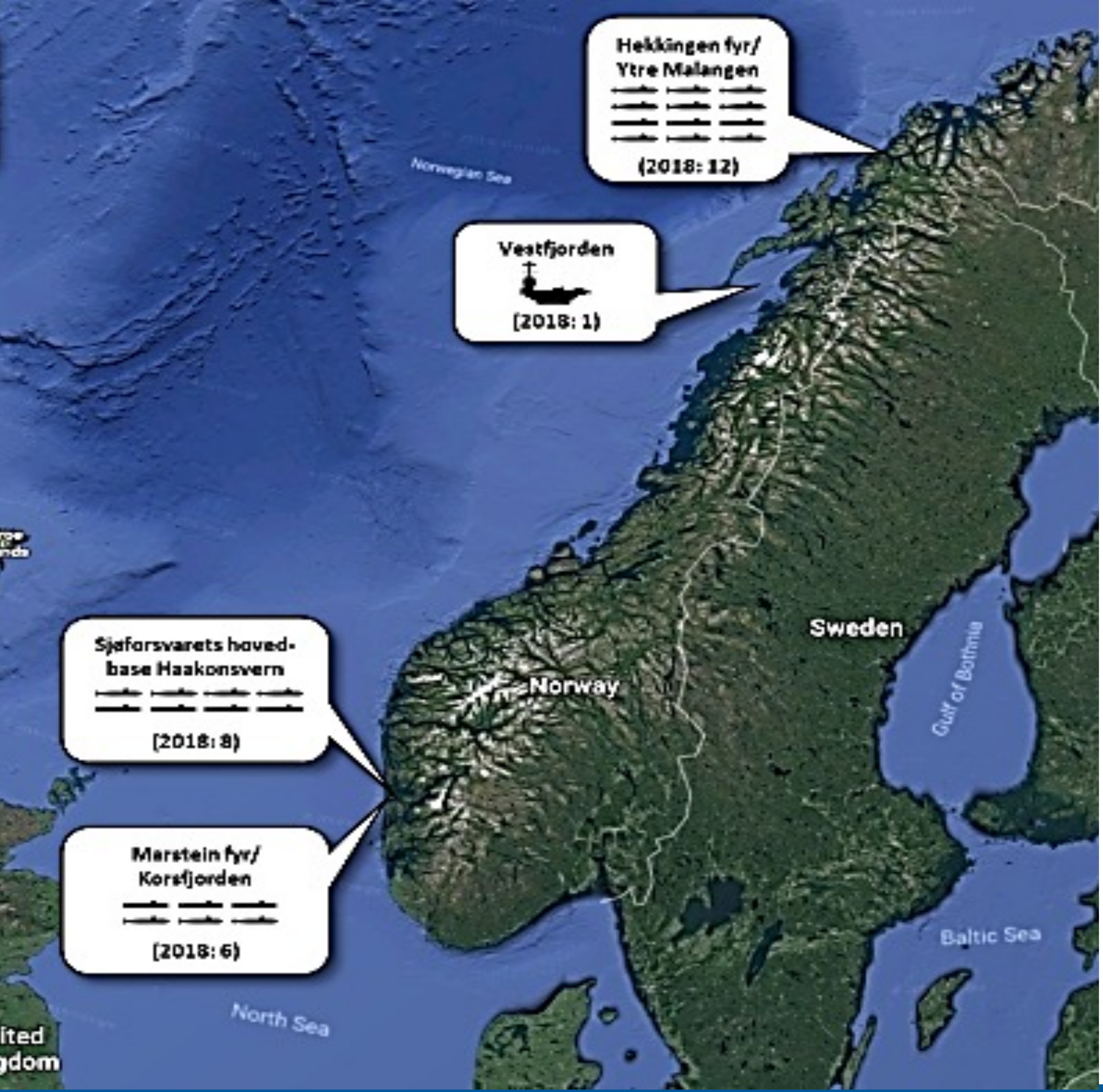
Participants

DSA

GEISLAVARNIR RÍKISINS
ICELANDIC RADIATION SAFETY AUTHORITY

NORD University

REDNINGSTJENESTEN



VISIT OF ALLIED NPVs

Visit in coastal waters (without port call)

USS New Mexico, Tromsø.

Photo: Barents observer

Traffic of civilian NPVs

Verdens største atomisbryter seiler langs Norge

Verdens største atomisbryter legger onsdag ut på en flere dager lang ferd langs hele norskekysten. Bellona frykter en alvorlig ulykke med utslipp av radioaktivt avfall.

The Barents Observer

中文 РУССКИЙ

Menu

Sevmorput is Monday sailing south of Bjørnøya into the Norwegian Sea. Map and photo: MarineTraffic.com / Rosatomflot / Barents Observer

Here comes a nuclear-powered cargo ship loaded with seafood

Norway's nuclear safety watchdog is informed about the voyage, but want to know more about Russia's future plans for sailing commercial cargo with the reactor-powered «Sevmorput» container ship.

Read in Russian | Читать по-русски

By Thomas Nilsen

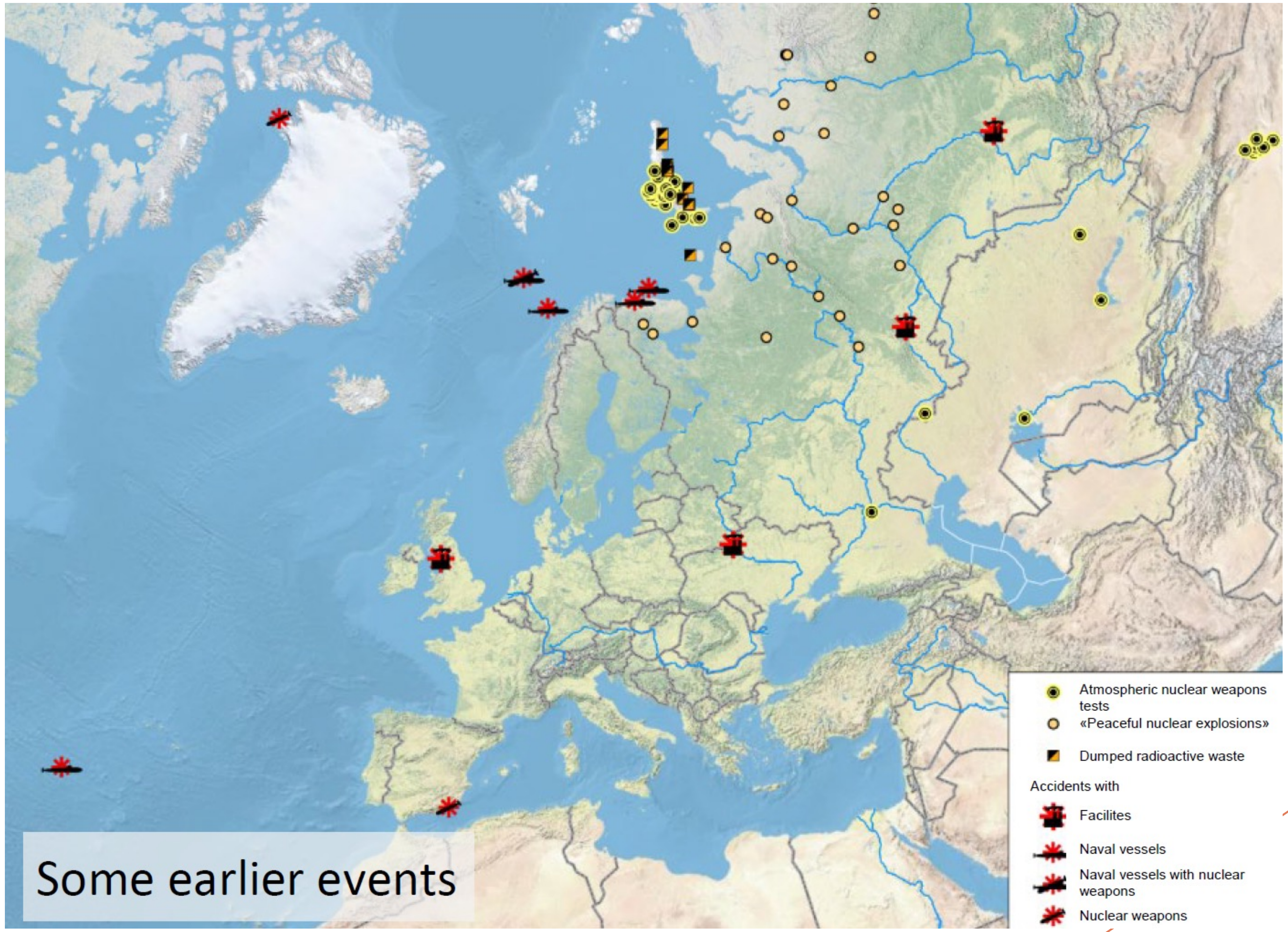
September 09, 2019

Traffic of Russian nuclear icebreakers includes to/from Bay of Finland and Murmansk (along entire Norwegian coastline)

Towing of floating NPP
Akademik Lomonosov
along the entire
Norwegian coast (2018)

- Photo: Rosatom

Low probability, high risk

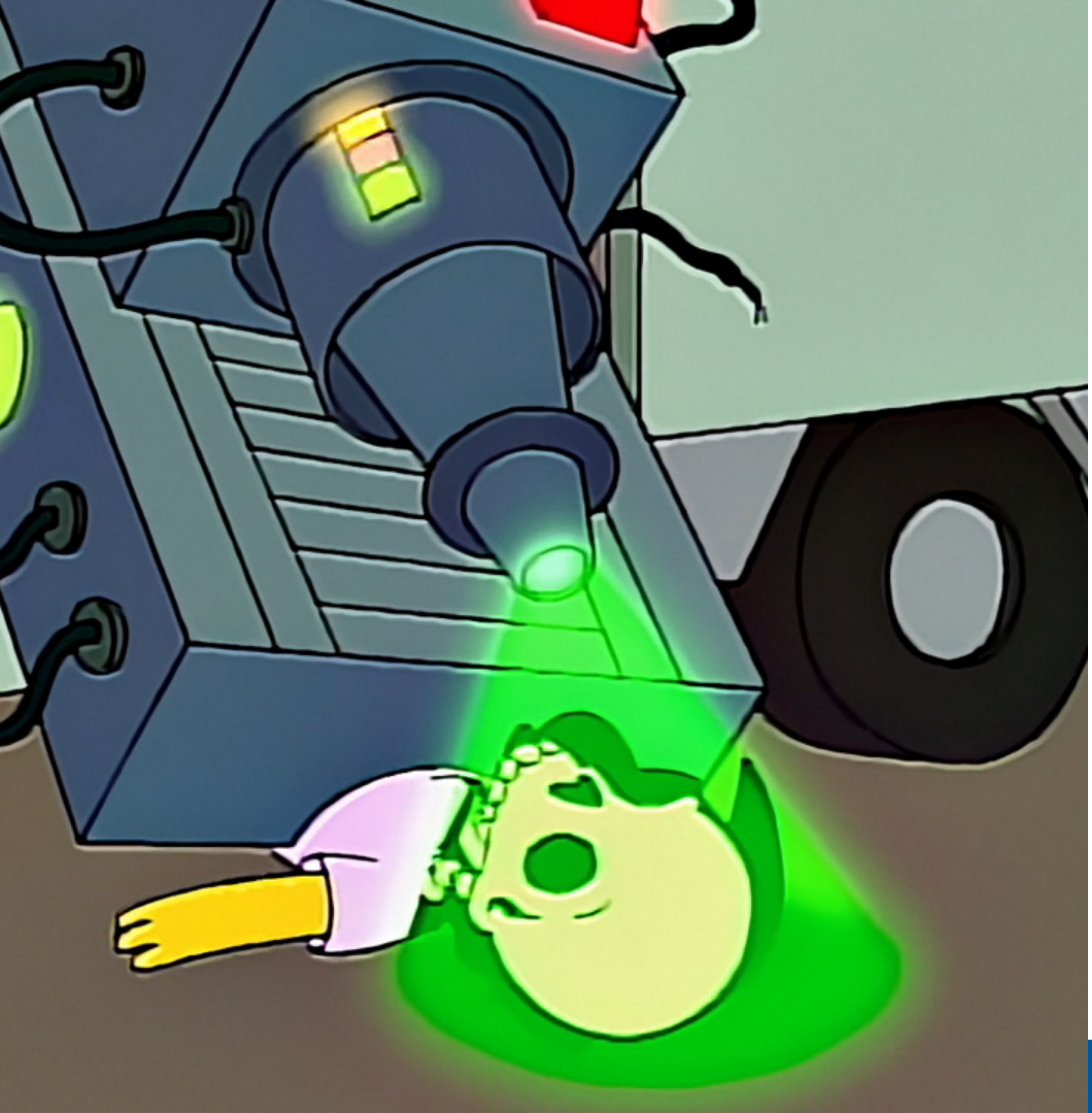


Date	Vessel involved	Geographical area	Co-ordinates		Depth (m)	Radioactive material involved	Recovered	Total activity	Marine monitoring	Release occurred	Estimated activity released
			Latitude	Longitude							
1967	Submarine[1]	Kola Bay off Severomorsk	69° N	33° E	–	Reactor core	Yes	–	–	–	–
11 Apr 1968	Diesel submarine K-129 (a)	Pacific 1230 miles from Kamchatka	40° 06' N	179° 57'	6000	2 Nuclear warhead(s)	Yes	37 GBq	–	–	–
10 Jan 1970	Submarine[1]	Mediterranean Sea Bay of Naples	–	–	–	Nuclear torpedoes	No	–	–	–	–
8 Apr 1970	Nuclear submarine K-8 (b)	Bay of Biscay	–	–	4000	2 reactors Nuclear warhead(s)	No	9.25 PBq 30 GBq	–	–	–
Apr 1970	Submarine[1]	Northeast Atlantic	–	–	–	Reactor core 4 nuclear weapons	No	–	–	–	–
Sep 1974	Kashin-class destroyer[1]	Black Sea	–	–	–	Nuclear weapons	No	–	–	–	–
1978	Lighter "Nikel" (c)	Off Kolguyev Island Southeastern Barents Sea	69° 31' N	47° 56.03'		Unenclosed solid radioactive LLW and ILW	No	1.5 TBq	–	–	–
Jun 1983	Submarine[1]	Northwest Pacific off Kamchatka Peninsula	–	–	–	Reactor core 8 nuclear weapons	No	-	–	–	–
8 Feb 1983	Satellite "Cosmos 1402" (d)	South Atlantic 1600 km East of Brazil	–	–	–	Reactor core U-235, Sr-90, Cs-137	No	1 PBq	–	–	–
10 Aug 1985	Nuclear submarine K-431 (e)	Soviet Pacific Coast, Chazhma Bay Shkotovo-22	43° N	132° E	–	Reactor core	Yes	185 TBq	Yes	Yes	–
6 Oct 1986	Nuclear submarine K-219 (f)	Atlantic Bermudas	31° 29' N	54° 42' W	5500	2 reactors	No	9.25 PBq	–	–	–
20 Aug 1987	RTG power supply (g)	Sea of Okhotsk, off Sakhalin island	50° 02 N[2]	144° E	~30	Sr-90 sealed source	No	25.3 PBq	–	–	–

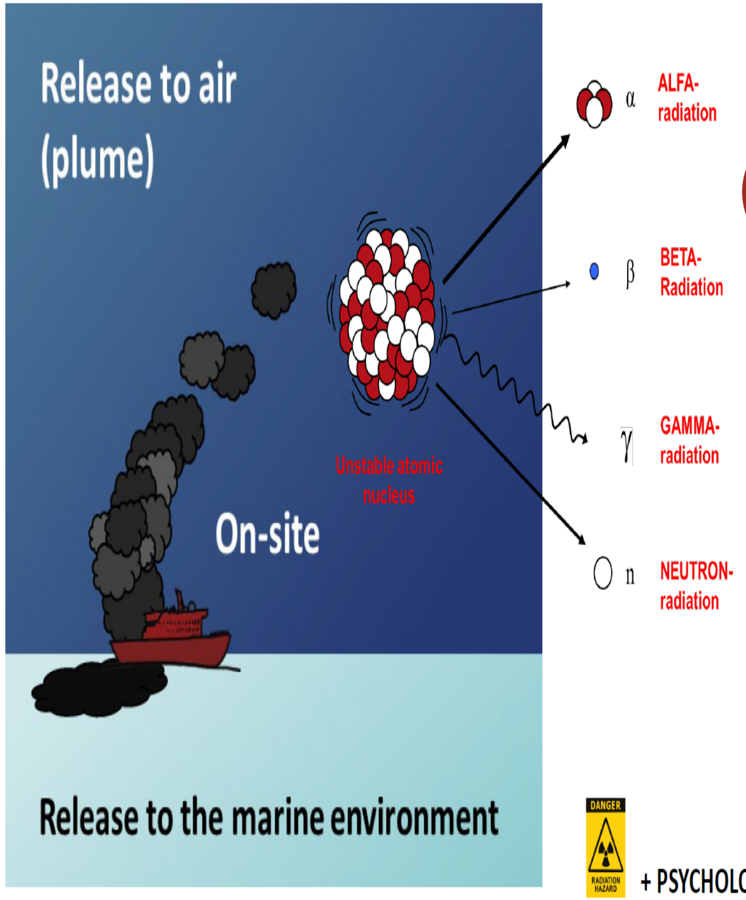
Date	Vessel involved	Geographical area	Co-ordinates		Depth (m)	Radioactive material involved	Recovered	Total activity	Marine monitoring	Release occurred	Estimated activity released
			Latitude	Longitude							
13 Feb 1950	B-36 Bomber[1]	Pacific Ocean, off Puget Sound	–	–	–	Nuclear material	–	–	–	–	–
10 Nov 1950	Aircraft[1]	Over water, outside USA	–	–	–	Nuclear material	–	–	–	–	–
18 Mar 1953	B-36 Bomber[1]	Atlantic Ocean, off Newfoundland	–	–	–	Nuclear material	–	–	–	–	–
10 Mar 1956	B-47 Bomber[1]	Red Sea	–	–	–	Nuclear material	–	–	–	–	–
5 Mar 1958	B-47 Bomber[1]	Atlantic Ocean, off Georgia	–	–	–	Nuclear material	–	–	–	–	–
2 Jun 1962	ICBM Thor Rocket (a)	Pacific Ocean, Johnston Island	–	–	–	Nuclear test device	No	–	–	–	–
19 Jun 1962	ICBM Thor Rocket (b)	Pacific Ocean, Johnston Island	–	–	–	Nuclear test device	No	–	–	Yes	–
10 Apr 1963	Nuclear submarine SSN-593 "Thresher" (c)	Atlantic Ocean, 100 miles east of Cape Cod	41° 46' N	65° 03' W	2590	Nuclear reactor	No	1.15 PBq[2]	Yes	Yes	0.04 GBq
21 Apr 1964	Satellite "Transit 5BN-3" (d)	West Indian Ocean, North of Madagascar	–	–	–	SNAP-9A generator[3]	No	630 TBq	Yes	Yes	630 TBq
5 Dec 1965	Skyhawk Jet A-4E (e)	Pacific Ocean, 250 miles South of Kyushu, 70 miles east of Okinawa	27° 35' N	131° 19' E	4800	1 nuclear weapon	No	–	Yes	–	–
17 Jan 1966	B-52 Bomber (f)	Mediterranean Sea, 5 miles off Palomares Spain	37° 12' N	1° 41' W	914	4 Nuclear weapons[4]	Yes	–	Yes	Yes	1.37 TBq
21 Jan 1968	B-52 Bomber (g)	Arctic Ocean, Thule, Greenland	76° 32' N	69° 17' W	247	4 nuclear weapons	Partial	–	Yes	Yes	3.12 TBq

Date	Geographical area	Co-ordinates		Depth (m)	Radioactive material involved	Total activity	Remarks
		Latitude	Longitude				
1974	Strvangerhorden	–	–	–	Ir-192	1.5 TBq	Industrial radiography container lost into the sea from an oil rig
5 Dec 1972	Block 2/7	–	–	–	Cs-137 Am-241/Be Ra-226 Co-60	55.5 GBq 185 GBq 3.7 MBq 14.8 MBq	Sources lost when the supply boat sank. All sources shielded and inside a transport container
20 Jan 1978	"Boss Rig"	–	–	–	Ra-226	3.7 MBq	Probably lost overboard.
28 Jan 1985	Odin	–	–	2235	H-3	370 GBq	–
7 Feb 1985	"Nortrym"	–	–	–	Th-232	59 kBq	Calibration source, probably blown into the sea
12 Oct 1988	Eldfisk	–	–	–	Cs-137	55.5 GBq	–
7 Dec 1989	–	–	–	4742	Cs-137 Am-241/Be	35 GBq 100 GBq	–
9 Feb 1990	Statfyord	–	–	3423 3425	Cs-137 Am-241/Be	55.5 GBq 111 GBq	–
13 Apr 1990	Gullfaks	–	–	3751	Cs-137	3.7 GBq	–
16 Jun 1990	Eldfisk	–	–	4090	Am-241/Be	666 GBq	–
10 Dec 1990	Statfyord	–	–	4212	Am-241	1.67 GBq	–
31 May 1991	Byford Dolphin	–	–	1920	Am-241	166.5 kBq	–

Date[2]	Geographical area	Co-ordinates		Depth (m)	Radioactive material involved	Total activity	Remarks
		Latitude	Longitude				
23 Feb 1981	Gulf of Mexico, near Louisiana	–	–	–	Am-241 Cs-137	666 GBq (18 Ci) 74 GBq (2 Ci)	Two sources
4 Mar 1981	Gulf of Mexico, near Louisiana	–	–	–	H-3	222 GBq (6 Ci)	Well logging
9 Oct 1981	Gulf of Mexico, near Louisiana	–	–	–	Am-241 Cs-137	592 GBq (16 Ci) 55.5 GBq (1.5 Ci)	Two sources
9 Oct 1981	Gulf of Mexico, near Texas	–	–	–	Am-241 Cs-137	592 GBq (16 Ci) 55.5 GBq (1.5 Ci)	Two sources
3 Nov 1981	Gulf of Mexico, near Texas	–	–	–	Cs-137	<3.7 GBq (<100 mCi)	Well logging
15 Jan 1982	Gulf of Mexico, near Louisiana	–	–	–	Cs-137	74 GBq (2 Ci)	Well logging
25 Mar 1982	Pacific Ocean, near Alaska	–	–	–	Ra-226	9 MBq (2.5 μCi)	Calibration source
10 Jun 1982	Gulf of Mexico, near Louisiana	–	–	–	Am-241 Cs-137	592 GBq (16 Ci) 55.5 GBq (1.5 Ci)	Two sources
21 Jul 1982	Gulf of Mexico, near Louisiana	–	–	–	Am-241	666 GBq (18 Ci)	Well logging
14 Oct 1982	Gulf of Mexico, near Louisiana	–	–	–	Cs-137	<370 GBq (<10 Ci)	Well logging



Worst-case scenario - Release from a nuclear-powered vessel

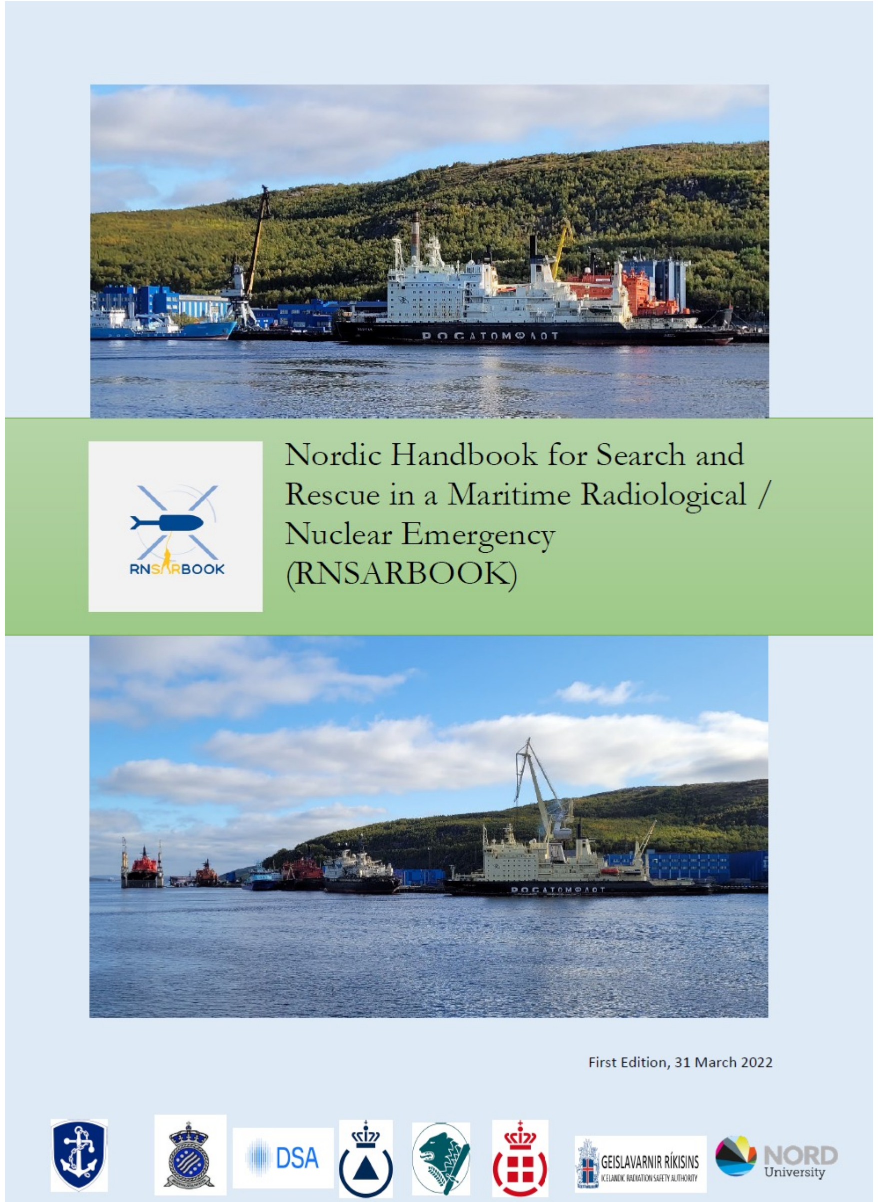


+ PSYCHOLOGICAL EFFECT

May affect, e.g.:

- Emergency workers, emergency helpers, crew
- Local communities; inhabitants and their livelihoods
- The Arctic environment
- Industries
- Political and other interests

DSA Norwegian Radiation and Nuclear Safety Authority



A basic introduction to RN

Operational plan for RN rescue operations

SOPs

- Assessment of the incident
- Determination of restriction area
- Arrival to the scene (RCC and SRUs)
- Boarding
- Rescue ops. on board
- Rescue procedures
- Evacuation and emergency towing
- Decontamination

1.4– Initial risk assessment

A **preliminary risk assessment** can be **conducted by the SMC**. Nevertheless, **national radiation authorities should be involved in** the operation as soon as possible and **subsequent risk assessments** should be re-adjusted following their advice.

Usual SAR risk assessment to be complemented by a specific RN risk assessment.

First step of the risk assessment dictated by the following questions (1.2.2 information gathering)

RN material compromised
Danger of RN material being compromised
Release to air
Danger of release
Increased radioactivity levels
Danger of increased radioactivity levels

		Affirmative	Negative	Danger
1	**Material compromised**	Proceed with caution See lines 2 and 3 of this table Continue appropriate risk assessment	No RNSAR operation Proceed with standard SAR procedures	Proceed with caution See this column lines 2 and 3 Continue appropriate risk assessment
2	**Release to air**	Proceed with caution Continue appropriate risk assessment Consider SRU capabilities, and decontamination possibilities and procedures See line 3 of this table	See line 3 of this table	Proceed with caution Continue appropriate risk assessment Consider SRU capabilities, and decontamination possibilities and procedures See line 3 of this table
3	**Increased radioactivity levels (over background levels)**	proceed with caution Continue appropriate risk assessment.	Deploy with caution	Deploy with caution Continue appropriate risk assessment

If radiation intensity readings are available, the following aspects can be considered:

1 mSv	Annual dose limit for the general population (including SRUs)		Low radiation doses do not pose an acute danger to living organisms and developing further sickness has a low probability
≥ 1 mSv			
4-5 mSv	Yearly dose for an average person (including background radiation, medical treatments…)		
10 mSv	CT scan		
≥ 50 mSv – only informed, voluntary personnel in life saving work and disaster mitigation			
100 mSv			
150 mSv			Moderate doses of radiation can have effects at the
500 mSv	Small changes in blood. Acute Radiation Sickness symptoms could appear		

1.1 – First communication

Y	N	U	ITEM
☐	☐	☐	Vessel / Call sign
☐	☐	☐	Type of vessel
☐	☐	☐	Position
☐	☐	☐	Communication channel + Backup communication channel
☐	☐	☐	Nature of emergency
☐	☐	☐	Type of assistance requested
☐	☐	☐	POB
☐	☐	☐	Injuries / Damages
☐	☐	☐	Weather conditions Precipitations Wind direction and speed Swell Sight
☐	☐	☐	Evacuation possibilities
☐	☐	☐	Equipment on board to deal with the emergency

IF NPV → 1.2. Information gathering NPV (p. 5)

IF TRANSPORT → 1.3 Information gathering transport (p. 6)

7 – DECONTAMINATION

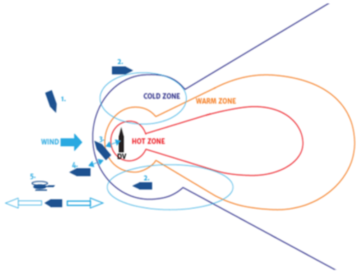
NB! Decontamination procedures only to be activated when there is a release or there is danger for a release

Step 1

Emergency decontamination
Location: in proximity of the vessel in distress outside the hot zone. Position: Upwind. Establishing: designated vessel or area with the capabilities to conduct the task in a safe manner. **NB!** If external conditions do not permit stablishing emergency decontamination stations, an onshore alternative should be arranged. Facilities: easy access to hot zone, fresh water supply, adequate PPE, capacity to provide clean transition to cold zone **NB!** Lifesaving medical measures will have priority over emergency decontamination. Victims can be transported without passing through the emergency decontamination station if the condition of the patient requires expedite measures that only can be provided in another location

Step 2

Decontamination of SRUs
SRUs, including personnel, vehicles and equipment is to be done as soon as possible to guarantee the continuity of the SAR system. Decontamination procedures should be arranged following the advice of the competent national radiation authority. Some SRUs might have the capabilities to conduct self-decontamination and internal procedures. These organizations should follow their internal procedures. Facilities to handle contaminated waste should be arranged offshore and onshore before the SRUs returning to land.



Possible tasks for SAR assets while deconaminating
1. On Scene Coordinator
2. Measurement and monitoring
3. Evacuation of personnel and decontamination first/inner vessel
4. Evacuation of personnel and decontamination second vessel
5. Transportation of evacuees to shore (by vessel or helicopter)

1.2. – Information gathering NPV

Y	N	U	ITEM
☐	☐	☐	Reactor type + thermal power
☐	☐	☐	Electrical power output
☐	☐	☐	Amount of nuclear fuel
☐	☐	☐	Old or fresh fuel
☐	☐	☐	Reactor integrity/damage, loss of coolant etc.
☐	☐	☐	Release Time of release
☐	☐	☐	Integrity of vessel propulsion Compartmentalization between propulsion mechanism and reactor cooling circuit is intact or damaged.
☐	☐	☐	Recent load on nuclear fuel (At what load has it been used, and for how long, e.g., 70% capacity for 6 days.) — The Nordic Handbook for Search and Rescue Operation in Nuclear / Radiological Incidents favors the use of Sievert (Sv) as the measuring unit of radioactivity. Most of SRUs in the Nordic countries also operate with this unit. Other countries and/or actors might operate with a different measuring unit. If acquiring the radioactivity measurement in Sv proves impossible, register the number and unit offered. National radiation authorities will be able to assess the situation at hand with any measurement unit.
☐	☐	☐	Increased radioactivity levels
☐	☐	☐	Level of reactivity Number and unit Distance from probe to source Time of the measurement
☐	☐	☐	Location of the reactor on board
☐	☐	☐	RN PPE on board Personal dosimeters EEBD Other PPE Vacuum system Crew trained in RN aspects
☐	☐	☐	Worst case scenario (risk of station black out (SBO)?)
☐	☐	☐	Inform IAEA and EU warning systems

→ 1.4 Initial risk assessment (p. 7) + 1.4.1 Initial risk assessment NPV (p. 8)

DETERMINATION OF RESTRICTION AREA

- Without measurements
- With measurements
- Prognosis tools

Thank you for your attention