Heavy Axle Loads and North American Railroad Network

- North American Class 1 Railroads are moving to heavier cars and higher axle loads
  - Double stack cars operate at up to 39 ton axle loads
  - Bulk commodity cars operate at 286,000 lb. gross weight on rails
    - 36 ton axle loads
  - Western coal and grain predominately at 286 today
- Significant operating savings for Class I railroads, customers
- Serious potential impact for Short Lines & Regional RR’s
  - Potential impacts on short lines and regional railroads
    - Safety
    - Maintenance of Way costs
The 286K Short Line Puzzle

• Understanding the Problem
  – Nature
  – Scope
• Engineering the Solution
• Financing the Solution

Short Line and Regional Segment

• $2.8B Est. Revenues ($1.5 SL, 1.3 RR)
• $290M Est. MOW Annual Capital Expenditure
• $310M Est. MOW Annual Expense
• 41,448 Miles of Roadway – 29% of rail network
• 45-60% incapable of handling 286K
• 6,284 track miles w/rail <90 lbs./yd.
• 9.4M carloads, 1.8M intermodal units (2004)
Effects of Heavy Axle Load Traffic

- Heavy axle load studies on Class 1 railroads and at TTCI show HAL most strongly effects MoW costs for
  - Rail and joints
  - Ties and fastenings
  - Ballast and surfacing
  - Turnouts and special track work
  - Bridges

Effects of Heavy Axle Load Traffic on Short Lines & Regionals

Effects of HAL traffic on Short Lines and Regional Railways
- Increase in surface degradation at joints, particularly cross-level
  - Need for ongoing monitoring program
- Increased degradation at turnouts
- Increase in surface spalling of rail
- Potential for increased rail defects, particularly at joints
  - Potential for broken rail derailments
  - Need for ongoing monitoring program
- Increase in tie degradation at joints
- Potential capital costs for bridges
  - Particularly bridges marginal at 263,000 lb.
**Heavy Axle Load Damage Factors**

<table>
<thead>
<tr>
<th>Damage* (per axle)</th>
<th>Damage* (per MGT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Wear</td>
<td>+9%</td>
</tr>
<tr>
<td>Rail Fatigue (internal)</td>
<td>+29%</td>
</tr>
<tr>
<td>Rail Fatigue (surface)</td>
<td>+16%</td>
</tr>
<tr>
<td>Rail Joints</td>
<td>+32%</td>
</tr>
<tr>
<td>Ties</td>
<td>+13%</td>
</tr>
<tr>
<td>Good Ballast</td>
<td>+9%</td>
</tr>
<tr>
<td>Poor Ballast</td>
<td>+60%</td>
</tr>
<tr>
<td>Turnouts</td>
<td>+29%</td>
</tr>
</tbody>
</table>

*Based on 286,000 lb. car

**HAL Effects**

- Using ZETA-TECH HAL analyses models, following effects were predicted for operation of 286,000 lb. HAL cars
- If all (100%) traffic is converted to HAL cars:
  - Increase in rail and turnout maintenance costs (to include capital costs associated with rail and turnout replacement): 28%
  - Increase in tie costs: 12%
  - Increase in surfacing costs: 23%

  Overall increase in maintenance costs associated with rails, ties, ballast, and turnouts: **17%**
Study Methodology

- A sample of railroads from ASLRRRA’s membership
- Calculation of track miles requiring new rails, ties, ballasting, and bridge upgrade/replacement
- Site Interviews performed
- Information quantified specific capital requirements as a function of:
  - operating speed
  - annual traffic volume
  - rail weight
  - tie condition
  - ballast condition
  - bridge condition

Study Sample

- 46 railroads of approximately 550 in the industry
- 4,742 track miles of an estimated total of 49,985
- Average annual tonnage per mile ranging from 0.1 MGT to 16 MGT
- Operating speed ranging from 10 mph to 50 mph
- FRA track class from “excepted” to Class 5
- Large regional railroads (Wisconsin Central, Florida East Coast) excluded from the analysis to avoid skewing the sample
Findings of the Analysis

<table>
<thead>
<tr>
<th>Component</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail</td>
<td>22% of track miles must be replaced</td>
</tr>
<tr>
<td>Ties</td>
<td>43% of track miles require at least <em>some</em> ties, depending on current tie condition</td>
</tr>
<tr>
<td>Ballast</td>
<td>23% of track miles require additional ballast; surfacing will also be required when ballast is added</td>
</tr>
<tr>
<td>Bridges</td>
<td>22% require replacement; 27% require upgrading</td>
</tr>
</tbody>
</table>

Costs

- The total cost of this required investment was calculated by use of standard railroad industry unit costs for:
  - Rail installation
  - Tie installation
  - Ballasting and surfacing
  - Turnout replacement
  - Bridge replacement (cost per track foot for timber, steel, concrete bridges)

- Costs were based on use of new components, since a track rehab program of this size would quickly exhaust supplies of secondhand rail, secondhand ties, and turnouts
Conclusions: Required Investment

<table>
<thead>
<tr>
<th>Component</th>
<th>Required Investment</th>
<th>Total Cost (Sample)</th>
<th>Total Cost (Industry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail and Turnouts</td>
<td>$ 75,106</td>
<td>$356,150,175</td>
<td>$3,754,182,002</td>
</tr>
<tr>
<td>Ties</td>
<td>$ 16,372</td>
<td>$  77,636,048</td>
<td>$ 818,362,236</td>
</tr>
<tr>
<td>Ballast/Surfacing</td>
<td>$  2,657</td>
<td>$  12,597,440</td>
<td>$ 132,789,720</td>
</tr>
<tr>
<td>Turnouts</td>
<td>$  7,882</td>
<td>$  37,377,454</td>
<td>$ 393,996,056</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$137,253</strong></td>
<td><strong>$650,847,006</strong></td>
<td><strong>$6,860,583,787</strong></td>
</tr>
<tr>
<td>Track Mileage</td>
<td>4,742</td>
<td>49,985</td>
<td></td>
</tr>
</tbody>
</table>

Practical $$$olutions – Company Level

- Cost to accommodate 286K cars highly dependent on speed, traffic density, type
- Repetitive unit train loading = greatest challenge
- Can operate on <90# rail at very low speeds
- Tradeoff between various infrastructure components: light rail requires good tie condition
- Selectively permit 286K operation
Cost Effective Strategies

- **Weld Rail in Place**
  - WC welded rail of 9020 or better for 35 mph, 5 MGT
  - Re-use OTM, add anchors
  - Less than 50% cost of CWR replacement
  - Requires large work windows
- Lay secondhand rail, less desireable sections
- Lay CWR in curves
- Use 6x8 ties v. 7x9
- Accept slow orders on bridges or strengthen components rather than replace
- Tradeoffs between costs, track-time, methods and standards

Challenge of Marginal Track

- Many miles of short line track are marginal for 263,000 lb. operations
- Rail <90 lb. with fair to poor tie condition
- Bridges with Cooper ratings <E40
- Little or no clean ballast, poor drainage
- Accumulated deferred maintenance of crossings
80# Rail – getting by with 100T traffic today including hazmat – not recommended for 286K

Cooper Rating: E-42
Barely adequate for 100T cars
Individual Company Decisions

- Line specific
- Speed dependent
- Traffic density influenced
- Risk factors:
  - Hazmat
  - Passenger
  - Unit Train
- Permanent fix or patch?
- How much is in the checking account?

A&M Approach

- In 2002 half the railroad was 263K (55 miles)
- Included mountain grade territory (2.7%), 4MGT
- Replaced 39 miles of jointed rail, T&S
- Eliminated joints in existing CWR
- Strengthened two steel bridges, re-decked two
- Upgraded many crossings with concrete panels
- Cost: $6M ($8.5M today)
Financing Improvements

- Two federal sources of non-traditional financing
  - RRIF Loans
  - Investment Tax Credit
- State grant and loan programs
- Traditional financing limited by cash flow and balance sheet
  - Frequent conflicts between need to upgrade and desire to expand capabilities/acquire new lines
  - Handling carriers need increased allowances to stay even; usually paid “per car”
RRIF Loan Program

- Really got started in 2002
- 25 year money at near-treasury fixed rates
- Process and covenants diverge from familiar commercial loans – political component
- Process shortened in 2005 – nominally 90 days
- Can be used for construction/capacity
- Lots of money: $35B potentially available
- Downside: it has to be repaid

Investment Tax Credit

- Major short line legislative victory
- Part of 2004 tax bill (H.R. 4520)
- 267 Congressional co-sponsors/18 Senate
- Huge lobbying effort involving customers, suppliers and entire small railroad community
- Lobbying supported by massive data collection
- Rich Timmons 2006 “Railroader of the Year”
Investment Tax Credit

• Effective for 2005, 2006 and 2007 tax years
• Provides 50% credit up to $3,500/mi.
• Partially transferable
• Approximately $175M/year at full utilization
• Estimate utilization at 80-90%
• Maintenance only – construction ineligible
• Limited to three years

Financing the Future

• Total need a moving target:
  - Lines are upgraded
  - Additional non-286K lines acquired by short lines
• Rail steel costs have doubled since 2003
• Some lines may not warrant upgrading
  - A political as well as economic decision
  - Many marginal lines are publicly owned/supported
• Tax credit extension principal federal strategy
• Many states increasing aid (e.g. NY bond issue)
Conclusions

• Move to 286K ongoing, 315K coming for coal
  – Strong economic benefit to Class I’s, shippers
• Short lines will be required to handle 286K to remain network players
• Short lines will bear increase MOW costs
  – Annual Expenses up 5-17%
  – Industry wide capital cost of $5-7B
• Traditional $250-300M infrastructure capital spend won’t get the job done
• External financing will continue to be required
• Work will be accomplished where justified