A New Bird in the Alaskan Arctic: Lessons learned during coordination of manned and unmanned aerial operations in 2013 and 2014

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Background information
The FAA Modernization and Reform Act of 2012 required the FAA to:

- Initiate a process to work with relevant Federal agencies and national and international communities to designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes and to establish procedures and requirements for the operation of small unmanned aircraft in the airspace over the Northeastern Chukchi Sea and the Beaufort Sea.
- Improve the ability of airspace users to communicate directly with field teams; 3) distribution of detailed flight plans throughout the AASCG, and 4) revision of communication protocols once projects commenced. Recommendations for improving coordination among manned and unmanned aircraft projects in the Alaskan Arctic in the future include designating a central authority to coordinate all flights in the 4A airspace, developing a grid-based system that can be referenced when communicating flight plans, and requiring that all airspace operators distribute detailed information about their proposed projects to airspace users well in advance of project start dates.

Concerns
- How to deconflict the airspace among all of the manned aircraft and UAS?
- UAS have limited detect and avoid capabilities
- FAA relies on theoretical analyses of the probability of collision
- Expected increase in the number of UAS operations in the Arctic in the near future
- Larger areas of UAS operation require more coordination and communication among airspace users because they are more difficult to avoid
- FAA regulations must be followed; however, they are not necessarily sufficient for promoting an environment where multiple airspace users can safely and successfully operate. If gaps exist between FAA regulations and what is necessary for safe and successful operations, airspace users should implement additional risk mitigation measures.

Achievements in 2013 and 2014
- During summer and fall of each year, 2013 and 2014, 3 UAS operations and 1 wide-bore aerial survey project safely and successfully shared the Northern Arctic airspace.
- The deconfliction process included senior staff with authority in their fields who were knowledgeable about the manned and unmanned aerial projects and aviation.
- Arctic Aerial Survey Coordination Group
- Established in 2014
- Enables information to be shared among airspace users, including commercial unmanned aircraft pilots, UAS pilots, research groups (private, governmental, and academic), and the FAA.
- Daily simultaneous operations (SIMOPs) calls
- Enables airspace users to communicate directly to ask questions or solve problems
- Permanent details about UAS and manned aircraft operations changed over the course of the field season. The SIMOPs calls provided a way to efficiently address issues in order to revise protocols, as necessary.
- Distribution of detailed flight plans (map or radius around ship) using a widely available communication system like telephone and email.
- How many UAS will be flying?
- Where will UAS be flying relative to others in the AASCG?
- Due to existing limitations in UAS ability to detect and avoid, the Aerial Surveys of Arctic Marine Mammals (ASAMM) project chose to avoid the UAS operation areas each day UAS were flying.
- Redundant communication systems
- Test communication systems in the field
- VHF radio, marine band radio, satellite phones, and email can all go down, sometimes simultaneously.
- ASAMM decided it was not acceptable to fly if the UAS or manned aircraft pilots could not communicate flight plans, changes to flight plans, or emergency situations with other airspace users.

Recommendations for improvement
- Organize and authorize a centralized coordination system, like the system used to coordinate airplanes flying through hurricanes.
- Implement a grid system to help communicate the location of daily flight plans.
- Ensure that all airspace users, manned and unmanned, participate in the AASCG and SIMOPs calls.
- Provide detailed information about UAS projects at least 7 days prior to the start of operations, including:
  - Location of study area (coordinates or GIS file)
  - Data of operations
  - Maximum number of UAS authorized to operate simultaneously
  - Typical time and duration of flights
  - Flight altitudes
  - Point contact for questions arising prior to or during field operations
  - In-field communication information:
    - VHF and marine band radio frequencies
    - Photo numbers
    - Email addresses
    - Websites
  - Study overview or concept of operations
  - Instructions for viewing the real-time location of the UAS (if possible)
  - Communications protocol

Abstract
Airspace over the northeastern Chukchi and western Beaufort seas is one of three locations in the Arctic where the Federal Aviation Administration (FAA) plans to establish permanent operational areas and corridor routes for access coastal launch sites for operating small UAS (4AHS) for research and commercial purposes. This action would enable over-water flights from the surface to at least 2,000 ft AGL. The airspace in this Alaskan Arctic area has been used for decades by manned aircraft transporting cargo and passengers, and conducting scientific research, military missions, search and rescue operations, and other activities. The level of UAS activity in the Alaskan Arctic has increased in recent years and is expected to continue to increase in the future; however, increased UAS traffic presents the development and standardization of UAS technology to detect and avoid other aircraft. While the FAA is working to develop rules, standards, and regulations specific to UAS operations, the airspace user community is proactively working to develop protocols to create an environment where a variety of aerial operations can occur safely, efficiently, and successfully. In 2013 and 2014, the airspace users worked together and with the FAA to deconflict the Alaskan Arctic airspace. We report on the lessons learned during the coordination of aerial operations in 2013 and 2014. Some of the achievements made during those years were: 1) creation of an Arctic Aerial Survey Coordination Group (AASCG), that included representatives from manned and unmanned aerial projects; 2) daily simultaneous operations (SIMOPs) phone calls to allow the AASCG to communicate directly with field teams; 3) distribution of detailed flight plans throughout the AASCG; and 4) evaluation and revision of communication protocols once projects commenced. Recommendations for improving coordination among manned and unmanned aircraft projects in the Alaskan Arctic in the future include designating a central authority to coordinate all flights in the 4A airspace, developing a grid-based system that can be referenced when communicating flight plans, and requiring that all airspace operators distribute detailed information about their proposed projects to airspace users well in advance of project start dates.

Aerial Surveys of Arctic Marine Mammals (ASAMM) project chose to avoid the UAS operation areas each day UAS were flying.

Figure 3. Example of detailed UAS flight plan, showing in red a radius around the research vessel used for launch and recovery. The UAS flight plan is shown relative to the ASAMM study area.

Figure 4. Aerial Surveys of Arctic Marine Mammals (ASAMM) project chose to avoid the UAS operation areas each day UAS were flying.

Figure 5. UAS plan to establish three permanent Arctic areas to comply with the Act: 1) Subarctic Arctic, 2) Bering Strait Area, 3) Northern Arctic Area.

Figure 6. Example of potential airspace users in the Northern Arctic Area during summer and fall of 2014: 1) AASCG study area showing survey tracks, 2) Chukchi Sea transect lines, and central Arctic area (transient lines in the Beaufort Sea are generated daily and, therefore, not shown).