

# Development of an Amphibious Remotely Operated Vehicle for Coastal Research and Education

(“The Surf Rover Project”)

Funding Agency: National Science Foundation - Major Research Instrumentation  
Grant Award and Duration: **\$515,000**; 8/15/2015 – 7/31/2019



Principal Investigator: William R. Dally, Ph.D, P.E., Associate Professor of Civil Engineering  
William R. (Bill) Dally has been a practicing coastal engineer for nearly 38 years. He received his Bachelor’s and Master’s degrees in Civil Engineering from the University of Delaware and his Ph.D. in Engineering Mechanics from the University of Florida, and specializes in analytical, physical, and numerical modeling of coastal dynamics and engineering works, as well as field measurements of nearshore and inlet processes.

Based upon other types of amphibious vehicles and the Principal Investigator’s previous experience with the initial development of a surf zone ROV (Dally, Johnson, and Osiecki, 1994), the platform envisioned will be bottom-crawling, propelled by six hydraulically driven tracks, and powered by a snorkel-aspirated diesel engine. The snorkel (~7.5 m long) will be equipped with drag-reducing cowlings to reduce both power requirements and impact loads from breaking waves. It will also carry antennas for radio control, data communications, and video feed, as well as suitable equipment for positioning and for accurate bathymetric surveying. With this mobile instrument platform, operations can be conducted seamlessly across the dry beach, out into the surf zone, and beyond. Although its frame will be nominally 5 m wide and 7 m long to maintain stability in breaking waves, the vehicle will have the ability to be folded into a suitable configuration so it can be easily and rapidly transported on a modified boat trailer to any coastal location.

To date, the design of the Surf Rover has essentially been completed, and fabrication has progressed to the point where the structural frame and tracks have been assembled (see attached photographs) and installation of the hydraulic system and diesel engine initiated. Since its inception, over 95 undergraduate and graduate students have participated in the design, fabrication, and field testing of various components of the vehicle.



# The Taylor Engineering Research Institute

**Dr. Donald T. Resio** joined the faculty at the University of North Florida as a Professor of Ocean Engineering and as the Director of the Taylor Engineering Research Institute (TERI) in 2011. In this position, he conducts extensive research activities and leads a world-class team of faculty members in developing improved information, insightful identification of problems and innovative problem solutions for those us living in coastal and estuarine areas.

Dr. Resio served as the Senior Technologist for the US Army Corps of Engineers Coastal and Hydraulics Lab from 1994 to 2011. He directed the Army's program for joint theater and post-disaster access, under which a new class of expedient bridging was developed to allow rapid access to coastal, estuarine and riverine areas under austere/degraded conditions. He is a recognized leader in the meteorology, hydrodynamics and probabilistic analysis of environmental hazards in coastal, estuarine, and riverine areas.



The Taylor Engineering Research Institute (TERI) was founded through a generous \$1 million gift from former Board of Trustees member and chair Dr. Bruce Taylor. TERI is the framework for the coastal program that fosters collaboration and builds an emphasis on innovation, both cross-cutting groups of students and professors. The level of collaboration is marked by the development of a strong graduate program in Civil and Coastal Engineering, focusing on coastal and estuarine processes, wave circulation, physics and modeling, beach response modeling, coastal risk assessment, and water resources.

Currently, TERI has a joint Ph.D. program in Coastal Engineering with the University of Florida, and the faculty are working with Dean Tumeo to submit a proposal for a standalone PhD in Engineering at UNF.. In addition, the Coastal Engineering undergraduate curriculum is in the Faculty Association's Academic Programs Committee, and we expect approval in time for the 2019-2020 academic year. This track will allow undergraduates to have a strong boost into the graduate program at UNF, a strong advantage over schools that do not have such undergraduate programs.

## **Mission Statement of Taylor Engineering Research Institute (TERI)**

An institute created to promote and support collaborative research among academia, private industry, and government agencies in field of coastal engineering and water resources. The institute also seeks to educate the next generation of coastal engineers and scientists to build coastal resilience.

## **Educational Component**

TERI provides a stable source of funding for most of the graduate students within the coastal program. It provides a common work area for its graduate students, who hold bi-weekly seminars for students only and helps organize special projects and trips for these students, such as their forensics study of Hurricane Matthew and energetic participation in ASCE-COPRI activities.

# **The Taylor Engineering Research Institute**

## **Building a Strong Research Team**

TERI emphasizes the fact that answers to tomorrow's problems often cannot be found in yesterday's tools and methods. It encourages professors to develop innovative approaches to coastal problems, which has produced over \$1.5M in funds brought into UNF and used to address leading-edge research problems, some examples of sponsors include (DHS-FEMA, National Hurricane Center, Office of Naval Research, National Science Foundation, the Nuclear Regulatory Commission, Electric Power Research Institute, Atkins International, and Florida Department of Transportation).

TERI also strongly encourages student creativity and teamwork among students and faculty. This year TERI and the Office of Sponsored Programs jointly sponsored the development of two patent concepts, within a collaborative team structure, which became part of a One Spark booth in May. These patents will be demonstrated for the public in early August. A tribute to the commitment of the students on this team is the countless hours that they have spent this summer in the construction of the new wave and tide pool needed for this demonstration.

## **Building Sustainable Teamwork**

TERI serves as an important buffer for the faculty and students within it, providing an important support role in assisting them in addressing problems that always emerge in academic environments.

## **Outreach**

A critical component of the growth and health of an academic program is the maintenance of a flow of qualified students entering into that program. TERI has been very active in this area over the last 6 years, recruiting not only from top-performing UNF undergraduates but also adding a wide range of students from around the world. We are still trying to facilitate direct access to TERI information on the UNF website; however, this continues to be delayed by "system inertia." We do have a TERI brochure that is available and given out at appropriate events and TERI supports public outreach in meetings, national magazines, TV and radio appearances, and panels at local events.