

Tab C

Opening Remarks Suggestions (1-2 mins)

-Good Morning (U.S./CAN-0600), Afternoon (DEN, SWE, NOR-1200, FIN-1300), Evening (NZL-2200)

-First Time all Signing ESC Members have been together.

-Unfortunate we will not be able to travel to NOR for ESC Meeting

-International Cooperation is key to safely operating in POLAR (North and South) environments.

-Working Group efforts to identify operator's needs for substantial efforts to increase capabilities, operability and safety in extreme conditions.

-Would like to continue momentum of the MOU going into effect to get PA's in staffing as quickly as possible.

U.S. ESC Comments (4-5 mins)

(More details in Tab D; U.S. Principals Summaries)

-Environmental Observations and Modeling PA in discussions; Will leverage Assets for the extremely difficult task of maintain an observation network in the Polar Regions. Model comparisons between countries to increase skill and accuracy through partnerships.

-Human Performance Working Group and Subgroups have been active. Great to see Human Performance and Platforms working together on Lifeboats.

-Platforms Working Group has generated interest from the U.S. Army to engage in a terrestrial Subgroup and our Energetics team are discussing a Weapons Systems and Materials Subgroup. U.S proposals will come forward for the November meeting.

-Situational Awareness has been focusing on 'mission area' project ideas that include some of the most critical current shortfalls like communications and navigation. There is also good cross-pollination between the Situational Awareness and Environmental Working Groups.

TAB D

Environmental Working Group-Dr. Martin Jeffries, U.S. Army Cold Regions Research and Engineering Lab (CRREL)

- U.S. Working Group meeting scheduled for early Oct.
- Finland ‘supposed’ to lead WG, but will lean on the U.S. for leadership.
- Many U.S. working groups already exist so U.S. team will leverage these (IARPC, PRCG)
- John Woods recently presented to NSF and has scheduled meeting with NOAA (early OCT) for ‘All of Government’ approach.

Human Performance-Dr. Patrick Mason, ONR Code 34

ICE-PPR Human Performance Working Group (HPWG) met virtually on 6 May 2020 and 2 Sept 2020.

There are approximately 20 DoD researchers interested in participating in ICE-PPR HPWG.

Terms of Reference (TOR) being developed for ICE-PPR HPWG and will be finalized after all ICE-PPR participating countries sign the MOU.

TOR will establish the following four Sub Working Groups: Nutrition, Instrumentation, Clothing, and Life Rafts/Life Boats.

Nutrition Sub Working Group will collaborate on nutrition and supplements to improve physical and cognitive performance in extreme cold weather. One area of research pertains to ingestion of tyrosine (a precursor to the development of the neurotransmitter Dopamine) and its influence on cognitive sustainment in high stress conditions, such as polar environments (prolonged cold and darkness).

Instrumentation Sub Working Group will collaborate on wearables to monitor the physiology of a warfighter, as well as equipment worn during an experiment to provide data of interest to researchers.

Clothing Sub Area Working Group will collaborate on training in the wearing of gloves or mittens, boots or socks, and goggles. Textiles/fabrics will be investigated with the goals being to improve comfort/temperature range performance and diminish bulk, as well as improve wicking of perspiration. One area of research pertains to the ability of downed aircrew to survive to rescue in the High Arctic, and return to flying duties/operations in a reasonable period of time. The Royal Canadian Air Force assesses rescue of downed aircrew and passengers should take no longer than 48 hours, anywhere in Canada, under any conditions.

Life Rafts/Life Boats Sub Area Working Group will collaborate on habitability of lifeboats (or rafts, or seaboats) under varying conditions for extended periods. One area of research pertains to surviving after falling into the seas of the Southern Ocean. Attempting to survive in a lifeboat, liferaft, or seaboat, is also challenging due to cold weather, high sea states, issues such as CO2 accumulation or venting, and a requirement to survive much longer before rescue than is commonly considered in Northern hemisphere operations.

Platforms Working Group-Jim Webster, NAVSEA 05

20 May ICE PPR PWG meeting: During kick off meeting of the ICE-PPR Platforms Working the Group, a framework for international cooperation in research, science, technology, and the conduct of operations supporting safe and effective Polar capable platforms of nations' air, land and maritime dimensions was established. The scope of engagement includes Air, Land, and Maritime Dimension Platforms and capabilities.

Nations engaged in discussions of platform general characteristics including principle dimensions, speed range, endurance, range, Classification Society/Regulatory Body compliance, machinery, habitability, and payload capacities. The scope of Platform Capabilities of interest to the group include:

- Mobility Capabilities include the timely movement of air, land, surface and subsurface ships and organic vehicles operating in benign and warfighting environments.
- Survivability capabilities include those provided by systems enabling performance of assigned missions subsequent to sustaining external perturbations to expected operating (natural and warfighting) environments.
- Flexibility; supporting the ability of a given asset to support change from designed mission performance in time domain.
- Operability; supporting the ability to perform national security missions in a given mission-environmental area. System robustness enabled by inherent capabilities in mobility, survivability, and warfare mission support areas are assessed in this capability area.
 - Warfighting Capabilities
 - Medical Capabilities
 - SAR Capabilities
 - HADR Capabilities
- Maintainability; a description of the maintenance philosophy of a platform – the capability area effected by onboard, deployed and maintenance facility capabilities.
- Polar Technologies – Domain (Air-Land-Maritime) peculiar technologies, existing and developmental, that may be applied cross domain;
- Facilities:
 - Polar Centers of Excellence – Training facilities, existing multinational COE's that can be leveraged to achieve ICE-PPR PWG objectives;
 - Polar Testing (ice model basins, field test sites, calibrated ranges, controlled environments supporting through season testing).

Discussed were Polar Technologies and the method of addressing R&D / S&T Interests.

28-29 JULY 2020 Arctic Days meeting: was attended by the US, CA, FIN, DEN, NOR, NZ with NATO HQ and Chile attending as an invited guests of the US. This was the first joint meeting that included organizational and nations' delegates representing the interests of:

- NATO Ship Design Capability Group Specialist Team on Polar Ship Design and Safety
- NAVSEA Arctic IPT
- ICE PPR Platforms working group.

Nations' delegates agreed with continuing forward with the method of business that leverages the NATO treaty to address exploratory Science and Technology and stewardship of Naval Ship Design and Arctic Operability guidelines and standards. Delegates recognized that data exchange enabled by the NATO treaty would be instrumental in identifying cooperative research opportunities executed as Project Agreements under the ICE PPR MOU.

A proposed Terrestrial PWG was discussed by delegates. The topic will be addressed at the ESG.

Several project agreement opportunities were identified including the numeric simulation of quasi steady and dynamic ice loading on ship structure and the evaluation of energetics efficacy in extreme cold conditions.

The next joint meeting of the ICE PPR PWG, NATO SDCG PSDS, and NATO AVT 300 will take place in late October 2020.

Decisions for the ESC include (THESE WILL WAIT UNTIL NOV CALL):

- PWG group structure: separate maritime and terrestrial groups or subgroups under the PWG umbrella.
- Approval to conduct a joint NATO-ICE PPR meeting in October 2020.
- No proposals are offered for PA consideration.
- ESC approval to permit participation of Chile and the Netherlands to PWG Maritime Session meetings in observer status.

Situational Awareness Working Group-MGen Randy 'Church' Kee, USAF (ret), Arctic Domain Awareness Center (ADAC)

The USSAWG formed in early May and has participated in overall ICE-PPR SAWG, led by Danish lead and has conducted 3 meetings (approximately monthly) since. The next USSAWG meeting is planned for 3 Oct 2020.

ICE-PPR SAWG is seeking project agreements in polar connectivity and communications, navigation and domain awareness technologies. Domain awareness technologies include satellites, sensors and long range/over the horizon radars.

USSAWG recommended to overall Danish lead that USSAWG's preference for Orientation of overall collaboration according to a "Mission"...oriented to finding solutions to known gaps and

shortfalls for the operational challenges in the Polar operating regions. This is principally for Peacetime missions (SAR/HA/DR and DSCA and crisis response. (such as low intensity conflict)

Science and technology for USSAWG is oriented to establishing areas of interest to share with Danish lead for multinational project areas that Inertial Navigation Systems, Advanced diamond magnetometer systems, tactical/operational domain awareness, connectivity and communications. Ideas for Polar communications and domain awareness collaboration includes Link 16 (line of sight) and Link 22 (beyond line of sight).

Lastly, USSAWG notes there are advances in and coming capability in planned polar orbiting commercial satellites. Accordingly, the group is trying to discern if there are commercial advances that can benefit the ICE-PPR SAWG in this area.