

April 25, 2017 - OI and MSRC Partner to Equip All TRACS Aircraft with State-of-the-Art Air-to-Ground Data Transfer Systems

Following the Deep Water Horizon oil spill incident in 2010, Ocean Imaging (OI) recognized the need to send data on oil location, extent and relative thickness down to response vessel in real time. Since oil on water moves quickly and is highly dynamic in regard to the responder's ability to act on areas of thick oil and quickly clean it up, information about the location of 'actionable' oil must be delivered as fast as possible to clean up and dispersant crews. In 2014 OI began the quest to develop a system to transmit both Visible (VIS) and Thermal Infrared image mosaics down to boats at sea. After some trial and error with a few wireless communication companies, Marine Spill Response Corporation (MSRC) offered to lend their expertise in communication technology. By early 2015 MSRC had developed and tested a low-cost, high speed data transfer system that could transmit data directly from an aircraft down to a vessel as far as 10 miles away at speeds as high as 50 Mbps. By mid-2015, OI developed and integrated the communication software necessary into the onboard TRACS acquisition and processing application so that image mosaics generated on the aircraft could be sent down to a boat within minutes of data acquisition.

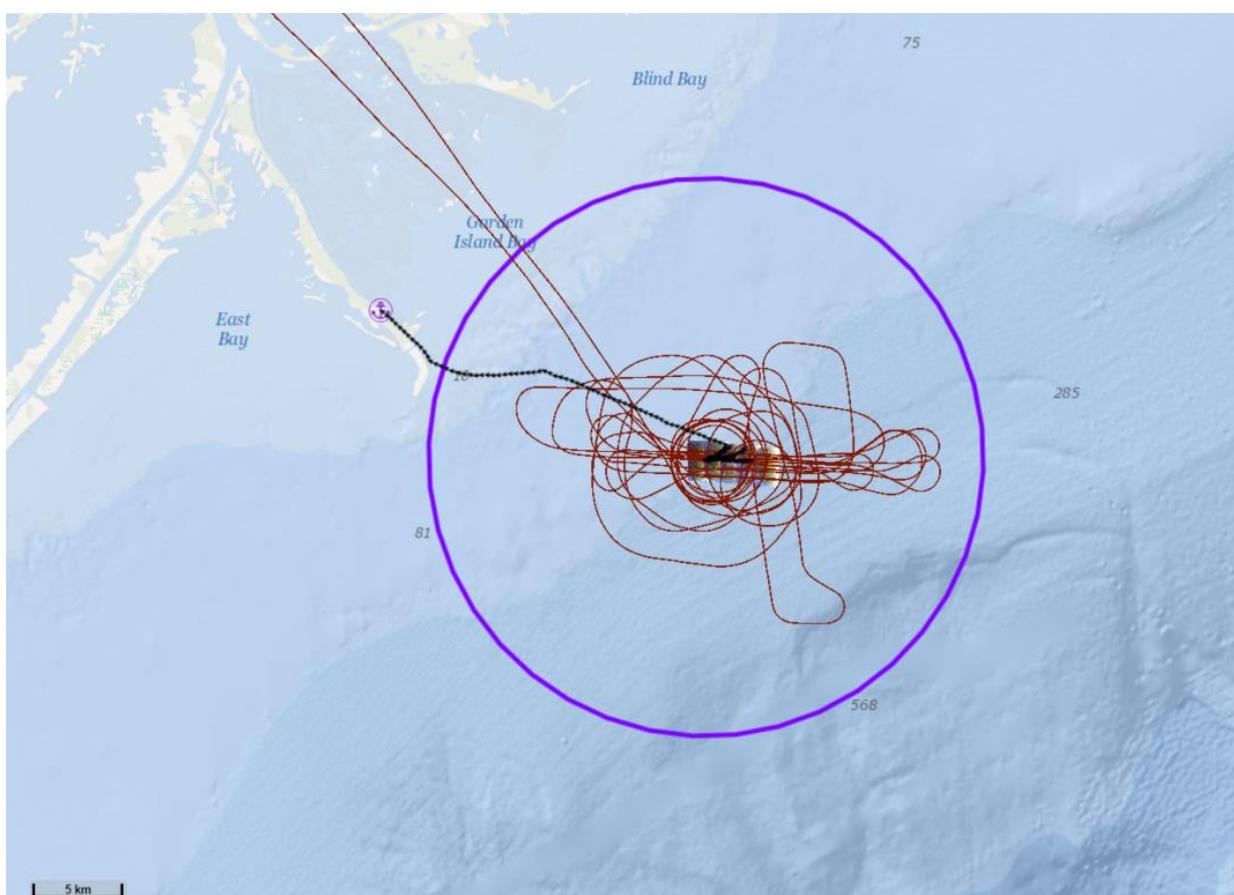
On April 25, 2017, OI and MSRC participated in study to help validate remote sensing data by collecting oil thickness data along with bulk oil samples to determine water content of the oil simultaneously with the acquisition of satellite and aerial remote sensing data. Prior to this exercise MSRC had thoroughly tested and proved the capabilities of this system, yet never before had TRACS data showing oil on water been transmitted down to a vessel the size of the sampling vessel used for the research (the *Miss D* - 44 feet in length) within a few minutes of acquisition.



OI/MSRC communication system antenna installed on the 44-foot "Miss D" sampling vessel. Oil location, extent and thickness imagery/information were sent down from the aircraft within 10-15 minutes of data acquisition to the crew sampling the oil on the ocean's surface below.

Several test data files ranging in size from a few kilobytes up to ~128 MB were transmitted to the *Miss D* on both 04/25 and 04/26. During the flight to the sampling site, two-way messaging communication was first established with the boat via a simple MS Windows-based application prior to arrival over the oiled areas. This allowed for clear and effective communication regarding the most heavily oiled areas to be immediately relayed down to the

Miss D helping them find the thicker oil as quickly as possible. Connectivity was established between the aircraft and the boat at a distance of approximately ten miles and optimal data transfer performance occurred within a range of four to five miles. The figure below shows the 10-mile connectivity range in reference to the area of oil imaged by the TRACS on 04/25, along with the on-water boat sampling track and the track of the OI/MSRC King Air. Following the acquisition of TRACS data, image mosaics of both the RGB and TIR imagery were created on board the aircraft while circling the boat. Once the mosaics were created and converted to GeoTIFF format for display on the boat, the person on the aircraft responsible for the data transfer contacted the person on the boat managing the communication computer and notified him via text that the data file transfer would begin. Most of the transfers took place at distances of 1.25 to 2 miles from the boat, however transfers were attempted and successful as far away as 4.5 - 5 miles. The largest file sent was approximately 128 MB in size and was delivered to the boat in less than one minute. The RGB and TIR TRACS imagery of the oil slick imaged only moments earlier was then immediately available for review by the boat personnel.



The 10-mile range of the OI/MSRC communication system (purple circle) in relation to one of the TRACS imaging areas, the on-water sampling vessel track (black line) as well as the TRACS aircraft flight line (maroon line). Note the repeating flight track circles around the area where the sampling vessel was working. This shows the flight pattern while the data transfers were taking place roughly 1.25 to 2 miles from the boat. TRACS data transfers were successfully complete as far as 10 miles from the vessel as part of this exercise.

Update November 2018: Since the 2017 demonstrations, further improvements have been made to the data transfer software and the communication system's antennas to both improve ease of use and data transfer efficiencies. OI and MSRC have participated in additional oil spill / remote sensing drills with Chevron in May of 2018 over the Gulf of Mexico and with the California Department of Fish and Wildlife's office of Oil Spill Prevention and Response (OSPR) in October of 2018. For the OSPR exercise, OI/MSRC transmitted TIR data directly down to support vessels within 5 minutes of data acquisition to guide and document the demonstration and testing of new mechanical dispersant and booming technologies.