

**RAHALL TRANSPORTATION INSTITUTE**  
**Research Project Description Form**

**Project Number:** RTI TRP 00-05

**Project Title:** "Integrated Track Stability Assessment and Monitoring System (ITSAMS) Phase III"

**Primary Investigator Contact Information:**

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**Project Objective:** The overall objective of project is to continue the development of remote sensing technologies that can be integrated and deployed in a mobile inspection vehicle i.e. Integrated Track Stability Assessment and Monitoring System (ITSAMS).

The specific objectives of Phase III are as follows:

1. Continue the development of remote sensing technologies that will rapidly assess the integrity of various track structure and substructure layers, such as the ballast, the sub ballast, and the subgrade, and to locate, identify and quantify weak rail track segments and underlying geological anomalies.
2. Continue the development of the laser interferometry technology for vertical track deflection and internal track stability.
3. Develop the processes for integrating "state of the art" remote sensing technologies (3-Dimensional Laser Scanning- Laser Induced Differential Absorption Radar and Global Positioning Systems) for site specific geo-technical/spatial surface data collection and monitoring with the technologies for sub-surface integrity, track deflection and internal track stability monitoring.

**Abstract:** The Marshall University Research Corporation of Huntington, WV (MU), in collaboration with the University of Nebraska-Lincoln (UNL), submitted in November 1999 a technical proposal for a research grant "to develop an integrated track stability assessment and monitoring system using site-specific geo-technical/spatial parameters and remote sensing technologies".

Subsequent to the proposal and as of result of meetings with FRA Office of Research and Development (ORD) staff members, a Statement of Work (SOW) consistent with the FRA strategic plan was approved effective through Dec. 2001. This grant (DTFRDV-99-G-60024) was processed in a single award to MU with UNL as a sub-contractor. The existing grant included non FRA resources from other transportation entities and the individual universities and focused on the evaluation and development of two separate technologies for track stability assessments and monitoring i.e. ground penetrating radar (GPR) for track structure and substructure and laser interferometry (LI) for track vertical deflection. A final report for this grant is currently under review.

As a result of discussions between MU, UNL and the FRA related to continued support, separate grant applications, one by each of the two universities, were submitted to the FRA for Phase II research. However, the two institutions continue to coordinate their research work, including sharing of data and the preparation of their separate SOW's to ensure that efforts are non-duplicative, complimentary and both SOW's contribute to, and are consistent with the project purpose as approved by the US Congress.

The Phase II grant for University of Nebraska focused on continuing the development of the GPR and LI technologies combined with an integrated track stability assessment modeling, while the Phase II grant for Marshall University (DTFR53-01-00307 - approved through November 2002) continued the development of the GPR and LI technologies with expanded efforts that addressed other remote sensing technologies (geophysical, seismic, etc) in addition to the incorporation of state of the art Global Positioning Systems (GPS) technologies.

As mandated by the US Congress, FY 02 funding was approved to expand the scope of research efforts to include human factors which has been addressed by the University of Nebraska in an approved SOW for Phase III. However, Phase III research for Marshall University will focus on the efforts as titled above.

**Task Descriptions:** Following are generalized descriptions of tasks required to accomplish the overall goals of this project:

- Review of relevant literature;
- Design and Construct a GPS Equipped Mobile Inspection Platform Prototype;
- Continue Field Testing of the Subsurface and Track Integrity Remote Sensing Technologies;
- Develop a Short-Line Rail Corridor Differential GPS for Vertical and Horizontal Track Monitoring Analysis; and
- Identify Locations on Active Rail Lines for Utilization of Surface Remote Sensing Technologies.

**Milestones, Dates, Schedule:** The period of performance shall be four hundred twenty five (425) calendar days effective the date of grant approval by the FRA.

**Yearly and Total Budget: Total:** \$550,000.00 - total project budget.

**Student Involvement:** Undetermined at this time.

**Relationship to Other Research Projects:** Continuance of “Integrated Track Stability...” Phases I & II

**Technology Transfer Activities:** “In furtherance of the safety of railroad operations in the US, this project will focus on: advancements in the detection of track and subsurface stability; analysis of the most appropriate remote sensing technologies for site specific geo-technical/spatial data collection and monitoring; and will build upon accomplishments of previous grants.” This project’s ultimate goal is to minimize railroad accidents caused by track and structure defects.

**Potential Benefits of this Project:** Increased railroad safety and the minimization of fatalities, injuries and property loss related to railroad accidents.

**TRB Keywords:** Infrastructure; Monitoring; Railroad; Track; Safety; Sensing; Stability.