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Federal Railroad Administration

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Federal Railroad Administration
Office of Research, Development, and
Technology

Research Initiatives in Support of Rail Safety

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Important Note – New This Year:

- All awards will be in the form of **firm-fixed-price** contracts.
- Appendix B – Cost Proposal – must be submitted in Excel format.

1. Introduction

Background

The Federal Railroad Administration (FRA) has a successful history of supporting the development of advanced rail technologies to meet the transportation needs of the country. Over the last few decades, FRA has provided funding and technical support to facilitate the research and development of new equipment, infrastructure, and testing technologies to enhance the nation's rail transportation safety and efficiency. These efforts are undertaken in support of the U.S. Department of Transportation's (DOT) mission:

Serve the United States by ensuring a fast, safe, efficient, accessible, and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.

FRA's Office of Research, Development, and Technology (RD&T) conducts research and development in support of improved railroad safety and national rail transportation policy. These activities support the objectives of DOT, the mission critical needs of FRA, and the rail industry through technology development and demonstration, applied research, and information exchange with the rail industry.

Purpose

The purpose of this Broad Agency Announcement (BAA) is to solicit a variety of applied technology research projects that will support RD&T's strategic objectives and the research needs of the four FRA research divisions:

- Track
- Rolling Stock and Equipment
- Train Control and Communication
- Human Factors
- Railroad Systems Issues

Projects shall develop technologies that have a direct impact on the safety and efficiency of freight and passenger rail operations in the US. Such technologies will:

- Reduce the operational and program deployment risks associated with mixed use rail lines.
- Improve safety by reducing human and technology failures.
- Bring about capital cost reductions and economy in producing equipment and facilities.
- Reduce the rail service operating costs by providing more efficient operations.

- Improve the reliability of equipment and infrastructure components by reducing failures and/or reducing false failure detections.
- Enhance the social benefits and/or environmental aspects of rail transportation.
- Facilitate the development of domestic manufacture of rail equipment and infrastructure components.

2. Strategic Research Focus

The following sections provide the strategic focus of FRA research, outlined in the Research, Development, and Technology Strategic Plan. Some of the research areas described in this section may be part of this BAA research announcement. See Appendix C – Research Topics for specific research topics. Additional research topics may be announced at any time during the open period of this BAA.

Railroad Systems Issues

Safety is the DOT’s primary strategic goal and thus, the principal goal for FRA’s BAA program. The aim is to reduce safety risk by reducing both the likelihood of accidents occurring and the consequence should they occur. Consequence can be defined as the harm to which an individual or group of people is exposed, which is the weighted summation of fatalities, injuries, shock, and trauma. Reducing risk over time will reduce the number of accidents and actual harm.

While being driven by the safety goal, the BAA seeks projects that also contribute towards the other DOT strategic goals, including:

- Maintaining a state of good repair and economic competitiveness
- Environmental sustainability
- Fostering livable communities
- Workforce development (WFD)

Workforce Development

This research provides WFD support and domain expertise to identify suitable approaches for both the management and capture of external rail industry workforce-related trends and responses to DOT data calls. This research increases the awareness of railroad industry WFD issues by establishing and/or participating in forums and research efforts to foster industry collaboration. As part of this effort, FRA has an interest in the intersection of workforce development in the railroad industry and impacts of automation and technology.

Human Factors Division

Human errors now account for more than one-third of train accidents in the U.S. Railroads depend on the adaptability of people, as well as the performance of infrastructure, equipment, and control systems to keep systems safe. Railroad workers need knowledge, training, tools, and alertness to do their jobs properly and to ensure the safety of the public, their coworkers, and themselves. When train crews are highly fatigued, the average total accident cost is more than triple the overall average cost of accidents.

Strategic priorities for the human factors division include:

- **Safety:** Identify knowledge gaps related to grade crossing safety and continue to address these safety issues by investigating technologies to improve grade crossing safety and motorists' behavior at grade crossings.
- **Fatigue:** Identify existing gaps in research, particularly related to the railroad industry, and assess and target them to study fatigue in railroad operations. Use a variety of research methods including survey research, human subject simulator experiments, and technology demonstrations.
- **Human Automation Interaction:** Address human error that contributes to accidents and fatalities and investigate the safety aspects associated with integrating people and technology. Examine the extent to which advanced technological systems in railroading affect employee training, job design, and other personnel issues.
- **Trespass/Suicide Prevention:** Continue research to better understand the two leading causes of rail-related deaths in the U.S., trespass, and suicide, by conducting pilot studies with rail carriers implementing strategies to mitigate them. Evaluate the effectiveness of these strategies.

Track Division

Track and infrastructure failure is the second-leading cause of train derailments in the U.S., and incorrect interaction between moving vehicles and the track is common among these failures.

Strategic priorities for this division are:

- **Autonomous Inspection Technologies:** Expand the use of autonomous inspection methods to provide more frequent and cost-effective measurements and quality assessments of track condition. Focus investments in defect-detecting payloads carried by drones and revenue service railcars, and the automation of data processing.
- **Artificial Intelligence (AI)-Based Risk Analysis:** Invest in the development of a suite of technologies utilizing AI to increase safety and reduce human error by improving the speed, accuracy, and consistency of inspection processes. The primary focus will be the application of predictive analytics to determine high-risk derailment locations before they exceed any safety threshold.
- **Safety Assurance Performance Measures:** Railroads are currently testing automated and autonomous technologies to supplement or replace manual safety inspections. RD&T will develop standards and procedures to verify and validate the performance of these new systems to ensure their efficacy.
- **Rail Safety Simulations and Testing:** In direct support of the FRA Office of Railroad Safety, invest in computer modeling capabilities to improve the state of science of vehicle-track interaction, wheel and rail profiles and contact conditions, minimum track safety requirements, derailment root causes, defect initiation and crack growth rates, and evaluation methods for the qualification of new high-speed equipment.
- **Advanced Defect Detection Measures:** Invest in research and development of improved methods to locate, monitor, and predict the performance of difficult to

detect railroad track safety issues such as rail internal defects, longitudinal rail force related issues, and ballast vertical and lateral restraint.

Rolling Stock Division

Research in this division aims to reduce the likelihood of derailments from equipment failures and to mitigate the consequences should derailments occur through these failures or other causes.

Strategic priorities are:

- Automated Inspection Technologies and Techniques: Partner with the railroad industry to foster further development of automated wayside and on-board inspection techniques and technologies.
- Improved Materials and Component Designs for Rolling Stock Components: Invest in testing and analysis to identify materials which can provide improved performance and durability in the railroad environment. Examine methods for developing electrical power systems for individual freight car applications.
- Occupant Protection Enhancements: Invest in means for improving train occupant protection in the event of collisions and derailments by mitigating the potential for loss of occupied volume and minimizing the secondary impact velocity to which passengers are exposed.
- Improving the Safety of Hazardous Materials Transportation: Continue to develop, analyze, and test means for improving the structural integrity of tank cars. Examine methods for protecting hazardous material tank cars from heat, and the capability of these tanks to survive post-derailment fire conditions. Examine thermal protection levels for the safe transportation of energy products (e.g., LNG, crude oil, ethanol) and improve techniques for modeling thermal performance to enhance the safety of hazardous material transport in high temperature conditions.
- Energy and Environmental Sustainability: Investigate advances in alternative fuels (e.g., natural gas, hydrogen) and alternative propulsion systems for rail vehicles that are efficient, safe, and suitable for their intended applications. Investigate technologies that can improve efficiency and emissions of locomotives.

Train Control and Communications Division

Train control and communications research aims to eliminate train-to-train collisions, reduce over-speed derailments, and increase the safety of track workers.

Strategic priorities for this division are:

- Positive Train Control (PTC) Performance Monitoring and Reporting: Continue in the development and deployment of data collection and analysis tools for PTC systems under normal operating conditions to monitor and evaluate system performance.
- Next Generation PTC Technologies: Enhance existing PTC technologies that use advances in automation, communication, and sensor technologies to further improve safety.

- Intelligent Transportation Systems: Invest in connected vehicle technologies to ensure safe interaction of road vehicles with trains at grade crossings. Investigate levels of train automations and develop requirements and standards.
- AI and Computer Learning (CL): Incorporate AI and CL into research related to predictive analyses for PTC system performance and faults as well as identifying risky trespasser behavior around railroad tracks and crossings.
- Next Generation Grade Crossings: What new technologies are out there that can advance Grade Crossing Technology and thus increase safety.

3. Program Guidelines

This BAA does not lend itself to the use of a common work statement due to its broad research focus. North American Industry Classification System codes will be specific to each individual contract award, as determined by the type of activity in which the Offeror will be engaged.

The Government reserves the right to select for award any, all, part, or none of the proposals received in response to this announcement. This BAA is an expression of interest only and does not commit the Government to pay any concept paper or proposal preparation costs.

This announcement constitutes the public announcement, as contemplated by Federal Acquisition Regulation (FAR) 6.102(d)(2), and no formal Request for Proposals or other solicitation regarding this announcement will be issued. Requests for the same will be disregarded.

By participating in this BAA, the Offeror agrees that if awarded a Firm-Fixed-Price type contract with milestone payments tied to deliverables, the Government's liability for any effort performed shall not exceed the payment amount of the preceding milestone. The Offeror shall propose and implement a program consistent with this requirement. If it is determined that the Offeror's performance under the contract is not progressing to the satisfaction of the Government, the Government retains the right to commence a process to modify or end performance. This process will require a 60-day notice and may be used in conjunction with FAR clause 52.242-15, Stop-Work Order.

Schedule

The open period for BAA concept papers is defined in Appendix C – Research Topics. The FRA may modify the schedule or research topics. If such changes are made, Appendix C – Research Topics will be amended. This BAA and amendments issued thereto will be posted to the SAM.gov website. It is the responsibility of the Offeror and interested parties to be aware of BAA amendments, notifications, and updates by regularly checking the SAM.gov website.

Communications Protocol

Those parties interested in responding to this BAA are encouraged to first contact RD&T via phone or e-mail (as outlined in [Section 0](#)) to discuss the prospective project prior to devoting resources towards completing the project concept paper. All non-technical inquiries should be directed to the Contract Specialist and Contracting Officer.

Any exchanges of information must be consistent with procurement integrity requirements of section 27 of the Office of Federal Procurement Policy Act (41 U.S.C. 423, as amended) (see FAR 3.104).

Communication between Offerors and FRA is encouraged prior to and throughout the project concept paper phase. After submission of project proposals, all information exchanges of a technical nature will be conducted through the BAA Program Manager, and exchanges of a non-technical nature through the BAA Contracting Officer. There shall be no discussion of proposals submitted by other Offerors or proposal evaluation data.

Offerors are advised that any indication of interest, in the affirmative, is not meant to imply nor in any way impart an obligation on the part of the Government that an award will be forthcoming for the offered work or project.

Data Sources and Points of Contact

All submittals shall be delivered in electronic format to the BAA Program Manager with copy to the BAA Contracting Office via the e-mail addresses listed below.

BAA Official Documents	SAM.gov , FRA.gov
BAA Program Manager, Andrew Duffin	202-236-8540 andrew.duffin@dot.gov
BAA Contract Specialist, Mandy Fenter	FRABAA@dot.gov
BAA Contracting Officer, Ric Schweitzer	FRABAA@dot.gov
System for Award Management	SAM.gov

Offeror Eligibility

Most topics are unrestricted; however, several are restricted to university applicants only. Certain topics were restricted to expose more academic researchers to rail industry needs and to encourage universities to develop greater expertise in certain areas. Any responsible source may submit a concept paper for consideration, including, but not limited to, States or local governments, or organizations of State or local governments, universities or institutions of higher education, hospitals, non-profit organizations, private individuals, corporations, and businesses or commercial organizations, except that any businesses owned in whole or in part by the Federal Government are not eligible. Although businesses owned in whole or in part by the Federal Government are not eligible for direct funding they may subcontract with eligible Offerors. Cooperative arrangements (e.g., joint ventures, limited partnerships, teaming arrangements, or collaboration and consortium arrangements) are permitted and encouraged. All Offerors must be registered on the Federal Government's System for Award Management (SAM; SAM.gov) systems prior to project award.

Small, Small Disadvantaged (SD), and Service-Disabled Veteran-Owned Business Concerns, and Veteran-Owned (VO) and Woman-Owned (WO), and Historically Underutilized Business Zone (HUBZone) Small Business Concerns, and Historically Black Colleges and Universities (HBCU) and Minority Institutions (MIs) are encouraged to submit concept papers on their own and/or in collaboration with others. However, no portion of this BAA will be set aside or reserved exclusively for Small, SD, or Service-Disabled Veteran-Owned Business Concerns, or for VO, WO, or HUBZone Small Business Concerns, or for HBCU and MIs.

Project Qualification Requirements

This BAA solicits research projects in response to specific research topics detailed in this document (Appendix C – Research Topics). Projects shall be designed to complete applied technology activities, to increase the scientific knowledge base of the rail industry, to exploit the potential of existing technologies, and to address issues that impact the safety and efficiency of rail operations, including high-speed rail, in the U.S. Projects designed to develop magnetic levitation (Maglev) technologies, or other non- traditional rail transport modes, will not be considered under this BAA. Transit-oriented research topics such as light rail, trolley, or monorail systems will not be considered. This BAA will not be used to sponsor projects that develop specific products or systems for sale. In the context of the technology readiness levels defined below, this BAA is designed only for projects in Levels 1 through 7, with preference given to those projects that are already advanced to the proof-of-concept testing stage (Level 3).

Technology Readiness Level	Description
1. Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology’s basic properties.
2. Technology concept and/or application formulated	Invention begins. Once basic principles are observed, practical applications can be invented. The application is speculative and there is no proof or detailed analysis to support the assumption. Examples are still limited to paper studies.
3. Analytical and experimental critical function and/or characteristic proof of concept	Active research and development are initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment	Basic technological components are integrated to establish that the pieces will work together. This is relatively low fidelity compared to the eventual system. Examples include integration of ad hoc hardware in a laboratory.
5. Component and/or breadboard validation in relevant environment	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so that the technology can be tested in a simulated environment. Examples include high fidelity laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment	Representative model or prototype system, which is well beyond the breadboard tested for TRL 5, is tested in a relevant environment. Represents a major step up in a technology’s demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.
7. System prototype demonstration in an operational environment	Prototype near or at planned operational system. Represents a major step up from TRL 6, requiring the demonstration of an actual system prototype in an operational environment, such as in a rail vehicle or on an actual track system.
8. Actual system completed and qualified through test and demonstration	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of a component of subsystem in its intended system to determine if it meets design specifications.

Technology Readiness Level	Description
9. Actual system proven through successful deployment	Actual application of the technology in its final form and under operational conditions, such as those encountered in operational test and evaluation. In almost all cases, this is the end of the last "Bug fixing" aspects of true system development.

Source: GAO/NSIAD-99-162

Program and Project Funding Limits

Funding for this program is appropriated in the Federal budget for railroad research and development. FRA will determine if any submittals are consistent with the objectives of this BAA and of interest to the Government. The primary basis for selecting proposals for acceptance shall be technical, importance to agency programs, and funds availability. Cost realism and reasonableness shall also be considered to the extent appropriate.

No funding provision or commitment can be made at the time of award for phased or expanded work or projects beyond the initial or base phase funded at the time of award that the applicant may propose in its submissions. If appropriated funds are authorized, FRA Contracting Officer may provide additional funding by issuing a bilateral modification for phased or expended effort under existing awards.

Awards may be of any dollar value, but it is anticipated that most individual awards (or that part of the Government's portion in a cost sharing arrangement) will have dollar values ranging between \$50,000 and \$500,000.

Cost Sharing

For the purposes of this BAA, cost sharing is a generic term denoting any situation where the Government does not fully reimburse the Offeror for all allowable costs necessary to accomplish the project under the contract or another award instrument. The term encompasses cost matching, participation in-kind, or other investment of resources as a means of venture sharing in lieu of a formal cost sharing arrangement, third-party in-kind contributions, cost limitations (direct or indirect) and similar concepts. Generally, many forms of cost participation, by their very nature and definition, minimize or negate the opportunity for profit or fee.

Cost sharing by awardees is not mandatory under this BAA, but because of the potential for long-term benefits to those firms or institutions involved in these research, development, and demonstration activities, it is FRA's policy to obtain cost participation, whenever possible. This is preferred when FRA supports efforts where the principal purpose is ultimate commercialization and utilization of the technologies by the private sector, and when there are reasonable expectations that the Offeror will receive present or future economic benefits beyond the instant contract/agreement. It is important that research conducted under this BAA be applicable to the development objectives of the program, and that the results of these research activities are practical for deployment within the railroad industry. Projects that include partnerships with, and cost sharing from railroad operators and other industry stakeholders, will facilitate future industry adoption of developed technologies. Such projects are preferred.

Project Selection Process

The BAA project selection is a two-step process.

Project Concept Papers

Step 1: Submission and evaluation of project concept papers. As detailed in [Section 4](#) and [Section 3.9](#), the concept paper provides a brief overview of the research effort, including the current state of development, the next steps in the development plan, and rough order magnitude price and schedule data. Concept papers will be used to gauge both the applicability and the Government's interest in the technology research area. All Offerors must first submit a project concept paper to be considered for an award.

Discussions between the Offeror and FRA are encouraged at this point in the process to develop or refine project concepts and to avoid unnecessary work efforts, by either party, on project concepts that the Government does not value, or cannot fund.

Concept papers shall be submitted in electronic form via e-mail to Andrew Duffin (andrew.duffin@dot.gov) **AND** the FRA BAA mailbox (FRABAA@dot.gov), which is monitored by both the Office of Research, Development, and Technology and the Office of Acquisitions. FRA will work to complete concept paper evaluations within 60 days of receipt and will notify Offerors of final disposition.

Project Proposals

Step 2: Following concept paper evaluation and discussion, FRA may invite the Offeror to submit a detailed technical and price proposal for award evaluation. Proposals shall be prepared in accordance with the requirements of [Section 5](#) and [Section 3.9](#). Submissions that are incomplete, materially lacking, or not responsive to the technical requirements of this BAA, may be returned unevaluated, or evaluated as is, without further opportunity for revision, at the discretion of the FRA's evaluation committee.

Oral Presentations

FRA may request that Offerors conduct an oral presentation of the proposal following an initial evaluation. Oral presentations may be conducted in person or via telephone or computer conference at the discretion of FRA. Oral presentations shall be prepared in a technical briefing format following the requirements of Section 6. FRA may ask technical questions for clarification during the oral presentation.

Intellectual Property Rights

Awards will generally contain detailed provisions concerning patent rights, rights in technical data and computer software, data reporting requirements, and other terms and conditions which may be negotiated as part of the award process, as specified in the Federal Acquisition Regulation (FAR), e.g., FAR 52.227-14 Rights in Data-General.

Offerors must describe any limitations on any intellectual property (patents, inventions, trade secrets, copyrights, or trademarks) that will impact the Offeror's performance of the contract or impact the Government's subsequent use of any deliverable under the contract. The Offeror must describe the intellectual property in sufficient detail to describe the limitations (data, including software, assertions of the Offeror or any subcontractor, potential patent licenses required by the Government, etc.), and to describe why or how the Government can accomplish the stated objectives of this BAA with the limitations described or proposed by the Offeror. For example, if applicable, the Offeror must describe

any software that it will bring in to perform the contract and any licenses the Government may need to use the contract deliverables during or after contract performance. In general, the Offeror will own intellectual property developed during contract performance, and unless otherwise restricted, the Government receives a paid-up, nonexclusive, irrevocable, worldwide license to such intellectual property. This information must be included in Volume III, Supplemental Information, of the proposal.

Patents

Offerors must list any known patents, patent applications, or inventions which may require the Government to obtain a license should the Offeror's proposal be selected for award. If any patent, patent application or invention is owned by the Offeror, the Offeror must provide a statement, in writing, that it either owns or possesses the appropriate licensing rights to patent, patent application or invention for which the Government may require a license for this program. If an Offeror does not own or have license rights to license the Government for any such patent or patent application, the Offeror must explain how the Government may obtain a license or whether the Offeror plans to obtain these rights on behalf of the Government.

For any patent or patent application listed above, the Offeror must provide the patent number or patent application publication number, a summary of the patent or invention title, and indicate whether the Offeror is the patent or invention owner. If a patent or invention is not licensed by the Offeror, identify the licensor. Be advised that no patent, patent application, or invention disclosure will be accepted if identified in the Data Rights Assertion list described below. Rights in patents, patent applications, and invention disclosures are addressed in the patent rights clause to be included in the contract and therefore, no assertion of limited rights in patents or patent applications will be accepted. The list of patents, patent applications and inventions of this section must be a separate list from the Data Rights Assertion list described below.

Proprietary Data Restrictions

Offerors are advised that the project concept papers and/or proposals may contain data the Offeror does not want disclosed to the public for any purpose or used by the Government except for evaluation purposes. If the Offeror wishes to restrict such data, the cover page of all submittal documents must be marked with the following legend, and relevant sheets marked as instructed.

This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed – in whole or in part – for any purpose other than to evaluate this proposal. However, if a contract is awarded to this Offeror because of – or in connection with – the submission of these data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in these data if they are obtained from another source without restriction. The data subject to this restriction are contained in Sheets [insert numbers or other identification of sheets].

Each restricted data sheet shall be marked as follows:

Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this document.

To the extent that such restrictions on proprietary data or information would not interfere with the intent of the Government to make the results of the work and projects awarded under the BAA available to all interested parties, and if in conformance with the Freedom of Information Act (5 U.S.C. 552, as amended), the Government will honor those desires.

4. Project Concept Papers

All project concept papers must respond to a specific research topic (Appendix C – Research Topics). The FRA will not evaluate concept papers that do not respond to a specific research topic. In the case of multiple project proposals from a single Offeror, a separate concept paper is required for each project. No project will be considered for an award without an approved project concept paper.

Project concept papers shall be prepared simply and economically and shall provide a concise description of the proposed research project, organized as defined in the following sections. Concept papers shall be no more than 5 pages in length (excluding cover page and Quad Chart), no less than 10- point font, and single-spaced, single-sided letter size pages with 1” margins (minimum). Project concept paper submissions should not include promotional brochures, advertisements, taped recordings, or other extraneous material.

A complete concept paper submittal includes two documents:

- Concept paper with cover page (Adobe PDF)
- Project Quad Chart (MS PowerPoint)

All concept papers must be submitted electronically, via e-mail, to the BAA Program Manager, with copy to the BAA Contracting Officer ([Section 3.3](#)).

Cover Page

Project concept papers shall include a cover page containing the following information:

- Working title of the proposed project
- BAA Research Topic title and reference Number ([Appendix C – Research Topics](#))
- Names, phone numbers, mailing and e-mail addresses for the principal technical and contractual points of contact (person or persons authorized to negotiate on the behalf of the Offeror and who can contractually obligate the Offeror organization)
- Secondary Offeror organization names and addresses (project partners), if any
- Date of submittal
- Proprietary data restrictions, if any (See [Section 3.9.2](#))

Technical Approach

The Technical Approach shall contain the Background, Scope of Work, Expected Outcomes, and Impacts associated with the project concept.

Background

In this section, the Offeror shall describe the following:

- **Mission Statement:** Briefly describe the technology proposed for research. Provide a statement(s) that conveys the Offeror’s vision of the fully developed technology and its impact on the FRA’s research topic.
- **Description of Need:** Describe the specific issue intended to be solved or improved by the technology proposed for research and development. Discuss the proposed application to rail safety and/or efficiency improvement in the U.S. Estimate the probability of the rail industry adopting this technology and provide a rationale for this estimate.
- **Technology Assessment:** Quantify the maturity of the technology in the context of the technology readiness levels detailed in [Section 3.5](#). Provide analytic and empiric evidence to support the assessment. Describe how the proposed research or technology is technically or scientifically innovative with respect to the research topic description.
- **Development Framework:** Describe the development history of the technology, both within the Offeror’s organization and from other sources, as applicable. Discuss the significant technical, financial, programmatic, or other factors that have impacted the development of this technology to date, both positively and negatively. Provide a technological risk assessment for future development of this technology.

Scope of Work

The Offeror shall describe the general scope of work planned for this research activity. This section shall describe the major research, testing, and analysis activities in sufficient detail to communicate the breadth of activities proposed. A detailed work breakdown structure is not required. The Offeror shall identify major progress milestones and associated deliverables in this section.

The scope of work shall identify all Offerors and associated stakeholder groups in the major activities of the project and shall indicate the estimated work effort required from each Offeror, expressed as a percentage of the total effort for each activity. In addition, the Offeror shall identify any third-party resource needs that are required during the project. These resources may include Government- furnished equipment.

Expected Outcomes and Impacts

Identify the significant outcomes expected from the project and their impact on the safety and efficiency of the rail industry, including short-, medium- and long-term effects. Describe these outcomes and impacts in the context of the technology readiness levels, and in terms of their impact on the realization of FRA goals as described by the specific research topic.

Qualifications

The Qualifications section of the Concept Paper shall introduce the project team, the team’s experience, and any unique capabilities.

Project Team

List all key Offerors proposed for the project, including Offerors from outside the prime Offeror’s organization. Organize the team by organization name and briefly describe each person’s roles and responsibilities on the project. Provide a short synopsis of each key

person's education, experience, and other qualifications applicable to the proposed project. Provide information on the business type (small, large, or disadvantaged) for each Offeror organization.

Experience

Describe the relevant experience of each organization participating in the project. Identify any publicly available and accessible resources that may provide more details regarding this experience, e.g., public web site links to past or current project documents.

Unique Capabilities

Briefly describe any unique capabilities that the Offeror team possesses that may reduce project risk, may reduce project duration, or may improve project financial performance. Describe these capabilities within the context of the research topic BAA and the proposed project's scope of work.

Schedule and Cost Estimate

Provide milestones for the proposed project that include start, finish, and major activity completion times. Express milestones dates as the number of weeks from project start.

Provide a rough order magnitude cost estimate. Provide a breakdown of these costs (as a percentage) for each organization in the project team. Provide a funding plan for the project. Identify each funding source and their contribution to the whole, expressed as a percentage. Include all anticipated sources, including Offeror internal sources, government funds, and partner organizations.

Quad Chart

Include a Quad Chart summarizing the project concept, per the example and instructions provided in Appendix A – Project Quad Chart.

5. Project Proposals

Following review, evaluation, and discussion of the concept paper, FRA may invite the Offeror to submit a formal proposal for the project. The project proposal builds upon the contents of the concept paper, as modified through discussions between the Offeror and FRA. Additional content and more detailed information are required in the proposal document, as described in the following sections.

Proposal documents are produced to the same formatting requirements as the concept papers, except for a 20-page limit. This 20-page limit is for Volume I only. Submissions that are incomplete, materially lacking, or not responsive to the technical requirements of this BAA, may be returned unevaluated, or evaluated as is, without further opportunity for revision, at the discretion of the FRA's evaluation committee.

Offerors are advised that FRA's evaluation of a project for possible award is based solely on the contents of the Offeror's project proposal document, oral presentation documents (see [Section 7](#)), and the Offeror's answers to any technical clarification questions, as transmitted through the FRA Contracting Officer.

It is the policy of FRA to treat all proposals as competitive information and to disclose the

contents only to government employees for the purposes of evaluation.

Please note that prior to an award, the Government reserves the right to perform a review of past performance. Sources for past performance may include the Past Performance Information Retrieval System, the Federal Award Performance, and Integrity System (FAPIS), and Government program managers and contracting officers who are familiar with the Offeror's relevant past performance may also be contacted.

A complete project proposal submittal includes 4 documents:

- Volume I: Technical Proposal (20-page limit) with cover page (Adobe PDF)
- Volume II: Cost and Pricing Data (Adobe PDF)
- Volume III: Supplemental Information (Adobe PDF)
- Project Quad Chart (MS PowerPoint)

All project proposals must be submitted via e-mail to the BAA Program Manager, with copy to the BAA Contracting Officer ([Section 3.3](#)).

Cover Page

Project proposals shall include a cover page containing the following information:

- Working title of the proposed project
- BAA Research Topic title and reference Number (Appendix C – Research Topics)
- "Project Proposal" written below the project title
- Names, phone numbers, mailing address and e-mail addresses for the principal technical and contractual points of contact (person or persons authorized to negotiate on the behalf of the Offeror and who can contractually obligate the Offeror organization)
- Unique Entity ID
- Secondary Offeror organization addresses (project partners), if any
- Date of submittal
- Proprietary data restrictions, if any (See [Section 3.9.2](#))

Volume I: Technical Proposal

The Technical Proposal shall contain the following sections:

1. Background
2. Statement of Work
3. Technical Approach
4. Project Management Plan
5. Capabilities and Experience

Background

Offerors shall explain, specifically, how the proposed technology or method enhances the

ability to meet the research topic goals; how it could be incorporated into existing railroad equipment, infrastructure, or operations (to include how major barriers, impediments or obstacles could be overcome or mitigated); and the interface modifications required to accomplish a demonstration.

Explain how its application will bring about an improvement to capital equipment or infrastructure, operating methods, safety and/or performance improvements. Also cite correlative benefits to general railroad operations, if any, since they can enhance the feasibility of passenger service added to freight routes. Quantitative support for these assertions should be provided.

Proposals may include a discussion of any optional future phase or phases of work. Such discussion shall be clearly labeled as “optional future phase or phases of work.” The first phase of work shall in no way depend on work described under future phases to meet the program criteria. If a future phase or phases are included, a rough order magnitude cost estimate shall be provided as a separately labeled section in the costs and pricing section of the proposal.

Proposals shall include references to past relevant research describing capabilities, work, and significant accomplishments in areas directly associated with proposed research area or in closely related areas. A bibliography of relevant technical papers and research notes that support the technical concepts and innovative ideas described in this proposal shall be included for technical reference.

- **Mission Statement:** Describe the technology proposed for research. Provide a statement(s) that conveys the Offeror’s vision of the fully developed technology and its intended impact on the FRA research topic.
- **Description of Need:** Describe the specific issue intended to be solved or improved by the technology proposed for research and development. Discuss the proposed application to rail safety and/or efficiency improvement in the U.S. Discuss the intended stakeholder groups expected to utilize this technology and discuss how each group is expected to leverage this technology to improve safety and operating efficiency. Estimate the probability of the rail industry adopting this technology and provide a rationale for this estimate.
- **Technology Assessment:** Quantify the maturity of the technology in the context of the technology readiness levels detailed in [Section 3.5](#). Describe the technology readiness in the context of the rail industry (operations, legal, regulatory, etc.). Provide analytic and empiric evidence to support the assessment. Describe how the proposed research or technology is technically or scientifically innovative with respect to the research topic description.
- **Development Framework:** Describe the development history of the technology, both within the Offeror’s organization and from other sources, as applicable. Discuss the significant technical, financial, programmatic, or other factors that have impacted the development of this technology to date, both positively and negatively. Provide a technological risk assessment for future development of this technology.
- **Expected Outcomes and Impact:** Identify the significant outcomes planned for the project and their impact on the safety and efficiency of the rail industry, including short-, medium- and long-term effects. Describe these outcomes and impacts in the

context of the technology readiness levels, and in terms of their impact on the realization of FRA goals as described by the specific research topic.

Statement of Work

The statement of work shall contain the following information:

- **Work Scope:** Describe the work to be accomplished as part of the research project. Include the technology under development, the objectives and goals of the effort, major milestones, and the expected outcomes.
- **Requirements:** Define the work. Separate the work effort into major tasks and subtasks as numbered paragraphs or in a table. Identify all project reviews, tests, demonstrations, and deliverables resulting from the execution of the project.
- **Deliverables:** All project deliverables should be clearly listed and described.

Technical Approach

Offerors shall provide a narrative description of the planned work, organized as it is expected to be performed. The technical approach shall include activities designed to integrate the rail industry into the development effort, either through active participation in the technology development or through demonstration and/or testing support. Describe the steps, tasks, and activities necessary to achieve the desired project results. Identify and describe all deliverables, presentations, demonstrations, tests, and periodic reports. Describe the quality requirements for the project and identify the processes and/or procedures that will be employed to ensure these requirements are satisfied.

The technical approach shall include a risk assessment. Technical, programmatic, market, and other risk elements shall be analyzed for their impact on the project. A scoring or ranking scheme shall be developed to quantify potential impacts. Data shall be presented in a probability/impact chart or another suitable format.

Project Management Plan

The proposal shall contain a detailed management plan for the project based upon the following minimum requirements.

- **Work Breakdown Structure (WBS):** Divide the project requirements into tasks and work packages. Hierarchically organize the project work down to the work package level. A table or chart format is preferred.
- **Project Schedule:** Sequence the project activities and identify and estimate resource requirements and activity durations. Identify the critical path. Present the project schedule as a bar or Gantt-style chart, including activity relationships (i.e., dependencies). Provide a milestone chart for the project illustrating key activities and their expected completion time in weeks from project start. Include intermediate progress reviews, demonstrations or tests, and periodic reporting activities in the schedule. All project deliverables shall be clearly indicated on the project schedule.
- **Mobilization Plan:** In the context of the project schedule, describe the plan to acquire and deploy the necessary resources, including personnel, facilities, equipment, and other resources (e.g., Government Furnished Equipment), deemed necessary for project execution.

- Organization Chart: Deliver an organization chart for the project illustrating resource roles and reporting relationships. Include all Offeror organizations. Clearly highlight organizations that are participating in cost sharing activities. Identify the type of business (large, small, disadvantaged, or educational) for each Offeror organization.
- Subcontracts/Teaming/Cost Sharing Management Plan: Identify and describe the Offeror's plans for subcontracting, teaming, and cost sharing. Clearly identify the roles and responsibilities of all organizations working within the project team, including technical and financial elements.
- Testing Plan: Describe the testing requirements, environments, and methods needed to assess or demonstrate the suitability of the technology in the railroad environment and to demonstrate the success of the proposed project. Cite railroad companies or other rail-related organizations, such as railroad industry suppliers, that have expressed their willingness to permit and/or support such testing or demonstrations. Letters or statements attesting to an outside organization's interest or commitment to permit and/or support testing or demonstrations should be furnished with the proposal in Volume III.

Capabilities and Experience

Identify and describe the capabilities and experience of key personnel and organizations within the project team as these elements relate to the proposed project. Describe any relevant technological, scientific, railroad, or other industrial or defense capabilities, experience, and resources (or those of team members) that demonstrate the ability to successfully conduct the proposed project. Describe the team member's (or organization's) familiarity with or position in the railroad community and access to critical resources for the project.

Describe any unique capabilities that the Offeror team possesses that may reduce project risk or duration and/or may improve project financial performance. Describe these capabilities within the context of the objectives of the BAA and the proposed project's scope of work.

Volume II: Cost and Pricing Proposal

See Appendix B – Price Proposal Format and Preparation Instructions for specific requirements for cost and pricing information content and formatting requirements. Cost and pricing proposals must conform to the requirements in Appendix B and below. This appendix should be submitted in an Excel spreadsheet.

General Requirements

Identify each funding source and their contribution to the whole, expressed as a percentage. Include all anticipated sources, including Offeror internal sources, government funds, and other Offeror organizations.

The cost or pricing portion of the project proposal should contain a cost estimate for the proposed effort to allow for meaningful evaluation and determination of price reasonableness and cost realism. The cost estimate shall account for the entire cost of the project, inclusive of that portion of cost the applicant or other Offerors would bear in any proposed cost sharing arrangement or other investment of resources, as a means of venture sharing, in lieu of a formal cost sharing arrangement. The cost estimate shall be

broken down for each year of the proposed work, and by all years combined. At a minimum, the cost estimate shall include the following information:

- Labor: Produce a breakdown of direct labor, by WBS index number, identifying the labor categories or individuals and projected hours, hourly rate, and their associated subtotals.
- Overhead and/or Fringe: Outline labor overhead and/or fringe rate(s) and base(s), and cumulative effect on labor costs.
- Materials, Supplies, and Equipment: Describe and estimate the cost of materials, supplies, and equipment, to include the basis of the cost estimate (e.g., historical data, competitive market quotes, and in house transfers). Specific mention should be made of any highly specialized or costly test equipment or supplies needed to accomplish the project.
- Milestones: Provide an Excel sheet that breaks down deliverables by name, acceptance criteria, delivery date, and payment amount.
- Travel and Transportation: Provide a breakdown of travel and transportation costs.
- Subcontracts: Break down individual subcontracts. State the amounts of time of subcontractor/consulting services to be devoted to the project, including the cost to be charged to the proposed contract/agreement.
- Other Direct Costs (ODC): Break down ODCs (reproduction, computer time, and consultants).
- Miscellaneous: Identify any other direct or indirect cost elements not identified elsewhere. For each indirect rate (identified here or elsewhere), indicate if the proposed indirect rate and allocation base have been approved by a government audit or cognizant agency for use in proposals, when the rate(s) was approved, and the name and telephone number of the cognizant auditor or approving official.
- General and Administrative (G&A): Identify G&A rate and base, and cost outcome.
- Profit or Fee: Generally, FRA does not anticipate providing profit or fee under contracts awarded under the BAA because of the potential for long-term benefits to those firms or institutions involved in these demonstration activities. However, profit or fee may be proposed, and if proposed, is subject to final negotiations.
- Cost Sharing/Cost Participation: Identify the extent of cost sharing/cost participation, if any (exclusive of the Offeror's prior investment). Include the actual dollars or the percentage of the cost share of the proposed research or technology project to be provided by the applicant, third party contributors, or other Federal funding sources, if allowable. Identify the type and extent of cost limitations (direct or indirect) or the specifics for and extent of similar concepts indicative of cost participation. (Note: The applicant may be required to certify that it has secured the appropriate cost share funding levels and identify the source of funding.)

The value of any proposed cost participation in the form of participation in-kind or other investment of resources as a means of venture sharing, in lieu of a formal cost sharing arrangement, or third-party in-kind contributions, must be assessed by the Government. (Note: These latter forms of cost participation are best suited for and may only be

applicable as the Offeror's cost share/match in a grant or cooperative agreement award.)

Recommended Procurement Instrument and Pricing Arrangement

Offerors shall include a summary of the recommended procurement instrument (e.g., contract, cooperative agreement, or grant) and pricing arrangements (e.g., firm-fixed-price, cost, cost-plus-fixed-fee, etc.) and include the rationale for their use. However, the FRA reserves the right to negotiate and award the types of instruments determined most appropriate under the circumstances. If warranted, portions of resulting awards may be segregated into pre-priced options. It is anticipated that most instruments will be contracts with firm-fixed-price pricing arrangements with milestone payments tied to deliverables. It should be noted that cost reimbursable type contractual arrangements are not permissible unless the awardee has an accounting system that has been approved by the Government as adequate to support the determination of costs applicable to the contract. Additionally, the accounting system will be subject to audit and surveillance during the awardee's performance to provide reasonable assurance that efficient methods and effective cost controls are being used.

Volume III: Supplemental Information

All proposals must respond to the following items. All resumes, letters of support, or other supporting material for the proposal should be included in Volume III.

System for Award Management (SAM) Registration

To be eligible for award of a contract resulting from this announcement, Offerors must be registered in the Federal Government's SAM system. The contractor must ensure that the registration process has been completed in SAM, as award may not be made until the contractor is registered in the system.

Administrative and Audit Offices

Offerors shall indicate which audit offices will represent them. For Defense Contract Audit Agency (DCAA) offices, Offerors can identify their DCAA office by going to www.dcaa.mil and entering their ZIP code.

Intellectual Property Declaration

Offerors shall submit information describing the intellectual property that will be used in the performance of the contract and any proposed restrictions on the Government's use of the intellectual property. See [Section 3.9](#) for additional information.

Offerors must provide a good faith representation, in writing, that they either own or possess appropriate licensing rights to the intellectual property that will be utilized for this project. If Offerors are unable to make such a representation concerning the intellectual property, provide a listing of the intellectual property needed, and explain how and when the Offeror plans to obtain these rights.

Offerors must describe any limitations on any intellectual property (patents, inventions, trade secrets, copyrights, or trademarks) that will impact the Offeror's performance of the contract or impact the Government's subsequent use of any deliverable under the contract. The Offeror must describe the intellectual property in sufficient detail to describe the limitations (data assertions of the Offeror or any subcontractor, potential patent licenses required by the Government, etc.), and to describe why or how the Government

can accomplish the stated objectives of this BAA with the limitations described or proposed by the Offeror.

For issued patents or published patent applications, provide the patent number or patent application publication number, a summary of the patent or invention title, and indicate whether the Offeror is the patent or invention owner. If a patent or invention is in-licensed by the Offeror, identify the licensor. If a patent application has been filed for an invention that has not been made publicly available and contains proprietary information, provide the patent application serial number, patent application filing date, a summary of the invention title, and indicate whether the Offeror is the invention owner. If the invention is in-licensed by the Offeror, identify the licensor.

Subcontracting Plan

Any Offeror submitting a proposal for an award anticipated shall submit a subcontracting plan. The subcontracting plan shall be complete information concerning the contractor's plans for subcontracting any portion of the experimental, research, or development efforts as stated in FAR [35.009](#), or, if no subcontracting opportunities exist, a statement to that effect.

If the award type results in any type listed in FAR [44.204](#), then clause [52.244-2](#) shall apply.

Key Personnel and Support Letters

Provide short summaries (2-page maximum, each) on the education, technical qualifications, and experience of all key personnel on the project. Provide any letters of support from industry partners or other stakeholders.

Quad Chart

Include a Quad Chart summarizing the project proposal, per the example and instructions provided in Appendix A – Project Quad Chart.

6. Past Performance

The Government reserves the right to perform a review of past performance. The Government shall consider sources in accordance with FAR 9.105-1(c).

7. Oral Presentations

FRA may request an oral presentation following an initial review of the proposal. Oral presentations are an opportunity for the Offeror to provide higher resolution to the topics discussed in the formal proposal. The presentation shall address technical factors only, not cost or pricing data, and shall not address topics not presented in the proposal submittal. FRA may ask technical clarification questions during the presentation. Oral presentations will be held at the FRA offices in Washington, DC, or they will be conducted using online applications. Location and format decisions will be made by FRA.

8. Evaluation and Award Process

The BAA evaluation process shall be conducted in accordance with FAR Subpart 35.016 (d) and (e). Offerors will be notified of evaluation results via letter.

Awards resulting from this BAA will be made based on the evaluation results of a two-phased process. The Government reserves the right to fund all, some, one, or none of the proposals submitted; may elect to fund only part of a submitted proposal. In either case, the Contracting Officer will have the ultimate authority and responsibility to make final scope determinations for selections of proposals that will not be totally funded to ensure the portion selected meets the solicited requirements. In addition, the Government reserves the right to create and maintain a reserve list of proposals for potential funding, if additional funding becomes available. All awards are subject to the availability of funds. Offers considered unresponsive to the Government's requests for information in a timely manner, defined as meeting government deadlines established and communicated with the request, may be removed from further consideration.

Project concept papers will be evaluated for overall technical value to the Government's area of interest, within the context of available funding. FRA will consider the degree of the potential impact on the realization of research topic goals, the technology readiness level, and the reasonableness of estimated costs for each concept paper submitted. FRA will also consider the Offeror's capability to perform the work based on the technical approach, background, and referenced resources provided in the concept paper.

FRA may request formal proposals for project concepts that are deemed to have technical value to the FRA's objectives and are found to fit within funding constraints. Project concept papers are not evaluated, or considered, as part of the award evaluation process.

Project Proposals

Proposals will be evaluated solely on the criteria published in this announcement. Oral presentations may be considered a subset of the proposal material and evaluated using the same criteria. Oral presentations will not be evaluated for oral delivery style, polish, or the style or format of the submitted material.

The criteria provided in the remainder of this sub-section are listed in order of relative importance.

Technical Factors

- Responsiveness to BAA Objectives and Requirements: The degree to which the proposed project meets the BAA program objectives and conforms to the funding limitations detailed herein, and the degree to which the proposal is responsive to the requirements published in this announcement
- Technical Approach: The degree to which the project impacts the realization of research topic goals, including enhancing rail safety, performance, and efficiency aspects of rail operations, maintenance, and/or design
- The degree to which the Offeror communicates the technological framework for the proposed project, in terms of analytical science, prior development progress, and rail industry application
- The degree to which the proposal provides a reasonable and logical technical approach to the project, integrates the rail industry in the scope of work, provides appropriate reports and deliverables to document progress and outcomes, quality controls, and a realistic project risk assessment

- The completeness of the project management plan in terms of required elements and the degree to which the Offeror has prepared the project for the execution phase
- The degree of experience and capability of the project team, including key personnel and team organizational partners, as these elements relate to the project work and influence the project's potential for a successful outcome

Cost and Pricing Factors

Project proposals that are evaluated favorably from a technical perspective, have no outstanding issues or areas for clarification, and are determined to be consistent with the objectives of the BAA and of interest to the Government, will be subject to a cost/price evaluation.

Cost and pricing data submissions shall be evaluated for realism and reasonableness. FRA will estimate the relative value of work proposed against the estimated costs. FRA will consider the level of proposed cost sharing as part of the evaluation.

Past Performance Factors

Technically acceptable proposals that are considered realistic and reasonable in terms of proposed cost, and fee, if applicable, may be subject to a review of past performance information provided by the Offeror or obtained from sources other than those identified by the Offeror.

Oral Presentation

Oral presentations and materials, if requested by FRA, will be considered part of the technical proposal, and evaluated accordingly.

Concept Paper and Proposal Rating

The technical evaluation panel shall rate each concept paper or proposal and ascribe one of the following ratings:

Exceptional (E): Exceeds expectations. No discrepancies.

Acceptable (A): Meets all or most expectations. May have some minor discrepancies.

Marginal (M): Approaches expectation. May be deficiencies in some key areas.

Unsatisfactory (U): Does not meet expectations in one or more critical aspect. Little chance to improve.

Awards

New this year: All awards will be in the form of **firm-fixed-price contracts**.

A proposal must be acceptable under all evaluation factors to be considered eligible for award. All evaluation factors other than cost or price, when combined, are significantly more important than cost or price alone. Technical evaluation is appreciably more important than cost or price and, as such, greater consideration shall be given to technical excellence rather than cost or price alone. Cost or price is somewhat more important than past performance and, as such, greater consideration shall be given to cost or price rather than past performance alone.

All awards will be subject to the availability of funds. Only the Contracting Officer can legally commit the Government to the expenditure of public funds under this BAA.

Notifications and Negotiations

All Offerors will receive written notification of the final disposition of their proposal. If selected for award, the Contracting Officer will contact the Offeror with further instructions, including negotiation procedures, if needed.

9. Appendix A – Project Quad Chart

The Quad Chart is used by numerous Government agencies during briefs. It provides a synopsis of the project objectives and progress, as well as providing a graphical representation of the project. The Quad Chart is one landscape-oriented page divided into four quadrants and suitable for use in briefings which help Task Monitors explain the work to others. Emphasis is placed on brevity and factual statements. Technical engineering details are not included, as the Quad Chart may be used to brief those who are not technical experts on the subject matter.

Each of the four quadrants conveys information on a specific aspect of the project. The first quadrant, located in the upper left-hand corner, includes a brief project description. A bulleted list format is used to present this information. For purposes of brevity, the description should be limited to a maximum of five bullets.

The second quadrant, located in the upper right-hand corner, comprises visually appealing graphics or pictures that clearly represent the key technological idea(s) or the expected impact of the research. If more than one picture is needed to clearly convey the technological idea(s), then a plurality of pictures may be used. Due to the limited space, the number of graphics and pictures should be limited to a maximum of five. If a plurality of pictures is included, they can be presented in any clear, appealing layout, such as a simple array of pictures or a collage of overlapping of pictures. However, they must fit neatly within the first quadrant. There may be something subtle or non-obvious to the casual observer in one or more of the pictures. If this is the case, graphics, such as red arrows, may be added to bring attention to important aspects of the picture(s).

The third quadrant, located in the lower left-hand corner, includes three to five quantitative statements discussing how the project work will revolutionize an area of importance to the safety of railroads, such as preventing derailments and detecting defects. Some questions that may be appropriate to address in this section are: How is the current system or procedure implemented now and with what limitations? What is truly new in this approach which will remove current limitations and improve performance and safety? How much can performance and safety be expected to improve? As in the second quadrant, a bulleted list format is used to present this information.

The fourth quadrant, located in the lower right-hand corner, includes two sections: 1) three to five significant project milestones and the approximate cost or projected cost associated with each of the milestones (the information is depicted on a three-year horizontal timeline or in a bulleted list format, as in the second and third quadrants); and 2) a bulleted list of project partners.

The Quad Chart also includes a project title that is clearly visible and centered at the top of the page. The Quad Chart concludes with the name of the FRA Task Monitor in the bottom left-hand corner and the name of the project partner in the bottom right-hand corner.

To achieve uniformity, specific fonts and font sizes are used in each of the above sections. All the text on the Quad Chart is placed in a common, clearly legible font, such as Times New Roman or Arial. The project title has a font size between 30 and 36. The text found in the second, third, and fourth quadrants has a font size between 14 and 16. The primary purpose of these limitations is to make the information clearly legible and to limit the amount of information on the Quad Chart.

Quad Charts will be accepted in Microsoft PowerPoint formats only. The Quad Charts are limited to one page, and the file size is limited to 500,000 bytes (0.5 MB). Reducing the size of the images in the file can help reduce the overall file size, if needed.

A formatted sample Quad Chart outline is attached with this announcement as a separate file. The following are the Project Evaluation Questions (George Heilmeyer Criteria):

- What are the project proponents trying to accomplish?
- How is it done now, with what limitations?
- What is truly new in this approach which will remove current limitations and improve performance? How much will performance improve?
- If successful, what difference will it make?
- What are the mid-term, final exam or full-scale applications required to prove the hypothesis? When will they be done?
- How could this transition to the end user (i.e., FRA/railroads)?
- How much will it cost?

10. Appendix B – Price Proposal Format and Preparation Instructions

The price proposal must include, at a minimum, two separate sections (provided in one submission): a price summary, not to exceed two-pages (see ‘A’ below), must precede the detailed price portion (see ‘B’ below) of the price proposal. Additionally, include detailed price submissions for all subcontractors and consultants. Submissions should be in an Excel sheet.

10.1 Price Summary

A summary price proposal must be prepared that includes the price elements presented in the following table based on 12-month increments. Add as many years to the summary as will be included in the full proposed period of performance. Note: The periods of performance must match the information presented in the Statement of Work. Include the applicable Technology Research Area on all pages of the summary price proposal.

Cost Element	Year 1			Year 2			Year 3		
	Rate Hrly, mthly	Quantity Hrs, Months	Total Amount	Rate Hrly, mthly	Quantity Hrs, Months	Total Amount	Rate Hrly, Mthly	Quantity Hrs, Months	Total Amount
Direct Labor (List each direct labor category or individual separately)									
ABC Category	\$	XX	\$	\$	XX	\$	\$	XX	\$
Dr XYZ	\$	XX	\$	\$	XX	\$	\$	XX	\$
TOTAL DIRECT LABOR		XX	\$		XX	\$		XX	\$
Labor Burden	Labor Burden Rate	Lbr Burden Applied To: (direct labor \$\$...)	Total Amount	Labor Burden Rate	Lbr Burden Applied To: (direct labor \$\$...)	Total Amount	Labor Burden Rate	Lbr Burden Applied To: (direct labor \$\$...)	Total Amount
Fringe Benefits	%	\$	\$	%	\$	\$	%	\$	\$
Overhead	%	\$	\$	%	\$	\$	%	\$	\$
TOTAL LABOR BURDEN			\$			\$			\$
Material/Equipment	Matl O/H Rate	Matl O/H Applied To: (direct matl \$\$...)	Total Amount	Matl O/H Rate	Matl O/H Applied To: (direct matl \$\$...)	Total Amount	Matl O/H Rate	Matl O/H Applied To: (direct matl \$\$...)	Total Amount
TOTAL MATL/EQUIPMENT	%	\$	\$	%	\$	\$	%	\$\$	
TOTAL TRAVEL COSTS			\$			\$			\$
TOTAL ALL OTHER DIRECT COSTS			\$			\$			\$
TOTAL SUBCONTRACTOR COSTS			\$			\$			\$
TOTAL DIRECT COSTS			\$			\$			\$

G&A OR F&A	G&A or F&A Rate	G&A/F&A Rate Applied To: (total cost \$\$...)	Total Amount	G&A or F&A Rate	G&A/F&A Rate Applied To: (total cost \$\$...)	Total Amount	G&A or F&A Rate	G&A/F&A Rate Applied To: (total cost \$\$...)	Total Amount
TOTAL G&A OR F&A	%	\$	\$	%	\$	\$	%	\$	\$
TOTAL FACILITIES CAPITAL COST OF MONEY (COM) (Attach Completed DD Form 1861)			\$			\$			\$
TOTAL COSTS			\$			\$			\$
Fee or Profit	Fee Rate	Fee Rate Applied To: (total cost, excluding COM...)	Total Amount	Fee Rate	Fee Rate Applied To: (total cost, excluding COM...)	Total Amount	Fee Rate	Fee Rate Applied To: (total cost, excluding COM...)	Total Amount
FEE OR PROFIT	%	\$	\$	%	\$	\$	%	\$	\$
TOTAL COST PLUS FEE			\$			\$			\$

Note: Itemize any planned items valued greater than \$5,000/unit immediately following the table and include all equipment/material (greater than \$5000/unit cost) in Total Direct Material/Equipment in the table (per [Section 10.3 Equipment/Government Property](#)).

Deliverable Title	Description	Acceptance Criteria	Delivery Dates	Payment Amount
Deliverable 1				
Deliverable 2				
Deliverable 3				
Deliverable 4				

10.2 Detailed Price (no page limit)

The Offeror's format will be considered acceptable provided it includes a detailed price breakdown of all pricing by cost element and statement of work (SOW) tasks based on 12-month increments. The Offeror must also provide a narrative to support the requirements in each cost element. In addition, the detailed price proposal must provide separate price proposals for each subcontractor or consultant, which includes the same level of details required of the prime Offeror.

The detailed price proposal will include the following three sections:

1. Tabular price breakdown by cost element and SOW tasks based on 12- month increments
2. Narrative to support the requirements in each cost element
3. Subcontractor price breakdown, as appropriate

Budgeted cost elements should reflect:

- Individual labor categories or persons (principal investigator, graduate students, etc.), with associated labor hours and unburdened labor rates
 - Allowable charges for graduate students including salary, appropriate research costs, and tuition

- Allowable charges for undergraduate students including salary and research training costs, but not tuition
- Provide milestones for the proposed project that include acceptance criteria, completion dates, and payment amounts in an Excel sheet. Express milestones dates as the number of weeks from project start.
- Cost of equipment, based on most recent quotations and itemized in sufficient detail for evaluation (see [Section 0](#))
- Estimate of material and operating costs
- Travel costs and the relevance to stated objectives
 - Number of trips, destinations, duration, if known, and number of travelers per trip
 - Travel cost estimations should be based on rates referenced on the General Services Administration's [per diem web page](#)
- Publication and report costs
- Consultant fees (indicating daily or hourly rate) and travel expenses and the nature and relevance of such costs
- Computer services
- Subcontract costs and type (the portion of work to be subcontracted and rationale), including a detailed cost summary
- Communications costs not included in overhead
- Other direct costs
- Indirect costs
- Fee/profit which an industrial/commercial organization proposes, if any.

10.3 Equipment/Government Property

Contractors are generally expected to provide the equipment needed to support proposed research. Where specific additional equipment is approved for commercial and non-profit organizations, such approved cost elements shall be separately negotiated.

Offerors desiring that the Government purchase the equipment under the proposed effort shall provide a justification of need for the equipment and rationale for why the Offeror is unable or unwilling to furnish the equipment. Government purchase of equipment that is not included in a deliverable item will be approved on a case-by-case basis. In accordance with FAR 35.014, title of equipment or other tangible property purchased with government funds may be vested in institutions of higher education or with non-profit organizations, whose primary purpose is the conduct of scientific research. Proposals that include equipment must itemize each item and its respective cost in Volume II – Cost Proposal.

“Equipment” is a tangible item that is functionally complete for its intended purpose, durable, nonexpendable, and needed for the performance of a contract. Equipment is not intended for sale and does not ordinarily lose its identity or become a component part of another article when put into use. Equipment does not include material, real property, special test equipment, or special tooling. Further, it is tangible property having a useful life of more than two years and an acquisition cost of \$5,000 or more per unit.

The justification for this type of equipment and its cost must be disclosed in the cost proposal to include, as applicable:

- Vendor quote: Show name of vendor and number of quotes received and justification of intended award (i.e., lowest price, best value, etc.)
- Historical cost: Identify vendor, date of purchase and whether cost represented the lowest bid. Include release(s) for not soliciting current quotes.
- Estimate: Include rationale for estimate and reasons for not soliciting current quotes.
- Special test equipment to be fabricated by the contractor for research purposes and its cost
- Standard equipment to be acquired and modified to meet specific requirements including acquisition and modification costs, listed separately
- Existing equipment to be modified to meet specific research requirements and modification costs
 - Do not include as special test equipment those items of equipment that, if purchased by the contractor with contractor funds, would be capitalized for Federal income tax purposes.
- Specification as to whether each item of equipment will be included as part of a deliverable under a resulting award

11. Appendix C – Research Topics

See separate document attached to the beta.sam.gov posting.

12. Appendix D – FAR 52.204-24 – Representation Regarding Certain Telecommunications and Video Surveillance Services or Equipment

See separate document attached to the beta.sam.gov posting.