

## Developing DJI M210RTK Shipboard Operations

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National Ocean Service, NGS/OCS

The NOAA Remote Sensing Division (RSD) and Hydrographic Services Division (HSD) successfully completed Phase One of a [UAS Program Office](#)-funded project to develop the capability and approved documented operating procedures to safely launch and recover an M210RTK UAS from NOAA ships and small boats manually.

The establishment of a fully operational M210RTK system, trained UAS and vessel operators, operations protocols, data management and integration strategy, will allow unmanned rotary wing aerial assets to acquire data supporting NGS roadmap and OCS strategic goals that align with elements of the NOS Program, Line Office and Agency strategic plans. This project furthers the NOS “Safe and Efficient Transportation and Commerce” Priority by exploring and optimizing the use emerging airborne technology for coastal mapping and obstruction investigation surveys and the “Preparedness and Risk Reduction” Priority by investigating the use of UAS as a tool for rapid deployment damage assessment imagery.

The anticipated advantages of incorporating the M210RTK into the NOS Coastal Mapping and Nautical Charting missions include increased productivity without an associated increase in cost, reduced risk to people and Government property and improved data quality. With the potential to reduce charting backlog, the addition of the M210RTK operated in conjunction with ship and launch data acquisition strategies allows surveys to be completed in less time than only traditional survey methods.



**UAS Description – DJI Matrice 210.**

The Matrice 210 has a closed shell body for weather and water resistance, a folding and collapsible design for portability. The airframe is equipped with a front-facing, 2-axis stabilized first person view (FPV) camera, offering the pilot a live view of what is in front of the aircraft. The Flight Autonomy system utilizes front, bottom and upper sensors working together to sense and avoid obstacles while simultaneously enabling precision hovering. All Zenmuse cameras and gimbals are natively compatible and full integration with third party software and hardware. Two batteries provide power redundancy. The Matrice 210 flight controller features a return-to-home function that aids in the aircraft's safe return if control signal is lost. As a variant the M210RTK is a versatile quadcopter capable of flight in extreme weather, dual battery redundancy and with dual high performance and top-mounted camera setup available with 4.4 pound payload, 4.35 mile maximum range and 38 minutes maximum flying time and made for industrial applications. The RTK on the aircraft is set up by mounting an additional antenna to the top of the aircraft and used with a Datalink Pro ground station. The 210 RTK is built to Ingress Protection Rating 43 resistance, so it can be flown in the rain. It is sized to remain stable in crosswinds, with added stability from its 17-inch propellers. The M210RTK has an upgraded obstacle sensing system. The foldable body, plus removable batteries, propellers and landing gear, make it easy to store and transport.



**Flight testing for magnetic interference.**

This project builds upon recent successful UAS operations aboard NOAA Ship *Thomas Jefferson* with the OCS Coast Survey Development Lab Hydrographic Systems and Technology Branch which demonstrated the potential for ship and small boat-based UAS operations in support of NOAA charting and emergency response requirements.



**Hand catching the DJI M210 on the NOAA Ship Shimada.**

Multiple M210RTK flights were conducted from the NOAA Marine Operations Center pier in Newport, OR and from the decks of the NOAA Ships Shimada and Hi'ialakai. Both hand launches and recoveries were successfully completed from the two ships at multiple deck locations. Protocols and procedures were tested and modified to eliminate any magnetic interference or initialization issues and ensure safe operations.



**NOAA Ship Bell M. Shimada arriving home to Newport.**

Phase Two will consist of operational flights from a NOAA Ship while at sea, tentatively scheduled for April 2020 to receive final shipboard operations airworthiness approval.