

# USAP Polar Research Ship Science Mission Requirements

## D.2.4.6 Unmanned Aerial Systems (UAS) support

### *Updated SMR*

The vessel should be capable of launching and recovering small unmanned aircraft for multiple science surveys, ice survey and reconnaissance (remotely or autonomously operated).

The design of the next generation polar research ship should meet the basic needs of UAS shipboard requirements, including:

- communication (air band radios),
- sufficient “real-estate” to install system antennas (omni and directional),
- sufficient physical clearance for take-off and landing (generally not an issue),
- crew training on basic UAS ship-based operations, and
- sufficient internet bandwidth to access remote sensing and aviation forecast products needed for flight planning.

In some instances, rapid response via small boat (e.g. Zodiac) will be necessary to retrieve a UAS (e.g. drone) that malfunctions. Drones are designed to return to launch GPS coordinates when batteries die or if any malfunction occurs. At sea, this may be problematic if the ship has drifted and will result in the drone crash-landing into the ocean.

*Priorities:* Requirements rated as “must have, as is”

Discussion:

UAS operations are increasingly part of research at sea. Science foci, among others, include physical oceanography, atmospheric studies, electromagnetic studies, sea-ice studies, biological studies, and various forms of scientific mapping. Outreach activities also increasingly use UAS support. For polar ships, there is demand for UAS support for ice reconnaissance, navigation, and ice station planning, although there are operational hazards such as icing that pose challenges for UAS operations at low temperatures.

Improved UAS technologies such as smarter navigation and control systems, automatic take off and landing with sensing capability for obstacle avoidance (e.g. A-frame, ship superstructure) are maturing rapidly. Ship-based UAS operations are anticipated to become a routine component of research operations conducted from US research ships.