United States Department of Transportation
Annual Modal Research Plans
Fiscal Year 2017

PIPELINE and HAZARDOUS MATERIALS SAFETY ADMINISTRTION
OFFICE OF PIPELINE SAFETY
James Merritt/Richard Boyle
August 22, 2016

FY 2017 RD&T Program Funding Details

RD&T Program Name	FY 2017 Pres. Budget ($000)	FY 2017 Basic	FY 2017 Applied	FY 2017 Development	FY 2017 Technology
Preventing Pipeline Damage	2,000		500	500	1000
Improving Pipeline Leak Detection Systems	3,000		500	500	2.000
Improving Pipeline Anomaly Detection & Characterization	5,000		1,000	2,000	2,000
Improving Pipeline Anomaly Remediation, Repair rehabilitation or Replacement Options	1,000		500		500
Enhancing Pipeline Design, Materials & Welding/Joining	1,000			500	500
Investigating the Impact on Pipelines from Alternative Fuels and Other National Challenges	553		553		
Pipeline Administrative Expenses	1,363		454	454	455
Pipeline Administrative total	**13,916**		**3,507**	**3,954**	**6,455**
Hazardous Materials Risk Management and Communication	1,500		1,500		
Hazardous Materials Emerging Technology	2,000		2,000		
Hazardous Materials Packaging Integrity	2,526		2,526		
Hazardous Materials Technical Analysis of Risks	3,000		3,000		
Hazardous Materials Administrative Expense	766		766		
Hazardous Materials Total	**9,792**		**9,792**		
PHMSA Totals	**23,708**		**13,299**	**3,954**	**6,455**

FY 2017 RD&T Program Budget Request by DOT Goal(s)

RD&T Program Name	FY 2017 Pres. Budget ($000)	Safety	State of Good Repair	Economic Competitiveness	Quality of Life in Communities	Environmental Sustainability
Preventing Pipeline Damage	2,000	1,000			500	500
Improving Pipeline Leak Detection Systems	3,000	1,000			1,000	1,000
Improving Pipeline Anomaly Detection & Characterization	5,000	2,500			1,000	1,500
Improving Pipeline Anomaly Remediation, Repair, Rehabilitation/Replacement Options	1,000	500				500
Enhancing Pipeline Design, Materials & Welding/Joining	1,000	500				500
Investigating the Impact on Pipelines from Alternative Fuels and Other National Challenges	553	300				253
Pipeline Administrative Expense	1,363	454			454	455
Pipeline Safety Total	**13,916**	**6,254**			**2,954**	**4,708**
Hazardous Materials Risk Management and Communication	1,500	1,500				
Hazardous Materials Emerging Technology	2,000	2,000				
Hazardous Materials Packaging Integrity	2,000	2,526				
Hazardous Materials Technical Analysis of Risks	3,000	3,000				
Hazardous Materials Administrative Expense	766	766				
Hazardous Materials Total	**9,792**	**9,792**				
PHMSA Totals	**23,708**	**16,046**			**2,954**	**4,708**

Preventing Pipeline Damage
2,000
($000)

Program Description: -Damage to pipe by excavation and outside force continues to be a leading cause of pipeline failure. Preventing or reducing such damage would dramatically improve pipeline safety. Damage is most often caused by contact with the pipe while digging around it. Much of the damage is caused by Operators of backhoes, bulldozers, and even shovels can cause much damage after failing to locate the pipe before digging.

Program Objectives: The program will study metrics of patrolling and monitoring technologies in addition to developing tools focused on preventing/reducing pipeline damage.

Anticipated Program Activities: Conduct research, development and deployment demonstrations task on various technology types to quantify the following tool attributes:

Repeatability/Reliable

Limited false-positives in diverse environments

Deployable in varying weather and terrain

Detects encroachment and notifies before damage occurs

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue international collaborative research with transportation stakeholder's initiative to study preventing pipeline damage.

Expected Program Outcomes:

Research in this area will develop and demonstrate new or improved technologies for preventing/reducing damage to pipelines that will prevent/lessen releases into the environment.

FY 2017 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Preventing Pipeline Damage	None

How does the Program meet statutory requirements? Research must play a large role in finding the solutions to national, regional and local pipeline operational safety and environmental challenges.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Improving Pipeline Leak Detection Systems
3,000
($000)

Program Description: Leak detection continues to present a challenge, especially in pipelines with very small liquid leaks. Ecological and drinking water resources can be impacted by pipelines with small amounts of hazardous liquid leaks that are not quickly or easily detected. An increased focus on methane detection of Grade 3 non-hazardous leaks will be seen in support of tools to both detect and quantify leak rates in support of climate change policy development and execution by the EPA. Research in this area will develop new or improved tools and technology solutions for reducing the volume of product released into the environment.

Program Objectives: Research in this area will develop new or improved tools and technology solutions for reducing the volume of product released into the environment and with identifying leaks before they lead to catastrophic ruptures.

Anticipated Program Activities: Projects must develop new or enhance existing sensing technologies to accurately quantify the rate and severity from non-hazardous or relatively small volume emissions attributed to leaks, and assist in more accurately locate the leaks. Technologies are targeted for sensor validation on leaks that are lower repair priority "non-hazardous" pipeline leaks that typically do not represent an existing or probable hazard to persons or property.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue international collaborative research with transportation stakeholder's initiative to study preventing pipeline damage.

Expected Program Outcomes: This technology should be able to measure leaks of a very small nature coming from a wide range of physical conditions. The primary pipeline types include gas distribution, but may also include regulated oil and gas gathering, so environments may cover the extremes of highly urban and rural environments.

Continue international collaborative research with transportation stakeholder's initiative to study Pipeline leak detection activities.

FY 2017 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Improving Pipeline Leak Detection Systems	None

How does the Program meet statutory requirements? Research must play a large role in finding the solutions to national, regional and local pipeline operational safety and environmental challenges.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Improving Pipeline Anomaly Detection & Characterization
$5,000
($000)

Project Description: Detecting and characterizing anomalies in pipelines require solutions having people, processes, and technology as part of a comprehensive program. The ability to detect must progress past simple corrosion to complex anomalies having a mixture of dents, gouges and corrosion characteristics. Solutions for complex defects and coming from a variety of threats are a key goal. Research in this area will develop new or improved tools, technology and assessment processes for identifying and locating critical pipeline defects while improving the capability to characterize the severity of such defects identified in pipeline systems. Handheld tools for in-the-ditch or above-ground inspection, improvements to traditional and robotic in-line inspection are a focus as well as for cast iron systems.

Project Objectives: Research in this area will develop new or improved tools, technology and assessment processes for identifying and locating critical pipeline defects and to improve the capability to characterize the severity of such defects identified in pipeline systems.

Anticipated Project Activities: A project must develop inspection technology for one or more pipeline material types. The technology must have functionality and or performance requirements for identification and characterization of pipeline defects, especially cracks with a focus on small diameter pipelines that either matches or exceeds current capabilities of Probability of Detection and Probability of Identification.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Continue international collaborative research with transportation stakeholder's initiative to study Anomaly Detection.

Expected Project Outcomes:

Anticipated results are new or improved inspection technologies in both sensors and inspection platform(s) to address various defect types in metallic and non-metallic pipes.

FY 2017 Collaboration Partners (Internal DOT)

Project Name	Name of Collaboration Partner(s) (Internal DOT)
Improving Pipeline Anomaly Detection & Characterization	None

How does the Program meet statutory requirements? Research must play a large role in finding the solutions to national, regional and local pipeline operational safety and environmental challenges.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Improving Pipeline Anomaly Remediation, Repair Rehabilitation or Replacement Options

1,000

($000)

Program Description: Reliable methods to repair damaged pipelines are paramount in bringing pipeline systems back on line. Research in this area will address improving the repair process by bringing automation to market and by improving standards or best practices for operators and contractors. In addition, a review of cured in place liners for cast iron systems as a rehabilitation method is critical so that operators have another viable option as part of urban replacement programs.

Program Objectives: Research in this area will enhance repair materials, techniques or processes, repair tools and technology for quickly bringing pipeline systems back on line and serving the nation.

Anticipated Program Activities:

Research, develop and demonstrate repair/replacement considerations for vintage or pre regulation onshore pipelines for liquid or natural gas.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Continue international collaborative research with transportation stakeholder's initiative to study pipeline repair methods.

Expected Program Outcomes: Develop and demonstrate repair/replacement considerations based on fitness for service standards and regulations for liquid or natural gas pipelines

FY 2017 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Improving Pipeline Anomaly Remediation, Repair Rehabilitation or Replacement Options	None

How does the Program meet statutory requirements? Research must play a large role in finding the solutions to national, regional and local pipeline operational safety and environmental challenges.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Enhancing Pipeline Design, Materials and Welding/Joining
1,000
($000)

Program Description: Improved pipeline materials can safely increase throughput capacity so pipelines can operate at higher pressures. The welding of these systems will require automation and inspection capabilities that safely improve the efficiency of construction activities. Operators in frontier areas such as Alaska and offshore continue to push pipeline material improvements for maximizing throughput. In addition, construction-related quality improvements directed toward reducing the likelihood of girth weld failures shortly after welding, during lowering-in, during hydrostatic testing, and in subsequent service are desired.

Program Objectives: Research in this area will improve the industry's ability to design and construct safe and long lasting pipelines using the most appropriate materials and welding/joining procedures for the operating environment.

Anticipated Program Activities: Investigate the essential variables required to update modern materials and welding standards covering qualification procedures for modern welding techniques and to ensure property consistency.

PHMSA makes an effort to leverage funds for research programs by seeking input and research from potential funding partners on collaborative research opportunities.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Continue international collaborative research with transportation stakeholder's initiative to enhancing pipeline design, materials and welding/joining issues.

Expected Program Outcomes:

Develop and demonstrate comprehensive set of testing methods for modern steels with higher strengths and their mechanical strength properties. Results are expected in industry's ability to use modern materials with modern fabrication standards and procedures while ensuring property consistency.

FY 2017 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Enhancing Pipeline Design, Materials & Welding/Joining	None

How does the Program meet statutory requirements? Research must play a large role in finding the solutions to national, regional and local pipeline operational safety and environmental challenges.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Continue research and support rulemaking in collaboration with other DOT mode to assure the safety of transportation.

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Investigating the Impact on Pipelines from Alternative Fuels and Other National Challenges
553
($000)

Program Description: Removing integrity threats and driving new knowledge into industry best practices and consensus standards are critical for enabling the safe pipeline transportation of alternative fuels. Assessing the impacts of CO2 and other alternative fuels on pipeline transportation is key action in supporting national climate change initiatives. Sometimes emerging issues for LNG, risk management and human factors require broad studies to understand how they impact the other pipeline safety research activities described in this document. General knowledge research and studies will be conducted as needed when these emerging issues materialize.

Program Objectives: Safety-Reducing Environmental Impact: Research in this area will identify and remove technical issues preventing the safe transportation of alternative fuels in pipelines and for addressing other emerging technological or policy issues of a national scale.

Anticipated Program Activities: Research is expected to leverage the materials testing with new scientific experiments to develop physics- based fully predictive models. The models will be validated through full scale testing and provide guidance to codes and standards bodies for alternative fuels and other national challenges.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue international collaborative research with transportation stakeholder's initiative to study of alternative fuels.

Expected Program Outcomes:

Anticipated results in reducing environmental impact by identifying technical issues preventing the safe transportation of alternative fuels.

FY 2017 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Investigating the Impact on Pipelines from Alternative Fuels and Other National Challenges	PHMSA Hazardous Materials Administration

How does the Program meet statutory requirements? Research must play a large role in finding the solutions to national, regional and local pipeline operational safety and environmental challenges.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Collaborate on alternative fuels, such as natural gas with other DOT modes. For improved emission and assured safety.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue research and support rulemaking in collaboration with other modes to assure the safety of surface transportation.

Hazardous Materials Risk Management and Communication
$1,500 ($000)

Program Description: While hazardous materials are transported daily by trained professionals operating in well-defined systems, accidents resulting in loss of life and environmental damage still occur. Analyzing transport operations and transport incidents using risk management methodology and communicating the results of the analysis should reduce the probability and minimize the consequences associated with hazardous material incidents.

Program Objective: Minimize the probability of hazardous materials transport incidents and their associated consequences by applying risk management principles to existing hazardous materials regulations, policies, transport systems and operations.

Anticipated Program Activities:

Identification and development of risk management methods to assess hazardous materials transport. Analysis would be both of regulatory operations and impacts and of transport operations and systems

Identification of communication tools and best practices to ensure results are communicated to the transport industry.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings.

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Expected Program Outcomes:

Address gaps and vulnerabilities within program; incorporate preventative measures in HM policies

FY 2017 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Hazardous Materials Risk Management and Communication	None

How does the Program meet statutory requirements? Research must play a large role in addressing and mitigating the risks associated with the transport of hazardous materials.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize advisory committees consisting of Subject Matter Experts from government, academia and industry to define program and evaluate progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with their DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Hazardous Materials Emerging Technology
$2,000 ($000)

Program Description: As the U.S. energy production expands, domestic and international transport expands. This expansion has included and will continue to spawn new energy sources, new transport systems and new packaging technologies. Regulators must research and understand these emerging systems and technologies so that existing levels of transport safety can be maintained or improved.

Program Objectives: Identify and analyze emerging materials, processes, packaging technologies and transport operations to assess their potential risks or benefit to the existing hazardous materials transport network.

Anticipated Program Activities:

Research and analysis of emerging energy products including various grades of crude oil; liquefied natural gas; ethanol and hydrogen

Research and analysis of new packaging materials and technologies

Research and analysis of transportation systems and operations.

Continue international collaborative research with transportation stakeholder's initiative to study emerging technologies.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Expected Program Outcomes: Use an improved understanding and knowledge of new materials and technologies to create and implement improvements for the packaging and transportation of hazardous materials.

FY 2017 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Hazardous Materials Emerging Technology	None

How does the Program meet statutory requirements? Research must play a large role in addressing and mitigating the risks associated with the transport of hazardous materials.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize advisory committees consisting of Subject Matter Experts from government, academia and industry to define program and evaluate progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Hazardous Materials Packaging Integrity
$2,526 ($000)

Project Description: One of the primary means to ensure the safe transport of hazardous materials is to ensure they remain contained within their packaging during transport. Accordingly, research and development in packaging technologies and testing and assessment of packaging integrity is a vital safety function.

Project Objectives: Evaluate and verify the suitability and effectiveness of existing packaging standards and practices; Improve transport safety by developing, evaluating and testing new packaging technologies and materials.

Anticipated Project Activities:

Testing and evaluation of existing packaging materials and packaging technologies

Analysis, evaluation and performance evaluations of emerging packaging materials and methods

Testing and evaluation of materials whose composition is included as part of the overall combination packaging.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings.

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Expected Project Outcomes:

Verification of the adequacy of existing packaging and technologies;

Development of new packaging and technologies;

Improved regulations and policies governing packaging for hazardous materials

FY 2017 Collaboration Partners (Internal DOT)

Project Name	Name of Collaboration Partner(s) (Internal DOT)
Hazardous Materials Packaging Integrity	None

How does the Program meet statutory requirements? Research must play a large role in addressing and mitigating the risks associated with the transport of hazardous materials.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize advisory committees consisting of Subject Matter Experts from government, academia and industry to define program and evaluate progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Hazardous Materials Technical Analysis of Risks
$3,000 ($000)

Program Description: Change is a constant in both the hazardous materials and the transportation industries. Our risk assessments, conceptual models and frameworks and evaluation methods used to evaluate activities, events or incidents must change if the overall level of transport safety is to be improved.

Program Objectives: Identify options to prevent fatalities and injuries resulting from hazardous materials transportation.

Anticipated Program Activities:

Analysis of individual incidents and accidents involving hazardous materials to determine root cause;

Analysis of all transport incidents and accidents involving hazardous materials to determine patterns or anomalies within packagings or systems;

Development of new inspection and test methods used to classify materials and to certify packagings

Continue international collaborative research with transportation stakeholder's initiative to study technical analysis of risk.

Expected Program Outcomes:

Improved understanding of incidents and accidents and identification of methods, policies or regulations to prevent them

Improved test and evaluations standards for materials and packagings

Fewer deaths and injuries resulting from the transport of hazardous materials

FY 2017 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Hazardous Materials Technical Analysis of Risks	None

How does the Program meet statutory requirements? Research must play a large role in addressing and mitigating the risks associated with the transport of hazardous materials.

How does the Program meet statutory requirements? Research program/projects utilize advisory committees consisting of Subject matter Experts from government, academia and industry to define program and evaluate progress. General public has wen based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

RD&T Projects
($5.0M or greater)
Fiscal Year 2017

FY 2017 RD&T Project Funding Details

RD&T Project Name	FY 2017 Pres. Budget ($000)	FY 2017 Basic	FY 2017 Applied	FY 2017 Development	FY 2017 Technology
N/A					
Totals					

FY 2017 RD&T Project Budget Request by DOT Goal

RD&T Project Name	FY 2017 Pres. Budget ($000)	Safety	State of Good Repair	Economic Competitiveness	Quality of Life in Communities	Environmental Sustainability
N/A						
Totals						

(Project Name)
(Funding Amount)
($000)
(Start and End Dates)

Project Description: N/A

Project Objectives: N/A

Anticipated Project Activities: N/A

Expected Project Outcomes: N/A

FY 2017 Collaboration Partners (Internal DOT)

Project Name	Name of Collaboration Partner(s) (Internal DOT)
N/A	

How will Project be evaluated? N/A

United States Department of Transportation
Annual Modal Research Plans
Fiscal Year 2018

PIPELINE and HAZARDOUS MATERIALS SAFETY ADMINISTRTION
OFFICE OF PIPELINE SAFETY

Preventing Pipeline Damage
2,000
($000)

Program Description: -Excavation damage to pipe and outside force continues to be a leading cause of pipeline failure. Preventing or reducing such damage would dramatically improve pipeline safety.

Program Objectives: The program will study metrics of patrolling and monitoring technologies in addition to developing tools focused on preventing/reducing pipeline damage.

Anticipated Program Activities: Conduct research, development and deployment demonstrations task on various technology types to quantify the following tool attributes:

Repeatability/Reliable

Limited false-positives in diverse environments

Deployable in varying weather and terrain

Detects encroachment and notifies before damage occurs

Continue international collaborative research with transportation stakeholder's initiative to study preventing pipeline damage.

Collaborate on alternative and domestic usage fuels with other DOT modes.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Expected Program Outcomes:

Research to develop and demonstrate new or improved technologies for preventing/reducing damage to pipelines will lessen releases into the environment.

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Preventing Pipeline Damage	None

How does the Program meet statutory requirements? Conduct research on pipeline operational, safety and environmental issues.

How will the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Improving Pipeline Leak Detection Systems
3,000
($000)

Program Description: Very small liquid leak detection continues to present a challenge. Continued research focused on methane detection with support tools to both detect and quantify leak rates. Develop new technology solutions for reducing the volume of product released.

Program Objectives: Develop new or improved tools and technology solutions for reducing the volume of product released.

Anticipated Program Activities: Develop new sensing technologies to accurately quantify small leaks. Technologies focused on lower repair priority "non-hazardous" pipeline leaks.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings.

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Expected Program Outcomes:

Tools to measure pipeline leaks coming from a wide range of physical conditions.

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Improving Pipeline Leak Detection Systems	None

How does the Program meet statutory requirements? Conduct research to address solutions to national, regional and local pipeline operational safety and environmental challenges.

How will the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Improving Pipeline Anomaly Detection & Characterization
$5,000
($000)

Program Description: Detecting and characterizing anomalies in pipelines as part of a comprehensive program. Broaden ability to detect complex anomalies having a mixture of dents, gouges and corrosion characteristics.

Program Objectives: Research the development of new tools, technology and assessment processes for identifying and locating critical pipeline defects.

Anticipated Program Activities: Develop and demonstrate inspection tools for various pipeline material types for identification and characterization of pipeline defects, especially cracks with a focus on smaller diameter pipelines.

Continue international collaborative research with transportation stakeholder's initiative to study anomaly detection and characterization.

Expected Program Outcomes: Develop and demonstrate repair/replacement considerations based on fitness for service standards and regulations for liquid or natural gas pipelines

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Improving Pipeline Anomaly Detection & Characterization	None

How does the Program meet statutory requirements? Conduct research towards new solutions to national, regional and local pipeline operational safety and environmental challenges.

How will the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with other modes to assure the safety of surface transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Improving Pipeline Anomaly Remediation, Repair Rehabilitation or Replacement Options

$1,000

($000)

Program Description: Demonstrating and validating reliable methods to repair damaged pipelines are paramount to bring pipeline systems back on line. Research in this area will address improving the repair process by bringing automation to market and by improving standards or best practices for operators and contractors

Program Objectives: Research in this area will enhance repair materials, techniques or processes, repair tools and technology for quickly bringing pipeline systems back on line and serving the nation.

Anticipated Program Activities: Conduct research, develop and demonstrate repair/replacement considerations for liquid or natural gas pipelines.

Continue international collaborative research with transportation stakeholder's initiative to study anomaly remediation.

Expected Program Outcomes: Demonstrate and validate repair or replacement methods to address various defect types in metallic and non-metallic pipes.

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Improving Pipeline Anomaly Remediation, Repair, Rehabilitation or Replacement Options	None

How does the Program meet statutory requirements? Conduct research to find solutions to national, regional and local pipeline operational safety and environmental challenges.

How will the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Enhancing Pipeline Design, Materials and Welding/Joining
1,000
($000)

Program Description: Improved pipeline materials so pipelines can operate at higher pressures. Strengthen construction-related quality improvements directed toward reducing the likelihood of girth weld failures shortly after welding, during lowering-in, during hydrostatic testing, and in subsequent service are desired.

Program Objectives: Improve the industry's ability to design and construct safe and long lasting pipelines using the most appropriate materials and welding/joining procedures for the operating environment.

Anticipated Program Activities: Update modern materials and welding standards covering qualification procedures for modern welding techniques and to ensure property consistency across industry.

Continue international collaborative research with transportation stakeholder's initiative to study pipeline design, materials and welding/joining issues.

Expected Program Outcomes:

Validate comprehensive set of testing methods for modern steels to their mechanical strength properties. Results are expected in industry's ability to use modern materials with modern fabrication standards and procedures.

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Enhancing Pipeline Design, Materials and Welding/Joining	None

How does the Program meet statutory requirements? Research must play a larger role in finding the solutions to national, regional and local pipeline operational safety and environmental challenges.

How will the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with other modes to assure the safety of surface transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Investigating the Impact on Pipelines from Alternative Fuels And Other National Challenges

553

($000)

Program Description: Removing integrity threats and driving new knowledge into industry best practices and consensus standards. Conduct research on the impacts of all national challenges on pipeline transportation in support of international climate change initiatives.

Program Objectives: Safety-Reducing Environmental Impact: Remove technical issues preventing the safe transportation of alternative fuels in pipelines and for addressing other emerging technological or policy issues of a national scale.

Anticipated Program Activities: New scientific experiments to develop physics- based fully predictive models needed to provide code and standards guidance for alternative fuels and other national challenges.

Continue international collaborative research with transportation stakeholder's initiative to study alternative fuels and other natural challenges.

Expected Program Outcomes:

Reduce environmental impacts associated with technical barriers on the safe transportation of alternative fuels.

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Investigating the Impact on Pipelines from Alternative Fuels and Other National Challenges	**PHMSA Hazardous Materials Administration**

How does the Program meet statutory requirements? Address the solutions to national, regional and local pipeline operational safety and environmental challenges.

How will the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize Technical Advisory Committees consisting of Subject Matter Experts from government, academia and industry to oversee progress. General public has web based access to program/project database to ensure transparency.

Collaborate on alternative fuels, such as natural gas with other DOT modes. For improved emission and assured safety.

Continue research and support rulemaking in collaboration with other modes to assure the safety of surface transportation.

Collaborate on alternative and domestic usage fuels with other DOT modes.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

United States Department of Transportation
Annual Modal Research Plans
Fiscal Year 2018

PIPELINE and HAZARDOUS MATERIALS SAFETY ADMINISTRTION
OFFICE OF HAZARDOUS MATERIALS SAFETY
March 31, 2016
Richard Boyle

Hazardous Materials Risk Management and Communication
$1,500 ($000)

Program Description: While hazardous materials are transported daily by trained professionals operating in well-defined systems, accidents resulting in loss of life and environmental damage still occur. Analyzing transport operations and transport incidents using risk management methodology and communicating the results of the analysis should reduce the probability and minimize the consequences associated with hazardous material incidents.

Program Objective: Minimize the probability of hazardous materials transport incidents and their associated consequences by applying risk management principles to existing hazardous materials regulations, policies, transport systems and operations.

Anticipated Program Activities:

Identification and development of risk management methods to assess hazardous materials transport. Analysis would be both of regulatory operations and impacts and of transport operations and systems

Identification of communication tools and best practices to ensure results are communicated to the transport industry

Continue international collaborative research with transportation stakeholder's initiative to study risk management and communication issues.

Expected Program Outcomes:

Address gaps and vulnerabilities within program; incorporate preventative measures in HM policies

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Hazardous Materials Risk Management and Communication	None

How does the Program meet statutory requirements? Research must play a large role in addressing and mitigating the risks associated with the transport of hazardous materials.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize advisory committees consisting of Subject Matter Experts from government, academia and industry to define program and evaluate progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with other modes to assure the safety of surface transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Hazardous Materials Emerging Technology
$2,000 ($000)

Program Description: As the U.S. energy production expands, domestic and international transport expands. This expansion has included and will continue to spawn new energy sources, new transport systems and new packaging technologies. Regulators must research and understand these emerging systems and technologies so that existing levels of transport safety can be maintained or improved.

Program Objectives: Identify and analyze emerging materials, processes, packaging technologies and transport operations to assess their potential risks or benefit to the existing hazardous materials transport network.

Anticipated Program Activities:

Research and analysis of emerging energy products including various grades of crude oil; liquefied natural gas; ethanol and hydrogen

Research and analysis of new packaging materials and technologies

Research and analysis of transportation systems and operations.

Continue international collaborative research with transportation stakeholder's initiative to study emerging technologies.

Expected Program Outcomes: Use an improved understanding and knowledge of new materials and technologies to create and implement improvements for the packaging and transportation of hazardous materials.

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Hazardous Materials Emerging Technology	None

How does the Program meet statutory requirements? Research must play a large role in addressing and mitigating the risks associated with the transport of hazardous materials.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize advisory committees consisting of Subject Matter Experts from government, academia and industry to define program and evaluate progress. General public has web based access to program/project database to ensure transparency.

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Continue research and support rulemaking in collaboration with other modes to assure the safety of surface transportation.

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Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Hazardous Materials Packaging Integrity
$2,526 ($000)

Project Description: One of the primary means to ensure the safe transport of hazardous materials is to ensure they remain contained within their packaging during transport. Accordingly, research and development in packaging technologies and testing and assessment of packaging integrity is a vital safety function.

Project Objectives: Evaluate and verify the suitability and effectiveness of existing packaging standards and practices; Improve transport safety by developing, evaluating and testing new packaging technologies and materials.

Anticipated Project Activities:

Testing and evaluation of existing packaging materials and packaging technologies

Analysis, evaluation and performance evaluations of emerging packaging materials and methods

Testing and evaluation of materials whose composition is included as part of the overall combination packaging.

Continue international collaborative research with transportation stakeholder's initiative to study packaging integrity.

Expected Project Outcomes:

Verification of the adequacy of existing packaging and technologies;

Development of new packaging and technologies;

Improved regulations and policies governing packaging for hazardous materials.

FY 2018 Collaboration Partners (Internal DOT)

Project Name	Name of Collaboration Partner(s) (Internal DOT)
Hazardous Materials Packaging Integrity	None

How does the Program meet statutory requirements? Research must play a large role in addressing and mitigating the risks associated with the transport of hazardous materials.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize advisory committees consisting of Subject Matter Experts from government, academia and industry to define program and evaluate progress. General public has web based access to program/project database to ensure transparency.

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Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with other modes to assure the safety of surface transportation.

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Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.

Hazardous Materials Technical Analysis of Risks
$3,000 ($000)

Program Description: Change is a constant in both the hazardous materials and the transportation industries. Our risk assessments, conceptual models and frameworks and evaluation methods used to evaluate activities, events or incidents must change if the overall level of transport safety is to be improved.

Program Objectives: Identify options to prevent fatalities and injuries resulting from hazardous materials transportation.

Anticipated Program Activities:

Analysis of individual incidents and accidents involving hazardous materials to determine root cause;

Analysis of all transport incidents and accidents involving hazardous materials to determine patterns or anomalies within packagings or systems;

Development of new inspection and test methods used to classify materials and to certify packagings

Continue international collaborative research with transportation stakeholder's initiative to study analysis or risks.

Expected Program Outcomes:

Improved understanding of incidents and accidents and identification of methods, policies or regulations to prevent them

Improved test and evaluations standards for materials and packagings

Fewer deaths and injuries resulting from the transport of hazardous materials

FY 2018 Collaboration Partners (Internal DOT)

Program Name	Name of Collaboration Partner(s) (Internal DOT)
Hazardous Materials Technical Analysis of Risks	None

How does the Program meet statutory requirements? Research must play a large role in addressing and mitigating the risks associated with the transport of hazardous materials.

How does the Program incorporate public and stakeholder input into the research planning process? Research program/projects utilize advisory committees consisting of Subject Matter Experts from government, academia and industry to define program and evaluate progress. General public has web based access to program/project database to ensure transparency.

Program staff is members of industry working groups for collaboration and coordination of research initiatives of committee meetings

Program staff presents research results for peer review at various industry and public conferences and in technical journals.

Continue research and support rulemaking in collaboration with other modes to assure the safety of surface transportation.

PHMSA makes an effort to leverage funds for research programs by seeking input and resources from potential funding partners on collaborative research opportunities.

Continue research and support rulemaking in collaboration with other DOT modes to assure the safety of transportation.