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A Maritime Advanced Geospatial Intelligence Craft for Oil Spill Response: White Paper

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WHITE PAPER

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In line with current research thrusts on unmanned systems, the University of New Orleans has formed a collaborative team from industry, academia, and government (e.g., Department of Homeland Security). UNO's intent is to work with organizations such as the Bureau of Safety and Environmental Enforcement (BSEE) to experiment and demonstrate the potential offered by Unmanned Surface Vessels within the Gulf of Mexico.

Collaborations are focused on development of a Maritime Advanced Geospatial Intelligence Craft (MAGIC) for oil spill response. A fully-integrated and operational MAGIC will be designed to:

- find oil with coarse sensors and distribute dispersant,
- find low concentrations of oil with sensors and follow if possible,
- contain oil with a boom-like device, and
- provide updated oceanographic data that will be used to predict oil movement and support decision makers.

Development of MAGIC supports the nation on the following topics:

- Reducing coastal risk is in the national interest.
- Oil spill prevention and response projects provide national economic benefits.
- Additional research needed.

Coastal Risk is in the National Interest:

The Gulf of Mexico is a unique semi-enclosed sea that includes estuaries and rivers. The Mississippi, the Apalachicola, the Usamacinta, the Everglades, and the Rio Grande are important nurseries that support commercially important fisheries. Marine spills impact water quality as evidenced by recent occurrences of red, green, and brown tides, massive fish die-offs, ailing coral reefs, and dolphin strandings. Since the Gulf of Mexico supports natural gas and oil

production, with onshore refineries and thousands of offshore drilling platforms, technologies such as MAGIC are needed to help control the inevitable spills and platform fires.

Future oil and gas exploration and development projects in the Gulf of Mexico include proposals for offshore wells and onshore infrastructure to fully exploit existing or new oil and gas reservoirs. There is substantial risk of oil spills from the onshore and offshore oil and gas exploration, production, processing, and transportation facilities. Examples of potential causes of oil spills from offshore and onshore marine facilities include uncontrolled oil well blowouts; pipeline leaks and ruptures; breaches of containment systems; containment tank overfills, leaks, or failures; and accidental discharges during oil transfer operations. Oil spills from oil and gas projects have had significant adverse impacts for the economic, cultural, and environmental resources of Gulf State coastal zones.

Oil spill prevention and response projects provide national economic benefits:

Ongoing research and technology transfer supports oil spill prevention and response and should be required to safeguard oil and gas exploration, development, and transportation. The economic benefits from oil and gas exploration must balance with the economic benefits derived from the protection of its scenic and sensitive coastal and marine resources.

Recent changes made to improve the safety of offshore oil and gas operations have been attributed to research and analysis following the 2010 BP Deepwater Horizon spill. Some noteworthy examples include modifications to oil spill contingency plan regulations to require offshore oil platforms to provide worst-case spill scenarios and response capability analysis for a 30-day uncontrolled well blow-out and oil spill and certification of the compatibility for blowout preventers for oil wells at offshore platforms. These types of policies are complemented by U.S. Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) regulations governing oil and gas platforms in the federal OCS waters of the Gulf of Mexico.

UNO and collaborators are focused on achieving the highest level of protection through the implementation of the ‘best achievable technology’ and innovative operational methods which provide the greatest degree of protection achievable. The best achievable protection should be based on the critical need to protect life and valuable coastal resources and marine waters. The focus is on more efficient location and containment of marine spills. MAGIC would be incorporated into Oil Spill Contingency Plans and used during drills and exercises.

MAGIC is designed to provide information for decision makers as well as operational support. Data from MAGIC can be used to support trajectory analysis to identify at-risk resources beyond what may have been estimated from a projected worst-case spill volume (including open ocean marine resources, mainland coastal areas, and offshore islands). Data from MAGIC would support the public domain’s BOEM/BSEE oil spill risk analysis (OSRA) model and the General NOAA Oil Modeling Environment (GNOME) spill response trajectory model. These are the operational models that are used in the Gulf of Mexico. Other research models should be assessed and transferred to operational organizations such as NOAA. Data from MAGIC helps to determine the location and extent of an oil spill and all-weather procedures to

track oil movement. MAGIC provides in situ characterization of the water column and ocean circulation.

MAGIC provides an innovative capability to contain and clean-up marine spills. Data from MAGIC is used to increase response times and will be transitioned as a primary piece of regional oil spill response equipment providing a first line of defense by supporting deployment of open-ocean booms for containment, skimmers (or other equivalent devices) for mechanical recovery of oil, dispersants, in-situ burning, and bioremediation. MAGIC will be maintained at UNO for quick deployment. The goal of MAGIC is to support the rapid containment of an oil spill and limiting its spread.

Additional research needed:
Based upon results from past BSEE and Gulf of Mexico Research Initiative projects, the collaborators recommend the following:

- USV to support the location and measurement of the spill to enable data driven decision making since successful mechanical recovery is limited by factors such as adverse weather conditions, oil viscosity and the effects of currents and waves.
- USV to enhance initial and ongoing boom and containment operations to improve the selective recovery of oil.
- USV to enhance pump capacity which affects the distance over which the oil can to be moved to storage.
- USV to support skimming operations.
- USV to employ the best combination of dispersant droplet size, concentration, and rate of application.
- USV to reduce response time
- Experiments to document the changes in throughput efficiency, recovery efficiency and oil recovery rate by employing MAGIC.