

United States Department of Transportation MARAD Annual Modal Research Plan

Cover Page

MARITIME ADMINISTRATION

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Executive Summary

The Maritime Environmental and Technical Assistance (META) Program was established by Congress to foster innovation in maritime environmental protection, and to improve U.S. competitiveness through improved energy efficiency and adoption of alternative fuels and technologies. The Program is executed through collaboration among the private and public sectors to identify, evaluate, and demonstrate promising new technologies and practices to achieve these objectives. The META effort serves not only to assist in the development of effective and affordable national maritime policy, but also to inform the maritime industry regarding the capital investments needed to meet current and future requirements.

Vessel and port automation technologies are rapidly maturing overseas, with a view toward early deployment of robotically controlled and/or fully autonomous vessels and ports. META funds are not available for vessel or port automation research, and MARAD receives no other Research and Development funding. In coordination with international organizations, the Transportation Research Board, the maritime industry, and sister DOT modes and federal agencies, MARAD is monitoring developments in this area, and participating in nascent efforts to develop a national strategy for increased maritime automation.

Section 1 – Program Descriptions, FY 2018

FY 2018 RD&T Program Funding Details

RD&T Program Name	FY 2018 Pres. Budget (\$000)	FY 2018 Basic (\$000)	FY 2018 Applied (\$000)	FY 2018 Development (\$000)	FY 2018 Technology (\$000)
META*	3,000		1300	300	1,400
Totals	3,000		1300	300	1,400

The Maritime Environmental and Technical Assistance (META) program operates by authority of 46 USC 5037. META funding is a line item in MARAD's Operations and Training budget; this funding is not provided under a designated Research and Development (R&D) account. META expenditures are, however, primarily used for maritime transportation technology and operational innovation and demonstration projects. This plan is nevertheless provided in order to provide OST visibility of this program.

**FY 2018 RD&T Program Budget Request
by Critical Transportation Topic Area**

RD&T Program Name	FY 2018 Pres. Budget (\$000)	PROMOTING SAFETY (\$000)	IMPROVING MOBILITY (\$000)	IMPROVING INFRASTRUCTURE (\$000)	PRESERVING THE ENVIRONMENT (\$000)
META	3,000*	750	750	750	750
Totals	3,000	750	750	750	750

**META funds do not fit neatly into the above categories; there is some overlap. For example, a project exploring the use of domestically produced liquefied natural gas (LNG) for vessel propulsion would have safety, mobility improvement, infrastructure and environmental dimensions.*

**Maritime Environmental and Technical Assistance Program
\$3,000,000**

Program Description:

46 USC 50307 authorizes the Secretary of Transportation to “identify, study, evaluate, test, demonstrate or improve emerging marine technologies and practices that are likely to achieve environmental improvements by reducing air emissions, water emissions or other ship discharges, increasing fuel economy or the use of alternative fuels and alternative energy... and controlling aquatic invasive species.” The Secretary has delegated responsibility for this program to MARAD.

Projects undertaken in the META program are decided upon annually, after careful review of the maritime industry’s most significant technological challenges and opportunities, and consideration of related work being done elsewhere in the United States and abroad. To preclude duplication of effort and ensure maximum synergy, MARAD coordinates each year’s META plan with other agencies interested in maritime technology, in particular the U.S. Coast Guard (USCG), Environmental Protection Agency (EPA), U.S. Navy, National Oceanic and Atmospheric Administration (NOAA), the U.S. Army Corps of Engineers and the Department of Energy (DOE).

Program Objectives:

The META Program supports MARAD’s statutory mission to “foster, promote and develop the merchant maritime industry of the United States” (49 USC 109(a)). META projects enable the industry to operate more profitably and with a reduced environmental footprint, by enabling vessels and port operations to maximize energy efficiency and make use of abundant domestically produced alternative fuels, such as Liquefied Natural Gas

(LNG), biofuels and hydrogen. Other META projects, such as for the control of invasive species, help avoid or minimize the economic damage that occurs when invasive species such as mussels clog water intake or outfall pipes, and reduce vessel efficiency by attachment to the hull.

Anticipated Program Activities:

- 1. Control of Aquatic Invasive Species. \$800,000

The presence of nuisance invasive species in U.S. waters results in significant economic costs to municipalities, power plants and farmers by clogging water intakes and outfalls. Invasive nuisance species also diminish the value of U.S. rivers and lakes for recreational purposes, such as when species like Asian Carp or Snakeheads displace native gamefish species such as bass, sunfish, and pickerel.

In an effort to avoid or minimize the introduction and spread of invasive species, MARAD supports U.S. based ballast water management system test facilities, which examine the effectiveness of shipboard ballast water treatment systems in preventing the spread of undesirable species of fish, shellfish, aquatic plants and microorganisms. Projects also include the identification and testing of methods for monitoring ballast water management system effectiveness over time. Other projects focus on underwater hull fouling and hull husbandry.

- 2. Maritime Industry Efficiency and Use of Domestically Produced Alternative Fuels \$2,200,000

META projects in this area support development and maritime adoption of improved technologies and practices that will lead to greater efficiency, cost savings and a smaller environmental footprint. Projects include demonstration projects to ascertain the feasibility of using hydrogen fuel cells for powering refrigerated containers, providing auxiliary power for large vessels, and providing propulsion power for smaller vessels such as ferries and towboats. The use of domestically produced drop-in biofuels, produced with a variety of feedstocks, will also be explored. Other projects will include development and demonstration projects for higher efficiency and lower polluting marine engines, examining technologies such as hybrid engines and improved high-density batteries.

Expected Program Outcomes:

- 1) Advance technology innovation in ballast water treatment system design and operation, and underwater hull husbandry to address hull fouling. Test, validate and identify methods and technology for easily assessing the effectiveness of ballast water treatment system. Advance hull husbandry and hull cleaning practices to reduce the risk of the introduction

and spread of aquatic invasive species. Provide ship owners/operators with independent information with which to inform investment decisions.

2) Advance alternative energy and energy efficiency technologies and application to expand their use in the maritime industry, with resulting lower costs and increased competitiveness. Provide the maritime industry stakeholders with independent operational, cost/benefit and other information for use in making investment decisions.

Collaboration Partners:

Collaboration partners include the OST-R, FTA, FRA, Department of Defense, Coast Guard, NOAA, DOE, state and local government agencies, universities and maritime industry stakeholders.

How Program meets Statutory Requirements:

Per 46 USC 50307, the META program authorizes the Secretary (delegated to MARAD) to “identify, study, evaluate, test, demonstrate or improve emerging marine technologies and practices that are likely to achieve environmental improvements by reducing air emissions, water emissions or other ship discharges, increasing fuel economy or the use of alternative fuels and alternative energy... and controlling aquatic invasive species.”

As described in other sections the program, projects and activities align closely with the statutory mandate.

Describe how public and stakeholder input have been utilized in the development of this research program:

The META program is built on the premise of public-private partnerships and collaboration with Federal, state and local government, academia, maritime industry and non-governmental organizations. Many META projects provide for substantial cost sharing with other governmental, academic, and private industry partners. MARAD partners have included vessel operators, such as TOTE Services (a U.S. Flag ocean going vessel operator), Americal Electric Power River Operators (AEP) (an inland barge operator), Interlake Steamship and American Steamship Company (Great Lakes vessel operators), the Ship Operations Cooperative Program - a non-profit consortium that includes ship owners/operators, maritime educational entities, maritime labor, and a consortium of Great Lakes maritime industry, academia, and Federal, state and local government from both U.S. and Canada. MARAD has also partnered with local entities such as Pittsburgh Clean Cities, California State Lands Commission, San Francisco Department of Environment, Puget Sound Air Quality Agency, Maryland Department of Transportation and multiple ports, and with numerous Federal agencies such as EPA, USCG, Department of Defense (DOD), DOE, NOAA, and U.S. Department of Agriculture (USDA).

Through sponsored workshops, meetings and informal discussions, MARAD works closely with industry to identify research needs, formulate research initiatives to address specific issues, and then transfer findings to the industry. For the most part, research is accomplished through contracts or cooperative agreement with industry partners and academia. In addition, MARAD staff have built strong relationships throughout the industry that position the Agency to accomplish valuable testing, verification and innovative technology initiatives with exponentially beneficial paybacks from the resources applied.

Section 2 - Program Descriptions, FY 2019

Maritime Environmental and Technical Assistance Program

Program Description:

46 USC 50307 authorizes the Secretary of Transportation to “identify, study, evaluate, test, demonstrate or improve emerging marine technologies and practices that are likely to achieve environmental improvements by reducing air emissions, water emissions or other ship discharges, increasing fuel economy or the use of alternative fuels and alternative energy... and controlling aquatic invasive species.” The Secretary has delegated responsibility for this program to MARAD.

Projects undertaken in the META program are decided upon annually, after careful review of the maritime industry’s most significant technological challenges and opportunities and consideration of related work being done elsewhere in the United States and abroad. To preclude duplication of effort and ensure maximum synergy, MARAD coordinates each year’s META plan with other agencies interested in maritime technology, in particular the U.S. Coast Guard (USCG), Environmental Protection Agency (EPA), U.S. Navy, National Oceanic and Atmospheric Administration (NOAA), the U.S. Army Corps of Engineers and the Department of Energy (DOE).

Program Objectives:

The META Program supports MARAD’s statutory mission to “foster, promote and develop the merchant maritime industry of the United States” (49 USC 109(a)). META projects enable the industry to operate more profitably and with a reduced environmental footprint, by enabling vessels to maximize energy efficiency and make use of abundant domestically produced alternative fuels, such as LNG, biofuels and hydrogen. Other META projects, such as for the control of invasive species, help minimize the economic damage that occurs when invasive species such as mussels clog water intake or outfall pipes, and reduce vessel efficiency by attachment to the hull.

Anticipated Program Activities:

1. Control of Aquatic Invasive Species.

The presence of nuisance invasive species in U.S. waters results in significant economic costs to municipalities, power plants and farmers by clogging water intakes and outfalls.

Invasive nuisance species also diminish the value of U.S. rivers and lakes for recreational purposes, such as when species like Asian Carp or Snakeheads displace native gamefish species such as bass, sunfish, and pickerel.

To minimize or avoid the introduction and spread of invasive species, the program will continue to support ballast water management system test facilities, which examine the effectiveness of shipboard ballast water treatment systems in preventing the introduction and spread of non-native aquatic invasive species. Projects also include the identification and testing of methods for monitoring ballast water management system effectiveness over time. Additional focus will be placed upon a second maritime transportation vector – hull fouling—which is of increasing concern. Projects will include work on hull cleaning techniques and fouling assessment methods and tools.

2. Maritime Industry Efficiency and Use of Domestically Produced Alternative Fuels

META projects in this area support development and maritime adoption of improved technologies and practices that will lead to greater efficiency, cost savings and a smaller environmental footprint. Projects include demonstration projects to ascertain the feasibility of using hydrogen fuel cells for powering refrigerated containers, providing auxiliary power for large vessels, and providing propulsion power for smaller vessels such as ferries and towboats. The use of domestically produced drop-in biofuels, produced with a variety of feedstocks, will continue to be explored. Other projects will include development and demonstration projects for higher efficiency and lower polluting marine engines, examining technologies such as hybrid engines and improved high-density batteries.

Expected Program Outcomes:

1) Advance technology innovation in ballast water treatment system design and operation, and underwater hull husbandry to address hull fouling. Test, validate and identify methods and technology for easily assessing the effectiveness of ballast water treatment system. Advance hull husbandry and hull cleaning practices to reduce the risk of the introduction and spread of aquatic invasive species. Provide ship owners/operators with independent information with which to inform investment decisions.

2) Advance alternative energy and energy efficiency technologies and application to expand their use in the maritime industry, with resulting lower costs and increased competitiveness. Provide the maritime industry stakeholders with independent operational, cost/benefit and other information for use in making investment decisions.

Collaboration Partners:

Collaboration partners include the OST-R, FTA, FRA, Department of Defense, Coast Guard, NOAA, DOE, state and local government agencies, universities and maritime industry stakeholders.

How Program meets statutory requirements:

Per 46 USC 50307, the META program authorizes the Secretary (delegated to MARAD) to “identify, study, evaluate, test, demonstrate or improve emerging marine technologies and practices that are likely to achieve environmental improvements by reducing air emissions, water emissions or other ship discharges, increasing fuel economy or the use of alternative fuels and alternative energy... and controlling aquatic invasive species.”

As described in other sections the program projects and activities align closely with the statutory mandate.

Describe how public and stakeholder input have been, or will be, utilized in the development of this research program:

The META program is built on the premise of public-private partnerships and collaboration with Federal, state and local government, academia, maritime industry and non-governmental organizations. Many META projects provide for substantial cost sharing with other governmental, academic, and private industry partners. MARAD partners have included vessel operators, such as TOTE (a U.S. Flag ocean going vessel operator), AEP (an inland barge operator), Interlake Steamship and American Steamship Company (Great Lakes vessel operators), the Ship Operations Cooperative Program - a non-profit consortium that includes ship owners/operators, maritime educational entities, maritime labor, and a consortium of Great Lakes maritime industry, academia, and Federal, state and local government from both U.S. and Canada. MARAD has also partnered with local entities such as Pittsburgh Clean Cities, California State Lands Commission, San Francisco Department of Environment, Puget Sound Air Quality Agency, Maryland Department of Transportation and multiple ports, and with numerous Federal agencies such as EPA, USCG, Department of Defense (DOD), DOE, NOAA, and U.S. Department of Agriculture (USDA).

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innovative technology initiatives with exponentially beneficial paybacks from the resources applied.