ARCSAR

Arctic and North Atlantic Security and Emergency Preparedness Network

FIRST STAKEHOLDER EVENT

ARCSAR Addresses the Arctic and North-Atlantic (ANA) region, preparing to cope with the maritime security and safety threats that will result from increased commercial activity in the region including traffic through the northern passages, cruise traffic, and offshore oil and gas activity.

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12-13

PORTSMOUTH, UK

Summary

Due to its multi-national stakeholder nature, the Arctic and North Atlantic region creates a challenging geo-political environment to make security and safety decisions.

The ANA region is also home to many other national and regional governments, industries and third sector players with an interest in the region, including indigenous groups (the Arctic Council, 2021).

The ARCSAR project is to establish and support a new Arctic and North Atlantic Security and Emergency Preparedness Network. This would serve practitioners engaged in front-line security and emergency response. It would directly involve practitioners, existing networks, stakeholders in universities, research centres, industry, and those involved in governance and policy-making. The freezing climate, long distances, and lack of infrastructure makes dealing with emergencies or disasters a challenging task in this region.

The primary goal of this event is to define and categorise innovation, as well as to demonstrate the adoption of innovation and knowledge in terms of previously identified and prioritised needs. The innovations under consideration are available products, services, systems, approaches, and solutions resulting from projects or emerging research developments. Where significant uptake has yet to occur, or where uptake has not occurred at the desired rate or level, uptake barriers are identified and classified. This event included presentations, a panel discussion, and work groups to discuss the event's theme.

V

VESSEL STRUCTURE & EQUIPMENT

L

LSA & SEA COLD SURVIVAL

C

COMMUNICATION

P

POLLUTION & INCIDENT CONTROL

N

NAVIGATION & VOYAGE PLANNING

T

PERSONNEL TRAINING & EDUCATION

THE CLASSIFICATION IS BASED ON REGULATIONS IN THE POLAR CODE [1]

ARCSAR PRIORITY THEMES CONSIDERED (FROM NEED MAPPING IN REFERENCE [2]*):

L

LSA & SEA COLD SURVIVAL

Collaboration on how to meet “5 days survival” requirement of polar code

(Assessed Importance 6.16/10, Difficulty 3.98/10)

Communication Technology to ensure satellite data is accessible within required timescale

(Assessed Importance 8.88/10, Difficulty 6.21/10)

C

COMMUNICATION

T

PERSONNEL TRAINING & EDUCATION

Standardised protocol for incident investigation and implementation of lessons learned

(Assessed Importance 8.52/10, Difficulty 6.03/10)

Enhanced sharing of results of ongoing SAR projects within ANA SAR community

(Assessed Importance 8.52/10, Difficulty 2.55/10)

T

PERSONNEL TRAINING & EDUCATION

*All ARCSAR identified needs have been classified by the methodology developed in [2] into six broad categories based on the IMO Polar Code, and assigned levels of importance and difficult on a 1 to 10 scale utilising the geometric mean score of a set of relevant experts. A balanced priority set of 17 sub-needs was then found by the technique of goal programming [3], four of which are considered at this stakeholder workshop

Themes and Speakers

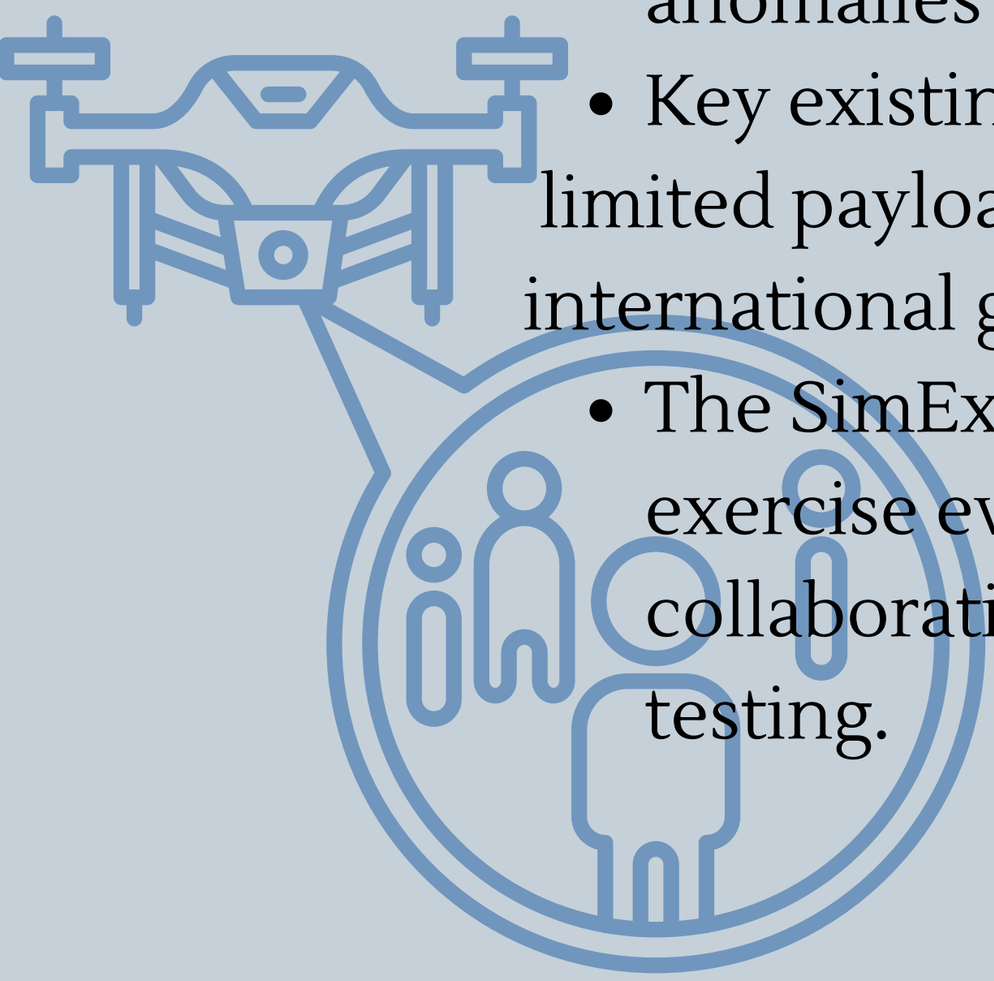
KEY THEMES

Usage of
(i) Satellite Technologies
(ii) Drones (UAV) and
(iii) AI tools
to improve situational awareness in Arctic and North Atlantic Search and Rescue and Marine Environmental Response

Key speaker-1: Richard Teeuw,
University of Portsmouth, UK
"An overview of satellite technologies and drones to enhance situational awareness in SAR activities"

Key Points:

- Drones already active in lifesaving in non Acrtic disaster situations.
- Drones (plus AI) provide safe way of capturing anomalies in harsh or unsafe conditions.
- Key existing barriers to further uptake include limited payload, battery life, and a lack of national and international guidelines or SOPs.
- The SimEx international disaster response SAR exercise event in Portsmouth [4] will provide good collaboration opportunities, including drone visibility testing.



Key speaker-2: Anders Martinsen, UAS, Norway

"Experiences of drone usage to assist SAR activities"

Key Points:

- Drones have a high capability to assist in SAR operations.
- Drones currently have a high acceptance level for a new technology.
- Need for more collaboration between industry and governmental authorities.
- Mapping of qualifications and training is progressing on an academic level.
- There is a need for standardisation and unified standards across the ANA region.

Key speaker-3: Kevin Fitzgibbon, Munster Technological University, Ireland

"An overview of the AI-ARC project"

Key Points:

- The AI-ARC project arose, in part, from the ARCSAR work.
- Need for AI and virtual reality technology to build a collaborative environment for improving situational awareness in the ANA region.

- Development of an AI-system for faster and easier detection of patterns of concern.
- AI Technology for the detection of maritime pollution, potential ice incidents or risky vessel behaviour.

Key speaker-4: Jan Pedersen, Norwegian Coastal Administration

"The use of satellite technologies and UAVs in dealing with environmental emergency response"

Key Points:

- UAV Techology for remote sensing allows for greater situational awareness and hence tactical decision-making.
- The value of multiple assets with diverse characteristics for remote sensing. Today UAV Technology supplement other assets like aircraft and satellites.
- The importance of integrating sensor data from multiple remote sensing sources in a shared visual map-based common operating picture.

Panel Session and Facilitated groups

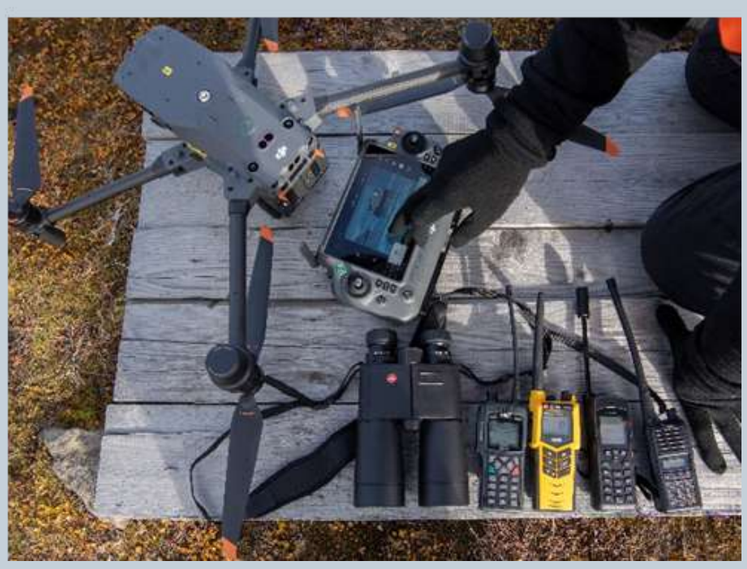
ROUND TABLE QUESTIONS:

- Q1: What are the key gaps in capacity, competence and infrastructure?
- Q2: What innovative products or processes are available / needed to fill the identified gaps?
- Q3: What needs to happen in order that the identified products/processes are widely used in the ANA region?

A1:Identified Gaps and Barriers

There are various challenges with capacity, competence, and infrastructure, including:

- The inability to launch drones swiftly due to cumbersome protocols such as permission or access to the sky.
- Insufficient flight time or battery capacity of the drone.
- Absence of a requirement for a transponder signal.
- A lack of agreed-upon procedure for coordination between drone pilots and other pilots in a SAR situation to share air space.
- It is difficult to capture an oil leak under ice.
- It is difficult to activate a drone in a faraway location.



- A lack of real-time mapping service in the region, include illegal and offence activities.
- A lack of cross-border collaboration (flying) protocols between countries.
- A lack of coherent, common systems with easily managed and visualised interfaces to give situational awareness.

A2: Potential Innovations to Fill Gaps

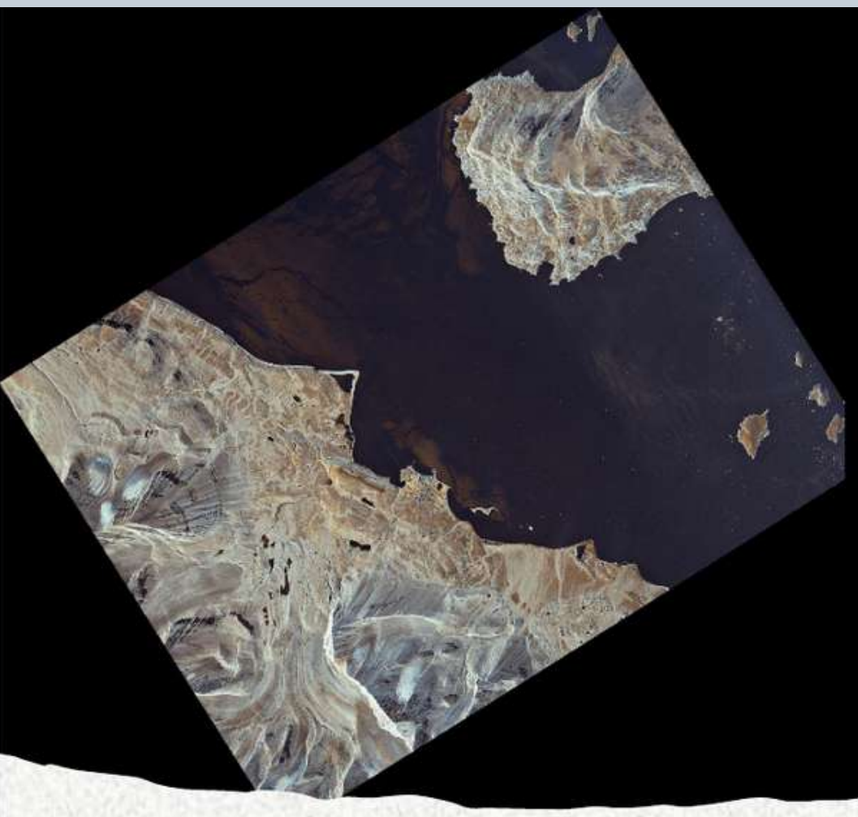
A2: Various innovative products are available to cover gaps, such as:

- Pre-programmed missions (Mission-charging) plans are available but have not yet been tested or used in a catastrophe.
- Mobile phone sensor mounted on a manned or unmanned platform, offering: Detection of any people in a specific area. Location of those people. Communication with those people even in areas of no local network coverage. Providing an alternative communication channel to any mobile phone in the area via voice or text, warning any, or targeted people of natural dangers in a constantly changing environment.
- In Sweden, remote activation of drones is employed for one-way flying in the Swedish Everdrone. Furthermore, one of the difficult things that may boost the vehicle's flying time is the solar panel attached to the UAV.
- Underwater drones can capture the oil spill beneath the ice. These technologies have been put through rigorous testing in the United States.
- AI-based tools are becoming available for ANA situational awareness, but need validation and bringing together under a common, user-friendly platform.

A3: Future Product and Process Innovation Requirements

Within the scope of the ARCSAR and beyond, the following process and product innovations to develop situational awareness through satellite data, drones and AI tools are suggested

- Real-time anomaly detection and risk management using a graphical user interface.
- An AI-based package that gives stakeholders a rapid awareness of diverse risks.
- An Arctic map indicating the location of the limited air space.
- A common unmanned traffic management (UTM) system.
- Standardised regulations and protocols across the ANA region, particularly with respect to UAVs.
- Harmonisation of procedures accross SAR entities in the ANA region.
- A remote ID system: allowing drones to send a signal revealing its location and the identity of the pilot.



Foresight and Conclusion

A projected growth in future Arctic shipping, and hence the risk of maritime SAR or pollution incidents in well accepted and its implications discussed in Deliverable 3.1 [5] of the ARCSAR project.

Whilst this trend is difficult to quantify exactly, it will be substantial and hence advances in both the technologies discussed at this workshop (Drones, Satellite Data and Coverage and AI tools) and, critically, the processes required to ensure their implementation are necessary and timely.

Rapid advances in drone and AI-capabilities are opening up significant new possibilities in Arctic SAR and pollution prediction and response, and this trend looks set to accelerate into the future.

However, in order to optimise their usage in the ANA, the unique territorial, climatic and geo-political challenges of the region must be considered.

Foresight and Conclusion

Part of this challenge is around adapting the technological products to the conditions, but of equal significance is the development of trans-national regulations and protocols around, for instance drone and satellite operating conditions, collection and usage.

Common forums, both virtual and face-to-face, real-time (such as TTX and LiveEX) and offline (such as the ARCSAR Innovation Arena [6]) have proven to have demonstrable value in sharing best practice and building collaboration, and it is hence foreseen that these continue to develop in the future.

A final point is regarding the inter-connection of the three technologies focused upon in the workshop, that the future growth in available satellite and UAV produced data will increasingly require AI-tools in order to process it in order that it can be visualised by SAR and MER practitioners in a meaningful way so as to enhance situational awareness and hence optimise decisions taken.

References

[1] Res. MEPC.68-21. International Code for Ships Operating In Polar Waters (POLAR CODE)

[2] Jones, D., Labib, A., Willis, K., Costello, J. T., Ouelhadj, D., Ikonen, E. S., & Cainzos, M. D. (2022). Multi-criteria mapping and prioritization of Arctic and North Atlantic maritime safety and security needs. European Journal of Operational Research.

[3] Jones D. and Tamiz M (2010) Practical Goal Programming, Springer Books.

[4] https://thesimexseries.org/

[5] Fitzgibbon K (2022) Foresight Analysis, Deliverable D3.1, ARCSAR project

[6] Galica A (2022) ARCSAR Innovation Arena, ARCSAR project, https://arcsar-innovation.eu/

Abbreviations

AI = Artificial Intelligence

ANA = Arctic and North Atlantic

CG = Coast Guard

MER = Marine Environmental Response

MTU = Munster Technological University

NCA = Norwegian Coastal Administration

SAR = Search and Rescue

SOP = Standard Operating Procedure

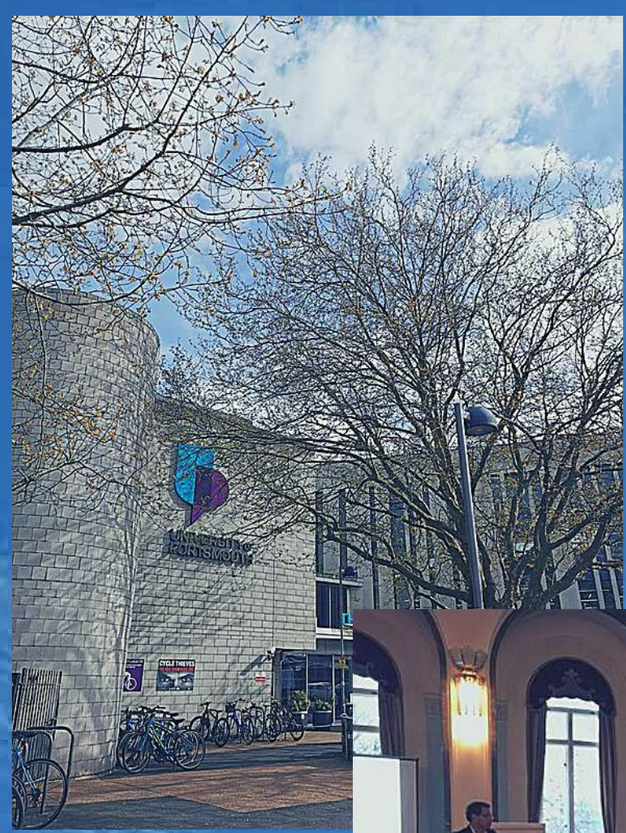
UAS = Unmanned Aerial Systems

UAV = Unmanned Aerial Vehicle

UoP = University of Portsmouth

UTM = Unmanned Traffic Management

PRESENTATION & DISCUSSION GALERY



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