

**Report of the SAREX nearby the North Pole,
on September 7th 2021,
with LE COMMANDANT CHARCOT
& Russian, Norwegian, Greenlandic/Danish, Canadian, US SAR**



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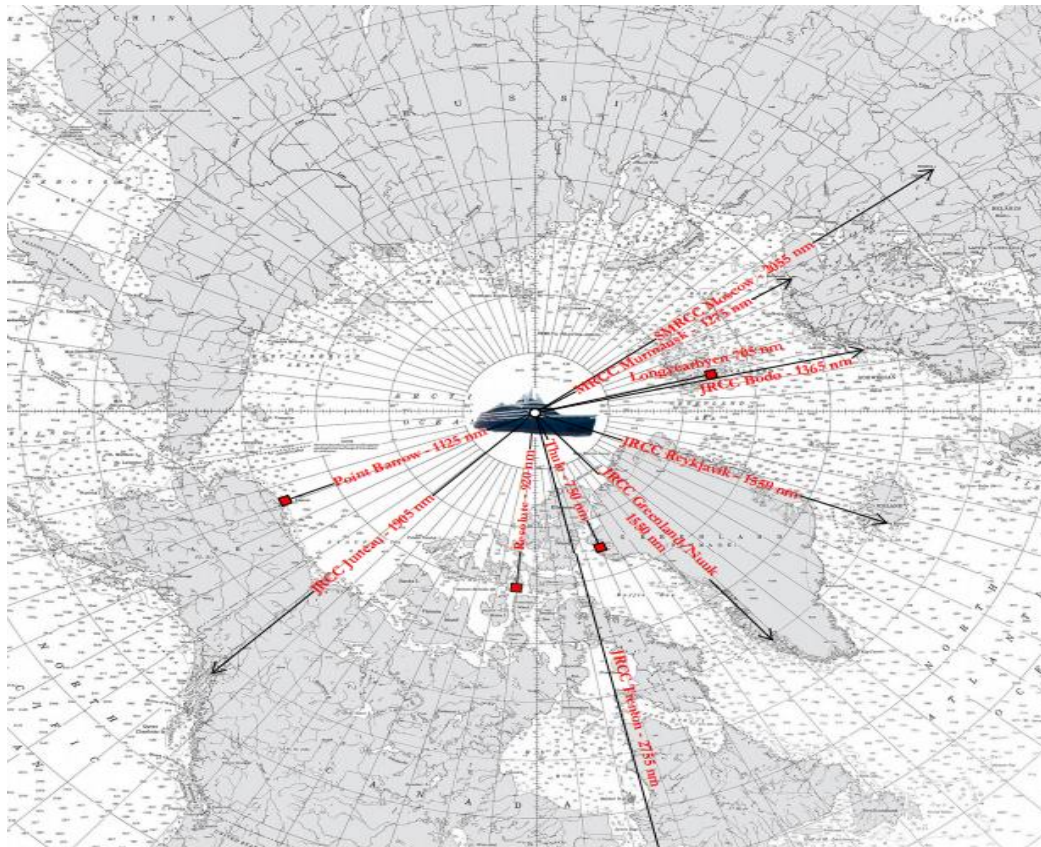
1. Overview:

- ✓ SAR professionals, Academic experts, Ship's officer & crew, Head Office Management will conduct a Life SAREX to determine the challenges, constraints and opportunities involved in an Arctic Massive Rescue Operation (AMRO) in extreme remote polar area (North Pole) in order to improve the safety in polar water.
- ✓ Ship's Crew, RCC, Rescue Parties and Head Office will collaborate to plan a survival and rescue strategy.

1.1 Scenario:

- ✓ On September 7th 2021, at 08h00 LT, LE COMMANDANT CHARCOT is sailing through heavy pack ice, nearby the North Pole, with 133 crew & 122 participants onboard, total POB: 255.
- ✓ At 08h09 LT, following a fire detection in the emergency storage room B (or Lithium Ion Batteries Room B), deck 2, Fire zone 3, a self-ignition fire start to spread through the battery room, with toxic smoke and generate some explosion.
- ✓ Three crew members are seriously burned and two have been intoxicated.
- ✓ Due to the fact the fire is not under control, the Captain decides to evacuate the vessel by all means available.
- ✓ A Mayday message has been send to all stations with the all communication means, ship's position: 89°54'N / 175°39'W (Russia SAR zone).
- ✓ 67 persons were selected to participate to this SAREX. They abandoned the ship on to pack ice with survival immersion suit, in order to establish a polar survival camp which included as well a hospital shelter and a command tent, for almost 24 hours, off the vessel.
- ✓ Average Ice thickness condition: 1.5 meter, Temperature: - 4°C / 25°F, wind: 15 to 20 kts / 320°.

1.2 LE COMMANDANT CHARCOT nearby the North Pole



1.3 Arctic Search & Rescue Zone



2. SAREX Participant's List, Total 67 persons:

- **33 Crew members** (captain, deck, engine, hotel, expedition, medical dept)
- **8 Polar's experts:**
 - ✓ **USA:**
 - LCDR Aaron RIUTTA, USCG representative, Aaron.L.Riutta@uscg.mil
 - Paul A. WEBB, USCG D17 Representative, Paul.A.Webb@uscg.mil
 - ✓ **CANADA:**
 - Chris BIANCO, Mass Rescue Operations Officer, Arctic Programs, Chris.Bianco@dfo-mpo.gc.ca
 - ✓ **NORWAY:**
 - Gudmund JOHANSEN, ex Norwegian Coast Guard, main instructor & lecturer in Polarcode-courses at Arctic University of Norway, gudmund.johansen@uit.no
 - ✓ **FRANCE:**
 - BUREAU VERITAS :
 - Aurelien OLIVIN, in charge of approbation LSA equipment: aurelien.olivin@bureauveritas.com
 - FRENCH NAVY:
 - CC Laurent MATTER, ex 2nd in command of the French Icebreaker « L'ASTROLABE », laurent.matter@intradef.gouv.fr,
 - LV Dimitri LEVREL, captain of the navy vessel « RHONE », dimitri.levrel@intradef.gouv.fr
 - FRENCH MERCHANT MARINE ACADEMY:
 - Hervé BAUDU, Senior Lecturer in Nautical Science, herve.baudu@supmaritime.fr,
- **26 participants, from 17 to 71 years old**, including 2 Inuits from Greenland

2.1. SAR Participant:

1. **Russia: MRCC Murmansk was responsible and took the lead for conducting the MRO.**
 - ✓ Oleg BURYI, Head MRCC Murmansk, chiefmrcc@mapm.ru; buryi@mapm.ru
2. **Norway: JRCC North NORWAY**
 - ✓ Duty Officer, JRCC North Norway, operations@jrcc-bodoe.no
3. **Iceland: JRCC Iceland:**
 - ✓ Guðmundur Rúnar Jónsson, Shift Manager, sar@lhg.is
4. **Greenland: JRCC Greenland**
 - ✓ Duty Officer , Joint Arctic Command, jrcc@jrcc.gl
5. **Canada: JRCC Trenton**
 - ✓ Duty officer, jrcctrenton@sarnet.dnd.ca
6. **USA: JRCC Juneau**
 - ✓ JRCC Juneau, Coast Guard D17 Command Center, JRCCJuneau@uscg.mil
7. **France: MRCC Gris-Nez**
 - ✓ Watch Officer, MRCC Gris-Nez, gris-nez@mrccfr.eu
8. **UK as SAR Data Provider:**
 - ✓ Duty Officer, United Kingdom Coastguard (UKMRCC), ukmrcc@hmcg.gov.uk

2.2. PONANT Head Office Participants :

- Frederic GALLOIS, EVP Fleet & Operations, fgallois@ponant.com
- Jean CAROTENUTO, SSE Manager, DPA-CSO, jcarotenuto@ponant.com or Emergency Line: ERPLine@ponant.com

2.3. TELEMEDICAL ASSISTANCE:

- 24/24 Hours Duty, cmm@chu-toulouse.fr

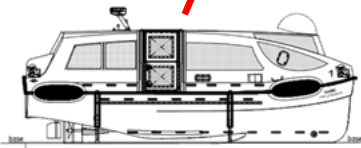
2.4. LE COMMANDANT CHARCOT Contact :

- Captain Patrick MARCHESSEAU, master.commandantcharcot@ponant-ships.com or pmarchesseau@ponant.com
- Staff Captain Mathieu TSINGRILARAS, mtsingrilaras@ponant.com

3. Lifesaving Appliance & Polar Survival Equipment



ICECUBE:
Quantity: 8
4 Polar Shelter/IceCube of 16 persons



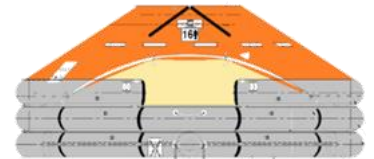
LIFEBOAT:
Quantity: 4
Capacity: 4 x 115 Persons
TOTAL: 460 Persons



RESCUE BOAT:
Quantity: 2
Capacity: 6 Persons



LIFERAFT:
Quantity: 6
Capacity: 20 Persons
TOTAL: 120 Persons



**8 ICECUBE with
32 POLAR SHELTERS** of 16 persons
1 Hospital Shelter + 1 Commandment Shelter
TOTAL Capacity : 512 Persons

ICE GANGWAY,
10.5 meters,
Storage on deck 10
Lowered with crane
powered on Emergency
Generator

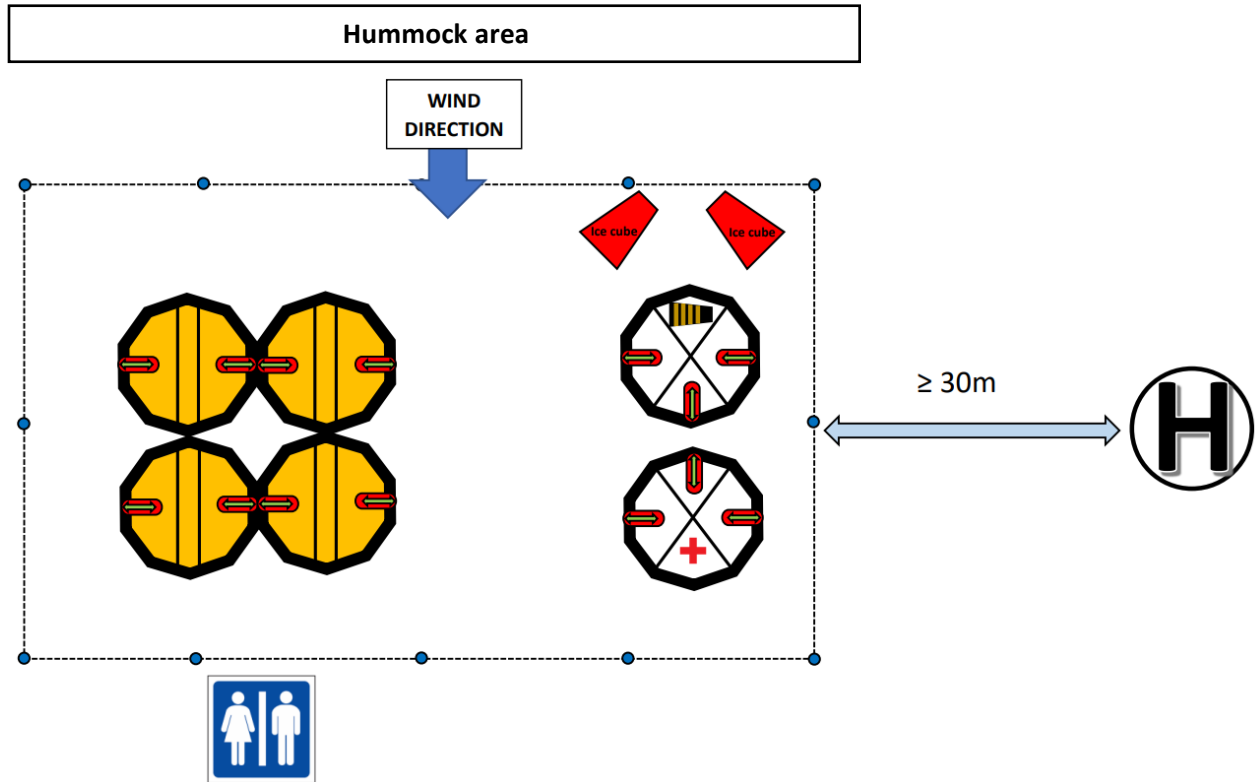


4. SAREX Weather record

DATE	Local Time	Air Temperature (°C)	Feeling Temperature (°C)	Dew point (°C)	Humidity (%)	Air pressure (hPa)	Wind direction (°)/ Speed (knts)	Predpation (mm)	Accumulation (mm)	Wheater description	Comments
9/7/2021	8:00	-3.4	-12	1.8	89	1019.8	318 / 16	0	0	Cloudy, good visibility	
	9:00	-3.5	-13	1.9	89	1019.7	324 / 20	0	0	Cloudy, good visibility	
	10:00	-3.8	-13	2.3	90	1020.1	320 / 19	0	0	Start snowing, visibility decreasing	
	11:00	-4.1	-13	2.6	90	1020.5	320 / 18	0	0	Cloudy, good visibility	
	12:00	-4.5	-14	3	90	1021	318 / 16	0	0	Cloudy, good visibility	Début des 24h du SAREX : 11:30
	13:00	-4.9	-13	3.3	90	1021	309 / 16	0	0	Cloudy, good visibility	
	14:00	-5.1	-14	3.4	88	1021.2	300 / 18	0	0	Cloudy, good visibility	
	15:00	-6.1	-14	4.5	89	1021.4	313 / 16	0	0	Cloudy, good visibility	
	16:00	-6.6	-16	4.6	86	1021.5	312 / 18	0	0	Cloudy, good visibility	
	17:00	-7.7	-17	5.9	88	1022	300 / 15	0	0	Cloudy, good visibility	
	18:00	-9.7	-18	7.9	89	1021.7	308 / 15	0	0	Cloudy, good visibility	
	19:00	-8.9	-16	7.1	89	1022	306 / 11	0	0	Cloudy, good visibility	
	20:00	-9.2	-16	7.1	87	1022.2	295 / 10	0	0	Cloudy, good visibility	
	21:00	-10.4	-17	8.3	87	1022.2	275 / 5	0	0	Fog (around 5 cables)	
22:00	-9.5	-17	7.9	90	1022.2	275 / 11	0	0	Fog (around 2 NM)		
23:00	-8.8	-17	6.7	87	1022.1	280 / 5	0	0	Sunny with some fog		
9/8/2021	0:00	-8.8	-17	6.2	83	1022.1	288 / 11	0	0	Sunny with some fog	
	1:00	-8.3	-15	5.1	80	1022	281 / 12	0	0	Sunny	
	2:00	-8.5	-15	5.5	81	1022.5	283 / 11	0	0	Sunny	
	3:00	-6.9	-14	3.5	79	1022.5	266 / 9	0	0	Sunny	
	4:00	-7.2	-15	4	81	1022.5	280/14	0	0	Sunny	
	5:00	-6.9	-17	4.8	82	1022.6	290/17	0	0	Sunny	
	6:00	-7	-10	4.5	86	1022.6	278/12	0	0	Hazy	
	7:00	-5.8	-14	3.1	83	1022.7	276/13	0	0	Sunny	
	8:00	-5.1	-14	2	80	1022.7	287/13	0	0	Sunny	
	9:00										
	AVERAGE	-6.828	-14.84				13.64				

- ✓ Average Temperature: -6.8°C
- ✓ Average Feeling Temperature: -14.8°C
- ✓ Average Wind Conditions: NW/ W, 13.4 Knots

5. SAREX's Polar Camp Plan:



6. SAREX Timeline:

- ✓ 08h09 LT, "Code Bravo" following fire detection in the Batteries Room A, deck 2, ship's position: 89°54'N / 175°39'W (Russia SAR zone)
- ✓ 08h14 LT, On Scene Commander at the Meeting Point
- ✓ 08h17 LT, All fire teams at the Meeting Point
- ✓ 08h21 LT, General Alarm, to gather pax & crew to their assembly station
- ✓ 08h23 LT, Email send to Arctic's Search & Rescue Operator & PONANT's head office to report the fire onboard
- ✓ 08h25 LT, Order from the Captain to set up the polar survival camp on the pack ice
- ✓ 08h25 / 09h10 LT, Call via Bridge Iridium phone, Emergency Line Ponant, MRCC Murmansk, JRCC Bodo, JRCC Greenland, JRCC Trenton, JRCC Juneau, MRCC Gris-Nez, MRCC UK & CCMM Toulouse (Telemedical Assistance)
- ✓ 08h27 LT, Report of 3 casualties
- ✓ 08h36 LT, Medical teams proceed to the hospital with the 3 casualties
- ✓ 08h44 LT, Loading & Transportation team for the polar camp ready at the meeting point
- ✓ 08h58 LT, Ice Gangway ready in position
- ✓ 09h09 LT, IceCube N°3 & Additional Liferaft offload on the ice
- ✓ 09h16 LT, IceCube N°7 offload on the ice
- ✓ 09h27 LT, Bear assessment completed by the bear watch team
- ✓ 09h29 / 09h35 LT, Transport of the 1st IceCube to the Polar Camp
- ✓ 09h56 / 10h17 LT, 1st Polar Shelter inflate on the pack ice
- ✓ 09h57 LT, 2nd IceCube in the Polar Camp
- ✓ 10h05 LT, Broadcasted message from the captain to the passengers to invite them to go to the toilet, to fill up their flask and to get dress with the immersion suit

- ✓ 10h13 / 10h30 LT, 2nd Polar Shelter inflate on the pack ice
- ✓ 10h24 / 10h38 LT, 3rd Polar Shelter & Hospital tent inflate on the pack ice
- ✓ 10h42 LT Abandon Signal broadcast by the captain
- ✓ 10h44 LT, 1st Group of participants to disembark from the vessel
- ✓ 10h54 LT, Last email sent from the vessel to all Arctic SAR professionals & PONANT Head Office to confirm the abandon ship's process.
- ✓ 11h00 LT, 2nd Group of participants to disembark from the vessel
- ✓ 11h05 / 11h18 LT, 4th Polar Shelter & Command tent inflate on the pack ice
- ✓ 11h07 LT, 3rd Group of participants to disembark from the vessel
- ✓ 11h29 LT, 4th Group of participants to disembark from the vessel following by the Medical team with the casualties
- ✓ 11h33 LT, Captain abandon the vessel
- ✓ 12h25 LT, 1st call from the Command Tent via Portable Iridium to PONANT Head Office
- ✓ 12h30 / 12h40 LT, call via portable Iridium to JRCC Bodo & MRCC Murmansk to update the situation
- ✓ 12h45 LT Meeting with the Polar Shelter leaders
- ✓ 13h00 LT Activate 1 Epirb & 1 PLB
- ✓ 13h33 LT Acknowledge of receive (by email to the vessel) from JRCC Bodo, regarding EPIRB signal
- ✓ 13h40 LT Acknowledge of receive from JRCC Juneau regarding the PLB signal.
- ✓ 14h05 LT Call via portable Iridium to MRCC Murmansk witch is working on an Air plan
- ✓ 14h10 LT MEDEVAC of one casualty conducted by the vessel helicopter
- ✓ 14h15 LT Participants authorized to get out of the polar shelter and walk in safe perimeter. Toilet facilities available.
- ✓ 14h50 LT Start to produce fresh water by melting ice & snow
- ✓ 15h40 LT 1st participant returned to the vessel, remaining 66 persons
- ✓ 16h10 LT, Call via portable Iridium with MRCC Murmansk witch is working with JRCC Bodo to coordinate a helicopter operation from Svalbard (Norwegian) with air drop of kerosene (Russian) on the pack ice, until an icebreaker will arrive in 4 to 5 days.
- ✓ 16h30 LT Call via portable Iridium to ERL PONANT to update information
- ✓ 18h45 LT Call via portable Iridium to ERL PONANT to update information
- ✓ 19h15 / 19h25 LT, 5 participants returned to the vessel, remaining 61 persons
- ✓ 19h25 LT, Call from ERL PONANT to update the situation
- ✓ 20h10 LT, One participant returned to the vessel, remaining 60 persons
- ✓ 20h45 LT, One participant returned to the vessel, remaining 59 persons
- ✓ 21h02 LT, Three participant returned to the vessel, remaining 56 persons
- ✓ 23h00 LT, One participant returned to the vessel, remaining 55 persons
- ✓ Day +1, 01h00 LT, One participant returned to the vessel, remaining 54 persons
- ✓ Day +1, 02h30 LT, One participant returned to the vessel, remaining 53 persons
- ✓ Day + 1, 05h30 LT, One participant returned to the vessel, remaining 52 persons
- ✓ Day + 1, 07h05 LT, Call via portable Iridium to MRCC Murmansk to update the situation
- ✓ Day +1, 07h10 LT, Call via portable Iridium to ERL PONANT to update the situation
- ✓ Day + 1, 08h15 LT End of the SAREX, all participants come back onboard the vessel

7. SAREX RECAP with numbers:

- ✓ Total participants: 67 persons
- ✓ Ratio Crew / Acting passengers: 34 / 33
- ✓ Ration Officer / Crew: 5 / 34
- ✓ Ration Manager / Crew: 9 / 34
- ✓ Ratio Expedition Guide / Crew: 8 / 34
- ✓ Age of the participants, from 17 to 71 years' old
- ✓ Average age of all participants: 39 years' old
- ✓ Ratio Male / Female: 75% & 25%
- ✓ Number of persons who returned to the ship before the end of the exercise: 15
- ✓ Average age of the persons who returned to the vessel prior the end of the drill: 33 years' old
- ✓ Three persons were in hypothermia when they returned to the vessel: 34° to 35°C
- ✓ Number of participants wearing "White Glacier Arctic 10+" Immersion Suit: 40
- ✓ Number of participants wearing "Hansen Protection N6 Arctic" Immersion Suit: 24
- ✓ Number of participants wearing "Regatta Active 911": 3
- ✓ 29% of persons wearing "Hansen Protection N6 Arctic" immersion suit returned to the vessel before the end of the exercise
- ✓ 15% of persons wearing "White Glacier Arctic 10+" immersion suit returned to the vessel before the end.
- ✓ Percentage of participants who complete the SAREX written survey: 80% (all comment from this survey have been analyzed in order to take in consideration the maximum of feedback, which are used to submit some improvement).

8. SAREX IMMERSION SUIT or FLOATING SUIT:

8.1 Introduction:

- ✓ Some research & development has been carried out in joint venture with the manufacturer White Glacier, in order to provide the "Arctic10+" immersion suit for LE COMMANDANT CHARCOT.
- ✓ Considering we didn't receive the complete set from White Glacier, onboard prior this SAREX, we rent some "Hansen Protection N6 Arctic" immersion suit which were tested as well.
- ✓ In addition, we were able to test some "Regatta Active 911" flotation suit, which will be provided to our guests during Zodiac cruising.
- ✓ **White Glacier Arctic 10+ Immersion suit for the crew member (yellow band):**



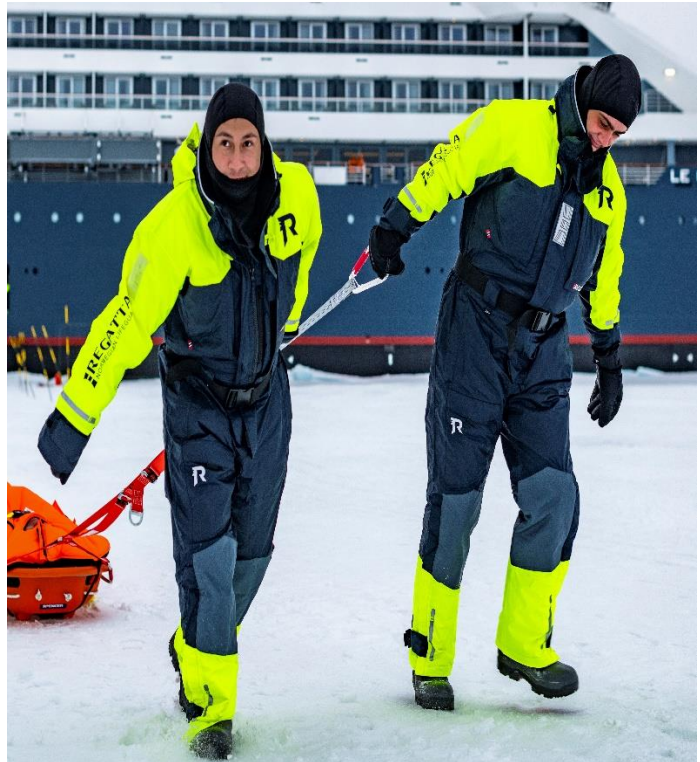
✓ White Glacier Arctic 10+ Immersion suit for the passenger:



Hansen Protection N6 Arctic Immersion Suit



Regatta Active 911 Flotation Suit

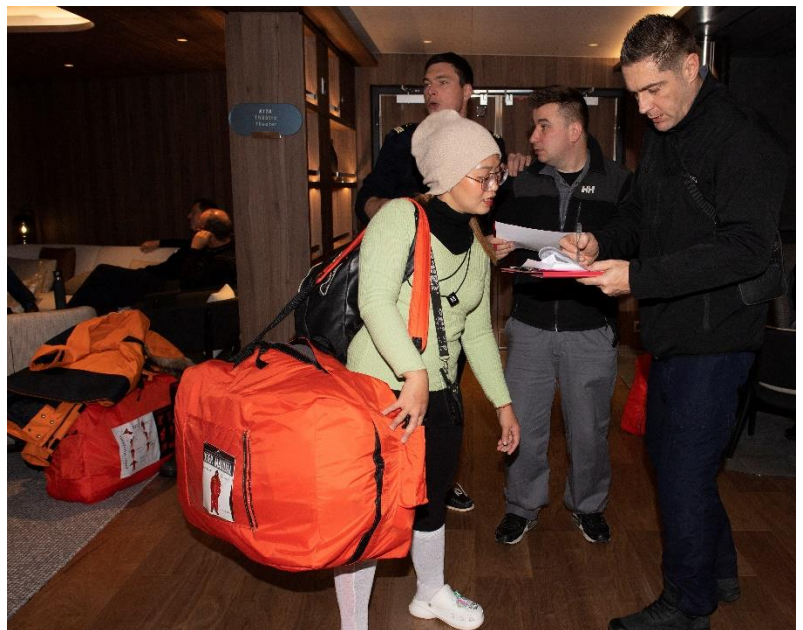


9. SAREX PHOTO ALBUM with timeline:

- ✓ 08h09 LT: Code Bravo, following fire detection in the batteries room A



- ✓ 08h21 LT, General Alarm to gather the passengers at the Assembly Station & PSK Distribution



Bag of White Glacier Immersion Suit

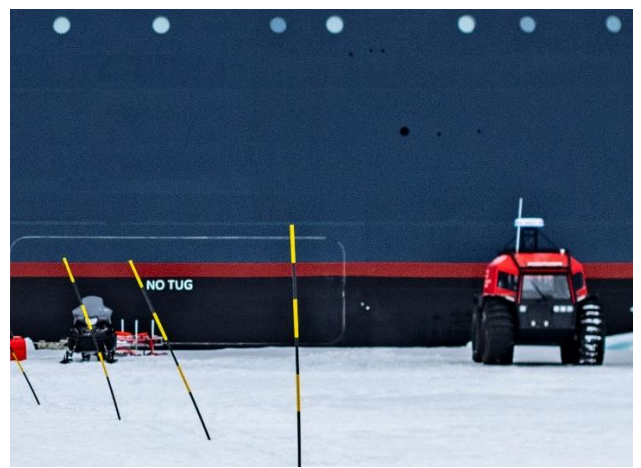
PSK distribution (Yellow color Assembly Station A & Orange color Assembly Station B)



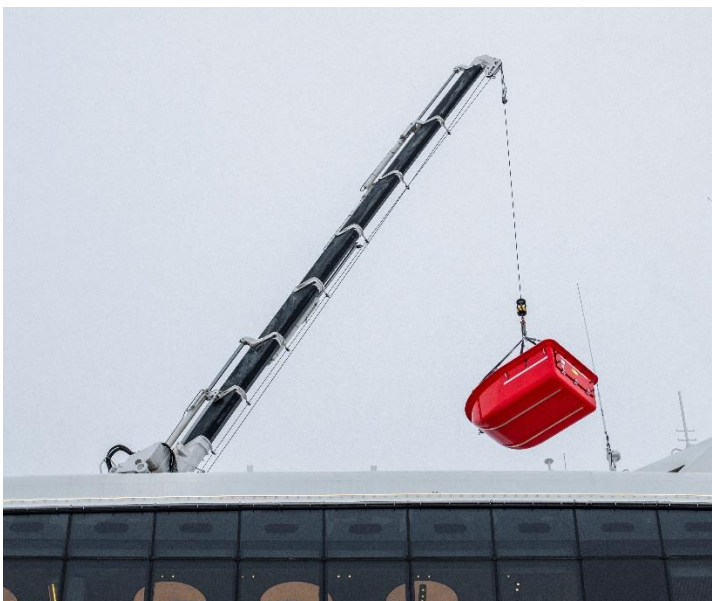
✓ 08h58 LT, Set up of the Ice Gangway



✓ 09h05 LT, Offloading of the SHERP & one skidoo, to be used only for Emergency or Safety during the SAREX, both on standby at the gangway.



✓ 09h09 LT: IceCube N°3 (GSK) & Additional Liferaft offload on the ice. The Crane is powered on Emergency Generator and the hook is fitted with automatic release system to offload the IceCube.





✓ 09h29 LT, Transportation of the material to the polar camp site



✓ 09h40 LT: IceCube Offloading: 6 pulka inside, including 4 polar shelters and safety & survival material





✓ 09h50 LT, Offloading of 1 pulka with one polar shelter, start to unpack the 1st polar shelter



09h56 LT: Lashing the Polar Shelter' strap into the ice & Inflating of the 1st Polar Shelter

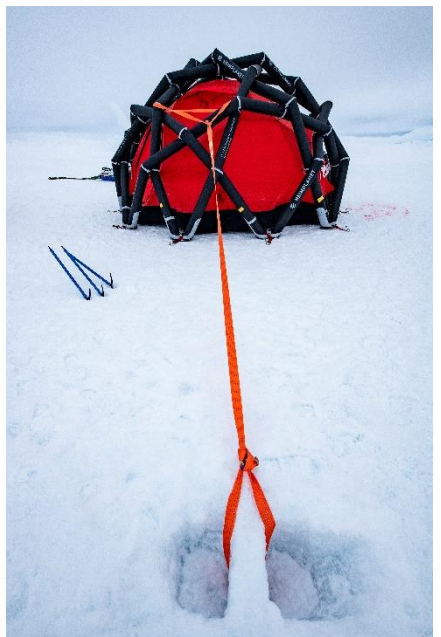




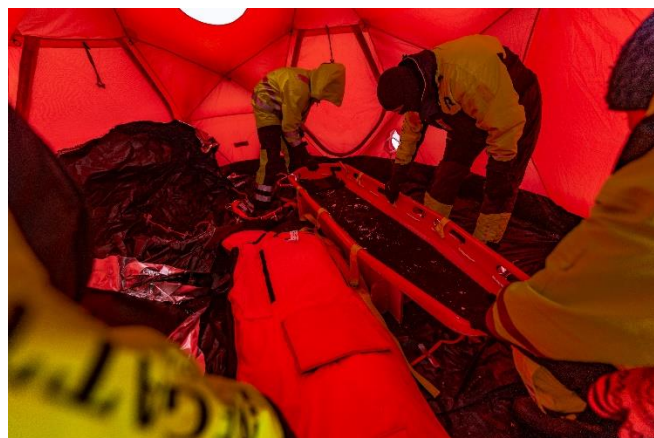
- ✓ 10h17 LT, 1st Polar shelter inflated. There is an air gap, between the floor and the ice, to prevent to get cold from the floor.



- ✓ 10h24 LT, Inflating the Hospital tent & lashing point into the ice



✓ 10h35 LT, Transportation of the medical equipment & material from the vessel to the hospital shelter



✓ 10h15 LT, Participants start to get dress with their immersion suit





✓ 10h44 LT, 1st Group of participants to disembark from the vessel following the Abandon Signal broadcasted by the Captain



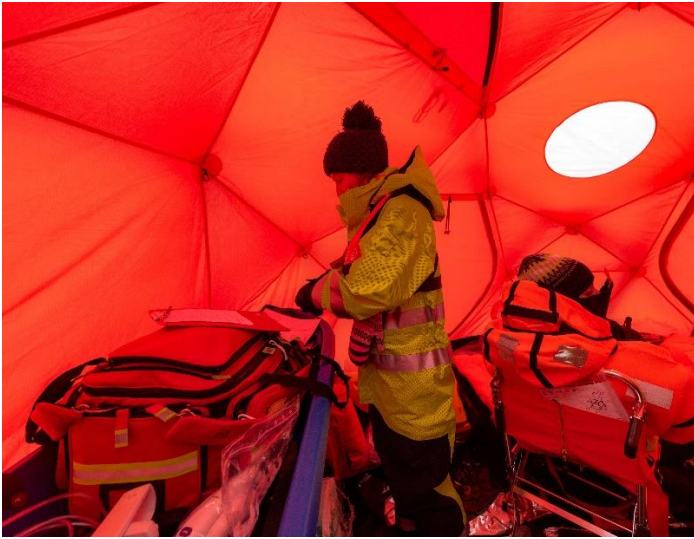


✓ 11h00 LT, 1st group of participants on standby into the polar shelter

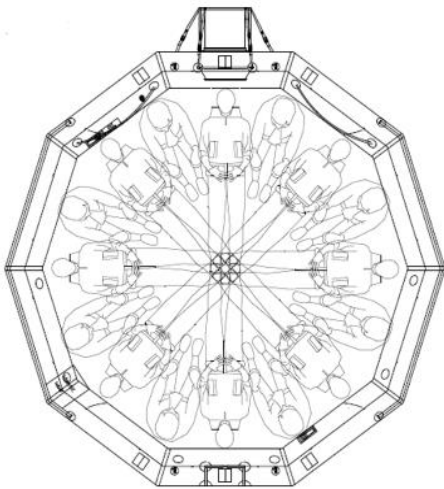


✓ 11h29 LT, Evacuation of the casualties from the ship's hospital to the hospital shelter





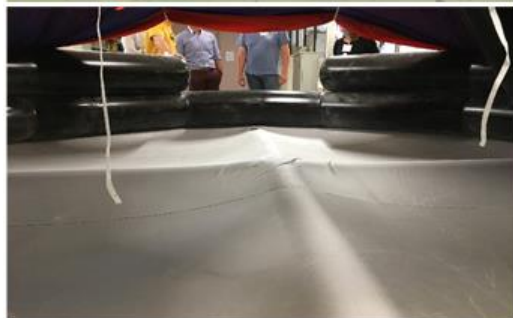
✓ 11h50 LT, all participants have been dispatched into the four polar shelters



X 8



X 8



- ✓ 12h25 LT, Inside the command tent, to maintain some updated list of the survival camp & communication with SAR operators/Ponant's Head Office via Portable Iridium



- ✓ 13h33 & 13h40 LT, Acknowledgement from JRCC Bodo & JRCC Juneau regarding EPIRB & PLB signal



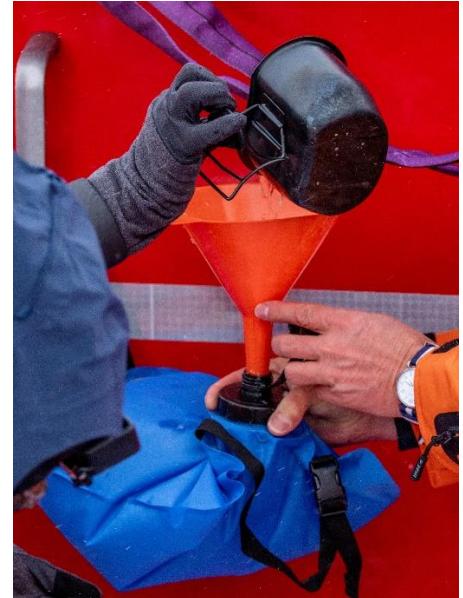
- ✓ 14h10 LT, MEDEVAC of one casualty with the vessel helicopter acting as SAR helicopter



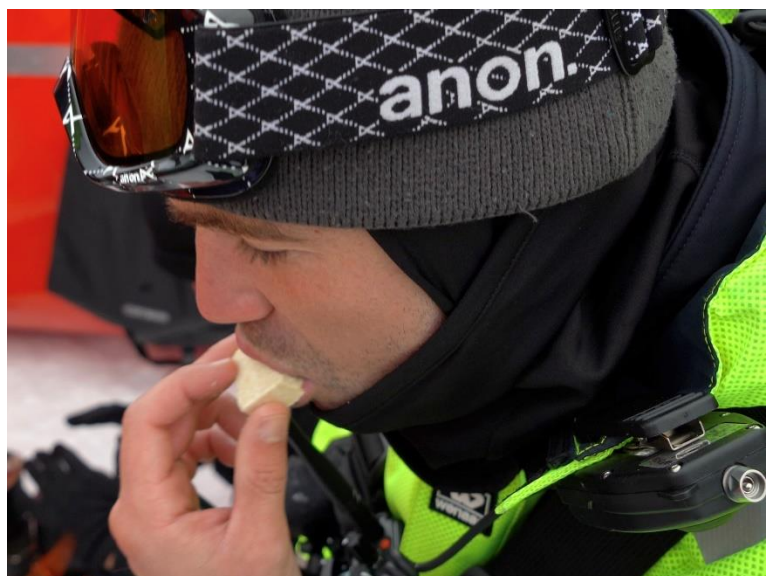
✓ 14h30 LT, Participants started to go to the toilet facilities



✓ 14h50 LT Start to produce fresh water by melting ice & snow



✓ Drinking water (500 ml) & food ration (10300KJ) from the PSK



- ✓ Alternative solution as Shelter: either inside the IceCube, or in the snow, with the wrapping material from the polar shelter



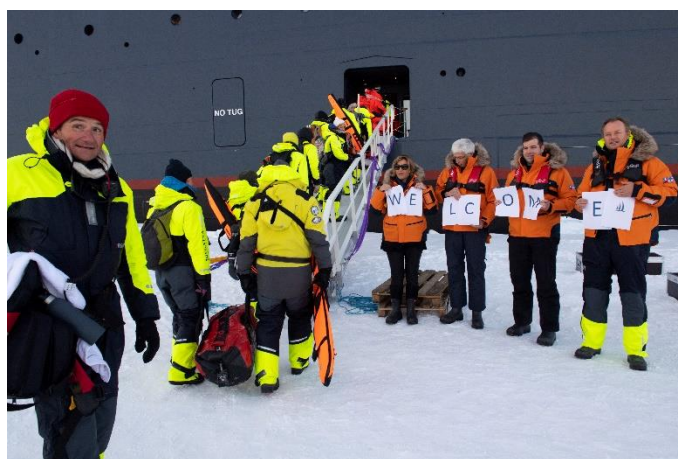
- ✓ Overview of the polar survival camp



- ✓ Day +1, around 01h00 LT, a walk guided by bear watcher around the camp to warm up some participants, and one participant returned with escort to the vessel



✓ Day + 1, 08h15 LT End of the SAREX, all participants come back onboard the vessel



10. Additional test after the SAREX:

✓ Floating of the polar shelter & lifting on the ice



✓ Floating & waterproof test of the immersion suit, & climbing test from the water into the polar shelter



11. SAR RESPONSE PLAN & HEAD OFFICE:

11.1 JRCC ICELAND:

✓ **Message received at 08h34 LT:**

Good morning,

Due to location of casualty, Icelandic Coast Guard does not have air asset with reach of casualty, Icelandic Coast Guard does not have surface vessel with capability of reaching the casualty. (Ice Breaking ability not existant).

No assets from Icelandic Coast Guard are available to assist with this casualty.

Regards,

Shift Manager

Icelandic Coast Guard

11.2 MRCC MURMANSK:

✓ **1st Message received at 08h51 LT:**

Your message received.

✓ **2nd Message received at 13h01 LT:**

Hello to all Arctic SAR Operators,

On behalf of SAR Authorities of the Russian Federation,

MRCC Murmansk is responsible and taking lead for conducting the MRO with the icebreaker LE COMMANDANT CHARCOT.

In the first approaches, to use of a Norwegian SAR helicopter for medical evacuation of 3 casualties in this situation is the preferred option, please clarify whether there is enough fuel for the return flight, if not, which refueling airfield can be used?

Kind regards,

Chief MRCC Murmansk

✓ **3rd Message received at 14h35 LT:**

Hello,

It's appears the first leg of the MOB has to be:

MEDEVAC of 03 injured persons from ice (point of distress) by NOR SAR Helix (?). Refilling for helicopter is not available from ice breaker!!! It's was confirmed over the phone by the Master.

MRCC Murmansk still waiting for Flight Plan for RUS SAR Air Unit.

✓ **4th Message received at 15h09 LT:**

Question: how much fuel (kgs) is required for the return trip for the NOR SAR Helicopter?

implies the use of AN 26 (SAR Aircraft) for dropping fuel for refueling the helicopter at the tent camp site///

Kind regards,

MRCC Murmansk

✓ **Antonov 26**



✓ **5th Message received on Day + 1 at 07h48 LT:**

Hello to all Arctic SAR operators!!!

1) Due to the remoteness of the point of distress from the nearest airfields Murmansk (2400 km) and Nagurskoe (Frans-Josef Land archipelago) (1030 km), it is not possible to evacuate by SAR air units and means (both by helicopter and by plane). For the survival of people who have landed on the ice, the SAR aircraft An-26 from the Murmansk airfield (with an intermediate landing for refuelling at the Nagurskoye airfield), after 7 - 8 hours, it is possible to provide landing of tents, stoves, a limited amount of fuel, warm clothing and food.

To organize evacuation by an SAR aircraft (helicopter) to the nearest airfield Nagurskoye, additional forces and means are required, as well as time for organizing helicopter refuelling points (dropping fuel barrels) using heavy transport aircraft (IL-76) on the helicopter flight route from Murmansk to Nagurskoye (in the presence of ice) and from Nagurskoe to the North Pole, or the preparation of an ice airfield in the disaster area for the An-74 aircraft, which requires long-term large-scale operations.

2) Another solution to the problem (evacuation of 67 people) is seen in the use of a nuclear icebreaker (Headquarters of Marine Operations of FSUE Atomflot), leaving the port of Murmansk in the direction of the accident site, the estimated transit time is 4 - 5 days, depending on ice and weather conditions.

Head MRCC Murmansk

✓ **Ilyushin-76**, To be used for airdrop of medical support & equipment. **Antonov 74**, Can land on the ice



- ✓ Nuclear Russian Icebreakers: **50 Let POBEDY** and **ARKTIKA**



11.3 JRCC GREENLAND:

- ✓ **1st Message received at 08h58 LT:**

A surveillance aircraft will take off in 30 minutes from BGSF in Greenland. ETA Le Commandant Charcot 7 SEP 1030UTC

Inussiarnersumik inulluarit/ Best Regards

Duty Officer

Joint Arctic Command (JRCC Greenland)



- ✓ **2nd Message received at 09h23 LT:**

JRCC Greenland has notified the Arctic Response Force. First available possible aid are Arctic 10 packs (for exercise), which can provide shelter, heating and freeze dried etc.

Let us know if we (for exercise) are to deploy the 10 packs within 10 minutes.

Inussiarnersumik inulluarit/ Best Regards

Duty Officer

Joint Arctic Command (JRCC Greenland)



✓ **3rd Message received at 09h41 LT:**

Disregard last message regarding the surveillance aircraft. The aircraft cannot assist and deploy aid to the position. JRCC has no available resources to deploy to the area.

Inussiarnersumik inulluarit/ Best Regards

Duty Officer

Joint Arctic Command (JRCC Greenland)

11.4 JRCC JUNEAU:

✓ **1st Message received at 09h28 LT:**

Greetings from JRCC Juneau,

JRCC Juneau can provide assistance via C130J, ETA would be approximately 8-9 hrs.

Very Respectfully,

JRCC Juneau



✓ **2nd Message received at 10h07 LT:**

Captain,

JRCC Juneau's ETA is 10 hours, 1800Z. The C130J has limited on scene time with the vessel but will attempt drop pararescuemen that have EMT level 3 training and advanced medical training. The C130J will also drop additional medical and rescue supplies to the camp. Please update us with a location on the ice if you abandon ship to the ice

Regards,
JRCC Juneau

11.5 JRCC North Norway:

✓ **1st Message received at 09h31 LT:**

JRCC North Norway are investigating available Norwegian assets for the situation. At present we have no vessels in the area capable of reaching the incident position. Investigating possibilities for air-drop of assets for exercise purposes. For exercise purposes: Has any MRCC planned to take the lead in this incident? Who has planned to execute live air-drops for this incident?
Duty Officer
JRCC North Norway

✓ **2nd Message received at 11h26 LT:**

JRCC North-Norway would have the possibility to send a rescue helicopter from Svalbard to the ships position (**only teoretically – NOT GRANTED FOR THIS EXERCICE**).

Distance 720 NM

ETA: approx. 8 hrs.

Could take up to 2-3 patients from the vessel back to Svalbard.

Best regards,
Joint Rescue Coordination Centre, North-Norway



✓ **3rd Message received at 13h17 LT:**

JRCC North-Norway hereby confirm that MRCC Murmansk will take lead of the SAR operation regarding LE COMMANDANT CHARCOT.

For exercise purposes – **NOT TO BE CONDUCTED LIVE**, a rescue helicopter could be sent from Svalbard and evacuate 2 casualties (if 3 casualties, one of the crew members on SAR helicopter has to remain on site, not to return by the helicopter).

The Norwegian SAR helicopter has to refuel along the route, refuelling on fuel depot on the northern point of Svalbard, and need to receive fuel from Le Commandant Charcot. Le commandant charcot need to confirm that fuel (JET A1) is available from the ship.

Best regards,
Joint Rescue Coordination Centre, North-Norway

✓ **4th Message received at 13h33LT:**

JRCC North-Norway hereby confirm reception of EPIRB distress signal from Le Commandant Charcot. Detected at 1109 UTC.

Joint Rescue Coordination Centre, North-Norway

✓ **5th Message received on Day+1, at 12h24 LT:**

Good morning LCC

Yes, Kronprins Haakon do have minimum 5000 liters helifuel onboard, and could be a refuelling asset for the rescue helicopter. I cannot guarantee that the ship is able to reach your current position, but we would have to discuss this with the captain of Kronprins Haakon.

Best regards,

Joint Rescue Coordination Centre, North-Norway



11.6 UK SAR DATA PROVIDER:

✓ **Message received at 08h55 LT:**

Sir,

Please see the attached SARCO Plan for the North Pole SAREX, LE COMMANDANT CHARCOT.

Regards,

Duty Officer

United Kingdom Coastguard (UKMRCC)

11.7 PONANT HEAD OFFICE:

✓ **Message received at 12h28 LT:**

Good afternoon

For exercise for exercise for exercise

This is the crisis management cell from Ponant.

Can you confirm the maximum range scale of your rescue helicopter please? Is 720NM X2 (1440NM) is really possible in order to take back casualties to Svalbard please?

At your disposal if necessary

Thanks you

Best regards

PONANT Emergency Line #1

12. EVALUATION:

12.1 Initial review and feedback:

During this SAREX, we identified the following remarks:

1. Positive remarks:

- The **White Glacier Immersion** Suit is warmer than the Helly Hansen, but offer risk of overheating, leading to wet clothes under survival suit. This risk of condensation should be monitored to prevent to get cold.
- The **IceCube** concept is convenient to carry all the polar camp material & equipment and can be used when empty for an alternative purpose.
- The **Polar Shelter** offered a good thermal protection from the wind & cold environment when there are enough survivors (at least 10 people) inside. The elevated floor in the shelters was absolutely crucial to preventing heat loss through the floor. It was very convenient to inflate all shelters and unnecessary to deflate during this SAREX.
- **All communication** with SAR Operators & PONANT's Head Office has been maintained through portable Iridium without any problem. (We used only one Iridium out of three available, with one spare battery out of 14)
- **Survivors tracking**: we were able to maintain a proper tracking of all survivors during the different steps of the exercise, with some paper list support and log book. (E Muster system has been ordered, but not yet delivered for this SAREX, so not yet tested. A magnetic tracking board has been ordered for the command tent to keep the survivor tracking, but was not delivered on time for this SAREX).

2. Subject to improve:

- **Immersion suit**: Lack of dexterity/mobility with the immersion suit which conduct to get cold specially at the peripheral limbs of the human body
- **Polar shelter**: Lack of comfort inside the polar shelter with 16 persons inside & due to floor structure which need to be more solid.
- **Management**: Lack of management in some shelter & check in schedule to monitor the physical conditions of the survivors.
- **Additional heated shelter**, to be used to warm up the survivors, to dry some clothes & to produce hot drinks.

12.2 Organization:

- The **overheating** prior to entering the polar camp leading to wet clothes under the survival suit & the lack of mobility in the survival suit.
 - Corrective action:
 - *To establish a SOP in order to decide when the survivors should wear the survival suit or the dedicated expedition clothing, according to the assessment.*
 - *Towels has been ordered, but not yet delivered prior this SAREX, to be used to dry the survivors who get wet.*
- The **Leadership & the Medical staff identification** within the camp should be visually distinguished from survivors.
 - Corrective action: *To use coloured vest in order to identify all key persons*
- The **air quality** (available Oxygen & CO2 levels) were not monitored, despite it appeared to be suitable for the survival period.
 - Corrective action: *One CO2 meter/shelter has been already ordered but not yet delivered for this exercise.*
- **Food, water monitoring** should be controlled to ensure adequate nourishment over the period of survival.

- Corrective action: To establish a Survival Field Manual with appropriate information regarding food & water intake, and to invite the survivors to record their daily consumption of food & water inside their guideline book for survivors.
- To set up a **flag color assessment code** (Green, orange & red) according to the risk assessment, to allow the survivors to get out of the polar shelters, with or without immersion suit.
 - Corrective action: *To order a flag mast with three flag color (red, orange & green)*
- **IceCube packing list:** The unpacking of IceCube seems confused or disorganized and set up crews had difficulty finding proper equipment.
 - Corrective action: *IceCube should be marked with a packing list in a readily available location*
- **Check in schedule:** All survivors were not actively checked at fixed intervals to determine physical conditions, needs.
 - Corrective action:
 - *To establish a SOP with a check in schedule of a visual observation of each survivor at fixed interval, to monitor physical condition, food & water intake.*
 - *To establish pair between the survivors, in order to cross check to minimize risk of hyperthermia which hasn't been noticed or reported.*
- **The polar shelter leader and assistant task:** the polar shelter leader & assistant should not be assigned to any other task, in order to be always available for the survivors.
 - Corrective action: *To ensure that the polar shelter leader and assistant are only dedicated to their task/duty.*
- **Survivor management time:** There was no clear instruction or organization for the shelter occupants, to set up some resting time for 75% or outdoor activities for 25%, like water production & distribution...consequently 12 persons is remaining inside the shelter.
 - Corrective action: *To set SOP with some guideline for the survivor management, including the report to the command tent and use of communication means like PLB & EPIRB.*
- To use the **competency of survivors** if needed (ex: doctor)
 - Corrective action: *To conducted a round of introduction per shelter to identify the survivors who could help according to their skill.*

12.3 Material:

- The **unheated medical** tent was too cold to provide adequate medical care.
 - Corrective action: *To provide a central heating unit*
- The lack of **flooring insulation** inside the command & medical tents.
 - Corrective action: *Isolated floor was ordered but not yet delivered for this SAREX.*
- The **PSK were disorganized** within the shelter.
 - Corrective action:
 - *To identify all PSK with a number,*
 - *To add some hook or/and hanging net into the shelter*
 - *To set up some standard in SOP regarding arrangement plan inside the shelter*
- **Uncomfortable shelter:** The cross support structure under the shelter's floor gave a hollow shape to the floor which made it uncomfortable when it is crowded with 16 persons. (half people laying down & half people seating)
 - Corrective action: *To add a rigid inflatable floor.*
- **Polar shelter condensation** causes dropping of water in the shelter.
 - Corrective action: *To keep in proper ventilation through the ventilation hatch*
- **Contents of the PSK** which were particularly useful: Vaseline, sunscreen, sunglasses.
 - Additional items to order: *hoo, gloves, sock, sleep mask and tea bags.*
- To collect the **garbage** which is produced.
 - Corrective action: *To add some garbage pack in the IceCube*
- **Survivor's Heat loss:** For some survivors within the camp, apparent heat loss occurred.
 - Corrective action:

- *To add a “meeting tent or food tent” with a central heating unit, to warm the survivors when necessary, to dry their clothes and to centralized the hot water production to increase efficiency in order to distribute some hot drink (tea, soup) to all survivors.*
 - *Additional items which were ordered but not yet delivered for this exercise: 20 hand warmers/PSK, plus some 20 extra/pers inside the GSK*
- **Second purpose for The IceCube:** The IceCube could be served for a second purpose, when there are empty.
 - *Corrective action: The IceCube can be used as wind blocking, and/or view blocking for the toilet facilities, and/or resting/sleeping shelter for the bear guards, and/or garbage storage*
- It was not possible to maintain a **permanent duty communication** inside the command tent, due to the lack of resting area.
 - *Corrective action: The set up one or two “sleeping” facilities inside the command tent, in order to organize some duty or watch for the communication.*
- **Toilet facilities** did not have a proper view blocking or privacy and too far from the camp.
 - *Corrective action: A set of visual barrier/screen has been ordered and was not yet delivered for the SAREX. The toilet facilities should be set up closer to the camp.*
- Some survivors get **cold at their feet**, when wearing the immersion suit.
 - *Corrective action: To recommend to wear some shoe type basketball shoe inside the immersion suit or additional sock.*
- Risk of **contamination of the melting snow by solid fuel**.
 - *Corrective action: to separate the solid fuel for the snow or ice and to set a SOP to be used as a check list for the water production*
- In Reference of MSC.1/Circ.1614 of 26 June 2019, we should provide: **Food Rations of a minimum of 5000 KJ (1195Kcal) / person / day & 2 liters of fresh water / person / day.**
- For information, the average water consumption during the SAREX was between 0.5 and 1 liter / pers. and the water purify pills gave an unpleasant taste to the water which has been produced.
 - **Food Ration:**
 - 1 Food Ratio of 10204 KJ / PSK...suitable for 2 days.
 - 32 Food Ratio of 10204 KJ x 8 = 256 Food ratio / GSK (IceCube) , for 64 persons, provide 4 foods ration/person suitable during 8 days.
 - **Food ratio suitable for 10 days expected time of rescue.**
 - **Fresh Water:**
 - We are able to **provide 2 Liters/Day/person during 7 days**, for 460 person, resulting:
 - To **produce 2,19 liters/pers/day during 5 days**, with the quantity of solid fuel & dedicated stove. See down below the calculation.
 - To **distribute, 4,2 Liters/pers** with the storage “Emergency Drinking Water”
 1. Water production:
 - Energy to produce 1Kg of ice at -25°C to 1 liter at 10°C: 444KJ
 - Energy Dragon solid fuel 28000 KJ/Kg or 28000 KJ will produce 63 Liters of water.
 - Production rate of the BCB Crusader stove: 20%: 63x0.2= 12.6 Liters
 - With a quantity of 400 Kg Energy Dragon solid fuel, we will be able to produce 400x12,6=5040 Liters, or 10,9 liters/pers, or 2,19 liters/pers/day
 2. Water distribution:
 - 1 Emergency Drinking Water of 500 ml / PSK
 - 1 Flask of Drinking Water of 500 ml / pers
 - 2520 Emergency Drinking Water of 500 ml, stored in carrying bag to provide 2,7 liters/pers for 460 persons

- 450 Emergency Drinking Water of 500 ml in the 6 liferafts, providing 0,49 Liters/pers for 460 persons.
- Total of stored emergency Drinking Water: 4,2 liters/pers

12.4 Exercise objectives & finding:

➤ VESSEL SAREX'S OBJECTIVES:

- ✓ To test the Primary & Emergency means of communication for a Search & Rescue operation nearby North Pole (Ship to MRCC, Ship to Head Office): **DONE**
- ✓ To set up the Emergency Cell Crisis (ECC) at PONANT Head Office to assist & coordinate action plan with MRCC: **DONE**
- ✓ To evaluate at ECC PONANT Head Office, the communication to the media, pax & crew family: **Not DONE**
- ✓ To test all the ship's polar survival equipment which has been specifically developed for "LE COMMANDANT CHARCOT" (Immersion suit, lifeboat, polar shelter, GSK or IceCube): **DONE**
- ✓ To train the vessel's officers & crew to set up a polar survival camp, with bear guards, in extreme remote area for a Massive Rescue Operation (MRO) with participants/observers for 24 hours: **DONE**
- ✓ To evaluate the challenge & constraints to survive for a long period (at least 24 hours) in a polar environment: **DONE**
- ✓ To set up a hospital shelter on the ice, in order to supply medical care & establish a triage & to test the telemedicine support: **DONE**
- ✓ To verify the vessel's safety protocol in order to comply with the requirement of the Polar Code: **DONE**
- ✓ To record a training video and to take pictures which will be used as support (video or manual) for polar training for all the crew & pax: **DONE**
- ✓ To issue a SAREX report, to be shared with IMO working group on Maritime Search & Rescue: **IN PROGRESS**
- ✓ To evaluate, if it is possible in the time frame of the abandon, the use of ship's skidoo, Sherp & Helicopter as valuable additional assets: **DONE**

➤ RCC SAREX'S OBJECTIVES:

- ✓ To test the SAR communication nearby the North Pole for instance status, elements and procedures of maritime communication systems for distress and SAR: **DONE**
- ✓ To evaluate SAR operational principles, procedures and techniques in extreme remote area for a MedEvac (Medical Evacuation): **DONE**
- ✓ To evaluate SAR system administration, organization and implementation methods and to check how the MRCC of the Arctic countries will be able to handle an AMRO in extreme remote polar area: **DONE**
- ✓ To evaluate the effect of various technical cooperation in conjunction with relevant Governments, organizations and agencies with a view to assessing their impact on implementing effective SAR services in Arctic: **Not DONE**
- ✓ To evaluate which Rescue Coordination Center (RCC) will assume command over this incident and how collaboration is working between RCC: **DONE**
- ✓ To evaluate which asset/equipment are available per country, their capabilities & ETA: **DONE**
- ✓ To consider possibilities of interaction (such as conference calls) with the home office about external communication plans regarding an ongoing incident: **Not DONE**
- ✓ To evaluate the priority needs of action & logistic support for the polar camp: **DONE**
- ✓ To evaluate SAR personnel staffing and training in extreme remote polar area: **Not DONE**
- ✓ To evaluate the limit of operation for an AMRO nearby the North Pole: **DONE**
- ✓ To evaluate how the weather, affect the SAR response: **Not DONE**

➤ SAREX OPERATIONAL OBJECTIVE:

- ✓ Identify, evaluate and confirm communications means used and procedures followed with rescue services and between ship-based personnel, vessel, and ice camp personnel: **DONE**

- ✓ Identify, evaluate and confirm abandon ship procedures and passengers/crew tracking method with support roles for ship's officers, crew & expe staff: **DONE**
- ✓ Identify, evaluate and confirm the use of lifeboats, life rafts and/or the Ice Gangway for the abandon of passengers and crew from the vessel to safe location on pack ice: **DONE**
- ✓ Identify, evaluate and confirm the safety and emergency equipment that can be transported to and used at the polar ice base camp: **DONE**
- ✓ Develop recommended standards for polar camp/survival camp SOP: **IN PROGRESS**
- ✓ Identify, evaluate and confirm effective cooperation and collaboration protocols for rescue between all parties in incident response – ships' officers, crew, expedition staff, rescue professionals, home office personnel: **Partially DONE**

➤ **SAREX TACTICAL OBJECTIVE:**

- ✓ To ensure that the Rescue Coordination Centre is contacted in a timely manner using predetermined communications equipment and protocols and ongoing communications strategy is established: **DONE**
- ✓ In collaboration, Ship's Officers, crew and Expedition Staff to carry out an effective ship abandonment process - mustering and movement of persons and survival materials from ship to the pack ice: **DONE**
- ✓ Ship's Officers, crew and Expedition Staff manage an effective and efficient passenger and crew tracking system: **DONE**
- ✓ Ship's Officers with Expedition Staff establish a polar ice camp for all persons providing shelter, warmth, food, water and lavatories as well as predator protection and medical care: **DONE**
- ✓ Ship's Officers, RCC and SAR personnel collaborate to plan a survival and rescue strategy: **DONE**
- ✓ Ship's Officers & RCC and SAR personnel will study the possibility to use the ship's helicopter to conduct the medical evacuation: **DONE**

13. Recommendations and way forward:

13.1 Organization, recommended action point:

1. To establish a **guideline list of the clothes** to wear in case of abandon, especially warm sock, extra polar underwear, polar hood, neck warmer, parka, flotation suit, basket shoes or comfortable shoes (to wear with the immersion suit)



2. To establish a **SOP for risk assessment**, in order to decide when the survivors should wear the survival suit or the dedicated expedition clothing.
3. To establish a **SOP for proper training** for the village, shelter leaders and their assistant. To ensure that the polar shelter leader and assistant are only dedicated to their task/duty. To set SOP with some guideline for the survivor management, including the report & frequency to the command tent and use of communication means like PLB & EPIRB.
4. To establish a **Survival Field Manual** with appropriate information regarding food & water intake and to invite each survivor to record it inside their Survival Field Manual
5. To set up a **SOP for resting & activities period**, based on 75% of resting time and 25% of outdoor activities for all the survivors in order keep at least a minimum of 10 to 12 persons/shelter, which contribute to maintain a “warmer or decent temperature” inside the shelter.
6. To request **volunteers** in order to help & speed up the polar camp construction.
7. To use the **survivors competency** according of their skill.
8. To establish a **SOP with a check in schedule** of a visual observation of each survivor at fixed interval, to monitor physical condition, food & water intake.
9. **Dedicated resting shelter** for the bear guards who should have their own resting shelter like the empty IceCube, in order to have a proper resting time.
10. To include in the **SOP procedure regarding pairs between the survivors**, in order to cross check to minimize risk of hyperthermia which hasn't been noticed or reported.
11. To **organize some activities** inside and outside the shelters, including games & socializing, water production, walk which help to keep the body temperature.

13.2 Material, recommended action point:

1. **Polar shelter:** To add a complete inflatable floor inside each polar shelter, in order to improve the comfort.
2. **Medical & Command tent:**
 - a. To add an isolated floor inside the medical & command tent.
 - b. To provide an active heat source for the medical & command shelters
 - c. To include a specific log book to record all event of the camp
3. **Changing clothes:** To provide some changing clothes for the key personnel involved in fire and/or damage, transport & construction of the polar camp, considering all effort which can issue excessive sweating
4. **Coloured vest:** To use some coloured vest in order to identify all key persons
5. **IceCube:**
 - a. Should be marked with a **packing list** in a readily available location
 - b. Can be used as **resting/sleeping shelter** for the bear guards.
6. **Toilet facilities:** To use the IceCube as wind blocking, and/or view blocking for the toilet facilities, and/or to order a set of visual barrier/screen to offer privacy and comfort for the toilet.
7. To add a “**meeting tent or food tent**” with:
 - a. **Central heating unit**, with its fuel (heli fuel) to warm up the survivors if necessary, to dry their clothes
 - b. **Gasoline tank**
 - c. **Cooking pot** to produce the hot water and to increase efficiency
 - d. **Tea or/and soup** to produce hot drinks
 - e. **Thermos** to distribute the hot drink to all survivors
8. To add in the **PSK** (which has already been identified with numbers to prevent the disorganization):
hoo, gloves, sock, hand warmer, sleep mask and tea bags.
9. **Additional material:**

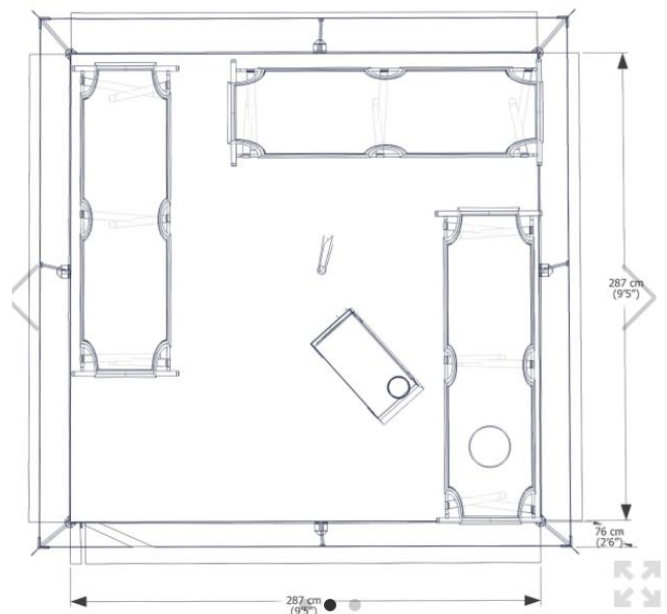
- a. To order a **flag mast with three flag color** (red, orange & green) according to the risk assessment (ex: Red: it is prohibited to go outside of the Shelter, Orange: it is permitted to walk at least by two persons, with the immersion suit, within the safe perimeter of the camp, Green: Free to go outside, with or without the immersion suit, inside the camp perimeter).
- b. To add some **garbage bags**.
- c. To add some **inflatable furniture**, to sit or to rest inside the medical, command & meeting tent.

13.3 Suggested Material or Equipment:

- **Tent for the “Meeting Shelter” heated with stove: Quantity 2**



- **Alternative solution: Esker Classic 10x10 Winter Camping Hot Tent (by Canadian Outdoor Equipment): Quantity 2**



- **Suggested stove** (Coleman 2 Burner Stove) to be used to heat the “Meeting shelter” and to produce hot drink (tea, soup)? Quantity: 2



- **Suggested portable heater** (Pioneer Trekker) supply with diesel by “Portable space heater Canada” for medical & command tent: Quantity: 2



14. Supplier / Manufacturer's contact:

14.1 Immersion Suit:

Diego Jacobson
White Glacier, CEO
Cell 787-306-7771
djacobson@whiteglacier.com



14.2 Polar Shelter:

Florian DUQUEYROIX
Area Sales Manager, Survitec Chevanceaux



florian.duqueyroix@survitecgroup.com

Mobile +33 (0) 6 74 82 01 47

DDI +33 (0) 5 40 16 19 36

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Tel +33 5 40 16 19 11 | Email surviteczodiac@survitecgroup.com | Web

www.survitecgroup.com – www.surviteczodiac.com

14.3 GSK / IceCube:

Fr. Fassmer GmbH & Co. KG

Industriestr. 2
27804 Berne
Germany

Phone +49 44 06 942-0

Fax +49 44 06 942-100

info@fassmer.de

15. Annexe 1 – Medical Survey

Physiological and psychological adaptation to survival condition in polar environment

A medical survey has been conducted by Doctor Alexandre Roux and Doctor Anne-Marie Carpentier, medical doctors onboard *Commandant Charcot*, while and after the SAREX about physiological and psychological adaptation to survival condition in polar environment. The data and results will be used for a medical scientific report, here are some of the first results.

Material and method

Sixty-three participants have answer to the survey on the 67, with an approval form signed prior to the SAREX to use the data for medical purpose. Different questions were asked about medical history, general health condition, sleep and toilets adaptation, feeling about medical support, and a psychological test about anxiety (General Anxiety Disorder: GAD-7). A total of 15 participants have left the SAREX before its end. We have compared the data of this abandon group with the general population of participants.

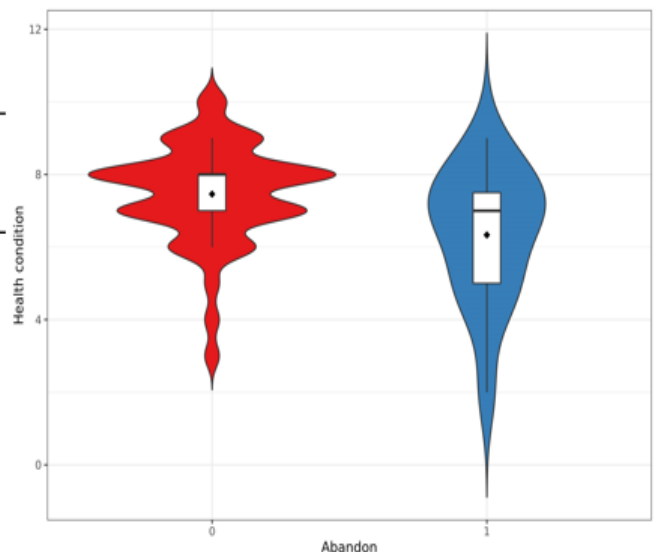
Results

The population of participants was young (mean=39 years old) with almost no medical history and above it all a mean general health condition at 7.3 over a scale of 10. Where 1/10 is “no practice of sport neither regular activity” and 10/10 is a “very regular athlete” (table 1. & figure 1.). The population in the abandon group was significantly younger (mean=33 years old) and had significantly lower general health condition.

	Abandon 0 (n = 48)	Abandon 1 (n = 15)	n	p
Health condition, mean	7.46 (±1.37)	6.33 (±1.84)	63	0.027

As the numbers of subjects compared were small, a non-parametric test was carried out (Mann-Whitney test). The exact interpretation is **that the average rank of Health condition is statistically significantly different depending on Abandon (p = 0.027).**

Table 1. & Figure 1.



The reasons of abandon are shown in the table 2.

Reason of abandon	n	%
Cold	13	87%
Discomfort	10	67%
Transit / Toilets	1	7%
Stress / Anxiety / Fear	2	13%

Table 2. Reason of abandon

About the toilet use, 20% (n=13) did not use it as they needed, and 8% (n=5) did not relieve themselves at all for 24h. Forty-one percent (n=25) did limit their hydration in order to avoid to relieve themselves.

The GAD-7 test about anxiety highlighted that 70% of the population had at least minimal anxiety factor, and 22% (n=14) had mild anxiety while the SAREX. Among the abandon group there was significantly higher level of anxiety.

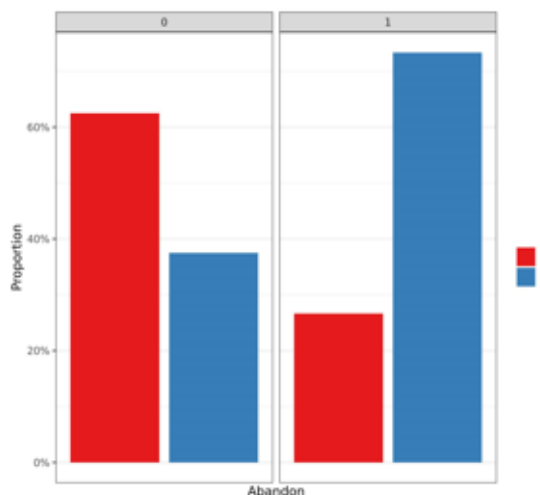
Seventy-eight percent (n=49) of participants had a high sleep privation with less than 3 hours of sleep in 24h, and 32% (n=20) did not sleep at all.

In the abandon group, a significant higher need of medical support has been identified (Table 3. & Figure 2.).

Medical support	Abandon 0 (n = 48)	Abandon 1 (n = 15)	n	p
Enough (0)	30 (62%)	4 (27%)	34	0.015
Wish more (1)	18 (38%)	11 (73%)	29	-

The distribution of More medical support is statistically significantly different depending on Abandon (p = 0.015).
Pearson's Chi-squared test

Table 3. & Figure 2.



Discussion

The population participating in this SAREX is not representative of the commercial target of the company, that we might expect older, with more medical history and lower general health condition.

Anxiety, hypothermia, discomfort, access to toilets, hydration and medical support are the main concern to work on in the prevention plan.

Knowing that there is a vicious circle between lack of hydration and hypothermia, the results showed how important it is to take care of a proper place for toilets, with respect of privacy if possible on such a camp.

Some results showed that the medical team should be clearly identified, and should be more present on the camp at the contact with participants. With regular patrol and check-up of the participants, it might have helped in order to avoid some of the abandon.

In such a situation, a medico-psychological emergency unit should be organised around hospital and medical team, as far as anxiety would be the main concern of global decompensation.

Conclusion

These preliminary results will be the subject of an in-depth further article to be published. Another SAREX with a target higher representative population and with more physiological field tests should be organised in the same conditions in order to improve the response to such an abandon ship in polar conditions.

16. Conclusion:

- **A Massive Rescue Operation nearby the North Pole will take several days to extract all the survivors.**
- **A cooperation between the different Arctic SAR Countries has been conducted in order to deploy the best marine or air asset available (for exercise).**
- **According to all SAR expert, no other polar expedition vessel has been developing so many survival equipment & strategy to comply with the Polar Code.**
- **All the survival polar equipment & material develop & implemented on board “Le Commandant Charcot” is going beyond the Polar Code.**
- **This SAREX was very useful to evaluate our polar survival equipment/ procedure/communication and to identify what need to be improved in order to increase the exposure time for the survivors.**
- **With this SAREX, PONANT gained some valuable experience and will be pleased to share its expertise with polar experts from IMO, SAR & Cruise Industry.**
- **PONANT will submit the idea to conduct another SAREX in 2022 in extreme remote area of the Arctic with “Le Commandant Charcot” for training purpose & to verify all improvement which will be done, following this SAREX.**
- **PONANT would like to thank all participants (onboard or ashore) involved into this SAREX who contribute to add a very valuable asset.**

