ABSTRACT

Cal Maritime requests funding to support the development of an innovative course that will expand our existing Maritime Emergency Rescue Boat (MERB) training program for first responders by developing a new 2-day training course (MERB 5). This course will include the implementation of instruction in UAV aerial drone technology into marine firefighting activity, fireboat operations and joint command ICS situation assessment for vessel fires.

The MERB 5 program addresses all New Framework for Action objectives by using UAV technology in emergency response situations. For this grant, the MERB 5 program will include delivery of pilot sessions to gain input on course curriculum from industry and the first responder community. Subsequently, we will launch formal course deliveries at our campus. From these courses, we will gather data from first responders and other users regarding the effectiveness of using drone technology in marine firefighting incidents.

NARRATIVE

Unmet Need

A serious response gap exists in marine firefighting capability across California's major port cities, as well as around the world's ports. As the U.S. Coast Guard's firefighting resources continue to shrink, local and regional fire departments are tasked with filling the response gap for serious vessel and ship fire and security incidents occurring within port city and offshore maritime domains.

Cal Maritime's Extended Learning Department is the only state education source that has the expertise in marine firefighting situations likely to be encountered in the state's ports by land based fire departments. The Commission is in a unique position to help the state's first responder workforce to acquire this specialized skill and training. It simply does not exist currently elsewhere.

This "needs application" is effectively and dramatically demonstrated with the following series of pictures:

1. The Problem:

2. The cavalry response:

3. The response conundrum though – where best to apply and how much water?

4. Too much firefighting water applied in the wrong places when trying to do the right thing

5. How we can see and evaluate the situation better for more effective response:

Aerial Drone Used to Save Two Swimmers' Lives in Australia

DEVELOPMENT GRANT DESCRIPTION

This first responder training course utilizing UAV technology contains elements that meet New Framework for Action objectives:

Meeting California's economic/workforce development needs: This training would support first responder public and employees and private fire departments in California's six major ports. It is also applicable nationwide in port areas and marinas around the country.

Increase access to educational opportunities: This training would be open and available statewide. Because of the unique application of UAV in emergency response, many additional applications other than marine firefighting could be utilized by a much broader student audience than just port, marina and beach area first responders.

Develop alternative instructional delivery systems: This course is developed so that it can be "suit cased" and delivered onsite around the state. The course would combine classroom settings, on-the-water exercises and practice at marine facilities.

Creatively develop new programs: Applied technology is one of the cornerstones of Cal Maritime's academic mission. Translating hypothetical and emerging technologies into practical application is our strength. Collaborating with fire departments, along with professional fire instructors within our department, will yield a practical solution to real-world challenges to increase safety preparedness statewide.

Provide personal/lifelong learning opportunities: The fundamentals in this course will allow organizations and students to apply the same technology to many aspects of emergency response in settings and locales other than maritime fire scenarios. Students will be able to grow beyond the fundamental concepts in this course and apply the technology in new settings.

Support international educational experiences: This technology, and the course development to utilize it, is transferrable to every major commercial port in the world.

The learning objective outcomes for this newly developed training course will match the syllabus content measured by our department's Grading and Assessment Methodology manual. Students will be required to demonstrate knowledge, understanding and proficiency in both knowledge examinations and practical demonstration assessments.

GI 2025: This unique training program will provide additional academic preparation in the newest technologies in the marine firefighting environment for our cadets. Data received using UAV drone technology will help students develop skills to make data-driven decisions in critical emergency response situations.

Cal Maritime's MERB training program combines world-recognized maritime operations/emergency expertise with professional maritime training. It was designed for first responder communities, who need to specialize and niche their fire and rescue skills into the unique maritime environment. Fire and police departments are naturally oriented to landside fire and law enforcement activity, who are ill-suited to marine operation specialties. They are fire/police centric, not maritime centric in their organization's experiences. Our MERB program addresses civilian municipalities' unique need to operate marine vessels, including large fireboats, and response to fires and rescue situations in commercial ports and marinas.

Significant risks exist when employing large modern fireboat assets to vessel fires. These represent dangerous challenges and injury potential to both crews and responding port-city fire department personnel. One is when fireboats are positioned offshore from burning vessels, crews are often overwhelmed by smoke and toxic fumes. They are required to retreat to and remain inside pressurized wheelhouses. They are unable to effectively see how and where to employ cooling water as directed by their operational command structure. The second, and _primary_ risk, is that these modern fireboats have incredible firefighting water deluge pumping capabilities – some in excess of 150 long tons per minute. This capability can easily become a detriment when too much firefighting water weight is applied to vessels in the wrong place with no consideration to that vessel's stability. This is difficult from the vessel's bridge viewpoint as well. Lack of

visibility due to smoke makes it difficult to see where the seat of the fire is and where water should be applied to maximize extinguishment efforts or cooling capability.

This proposal combines the nexus of existing vessel and firefighting training and augments it with the evolving innovation of UAV aerial drone capabilities. Competent and comparatively inexpensive drone assets, launched from fireboats or response truck units, can completely shift response tactics. Because drones can fly unimpeded above and around the fire scene without human risk, they can see into the fire using conventional high-definition or heat-sensing infrared cameras. This capability to remain upwind and quickly move around the fire perimeter provides critically important assessments: first, responders can see exactly where the primary seat of the fire is to know how best to employ extinguishing agents; and two, assess the effects of the employment. Both of these critical elements can be done without risking humans. By maximizing firefighting water application, unnecessary weight above a vessel's center of gravity, threatening capsizing and unnecessary cargo destruction, is now minimized.

Possessing organic aerial drone capability in marine first response units goes beyond just firefighting applications. Many drone models have a small limited lifting and drop payload capability that are used to not only find distressed persons in the water, but drop them lifesaving floatation devices as well. Aerial drone technology, and concomitant operator skill, has evolved to where many of the drone's self-preserving in-flight attributes are contained in AI self-protections, instead of constant direct and sophisticated human operator input. These technologies serve to make the technology semi-automated and greatly survivable.

VALUE & VIABILITY

Formal instruction in efficient and legal operation of UAV technology is overdue as our society struggles with balancing the sometimes-contradictory imperatives and freedom of innovation and societal control. By providing professional and structured education of many factors involved in utilizing this emerging technology, students will gain a better respect for its responsible use. This course will provide many response organizations with the opportunity to institutionalize proper training approaches, instead of relying on personality impetus in the name of expediency to adopt this type of technology within operational doctrine.

Integrating this training course within our existing MERB program will require nine months to develop with another four months for developing practical training exercises. The course will launch within thirteen months of grant award. Course development efforts will include local fire departments and Mare Island Shipyard, with Cal Maritime as lead. Deliverables include course development, lesson plans, operational instructions and assessments, as verification of completion.

SUSTAINABILITY

Once developed, this course will become the model framework to expand UAV usage in the emergency response community for many other applications beyond marine firefighting. The potential of this course is as limitless as is the imagination is to utilize remote aerial imaging.

Cal Maritime developed the current MERB program, and invested funding resources in creating this multi-tiered suite of courses for first responders. The campus remains committed to the

addition of new courses to enhance existing content, and will support the training needs of our emergency response partners and maritime industry.

PERSONNEL

These individuals will be responsible for course development and subsequent course deliveries.

Captain Paul Leyda   Principal Investigator, Primary Instructor and Course Developer, Merchant Mariner, Retired Cal Maritime Undergraduate Faculty

Captain Richard MacKenzie Retired Fire Battalion Chief, Secondary Course Developer

Dan Lintz   Retired TS Golden Bear, Chief Mate, UAV Instructor/Pilot