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ARCTIC DOMAIN AWARENESS CENTER
A DEPARTMENT OF HOMELAND SECURITY CENTER OF EXCELLENCE

Center News

Quarterly Newsletter • May 2021

A USCG Jayhawk prepares to release LRAUV into Buzzards Bay off the coast of Massachusetts for it's first succesful helicopter deployment. Image taken by Jayne Doucette, Retrieved from Woods Hole Oceanographic Institution - whoi.edu/oceanus/feature/lrauv-arctic-oil-spill-response/

Center Update

By: Maj. Gen. USAF (Ret.) Randy "Church" Kee; ADAC Executive Director

Dear and distinguished colleagues.

The first Quarter of 2021 has been somewhat a blur for ADAC. We had 2 new projects awarded (the Alaskan and Arctic Communications and Connectivity Analysis as well as the Arctic Facilities and Infrastructure Environmental Change Risk Index project. These important projects are focused on the U.S. Coast Guard District 17 mission and provide a meaningful new addition of our research portfolio. We will be discussing these projects as well as the rest of our research program at our upcoming ADAC Annual meeting on 2-3 June 2021.

In the first quarter of 2021 we welcomed our newest ADAC Executive Counselor, Ms. Gail Schubert, President and CEO, Bering Straits Native Corporation. We are pleased and greatly honored that Ms. Schubert accepted our invitation to join our amazing group of Executive Counselors (otherwise known as our Board of Advisors). Gail, always a voice of remarkable wisdom and insight at ADAC conferences and workshops is a remarkable Alaskan Arctic leader. In addition to leading Bering Straits Native Corporation, Ms. Schubert is also an esteemed leader within the Alaska Federation of Natives.

We somehow survived our self-imposed/subscribed "March Madness" in planning and conducting 3 major workshops in 3 weeks (Alaskan Command's Arctic Senior Leader Summit 2021, ADAC's Arctic Challenges, Innovations, and Commerce Expo (Arctic CICE), and Advancing Collaboration in Canada-U.S. Arctic Regional Security (ACCUSARS) II workshop. It was quite an eventful time and frankly, individually and collectively, these three workshops provided a complex and diverse set of reflections and understandings, and each provided participants a chance to connect with quite a remarkable group of leaders from Alaskan Native & Arctic Indigenous communities, defense & security, and economic & environmental research. We have had quite a successful run for our research projects...making key advances All Hazards WebGIS, Geofencing/Vessel Alert, Long Range AUV, Arctic Copepods and Arctic Mussels oil spill research, Marine Induced Polarization, Arctic Maritime Spill Modeling (AMSM), and Unmanned Aircraft System (UAS) for remote region inspection and response. In sum, we are proud of our research team and their remarkable advances in science and technology for the Arctic operator. On the education front, we are honored that we have a number of our Center Fellows graduating from our program and they with their degrees. In truthfulness, while hardware, software, firmware and knowledge products are important..."peopleware" matter most.

Last week I was honored to meet with the USCG District 17 team in person for the first time in 14 months to roundtable on our research programs...it truly feels good to see what we hope...is the light at the end of the tunnel and that we can once again feel normal in conducting in person meetings. While in Juneau, I had the chance to personally congratulate the incoming Vice Commandant of the USCG, Admiral (Nominated) Linda Fagan, who is finishing an amazing command tour of USCG Pacific Area. During this same trip, it was an honor to congratulation RADM Matt Bell for his remarkable career of service in 36 year of wearing the USCG uniform and to briefly meet RADM Nathan Moore, the new USCG D17 Commander.

We sincerely thank you for your interest and collaboration that supports the U.S. Coast Guard and the other Arctic operators. We are honored to be a part of the USCG family, a contributing team for the Arctic Research community and a hard serving member of the Homeland Security Enterprise.

Winter Sailing Marks New Age in Arctic Shipping

By: Kelsey Frazier; ADAC Research Associate

In January of 2021, the Russian LNG tanker Christophe de Margerie sailed from the Yamal Peninsula in Russia through the Bering Strait, ushering in a new age for Arctic shipping. For centuries, the lore of immense sea ice has kept all but the most spirited sailors away for winter transits in the Arctic. In 1778, Captain James Cook observed multi-year sea ice well into the summer in August, reportedly 12 feet above the waterline at the time. Today, that fabled ice is all but gone, allowing for the possibility of year-round shipping in the Arctic.

To ensure safer Arctic marine activity and support mariner route planning, the Arctic Domain Awareness Center has been engaged in a two-year program to develop an Arctic Ice Conditions Index (ARCTICE). This program developed a navigation support algorithm that produces charts displaying the relative risk of a vessel traveling through sea ice, based on the vessel's unique ice classification. Risk is calculated using the International Maritime Organization's Polar Code, specifically the POLARIS amendment. This amendment was developed in collaboration by the Russian Federation, Canada, Finland, and Norway based on their extensive experience in Arctic navigation. ARCTICE is primarily focused on charts to aid decision making in the U.S. Exclusive Economic Zone (EEZ), but produces charts covering the pan arctic region. Testing ARCTICE has been a particular challenge as observational data is still difficult to obtain.

However, the January transit by the Christophe de Margerie, owned by shipping company Sovcomflot presented a unique opportunity to compare the algorithm's produced graphics and the Russian tanker's transit. Using a combination of AIS data and media sources, the team learned that this vessel completed the 2,474 nautical-mile trip, from the Sabetta LNG terminal on the Yamal Peninsula, to the Bering strait, in approximately 10 days. Averaging around 9.5 knots, the vessel has ice capabilities roughly similar to a Polar Class 3

Polar Class 3 vessels have ice capabilities, based on their ice strengthened hulls, of approximately 1.3 meters. This means ice that is 1.3 meters thick, or less, will not present significant hazards to a vessel of this specification. Using the hindcast ARCTICE charts, the team reviewed the risk plots on January 6th, when the LNG tanker left port, and forecast plots for the next two weeks while the vessel was in transit in the Arctic Ocean. These plots use an internationally adopted color scheme to communicate low risk

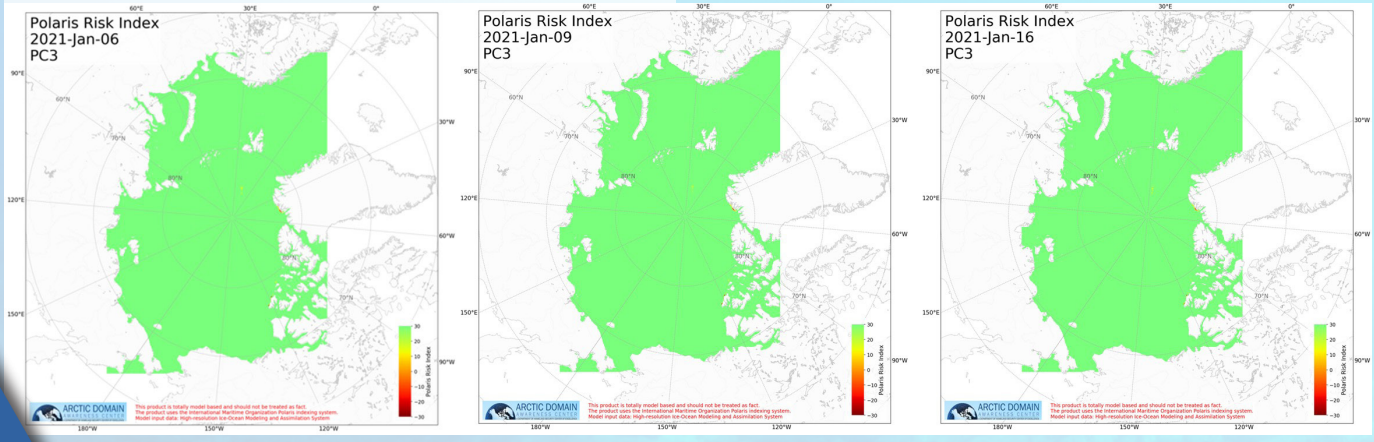
The Christophe de Margerie Image from Novatek

(green), moderate risk (yellow), and high risk 'no-go' (red) areas. For a PC3 class vessel, in January of 2021, the risk of significant ice damage to a vessel was low.

How does this low risk translate into what the mariner would see while underway? ARCTICE has a resolution of 2 kilometers, which is a "high resolution" scale considering the current state of sea ice modeling but cannot inform a mariner about the less than 2 km scale around their ship. This means that anyone using the plots could plan a route with confidence, but must rely on live observations to determine if large singularities, like unusual ridging, should be avoided. To illustrate what the ice cover was when the LNG tanker passed through the Strait, the team pulled the sea ice cover, derived from satellite data, for the 16th of January (figure 4). What you see on the figure is that the concentration of sea ice was high, in excess of 90% of the surface ocean was covered with ice. That ice was predominantly classified as 1*, which means it was 70-120 cm or 0.7-1.2 m thick.

Therefore, the conditions for the Christophe de Margerie were well in line with the tanker's ice capabilities, thus the successful voyage of the vessel. It has also been reported by Russian newspapers, and confirmed by AIS data, that this was not the last winter transport of LNG but followed by several more vessels heading back and forth to ports in China. Following this successful series of transits, it is clear the Russian Federation may consider the Bering Strait open for business year-round.

Figure 3 ARCTICE plots illustrating relative risk to a PC3 vessel in the Arctic Ocean on January 6, 2021 (left), January 9, 2021 (middle), and January 16, 2021 (right).



ADAC Spring Event Series 2021

"March Madness" at ADAC

By: Connor Keesecker; Communications and Research Associate

Informally known amongst the Center staff as "March Madness," ADAC successfully executed three virtual events in March. As COVID-19 prevented in-person gatherings, Center staff updated existing event plans for a virtual format. While in-person meetings may always be preferable for some activities, the virtual format provided a greater opportunity for attendees to participate from outside of Alaska and across the globe. These events, of course, could not have been possible without the help of collaborators and partners which are too numerous to list here. Thank you to everyone who supported ADAC's Spring events!

Arctic Senior Leader Summit

The Arctic Senior Leadership Summit 2021 was conducted over two days from 10-11 March 2021 in support of the United States Northern Command (USNORTHCOM), Alaskan Command ALCOM). The online event gathered a diverse array of leaders in Arctic security from across the U.S. Federal Government and the Circumpolar North. ASLS21 facilitated a discussion on the evolving challenges and opportunities in the Arctic. Day one of the summit featured plenary talks on Arctic geopolitics, environmental security, indigenous community security, and other component issues to overall Arctic security.

Day two of the Summit brought together a focused group of military and first-responders for a tabletop exercise. Participants were pitted against three challenging fictional yet realistic scenarios based on current or near-future challenges in the Arctic. In the first scenario, participants were faced with a crashed air-passenger jet on Arctic sea ice off the coast of the North Slope of Alaska. Participants identified steps to extract passengers from the crash site before a significant winter storm reached the crash site and Utqiaġvik.

For the second tabletop exercise move, participants considered disaster response for Utqiaġvik, Wainwright, and other Alaskan villages following a severe late fall storm. Participants were tasked with organizing deployments of food, water, and shelter to communities affected, and considered evacuation of casualties in anticipation of a severe cold front. The final exercise focused on Arctic geopolitics, featuring a flotilla of foreign-flagged vessels performing a "scientific expedition" just outside of the U.S. EEZ. Participants measured response as reports emerged that ships could be engaged in illegal fishing while in possession of anti-ship weaponry.

The scenarios mentioned above tested participants' ability to respond to crises and provoked serious conversations on how the U.S. can prepare for challenges and seize upon opportunities emerging from a changing Arctic region. Throughout the exercise, participants were quick to note the need for a unity of effort between all levels of government and U.S. allies and partners within the Arctic. When considering the far-ranging implications of Arctic change, from rising geopolitical tensions with Russia and China, to violent storm surges on the Alaskan coast, participants stressed the importance of solid relationships between the federal government and partners in the region. As noted by participants, a 'crisis is the wrong time to be exchanging business cards.' A full report on the event will be released later this year.

ADAC's Arctic Challenges, Innovations, & Commerce Expo (Arctic C-ICE)

Just the week following the Arctic Senior Leaders Summit, ADAC conducted its first Arctic Challenges, Innovations, & Commerce Expo (Arctic C-ICE). The two-day virtual event sought to explore the networks, resources, and infrastructure needed to enable commerce and economic development within the Arctic. The expo utilized a collaborative approach to foster conversations interdisciplinary regarding how business can rise to meet emerging opportunities in the Arctic domain. The first day of the expo featured product demonstrations from businesses and ADAC research teams, discussions on emerging Arctic opportunities, and insights from Alaska Native leaders on forging responsible partnerships in rural Alaska. Following the plenary sessions, participants explored a series of virtual booths, which allowed them to speak one-on-one with representatives from ADAC project teams and businesses participating in the expo.

On the second day, the University of Alaska Anchorage Center for Economic Development facilitated 'a Strategic Doing' tabletop exercise that helped participants consider opportunities for collaboration when addressing complex challenges in the Arctic region, while also capitalizing upon emerging opportunities. In order to foster collaboration, participants were encouraged to identify their own existing capabilities and assets that they might bring to the table to address security challenges and business opportunities in the Arctic.

Overall, the event helped to forge new connections between ADAC's research community, federal partners, and the business community. As the event was open to the public, recordings from each expo session are available on ADAC's Website. ADAC Leadership looks forward to hosting a follow-up C-ICE event in 2022.

Advancing Collaboration in Canada-U.S. Arctic Regional Security (ACCUSARS) II

ADAC's final March event was ACCUSARS II, a follow-up conference to the first ACCUSARS held in September 2020. The event was co-hosted with the North American and Arctic Defense and Security Network (NAADSN) at Trent University, Peterborough, Ontario, and brought together leaders in Arctic security from both sides of the U.S.-Canadian border. The purpose of ACCUSARS is to create a Strategic Foresight Assessment (SFA) for the North American Arctic. ACCUSARS II focused on Alaskan and Western Canadian issues specifically.

In addition to panel discussions and keynote addresses, ACCUSARS II included a Strategic Foresight Activity facilitated by the U.S. Coast Guard Office of Emerging Policy (DCO-X). Participants organized into groups addressing topics related to Arctic security to brainstorm potential challenges and identify solutions. Overall, discussions were incredibly valuable for the purposes of the SFA report, as participants explored common issues on both sides of the border in the Western North American Arctic. By identifying the unique policy responses on either side of the border, the U.S. and Canada can find opportunities for further collaboration and better prepare for the 21st Century Arctic.

A full event report is now in development and will be released in Summer, 2021. ADAC and NAADSN expect to hold the third ACCUSARS III event in Fall, 2021, focused on the Eastern Canadian Arctic. Details, including online registration, will be announced soon.

ADAC's Spring 2021 Graduating Fellows

By: Ellee Matthews; ADAC Education and Adminstrative Manager

As we approach the month of May, it's hard to believe that another academic year has come to an end. Another year coping with the difficulties of the COVID-19 pandemic, nonetheless. That said, no matter the challenges, twists, and curve balls that have taken place this year, ADAC's Fellows haven't waivered once in their hard work and commitment to their fellowship program and to this Center. With that, ADAC is very proud to announce that we have five ADAC Fellows graduating from not only the fellowship program, but from their respective academic degrees as well: Kevin Fitzpatrick, Stacey Hanson, Tristan Goers, Rachel Lewis, and Megan Verfaillie.

ADAC Student Fellows in Utqiagvik for ADAC's 2019 Arctic Summer Internship Program

Kevin Fitzpatrick is a graduate student from the University of Alaska Anchorage (UAA) where he is finishing up his master's degree in biochemistry. Upon joining ADAC's fellowship program in the summer of 2019, Kevin jumped right into conducting intensive and critical biochemical research on ADAC's Arctic Mussels project with Dr. Patrick Tomco at UAA. In addition to his work with Dr. Tomco, Kevin has also participated in ADAC's Arctic Summer Internship Program, as well as countless additional center-related activities, such as workshops, conferences, and research symposiums. When asked what he will miss most about his time with ADAC, Kevin stated that he will really miss the community mindedness of the Center, and the shared desire to serve the Arctic.

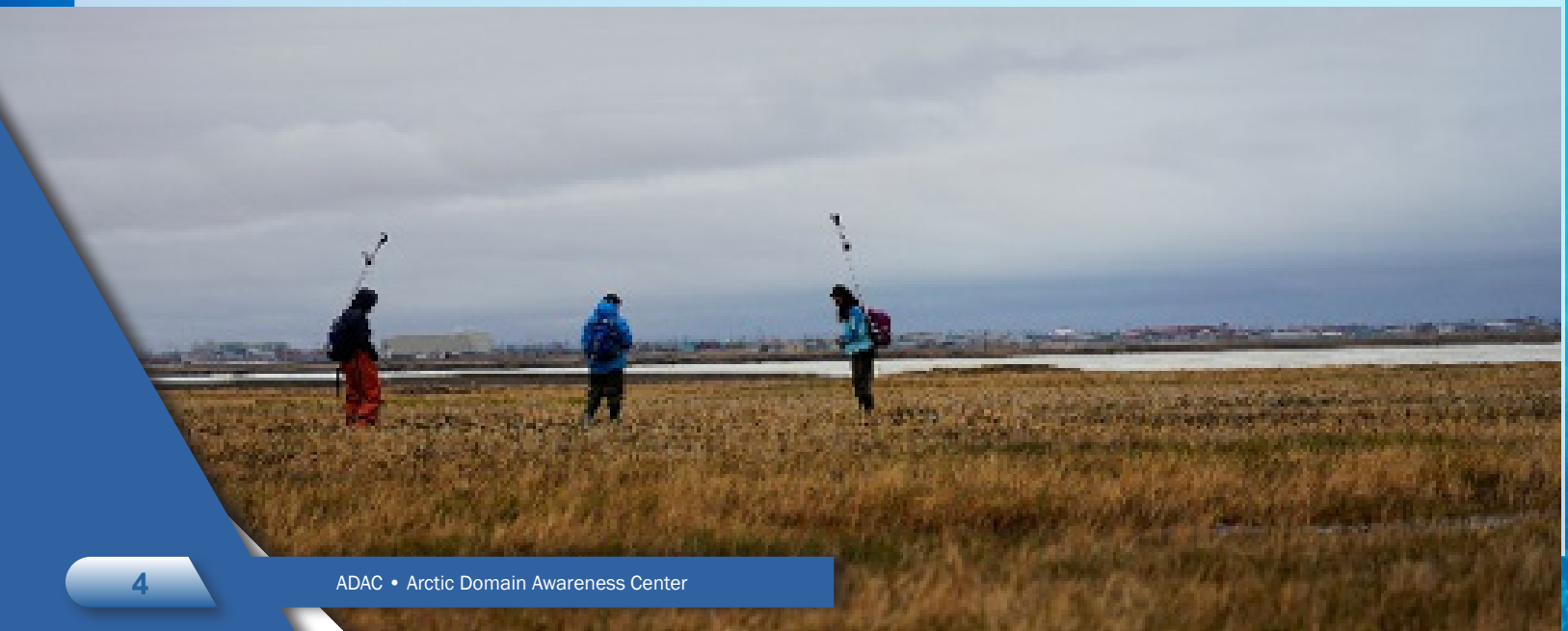
Another graduate student from UAA, Stacey Hanson is just about complete with her master's degree in biology. Stacey has also been working with Dr. Tomco on ADAC's Arctic Mussels project, and has contributed significantly to the analysis of the biological side of the project. A fellow with ADAC since the spring of 2019, Stacey is greatly looking forward to her upcoming graduation, and plans to enter the workforce in a career ideally in the marine sciences.

Also a masters student at UAA, Tristan Goers will be graduating with his degree in data sciences at the end of this spring 2021 semester. A fellow with ADAC since 2018, Tristan has been involved in numerous projects and activities during his tenure at ADAC, including working directly with ADAC's constituents at the United States Coast Guard (USCG) Sector Anchorage where he helped to significantly advance a GRS project focused on the mission needs of the USCG in the Arctic. When asked what he will miss most about his time with ADAC, Tristan stated that he will miss all of the extensive networking opportunities provided to him as an ADAC Fellow, as well as the Center staff.

Our fourth and final UAA student graduating this year, Rachel Lewis, has just completed her bachelor's degree in computer science. Rachel began her fellowship in the spring of 2019, where she immediately began research with Dr. Shawn Butler at UAA on ADAC's Arctic Geofencing Project. In addition to her work with Dr. Butler, Rachel has been a critical member of numerous ADAC programs and activities, including the Arctic Summer Internship program, Arctic IoNS events, and the Arctic and Alaska Communications and Connectivity Analysis project.

Lastly, but most definitely not least, Megan Verfaillie is a graduate student at the University of New Hampshire (UNH) who will be graduating with her master's degree in environmental engineering at the end of this spring semester. An ADAC Fellow since the spring of 2019, Megan has been a critical member of ADAC's Arctic Maritime Spill Modeling team under the mentorship of Dr. Nancy Kinner. Upon graduating with her master's degree, Megan will begin a PhD at UNH where she will focus on the intersection between remote sensing and environmental engineering. When asked what she will miss most about her tenure at ADAC, she stated that she will miss the community aspect of the program, and that her most memorable experience was gaining hands-on field work experience in Utqiaġvik during ADAC's 2019 Arctic Summer Internship Program.

To say that that the ADAC team will miss these fellows is an understatement. However, we couldn't be more proud of how far they have come, and of the many accomplishments they are sure to achieve in their futures. Congratulations, Kevin, Stacey, Tristan, Rachel, and Megan!



Alaska and Arctic Maritime Communications and Connectivity

By: Jason "Olaf" Roe; ADAC Associate Director and Senior Research Professional

The Alaskan and Arctic maritime regions are defined by key elements that exist few other places on earth. Great distances, extreme cold temperatures, limited infrastructure, and severe weather conditions greatly challenge operators and complicate operations, increasing risk. In striving together to meet these challenges, Alaskan and Arctic operators maintain strong traditions founded upon a inherent willingness to assist others in need when a call for assistance is received, often-times at significant personal expense or difficulty. From fisherman to subsistence mariners to recreational boaters to large commercial vessels, vessel operators understand that response time is critical and the best chance for survival in such a remote and extreme cold environment is direct timely notification of response organizations and nearby potential Good Samaritans. Ensuring there are reliable modern communications and connectivity pathways for those critical communications is paramount to Alaskan and Arctic stakeholders and instrumental to the safety of maritime operations in Alaska and the Arctic.

A recently initiated ADAC project, the Alaskan and Arctic Maritime Communications and Connectivity Analysis, is currently underway in developing a comprehensive understanding of the communications and connectivity needs of Alaskan and Arctic mariners, and is also at work in identifying shortfalls in current-generation communications technologies. The project is also examining newly identified technologies along near term, mid-term, and long term time horizons that have the potential to successfully integrate into existing communications methods to increase reliability, or to completely transform Alaskan and Arctic communications and connectivity with new a better communications pathways.

The Alaskan and Arctic Maritime Communications and Connectivity Analysis project will continue research over the next 12 months through multiple avenues including Engaging the Community meetings, strategically focused working groups, a market survey, and a Alaskan and Arctic Maritime Communications and Connectivity Workshop. These activates will culminate in the production of a Alaskan and Arctic Maritime Communications and Connectivity Analysis comprehensive knowledge product that will provide a review, recommendations, and conclusions for state-of-the-art Alaskan and Arctic maritime communications technologies along near-term, mid-term, and long-term time horizons.

Current Alaskan and Arctic Maritime Communications and Connectivity challenges include non-uniform coverage, large infrastructure requirements, high maintenance costs, geomagnetic interference, signal disruption from mountainous terrain, and susceptibility to harsh environmental conditions to name just a few. New technologies that can reduce or eliminate these challenges and are proven reliable will be of great benefit to the Arctic operator, reducing risk and increasing operational efficiency throughout the Alaskan and Arctic maritime community.

USCG with transportable communications station, via Wikimedia Commons

Upcoming Events

As a reminder, we are "open season" in signups for upcoming events. Please see details for ADAC hosted events at: https://arcticdomainawarenesscenter.org/Events

1. Arctic Maritime Horizons. In partnership with HQ USCG Director of Maritime Transportation Systems and Senior Arctic Policy Advisor, are creating a tabletop exercise planned as an in-event for 4-6 May 2021 in Anchorage Alaska focused organized to address policy, plans and initiatives to support HQ USCG and the Coast Guard Enterprise in addressing the 2019 USCG Arctic Strategic Outlook (ArcSO) task to "Advance and Modernize the Arctic Marine Transportation System."

2. Next Wilson-ADAC Arctic Security Dialogues: 7 May 2021, 3:30-5 PM Eastern, 11:30-1 PM Alaska Daylight Time. The planned title is "Addressing the new dynamics of the trans-Atlantic Arctic maritime. This Arctic Security Dialogue, jointly hosted by the Woodrow Wilson Center Polar Institute and ADAC will be the third of a series of the security dialogues and provides a great opportunity to hear from a multidiscipline community of Arctic leaders on the changing conditions and updated priorities in policy and measures to address U.S., Allied and partner security in the Arctic region.

3. DHS S&T (Virtual) Summit 2021. This year's event is planned for education, tech show cases and plenary events from 17 – 21 May 2021, that has scheduled the principal plenary activities from 19-20 May. ADAC is honored to co-host a panel on risks to the Maritime Transportation System and support the Education Grand Challenge. We and our fellow DHS S&T OUP CoE hope you will join us by registering at: https://cina.gmu.edu/conference/coe-summit-2021/agenda/

4. ADAC Annual (Virtual) Program Year 7 Meeting. ADAC is honored to conduct our latest Annual meeting as a virtual event, now planned for 2-3 June 2021 as two 2/3rd day events. Due to a schedule conflict on another significant event, we have shifted to this new date. We have a number of planned guest speakers and will showcase our Center's research activities in this important update of our maturing and transitioning research. Registration is open and stay tuned for an array of research update materials that will be posted the planned "event hub" in advance of the meeting.

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ADAC's Mission

The Arctic Domain Awareness Center, led by the University of Alaska, develops and transitions technology solutions, innovative products, and educational programs to improve situational awareness and crisis response capabilities related to emerging maritime challenges posed by the dynamic Arctic environment.

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