

Topic: N122-124

Charles River Analytics Inc.

Advanced Mission Planning Tools (AMPT)

Charles River Analytics, a leading customer-focused provider of innovative R&D solutions for increasingly complex and important human-systems challenges, is developing Advanced Mission Display and Planning Tools (AMPT) providing operators of a multi-vehicle (manned and unmanned), multi-domain (air, ground and sea) common control station with decision support for real-time re-tasking and re-planning of multiple assets. Formal analysis efforts have identified task and information requirements for manned-unmanned teaming, which has driven the design of a set of display concepts and a prototyping and demonstration environment used to validate AMPT technology. We seek to fully integrate software into the PMA-281 Common Control System (CCS) for testing and performance validation and verification.

Technology Category Alignment:

Satellite Communications (SATCOM)

Robotics/Automated Material Handling Equipment

Shipyards/Shipbuilding

Supply; Storage

Satellite Communications (SATCOM)

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Supply; Storage

Supply; Storage

Satellite Communications (SATCOM)

Satellite Communications (SATCOM)

Shipyards/Shipbuilding

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Protection, Sustainment, and Warfighter Performance

Medical Chem-Bio Defense

Military Infectious Diseases

Propulsion and Extreme Environments

Fixed Wing Vehicles (includes UAS)

Survivability

Maintainability/Sustainability

Unmanned Ground and Sea Vehicles

Corrosion

Advanced Computing/Software Development

Networks and Communications

Modular/Open/Reconfigurable Architectures

RF Components for sensing, transmission and communication

Electronics Integration

Broadband/Multispectral Components and Systems

Sensors, Electronics and Photonics

Radio Frequency (RF) (non-EW)

Survivability

Broadband/Multispectral Components and Systems

RF Components for sensing, transmission and communication

Radio Frequency (RF) (non-EW)

Networks and Communications

Guidance, Navigation & Control (GN&C) and Data Links
RF Components for sensing, transmission and communication
Networks and Communications
Cognitive/Adaptive Capabilities
Preemptive/Proactive Effects
Broadband/Multispectral Components and Systems
Advanced Computing/Software Development
Networks and Communications
Personalized Assessment, Education, and Training
System Interfaces & Cognitive Processes
Aircraft Propulsion, Power and Thermal
Modeling, Simulation & Test Infrastructure
Rotary Wing Vehicles
Fixed Wing Vehicles (includes UAS)
Fixed Wing Vehicles (includes UAS)
Acoustic, Seismic and Magnetic
Rotary Wing Vehicles
Structures and Protection
Energy storage
Unmanned Ground and Sea Vehicles
Mobility
Power and Energy
Synthesis/Analytics/Decision Tools
Information Collection/Management
Advanced Computing/Software Development
Survivability
Unmanned Ground and Sea Vehicles
Radio Frequency (RF) (non-EW)
Power Generation/Energy Conversion
Energy storage
Power and Energy
Sensors, Electronics and Photonics
Maintainability/Sustainability
Advanced Computing/Software Development
EO/IR Components for sensing, transmission and communication
Microelectronics and Nanoelectronics
Networks and Communications
Mobility
Broadband/Multispectral Components and Systems
Sensors, Electronics and Photonics
Structures and Protection
Electro-Optical/Infrared (EO/IR)
Human/Autonomous System Interaction and Collaboration
Maintainability/Sustainability
System Interfaces & Cognitive Processes
Aircraft Propulsion, Power and Thermal
Power Generation/Energy Conversion

High Energy Lasers (HEL)
Propulsion
Biomedical Informatics / Health Information Systems & Technology
Protection, Sustainment, and Warfighter Performance
Modeling, Simulation & Test Infrastructure
Maintainability/Sustainability
Mobility
Personalized Assessment, Education, and Training
RF Components for sensing, transmission and communication
Broadband/Multispectral Components and Systems
Sensors, Electronics and Photonics
Radio Frequency (RF) (non-EW)
Radio Frequency Weapons (RFW)
Energy storage
Power Generation/Energy Conversion
Thermal Transport and Control
Unmanned Ground and Sea Vehicles
Acoustic, Seismic and Magnetic
RF Components for sensing, transmission and communication
Guidance, Navigation & Control (GN&C) and Data Links
Survivability
High-Speed/Hypersonics
Power Generation/Energy Conversion
Acoustic, Seismic and Magnetic
Radio Frequency Weapons (RFW)
Electronic Materials
Electronics Integration
RF Components for sensing, transmission and communication
Electromechanical conversion
Energy storage
Power Control and Distribution
Power Generation/Energy Conversion
Thermal Transport and Control
EO/IR Components for sensing, transmission and communication
RF Components for sensing, transmission and communication
Fixed Wing Vehicles (includes UAS)
Fixed Wing Vehicles (includes UAS)
Distributed/Coordinated/Net-Enabled Systems
High-Speed/Hypersonics
Propulsion and Extreme Environments
Energy storage
Ordnance
Human Computer Interfaces (HCI) for Decision Making
Information Collection/Management
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EO/IR Components for sensing, transmission and communication
Rotary Wing Vehicles

Protection, Sustainment, and Warfighter Performance
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Fixed Wing Vehicles (includes UAS)
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Electro-Optical/Infrared (EO/IR)
Modeling, Simulation & Test Infrastructure
Radio Frequency (RF) (non-EW)
Machine Perception, Reasoning and Intelligence
Assuring Effective Missions
Modular/Open/Reconfigurable Architectures
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Machine Perception, Reasoning and Intelligence
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Mobility
Maintainability/Sustainability
Power Generation/Energy Conversion
Maintainability/Sustainability
Acoustic, Seismic and Magnetic
Test, Evaluation, Validation, and Verification
Maintainability/Sustainability
Corrosion
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Networks and Communications
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Rotary Wing Vehicles
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EO/IR Components for sensing, transmission and communication
Fixed Wing Vehicles (includes UAS)
Information Collection/Management

Electro-Optical/Infrared (EO/IR)
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Machine Perception, Reasoning and Intelligence
Scalable Teaming of Autonomous Systems
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Synthesis/Analytics/Decision Tools
Combat Casualty Care
Military Infectious Diseases
Military Operational Medicine
Readiness
Maintainability/Sustainability
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System Interfaces & Cognitive Processes

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Mobility
Modularity
Survivability
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Radio Frequency Weapons (RFW)
Aircraft Propulsion, Power and Thermal
Power Generation/Energy Conversion
Modeling, Simulation & Test Infrastructure
Propulsion
Biomedical Informatics / Health Information Systems & Technology
Biomedical Informatics / Health Information Systems & Technology
Electro-Optical/Infrared (EO/IR)
High Energy Lasers (HEL)
EO/IR Components for sensing, transmission and communication
Networks and Communications
Sensors, Electronics and Photonics
Electro-Optical/Infrared (EO/IR)
Human Computer Interfaces (HCI) for Decision Making
Information Collection/Management
Synthesis/Analytics/Decision Tools
Human Aspects of Operations in Military Environments
System Interfaces & Cognitive Processes
Clinical & Rehabilitative Medicine
Combat Casualty Care
Military Operational Medicine

Protection, Sustainment, and Warfighter Performance
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Advanced Electronic Protection Techniques and Technology
Survivability
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Ordnance
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Protection, Sustainment, and Warfighter Performance
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Manufacturing Technology for Affordability
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Fixed Wing Vehicles (includes UAS)
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Manufacturing Technology for Affordability
Manufacturing Technology for Affordability

Propulsion
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Trust Foundations
Trust Foundations
Distributed/Coordinated/Net-Enabled Systems
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Agile Operations
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Protection, Sustainment, and Warfighter Performance
Human/Autonomous System Interaction and Collaboration
Human Computer Interfaces (HCI) for Decision Making
Synthesis/Analytics/Decision Tools
Information Collection/Management
Human Aspects of Operations in Military Environments
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Biomedical Informatics / Health Information Systems & Technology
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Fixed Wing Vehicles (includes UAS)
Aircraft Propulsion, Power and Thermal
High-Speed/Hypersonics
Propulsion
Aircraft Propulsion, Power and Thermal
Electro-Optical/Infrared (EO/IR)
RF Components for sensing, transmission and communication
Networks and Communications
Distributed/Coordinated/Net-Enabled Systems
Radio Frequency (RF) (non-EW)
EO/IR Components for sensing, transmission and communication
Networks and Communications
Sensors, Electronics and Photonics
RF Components for sensing, transmission and communication
Networks and Communications
Distributed/Coordinated/Net-Enabled Systems
Radio Frequency (RF) (non-EW)
EO/IR Components for sensing, transmission and communication
Test, Evaluation, Validation, and Verification
Electro-Optical/Infrared (EO/IR)
Modeling, Simulation & Test Infrastructure
Fixed Wing Vehicles (includes UAS)
Fixed Wing Vehicles (includes UAS)
Structures and Protection
Modeling, Simulation & Test Infrastructure
Networks and Communications
Trust Foundations
Fixed Wing Vehicles (includes UAS)
Test, Evaluation, Validation, and Verification
Unmanned Ground and Sea Vehicles
Modeling, Simulation & Test Infrastructure
Machine Perception, Reasoning and Intelligence

Synthesis/Analytics/Decision Tools
Cognitive/Adaptive Capabilities
Preemptive/Proactive Effects
Propulsion and Extreme Environments
Manufacturing Technology for Affordability
Manufacturing Technology for Affordability
Ordnance
Propulsion
Machine Perception, Reasoning and Intelligence
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Assuring Effective Missions
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High-Speed/Hypersonics
Corrosion
Power and Energy
Sensors, Electronics and Photonics
Acoustic, Seismic and Magnetic
Structures and Protection
Human Computer Interfaces (HCI) for Decision Making
Maintainability/Sustainability
Corrosion
Structures and Protection
Energy storage
Power and Energy
Survivability
Propulsion and Extreme Environments
Sensors, Electronics and Photonics
Ordnance
Aircraft Propulsion, Power and Thermal
Fixed Wing Vehicles (includes UAS)
Power Generation/Energy Conversion
Power and Energy
RF Components for sensing, transmission and communication
Radio Frequency (RF) (non-EW)
Protection, Sustainment, and Warfighter Performance
Readiness
Structures and Protection
Undersea Weapons
Machine Perception, Reasoning and Intelligence
Broadband/Multispectral Components and Systems
Electro-Optical/Infrared (EO/IR)
Radio Frequency (RF) (non-EW)
Electronics Integration
RF Components for sensing, transmission and communication
Sensors, Electronics and Photonics
Sensors, Electronics and Photonics

Maintainability/Sustainability
Sensors, Electronics and Photonics
RF Components for sensing, transmission and communication
Preemptive/Proactive Effects
Power Control and Distribution
Acoustic, Seismic and Magnetic
Power Control and Distribution
Acoustic, Seismic and Magnetic
Fixed Wing Vehicles (includes UAS)
Aircraft Propulsion, Power and Thermal
Rotary Wing Vehicles
Aircraft Propulsion, Power and Thermal
Aircraft Propulsion, Power and Thermal
Power Control and Distribution
Propulsion and Extreme Environments
Propulsion
EO/IR Components for sensing, transmission and communication
Satellite Communications (SATCOM)
Networks and Communications
Trust Foundations
Electro-Optical/Infrared (EO/IR)
RF Components for sensing, transmission and communication
Networks and Communications
Advanced Electronic Protection Techniques and Technology
Distributed/Coordinated/Net-Enabled Systems
Radio Frequency (RF) (non-EW)
Unmanned Ground and Sea Vehicles
Maintainability/Sustainability
Modularity
Survivability
Electro-Optical/Infrared (EO/IR)
Sensors, Electronics and Photonics
EO/IR Components for sensing, transmission and communication
RF Components for sensing, transmission and communication
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Clinical & Rehabilitative Medicine
Combat Casualty Care
Medical Chem-Bio Defense
Energy storage
Protection, Sustainment, and Warfighter Performance
Human Computer Interfaces (HCI) for Decision Making
Synthesis/Analytics/Decision Tools
Undersea Weapons
Human Computer Interfaces (HCI) for Decision Making

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Mobility
Unmanned Ground and Sea Vehicles
Fixed Wing Vehicles (includes UAS)
Rotary Wing Vehicles
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Readiness
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Human/Autonomous System Interaction and Collaboration
Machine Perception, Reasoning and Intelligence
Human Computer Interfaces (HCI) for Decision Making
Survivability
Unmanned Ground and Sea Vehicles
Aircraft Propulsion, Power and Thermal

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Individual Warfighter
Synthesis/Analytics/Decision Tools
Collaborative Analysis and Decision-making
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Synthesis/Analytics/Decision Tools
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RF Components for sensing, transmission and communication
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Power Control and Distribution
Power Generation/Energy Conversion
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Energy storage
Power Control and Distribution
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Energy storage
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Thermal Transport and Control
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EO/IR Components for sensing, transmission and communication
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Energy storage
Thermal Transport and Control
High Energy Lasers (HEL)
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Mobility
Modularity
Electronic Materials
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Personalized Assessment, Education, and Training
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Radio Frequency Weapons (RFW)
Sensors, Electronics and Photonics
RF Components for sensing, transmission and communication
EO/IR Components for sensing, transmission and communication
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High Energy Lasers (HEL)
EO/IR Components for sensing, transmission and communication
Broadband/Multispectral Components and Systems
Survivability
High Energy Lasers (HEL)
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Ordnance
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EO/IR Components for sensing, transmission and communication
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High-Speed/Hypersonics
Guidance, Navigation & Control (GN&C) and Data Links
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Human Computer Interfaces (HCI) for Decision Making
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Computational Research Engineering Acquisition Tools and Environment
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Frameworks for Interoperability
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RF Components for sensing, transmission and communication
Sensors, Electronics and Photonics
RF Components for sensing, transmission and communication
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Sensors, Electronics and Photonics
Microelectronics and Nanoelectronics
RF Components for sensing, transmission and communication
Radio Frequency (RF) (non-EW)
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Electronics Integration
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Power Generation/Energy Conversion
Rotary Wing Vehicles
Protection, Sustainment, and Warfighter Performance
Energy storage
Power Control and Distribution
Power and Energy
Propulsion and Extreme Environments
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Energy storage
Power and Energy
Test, Evaluation, Validation, and Verification
Synthesis/Analytics/Decision Tools

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2017-720

Topic # N122-124

Advanced Mission Planning Tools (AMPT)

Charles River Analytics Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-281
Unmanned System Common
Control System (CCS)

Transition Target: PMA-281
Common Control System (CCS)

TPOC:
(301)757-1884

Other transition opportunities:
AMPT analysis and design efforts
will help to shape the future of
teaming concepts and mission
displays for platforms such as the
MQ-4C Triton, MQ-8 Fire Scout, and
MQ-25 Stingray.

Notes: As an example of an
alternate SBIR transition path
successfully pursued on another
program, Charles River developed a
tool to guide the war-fighter through a formalized approach to assessing, analyzing, and forecasting
human behavior (Contract Number FA8650-04-C-6403). The tool eventually underwent a successful
Military Utility Assessment in 2008 and an Extended User Assessment with a Joint agency; it is now in
use by DoD warfighters worldwide.



<http://www.navy.mil/management/photodb/webphoto/web-N-DX365-165.JPG>

WHAT

Operational Need and Improvement: When teaming with unmanned vehicles, decision making processes are impeded by current state-of-the-art capabilities to display pertinent information. Limitations are inherent in current control systems during re-planning and re-tasking of vehicles in situations when target priorities change, a vehicle experiences a malfunction or encounters fuel limitations or inclement weather conditions and other situations. Decision making must be made in real-time and many scenarios increase the complexity of decision making to a point which makes it nearly impossible for an operator to make the necessary changes.

Specifications Required: Operators need more effective and efficient human machine interfaces and mission displays for manned/unmanned teaming operations. Simplicity of visualization will be required to allow operators fluid control of multi-vehicle, multi-domain operations. Software development of these human-machine interfaces should be conducted within an open architecture.

Technology Developed: Advanced Mission Display and Planning Tools (AMPT) provides effective decision support interfaces that intuitively convey complex behavior-shaping events and operational constraints, enabling operators to efficiently perceive system status, identify response requirements, and direct autonomy, thereby enabling efficient teaming between manned and unmanned vehicles.

Warfighter Value: Software tools, driven by formal requirements analysis, with the capability to provide operators of a multi-vehicle, multi-domain (air, ground and sea) common control station with decision support will enable real-time re-tasking and re-planning of unmanned teammates.

WHEN

Contract Number: N68335-16-C-0241 **Ending on:** December 27, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototypes of displays for targeted manned/unmanned teaming	Low	Proof-of-concept demonstration of software prototype approach	4	December 2017
Extended prototypes of manned/unmanned teaming displays	Med	Driven by representative data	5	December 2018
Proof-of-concept demonstration	Med	Limited integration in a supervisory control station	6	June 2020

HOW

Projected Business Model: Charles River has over 30 years of steady growth providing innovative, cost-effective solutions through intelligent systems R&D. Over 100 Charles River projects have produced a wealth of advanced-technology prototype software that can facilitate the rapid integration of critical technology into operational systems. Charles River Analytics plans to develop the software and pursue either direct development for the government or license agreements with a Prime Integrator for the Program of Record. We would also need to work with the Navy as well as 3rd party suppliers who develop unmanned systems and components.

Company Objectives: The ultimate goal is to integrate and transition this technology into government and prime contractor mission systems for unmanned vehicles, such as those for MQ-25 Stingray, Broad Area Maritime Surveillance (BAMS), or the Navy's Common Control System (CCS). Other applications include mission planning systems such as the Theater Battle Management Core Systems (TBMCS) and the Distributed Common Ground/Surface System (DCGS).

Potential Commercial Applications: This capability is suitable for a broad range of government missions, (e.g. homeland security, border security, coastal patrol, fighting forest fires, and some industrial & commercial applications).

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