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T2.5. ARCSAR Innovation and Knowledge Exchange event 2

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EXECUTIVE SUMMARY

The second Innovation and Knowledge Exchange event took place in **Wellington and Auckland, New Zealand on 24.-27. February, 2020**. The event was called: *From Antarctic to Arctic: Seminar on innovations and solutions for coordination and emergency response in remote areas*.

The aim of the seminar was to highlight experiences, best practice and shared knowledge from the Antarctic to the Arctic, and vice versa. Participants included representatives from practitioners, professionals, the industry and academia. The seminar covered a range of various topics, among others SAR in New Zealand and Antarctic region, innovation and technology transfer in oil spill response, indigenous population involvement and response, emergency management, and innovative technology for use in SAR response. The seminar also included visits to the Rescue Coordination Centre New Zealand (RCCNZ), the maritime radio, the Whenuapai Air Force Base of Royal New Zealand Air Force (RNZAF) and to the Marine Pollution Response Service (MPRS) of New Zealand.



Picture 1. Participants at the second Innovation and Knowledge Exchange event gathered in front of the P3 Orion at Whenuapai Air Force Base, Auckland.



1. Background

The main goal of the Innovation and Knowledge Exchange events (T2.5) is to facilitate exchange of information on innovations and knowledge and increase the likelihood of innovation and best practices uptake. The events are arranged in Year 1, 2, and 3 and will all have different themes, facilitate continuous mapping of needs, monitoring of solutions, and provide a forum where practitioners can engage with innovation providers. Knowledge transfer is incorporated in various ways during the events i.e. from peer-to-peer practitioner learning, learning from local communities including indigenous peoples and volunteers, workshops face-to-face and online, use of case studies and scenarios, and through table-top exercises. Tacit learning will be captured particularly from practitioners, local communities, and voluntary groups.

The theme for the second event was innovations and solutions for coordination and emergency response in Antarctica, and the goal was to seek experiences and best practice to be exchanged with ARCSAR partners from the Arctic.

2. Seminar structure

The Innovation and Knowledge Exchange Event was held in Wellington and Auckland, New Zealand. The first two days were held in Wellington, where presentations of New Zealand's search and rescue system and the work in Antarctica were presented by various stakeholders and organizations. The second half of the first day included a visit to Maritime Radio New Zealand and the Rescue Coordination Centre New Zealand. The third day of the workshop took place in Auckland, and included visits to the Whenuapai Air Force Base of Royal New Zealand Air Force (RNZAF) and to the Marine Pollution Response Service (MPRS) of New Zealand.

3. Summary of presentations

SAR in New Zealand – by Duncan Ferner, manager of the New Zealand SAR Region

Mr. Ferner gave an outline of how the NZSAR system operates in the large region from the equator to the South pole. New Zealand's SAR region is 30 km², and stretches from the Pacific in the north to Antarctica in the south. Most of the SAR operations takes place close to the main land, and there are more operations in the Pacific than Antarctica. New Zealand handles approximately 2700 SAR operations during one year, which is divided between land- and sea-based rescues. The SAR system in New Zealand is divided in two categories: Category 1 is everything that happens on land or close to land, which is handled by the police. Category 2 are missions at sea, and they are handled by the Rescue Coordination Centre of New Zealand (RCCNZ). These missions are most often received through channel 16 or emergency beacons. With the police and the RCC in core, the SAR system is supported by actors such as the Coast Guard, lifesaving- and surf organizations, rescue helicopters and volunteers. The latter group make up 94 % of the people providing operational SAR rescue. One of the challenges is to keep up with training of key personnel in the volunteer sector, as there is a constant change of people. Another challenge is to keep up with the new technology of apps and



similar being used by the public, as there has been a solid increase in the registration of emergency beacons across the country; from handling maximum 600 each month in 2011 to maximum 1400 each month in 2019. However, the most important aspect of running a SAR service consisting of a range of different actors is relationships – meeting and discussing common questions and challenges across organizations makes it easier to handle incidents.

Indigenous response – by Wayne Rhodes, Manager incident readiness and response Maritime NZ

Mr. Rhodes gave a presentation on how New Zealand manages indigenous issues within incident response. The Maori has two distinct groups with tribes over the whole country, and the largest group is Iwi. A range of Maori principles are used as guidelines for companies seeking to engage with the Iwi. These principles recognize the importance of mutual respect, commitment to environmentally sustainable operations, engaging with people at the same level kinship, and prioritizing face to face communication when possible. The New Zealand government has worked over time to establish relationships and develop plans for cooperation with the indigenous people with regards to incident response. Iwi are involved in trainings and governance groups, and also give advice of the local culture and important sites such as burial sites and important landmarks in emergency coordination response. An example of engagement and involvement was the Pigeon Valley Fire in Nelson (2019), where the government and Iwi gave daily updates on the situation via social media to the people in the area. This was particularly important as the incident took place in a remote area, and people did not know what was going on. Furthermore, New Zealand has developed “Best Practice Guidelines for engagement with Maori”¹ as a means to provide companies with the tools to successfully engage with Iwi to address opportunities and issues.

Emergency Management and Coordinated Incident Management System (CIMS) – by Mike Hill, Manager of the Rescue Coordination Centre New Zealand (RCCNZ)

Mr. Hill gave an overview of how the coordinated incident management system (CIMS) is used in emergency management in New Zealand. The purpose of CIMS is to enable personnel to respond effectively to incidents; provide common structures, functions and terminology across organizations; provide a system that is flexible and scalable; and provide organizations with a common framework where they can use their own unique responsibilities. A national security system handbook² sets the structure that allow agencies to come together. CIMS is used in all types of incidents like pandemics, terrorism, earthquakes and biosecurity threats.

Antarctic response – by Greg Johnston and Christine Wilson, Rescue Coordination Centre New Zealand (RCCNZ)

Mr. Johnston and Ms. Wilson gave an outline of New Zealand’s SAR approach to issues in the Antarctic. They also gave insight to the various risks of operating in the Antarctic, as well as several case studies to illustrate some SAR incidents. New Zealand’s share of the Antarctic SAR covers the Ross Sea region, and Christchurch is the gateway city for most trips to the area. The traffic in this

¹ <https://www.nzpam.govt.nz/assets/Uploads/doing-business/engagement-with-maori-guidelines.pdf>

² <https://dpmc.govt.nz/sites/default/files/2017-03/dpmc-nss-handbook-aug-2016.pdf>



region is made up of about 20 seasonal tooth-fishing vessels is each year, some tourist activity and independent adventurers. In the past, the whaling fleet and its protest fleet also operated in the area, but this has ceased now. In addition, there are seven international research bases within this region. There is close cooperation between the Antarctic programmes of New Zealand and the United States. Challenges with operating in Antarctica are manifold: The environment such as the weather, temperature, sea ice and darkness/light impacts on operations; there are long distances and it can take long time to reach a place of safety (which will usually be either Christchurch or the McMurdo base); and there is a lack of SAR capabilities in the area.

The RCC has an Antarctic SAR response plan which is based on the IAMSAR manual. The plan covers issues like readiness and an overview of resources that might be likely to help in incidents, as well as plans for coordination and response. This plan is updated yearly, and the RCC has annual training for all the search and rescue operators (SARO's)/search and rescue mission coordinators (SMC's) prior to the season. Moreover, the RCC participates in pre- and post-season meetings with other agencies in order to be best prepared and coordinated. There are little resources available for SAR in the Ross Sea. There are no dedicated resources from New Zealand, but military aircrafts can be used, as well as assets from the national research programmes in the region. The US has most of the assets. Vessels of opportunity can be used for assistance in SAR operations, but even if they are close they might be hindered by ice or other environmental obstacles. In terms of communication, HF maritime radio is to be relied on, although satellite coverage is improving.

Mr. Johnston and Ms. Wilson gave several case studies from incidents in NZ Antarctica, among others the incident with the Russian fishing vessel "Sparta" in 2011. The first communication about the fishing vessel Sparta, which was holed and taking in water, was received through the northern hemisphere. The RCCNZ had established contact with the vessel after 20 minutes. The vessel had 32 people onboard, and it was not built for operating in polar waters. First, an airplane from the US McMurdo base flew over to survey the situation. Second, the NZ Air Force flew over with the Hercules to drop equipment in order for the crew to fix the damages to the hull. Two drops of equipment were necessary, as the first did not contain the proper equipment. One of the learning points was to ask more questions in order to make sure that kits contain everything that is needed. The whole operation took about one month in total and all lives were saved.

Antarctic and Southern Ocean Incident Coordination – by Jana Newman, Manager Antarctic and Southern Ocean Unit in the Ministry of Foreign Affairs and Trade (MFAT)

Ms. Newman gave an overview of the MFAT led Southern Ocean Season management of the fishing industry in the Southern Ocean during the summer fishing season. MFAT is the leading agency for all Antarctic and Southern Ocean matters, and they also coordinate between different agencies. A range of treaties regulate activity in the Southern Oceans, among others the Antarctic Treaty which is 60 years this year. Prior to the fishing season the MFAT prepare for incidents that can go wrong in cooperation with other agencies such as the RCCNZ. Fishing vessels in distress are the most common incidents. Other incidents that might have to be handled are deaths in Antarctica, which can be difficult legal issues, and illegal, unregulated fishing. There has been no registered incidents with tourist vessels so far, and although there is a small number of vessels operating in the area today the



government expect a doubling of activity during the next ten years. There has been an increase in unpermitted vessel activity in the Antarctic during the last years, and one experiences that these vessels are often poorly equipped in terms of safety. Working with these cases can have legal implications, for example with following-up the case of Berserk, an unpermitted vessel in the Ross Sea which was lost close to the Scott base in 2011. The success criteria for managing these issues is to be closely coordinated across all agencies, pre- and post-season. Relations are important, and New Zealand benefit from having a relatively centralised and system.

NZ Defence force capability and response to SAR in the Southern Ocean – by Major Jon Garton, HQ Joint Forces New Zealand, plans officer (J3)

Major Garton gave an outline of the NZ Defence force capability and response to the Southern Ocean and Antarctica. The air force has several capabilities: C-130 Hercules, B-757 and P3 Orion, and they take between five and eight hours to reach the Antarctic McMurdo Base from the main land. The air force is on SAR standby, and in each specific incident they will consult with the RCCNZ about that kind of equipment is needed in the medpacks that are dropped by the vessel in distress. A personal locator beacon will always be part of the pack. The Orion has an important role in serving as on-scene coordinator in a SAR-incident, among others to establish connection with other vessels that are in the area. The Orion is ready on two hours' notice while the Hercules has 14 hours' notice to get ready for take-off. In addition, the Orion assist the MFAT with air surveillance and monitoring of the fishing fleet during the season. The P3 Orion will be replaced with P8 Poseidon during the next few years.

For the NZ Navy there are some operational challenges with presence in Antarctica, among others the distance and remoteness, challenging weather conditions and ice conditions. An ice breaker is needed. A new vessel, the HMSNZ Aotearoa, will have winterization capabilities and thus will be able to sail in the Southern Oceans.

Extending the IMOS Polar Code to non-IMO vessels – by Cathy McGregor, Maritime NZ, international engagement and coordination team

Ms. McGregor gave a presentation of New Zealand's support of Polar Code II as a means to improve safety within the Southern Oceans. The current Polar Code was adopted in 2014, and made mandatory for all vessels that lie under the SOLAS-convention in 2017. This means that the Polar Code applies to large vessels like cargo- and passenger vessels, but not smaller fishing vessels. New Zealand has been one of the countries advocating for an extension of the Polar Code, so that the rules will apply for fishing vessels and private yachts as well. There has already been extensive work on voluntary guidelines for non-SOLAS vessels, which has progressed well and are near completion. Now the work has started to make these provisions mandatory. However, there is some resistance to these measures, and it is expected that this process will continue over several years.

Presentation of HIT Lab and applied immersive training – by Rob Lindeman, Professor/director, and Heide Lukosch, associate professor, at the Human Interface Technology Lab, engineering department, University of Canterbury



Professor Lindeman explained how the Human Interface Technology Lab (HIT Lab) uses technology to improve the quality and efficiency in training. The people are always in focus when designing training schemes before applying the proper technology. The HIT Lab uses 360 degree video with audio as a medium connected to low-cost virtual reality (VR) glasses. They can capture first-person experiences for training- and education purposes. The New Zealand fire emergency service has collaborated with the HIT Lab for training purposes, which allows them to train high risk scenarios and/or scenarios that might have high cost to train in reality, as well as increase the time spent on the actual task-training. Moreover, it is easy to change the variables in the simulation such as the terrain, types of assets available and the time of day.

Associate professor Lukosch outlined how applied immersive games are an effective means for training, awareness building and policy management. Applied immersive games are models of reality that players can interact with, with the aim to allow people to train for complex tasks that are expensive, difficult or dangerous to engage with. Such games can be aimed at learning, where decisions are visualized and debriefing sessions can be used to discuss and evaluate decisions made. They can also focus on exploration, for example in the case of a board game developed to train humanitarian support and logistics, where systems and policy development were tested. Games can also aim to discuss challenges with policy making, where lessons learnt can be transferred to real life. The objective with applied immersive gaming is that focusing on playfulness is both engaging and motivational, and it allows for realistic models of complex systems.

Cellphone locating technology – by Peter Myers, Smith Meyers

Mr. Meyers presented emerging technology on the market, where a mobile phone can be used as a location beacon and a communications channel. The idea is that a mobile network can be airborne in a helicopter, allowing SAR personnel to find people in areas with no coverage. It can also be used to send text messages and voice calls, as long as the receiver has power left on her phone. The system is called Artemis, and it uses simple antennas and can read GPS signals from the subscriber equipment. A helicopter or fixed wing plane can use triangulation as a method to locate someone by changing the location of the aircraft and measuring the distance to the phone. Artemis is selected for the AW101 helicopters. This technology can for example be applied to create situation awareness, communicate when infrastructure is destroyed and be used for call relay. It is best applied in rural areas and not in urban areas.

4. Summary of field visits

Visit to the Rescue Coordination Centre New Zealand (RCCNZ) and the Maritime Radio

The RCCNZ will usually handle incidents related to offshore marine operations, missing aircrafts, emergency beacons and response to medevacs. The RCCNZ uses google earth as the main map for all operations, and can put layers with geographical information on top. For example, they have access to ice maps that are updated every six hours. The RCCNZ argued that everyone operating in Antarctica can be both a risk and a resource. They use a lot of resources upholding the network of partners operating in the region and to prepare themselves before upcoming seasons.



The maritime radio is located in the building next to the RCCNZ. They have three stations set up for monitoring the radio communication in the geographical areas within their response area. In case of emergencies such as earthquakes, the maritime radio has three mobile stations which are stored in the RCC localities. This allows them to set up radio communication anywhere, and is an important asset in terms of emergency preparedness planning.



Picture 2. Participants at the second Innovation and Knowledge Exchange event gathered in the operation room at the Rescue Coordination Centre New Zealand (RCCNZ). Photo credit: Maritime NZ.

Visit to Whenuapai Air Force Base

The seminar participants were given capability briefs of the P3 Orion and C130 Hercules, as well as a site visit and review of the P3 Orion.

New Zealand has six P3 Orion aircrafts based on the air force base near Auckland. When flying to Antarctica, they will preposition at Christchurch or Invercargill, and from there it is approximately six hours flight to the McMurdo base. The first P3 Orion landed in Antarctica in 2005, and the last aircraft landed in 2013. Now, the focus is mostly on patrolling the Southern Oceans. Fuel planning is important when flying to Antarctica, as the point of safe return is about 60 miles north of the landing points on land. When patrolling in the Southern Oceans, the P3 Orion can spend about two hours around 60 degrees south. Search considerations are related to the visual challenges such as weather, light and endurance; the radar which easily detects ice bergs, and the limited time available for performing search before having to return to base. The P3 Orion will be replaced by the P8 Poseidon in a few years' time, which will have more technological capabilities.



The C130 Hercules was involved in a rescue mission on the day the visit took place, and one of the aircrafts had dropped four packs with life saving equipment to a person in a life raft the night before. The person caught one of these packs, and were later picked up by a vessel and brought to safe land. These delivery cases can be packed with the equipment that is deemed necessary in each mission, for example life rafts, survival kits, medical equipment, food and water.

The C130 Hercules was involved in the rescue of the FV Sparta in 2011, a Russian fishing vessel close to the Antarctic ice shelf about 2000 nautical miles south-east of New Zealand. The vessel was taking in water and sinking. All other vessels in vicinity were stuck in pack ice and could not come closer to assist. The life rafts were out in case the crew needed to evacuate quickly, and it was communicated that they needed salt water pumps in order to try to fix the damage in the hull. The C130-crew had to make several planning considerations before flying out to assist, among others weather conditions and the point of safe return; how to drop the salt water pump to the crew; language barriers; and considerations of ice bergs. They ended up doing the first drop at 500 feet, and returned the next day with more equipment. The fishing vessel crew eventually managed to temporarily fix the damage and sailed to a safe harbour.

Marine Pollution Response Services – by Renny Vandervelde, Maritime NZ

The seminar participants were given a presentation of the Marine Pollution Response Service based in Te Atatu Auckland, as well as a tour of the premises and presentation of some of the equipment being used in an oil spill incident.



Picture 3. Visit to the Maritime Pollution Response Service, and outline of the equipment and working methods applied in an oil spill.

Mr. Vandervelde outlined how the Marine Pollution Response Service (MPRS) operates in incident response in offshore oil spills. As a government agency the responsibility of the MPRS is to act as lead agency, have oversight and coordinate the actions taken. The industry's responsibility is to do immediate on-scene response. Oil spill response in New Zealand is divided in three levels; national, regional and local. The MPRS maintain one national exercise every three years plus table-top exercises, as well as yearly regional exercises. They also provide support to Pacific Island countries if needed.



The incident with the tanker *Rena*, which hit a reef 12 km from the coast in 2011, is the major oil spill incident in recent history of New Zealand. The tanker had 1500 containers onboard, and the government had to hire a salvage company to manage the oil spill. After this incident, New Zealand has improved its oil spill response capacities. This incident also ensured better on-scene organization structures and community engagement, particularly with the indigenous people.

Oiled wildlife – by Louise Chilvers, professor at Massey University

Ms. Chilvers gave an outline of the partnership between Maritime NZ and Massey University when it comes to managing oiled wildlife within an oil spill response. There is a wide collaboration between the national, regional and local levels of government and private companies in handling oiled wildlife response in New Zealand. Oil spills will affect the wildlife in many respects: Physical injuries, such as birds losing their waterproofing, ingestion aspiration, and in addition some indirect effects such as the food chains and habitats being affected. The success factors for oiled wildlife response are having qualified and trained people; the proper equipment and facilities; and plans including risk analysis, permits and cooperation with other actors at hand before something happens.

The aim of the oiled wildlife response is firstly to avoid wildlife being implicated in an oil spill, and second to mitigate and remedy if something happens. The last resort is to the capture, wash and rehabilitate the animals. Recent research on birds affected by oil spills confirms that this strategy has a positive effect on animal survival rates, as long as the birds are fit enough. Voluntary engagement is the core of the oiled wildlife response. There are biannual workshops and exercises, in addition to online training and specialised training. Small kits for initial response are placed locally, while response trailers with equipment and a mobile unit can be transported to the incident scene. Oiled wildlife response in remote areas in Antarctica is crucial as there are 36 species found only in these areas in the world. The response in these areas are similar to the response on the mainland, but it is more challenging due to long distances and challenging climate.

5. Key take-aways

Several key take-aways from the second Innovation and Knowledge Exchange event were noted:

New Zealand’s SAR region is large, and faces challenges with changing weather conditions and long distances. There are lack of good weather forecasts for parts of the Antarctica, and sea ice might hinder close-by vessel to assist in rescue operations. The changing climate impacts the landing conditions for aircrafts in Antarctica. **Close operation with other countries is important for SAR response**, particularly with the nations with Antarctic bases in the Ross Sea region. However, New Zealand has **developed SAR-kits which can be dropped from aircrafts**. They can contain different kind of equipment depending on each incident, and has proved to be important for saving lives in a region where it can take long time before rescue resources can help. There is little tourism activity in the New Zealand Antarctic region today, but it is expected an increase over the next decade.

New Zealand has been active in the Polar Code II-promotion in order to increase safety in the Southern Oceans. There has already been extensive work on voluntary guidelines for non-SOLAS



vessels, which has progressed well and are near completion. Now the work has started to make these provisions mandatory.

Having good relations and communications is key for incident response. There are a number of actors with a role in Antarctica, each with different roles and access to information. They are all working closely to coordinate before, during and after the season. Several speakers highlighted that New Zealand is a small country with centralized system, which is an asset for coordination and response.

Community engagement is vital in SAR and oil spill response. The volunteers contribute to a large amount of the available resources. One of the challenges is to keep up with training for these groups, ensuring that qualifications are in order. There has also been a particular focus from the government on engaging with the indigenous people, both on managing indigenous issues within incident response and cooperating more closely on issues and opportunities.

Innovative technology were lifted as opportunities for improving SAR and training of personnel in the future. One example was the cell phone locating technology for SAR, which can be used in areas without coverage. Another example was the use of VR and applied immersive gaming for training purposes. The objective is that low-cost technology, games and playfulness can make training engaging and motivational, allow training on high risk topics, as well as increase the numbers of trainings that can be performed during short amount of time.