Project Title:

Railway Models for Educational Purposes

University:

North Dakota State University/University of Tennessee

Principal Investigators:

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Description of Need:

Multidisciplinary multimodal education is a goal of the University Transportation Centers program. Railway education is receiving increasing attention in the United States after decades of being overshadowed by highway curricula. Railways are often viewed as a partial solution to rapidly growing truck traffic and increasing highway congestion in intercity corridors. Railway traffic is expected to grow in the future as a result of global trade and long distance freight movements.

Universities need to reconsider their curricula in light of the growing importance of railways in multimodal planning. Expansions of railway educational programs are being contemplated, including a potential on-line certificate in railway planning. However, the resources available to teachers are limited. When teaching highway planning, instructors can utilize the Highway Capacity Manual and other public-domain models to teach key concepts in highway operations, capacity, and performance. Similar teaching tools do not exist in the railway educational field. Railway simulation models are proprietary products. The high-end simulation models are prohibitively expensive and data intensive. They require very detailed and precise track profile, station, and origin-destination data for an entire region or territory.

While these models are great planning and scheduling tools for Class I railroads, they are not necessarily the best means to illustrate key principles—e.g., the most important factors that affect line capacity/performance and the sensitivities of performance indicators to variations in key parameters (e.g., train speeds [average, mixed, and slowest], train priorities, siding spacing, uniformity of siding spacing, etc.). In comparison, the objectives of educational models are to illustrate key relationships and sensitivities and build intuitive understandings of the underlying causes and effects. There is a subtle but important different in the capability to run a train simulation model and the capability to understand whether the results are reasonable. The former is not an objective of university education. The latter is.

Objectives:

The essential purpose of this project is to create a railway educational model that can be used by teachers to illustrate key concepts in operations, train performance, and line capacity. The model will be built upon an earlier platform developed by David Clarke in his thesis. A train performance simulator will be integrated with the updated simulation model. The model will be written in a modern simulation language that is transportable, with a user interface and graphic output capabilities.
In this project, North Dakota State University will provide funding for several doctoral students as well as operational funding. Dr. Clarke will contribute time to guiding the project and reviewing interim products.

Potential Benefits and Applications:

The model will provide the capability to develop more advanced courses in railway planning and performance—which are critical components of a modern railway education curriculum. The model will be used immediately to develop illustrations and problems for the courses in a prospective on-line graduate certificate program in railway planning—which is expected to be offered in 2012. After completion and testing of the model a use guide will be prepared. Then, the model and documentation will be made available to any university transportation center participating in USDOT's railway educational initiative and/or offering railway courses. However, use of the model will be restricted to educational and non-profit purposes. The model is not intended for commercial use or to compete with existing commercial models.

Time Duration:

July 1, 2010 – June 30, 2011

Total Project Cost:

$114,800

MPC Funds Requested:

$80,000

Sources of Matching Funds:
North Dakota State University will match the project through the contributed time of staff and Dr. Tolliver, as well contributed project and grant administration costs. Industry experts will also contribute time in the review and testing of the model. $34,800