

Helping Shortlines Meet the Challenges of HAL

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As the American Class 1 railroads continue to move towards the new generation, 286,000-pound heavy axle load cars, the American shortline industry must now gear up to address this issue.

While the current level of track and structures on shortlines is generally adequate for traditional 263,000-pound railroad cars with 33-ton axles, it is often marginal or even inadequate for the new generation 286,000-pound cars with 36-ton axle loads.

Recent studies have shown that the approximately 10-percent increase in load associated with the 286,000-pound cars can translate into damage to the track structure that is as much as 20 percent higher than that caused by the "standard" 263,000-pound car¹

This is further exacerbated by the fact that track on shortlines is generally not of the same standard as that found on Class I mainlines with lighter rail sections, fewer crossties and smaller ballast sections.

In fact, one recent study of the capital needs of the U.S. shortline industry² showed that there was a significant capital requirement for track upgrade needed by the approximately 550 shortline and regional railroads to allow them to operate the new generation heavy-axle-load equipment safely and cost effectively on an ongoing, long-term basis.

This study showed that the approximately 50,000 miles of track operated by these shortline and regional railroads requires \$6.86 billion to upgrade their tracks to allow for safe, effective and long-term operations under HAL equipment. Furthermore, this study indicated that for long-term operations 22 percent of rail must be replaced, 43 percent of track miles require some replacement ties and 23 percent of track miles require some ballast.

Noting that the rail sections frequently found on shortline railroads are lighter rail sections, many with four-hole joint bars whose strength may not be adequate for carrying these heavier cars on an ongoing basis, it is not surprising that the largest single-cost category was found to be rail with a total projected capital cost of \$3.75 billion.

In order to help meet this heavy-axle-load challenge, the American Short Line and Regional Railroad Association embarked on a multi-faceted program to provide support and assistance to its members.

This program included an aggressive campaign to obtain additional funds for its members to upgrade their track, including working with the FRA on its RRIF³ capital loan program and working with Congress on legislation that will provide capital grants to shortline railroads. It also included the development of tools that can be used by ASLRRRA members to help them manage their current assets and more effectively deal with the new heavy-axle-load cars.

The screenshot shows the HALImpact software interface. The 'Summary' tab is selected. The 'HAL Characteristics' table compares 'Base' and 'HAL' values for Car Weight, Axle Load, and Axle Reduction Factor. The 'Annual Cost Summary' table compares 'Capital Costs' and 'MDW Costs' for various track components, including a total summary row.

HAL Characteristics		
Car Weight, lb	Base	HAL
Total	253000	286000
Tare	51000	66000
Net	202000	220000
Axle Load, ton	32.875	35.750
Axle Reduction Factor		0.92

Annual Cost Summary			
	Capital Costs	MDW Costs	% Inc. in MDW Cost
Rail	\$2459650	\$691691	48%
Ties	\$1267500	\$276969	25%
Ballast/Surfacing	\$76360	\$129899	29%
Turnouts	\$41605		
Bridges	\$0	\$0	0%
Total	\$4845125	\$1398448	

HALImpact summary screen showing costs of needed capital upgrade and increased track maintenance for HAL operations.

As part of this HAL effort, ASLRRA, with the financial sponsorship of the Federal Railroad Administration,⁴ commissioned ZETA-TECH Associates, Inc., to develop a series of software "tools" that can be used by ASLRRA's members to effectively monitor and manage their track assets, as well as to evaluate the ability of their track to handle heavy-axle-load equipment.

Two of these tools have been recently made available to ASLRRA member railroads with the third to be released shortly.

RailManage software

The most recent software tool that was developed and is currently being made available to ASLRRA members is RailManage, a track-infrastructure asset-management model specifically designed to provide shortline and regional railroads with the ability to monitor the performance of their rail and track assets.

Since most shortlines do not have the same level of computer sophistication as their larger Class I cousins, it is critical for any asset-management tool designed for shortlines be easy to understand and use.

In order to accomplish this, RailManage was developed in the familiar Windows format, and structured to present its information in a traditional track-chart-type form. As a result, RailManage provides shortlines and regional railroads with a comprehensive database of their track information, a complete set of track charts that can be readily updated and printed out, and a user-friendly interface with which the user can easily access and update track data.

Furthermore, by keeping this information in a dynamic data-base structure, the information is continuously being updated for the track charts, system map and output reports.

RailManage also provides shortlines and regional railroads with an FRA-compliant defect-management system that allows them to record open defects, both "red"

FRA violations and "yellow" warnings. This defect management system meets FRA requirements for security of data.

In addition, it allows the railroad to close out open defects as they are repaired and provides reports of both open defects (red and yellow), as well as closed out defects.

These FRA defects can also be plotted on the railway system map, together with other key information such as rail condition (wear and/or fatigue), HAL questionable/inadequate segments, etc.

Because rail represents the largest of the heavy-axle-load track-upgrade costs, accounting for more than half of the upgrade dollars needed by the shortline industry, RailManage places a major emphasis on the monitoring and management of this high-cost asset.

It should be noted that this emphasis is different from the traditional shortline focus on ties and ballast and is more in line with Class 1 experience, where rail is the largest track-maintenance-cost area.

Historically, smaller railroads, with lighter tonnage and more limited resources have continued to use rail that would be removed from track by larger railroads. This lighter rail, which often includes significant amounts of non-control-cooled rail, requires careful monitoring and management under heavy-axle-load operations.

RailManage also provides a means for monitoring and management of other track defects, particularly FRA defects.

RailManage is designed to provide this needed management and oversight tool to shortlines and regionals and allow them to:

- Monitor the condition of the rail on an ongoing basis.
- Provide rail replacement "warnings" based on defined wear and fatigue limits.
- Provide excessive wear ("lubrication need") warnings.
- Evaluate the suitability of rail sections for the traffic being carried.

Control "risk" of rail failure/accidents by improved scheduling of rail testing.

Monitor track defects to include FRA defects and maintain FRA-compliant defect records.

Maintain a comprehensive dynamic track data base.

Maintain up-to-date track charts.

In addition to the track charts, Rail- Manage offers several different management reports to include:

- FRA defects
- Rail Wear Segments
- Rail Defect Segments
- Rail Testing Requirements
- HAL Segments
- Lubrication.

Each of these reports provides the, shortline's management with key information needed to monitor rail and track condition and determine maintenance or replacement needs. Thus, for example, rail fatigue defect and wear rates are determined and unacceptable conditions identified based on appropriately-defined criteria. The resulting

rail wear and defect segment reports can then be used in determining maintenance programs.

RailManage has just been released by the ASLRRA and is now available to ASLRRA members for licensing.

HALImpact computer model

Earlier this year, the first tool that was developed under this program was released, a software package called HALImpact. HALImpact is a user-friendly computer model that is designed to allow a shortline or regional railroad to evaluate the ability of its track to effectively handle 286,000-pound cars.

As part of this assessment, HALImpact determines what railroad segments require capital upgrade for rails, ties and/or ballast and determines the cost of this upgrade.

In addition, HALImpact calculates the expected increase in track-maintenance costs associated with the introduction and operation of 286,000-pound cars. These costs are based on the engineering impact of increased loading and resulting damage to the track structure due to heavy-axle-load cars.

As part of its railway-specific engineering assessment HALImpact examines each of the key track components (rail, ties, ballast, turnouts) on each individual line segment. It then determines if that component is adequate for 286,000-pound car loadings, marginal for HAL loading or inadequate.

In the latter case, the component is deemed to require replacement or improvement, and the costs associated with these upgrades are defined. Also presented are capital upgrade costs associated with bridges and the calculated increase in annual track maintenance costs for each of the five major component categories.

In all cases, the impact and costs are determined as a function of the projected percentage of traffic that will be shifted from conventional equipment to the 286,000-pound HAL cars.

ASLRRA distributed HALImpact to members earlier this year in conjunction with the Association's four regional meetings. HALImpact is available at no cost to all ASLRRA members.

HALEcon for economics

The third and final software tool being developed under this program is HALEcon, a user-friendly model for the determination of the overall economics of HAL operations on shortlines and regional railroads. This model, which is currently being finalized, allows the railroad user to determine the full operating and capital costs and impacts associated with heavy-axle-load cars, to include estimates of reduced crew, fuel and other operating costs.

This model takes input from HALImpact to give the user a full picture of the economics of heavy-axle-load operations on a line. The result is a financial summary of the pros and cons of heavy axle-load operations as a function of projected HAL traffic levels. It also provides shortlines with financial information that can help them set rates and charges for this new class of equipment.

It is expected that HALEcon will be available for distribution to ASLRRA members later this year.

All three of these models represent an important step in the process of providing needed tools to shortlines and regional railroads, who individually may not have the financial or technical resources to develop these tools on their own.

By providing these tools to its members, the ASLRRA recognizes the importance of giving its members the resources they need to meet the challenge of 21st Century railroading and help them move towards the levels of sophistication of the Class 1 cousins.

The Association plans on continuing in its efforts to provide tools and resources to its members to meet the challenge heavy-axle-load cars as well as the other challenges faced by the shortline railroad industry.

References

1. Zarembski, A. M., "The Implications of Heavy Axle Load Operations for Track Maintenance on Short Lines," Proceedings the 2000 Annual Conference of the American Railway Engineering and Maintenance-of-Way Association, Dallas, September 2000.
2. ZETA-TECH Associates, Inc., "An Estimation of the Investment in Track and Structures Needed to Handle 286,000 Rail Cars," report prepared for the American Short Line and Regional Railroad Association, May 2000.
3. Railroad Rehabilitation and Improvement Financing program established by the Transportation Equity Act for the 21st Century (TEA-21) to provide direct loans and loan guarantees to acquire, improve or rehabilitate intermodal or rail equipment or facilities.
4. FRA Grant/Cooperative Agreement No. DTFR53-01-H-00018401598-8102.