

Automated Track Geometry Inspection: Current State of the Art

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History – First Ever Unmanned TGMS

In 2008, the FRA funded a research project to make the first ever Unmanned TGMS in North America.

Installed on autotrain baggage car (Lorton VA to Florida)

Averaged 153,000 miles per year.

Decommissioned in 2011.



History – First Ever ATGMS

In 2013, CP purchased the first Autonomous Track Geometry Measurement System (ATGMS).

Installed on former revenue boxcar.

Diesel Generator, Solar, and Battery Powered.

Autonomous operation with cellular transfer, automated exception editing, and email alerts.

Still in operation today.



Fleet Size and Types

~35 Currently in operation on North American Freight Railroads

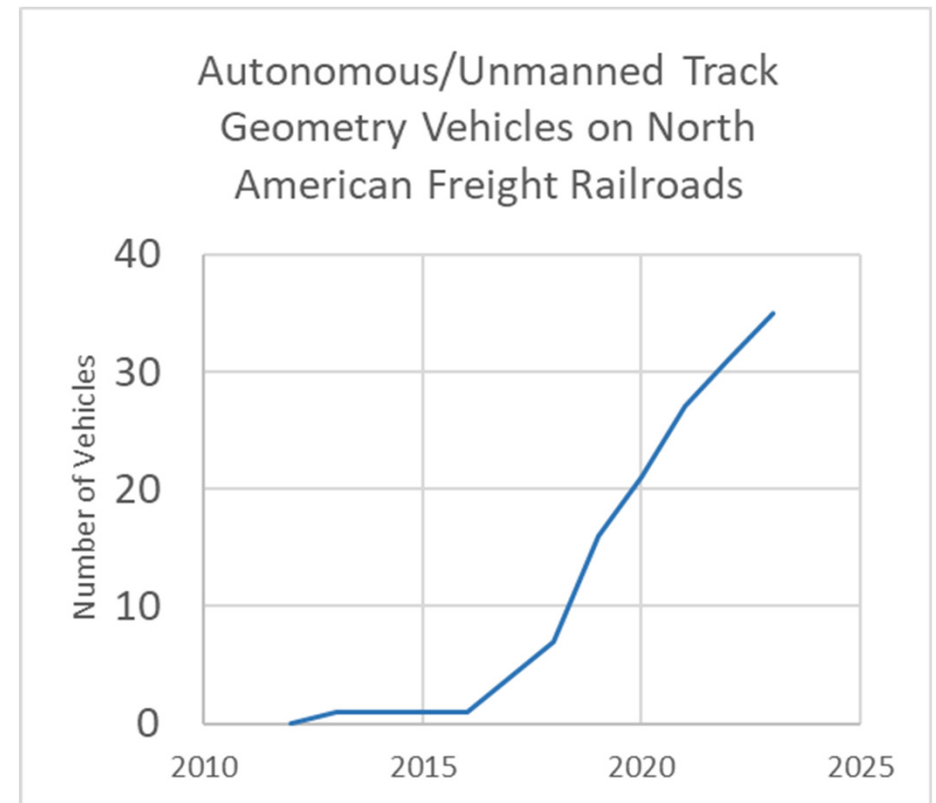
Every Class 1 has them

Vehicle Types:

Boxcars (77% of fleet)

Locomotives (14% of fleet)

Former Passenger Car (9% of fleet)



Vehicle Types: Pros/Cons

Boxcars



Pros:

- Easy to put into Mixed Manifest Trains
- Lots of room to add more inspection systems
- Low Vehicle Cost
- Minimal Impact to Mech/Ops Depts

Cons:

- Need to provide electrical power source
- Non-revenue generating vehicle (when concrete ballast added)



Vehicle Types: Pros/Cons

Locomotives



Pros:

- Already has power
- Revenue vehicle
- Already at weight

Cons:

- Challenging to stay on one railroad
- Limited space
- Bigger impact to Mech and Ops Depts
- Maintenance in Loco Shops



Vehicle Types: Pros/Cons

Former Passenger Vehicles



Pros:

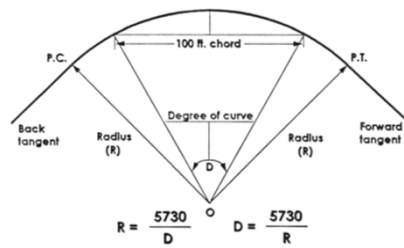
- Allows people to ride onboard
- Lots of room to add more inspection systems

Cons:

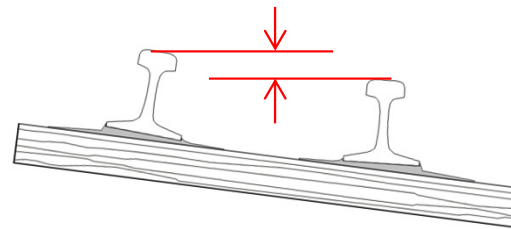
- Difficult to put in Mixed Manifest (generally put in dedicated train consist)
- Need to provide electrical power source
- Non-revenue generating vehicle



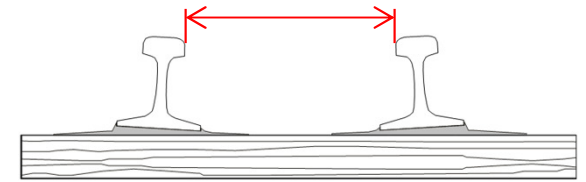
Base Measurements



Curvature



Crosslevel
Warp & Twist



Gauge



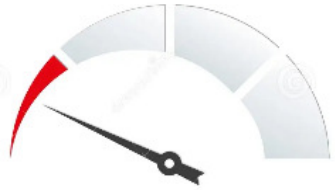
Profile



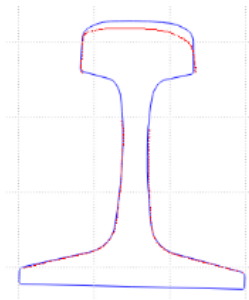
Alignment



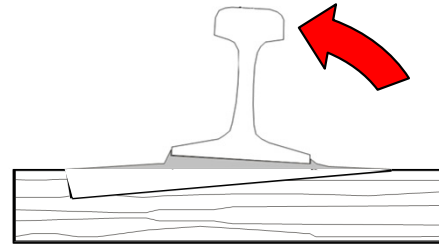
Add-On Technology



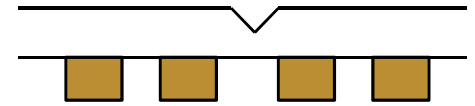
Zero-Speed
Track Geometry



Rail Profile



Rail Cant



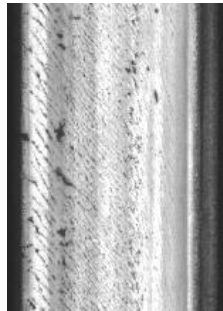
Wheel/Rail
Acceleration



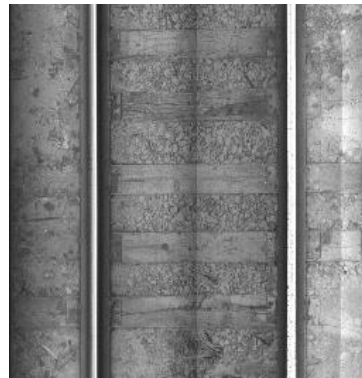
Add-On Technology (continued)



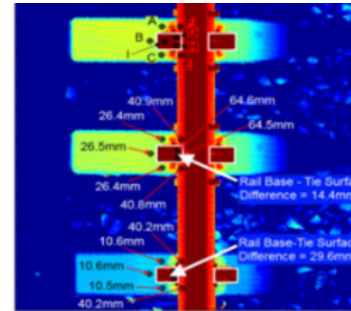
Joint Bar Imaging



Rail Surface Imaging

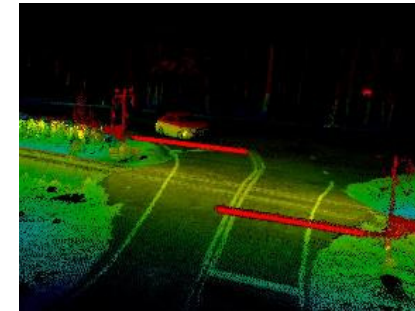


Track Component Imaging



3D Machine Vision

Ref: <https://railai.tetrattech.com/3d-railroad-track-assessment-system/>



Right-of-Way Inspection with LiDAR



Continued Trends:

Inspecting more track conditions

Reproducibility and Calibration expectations

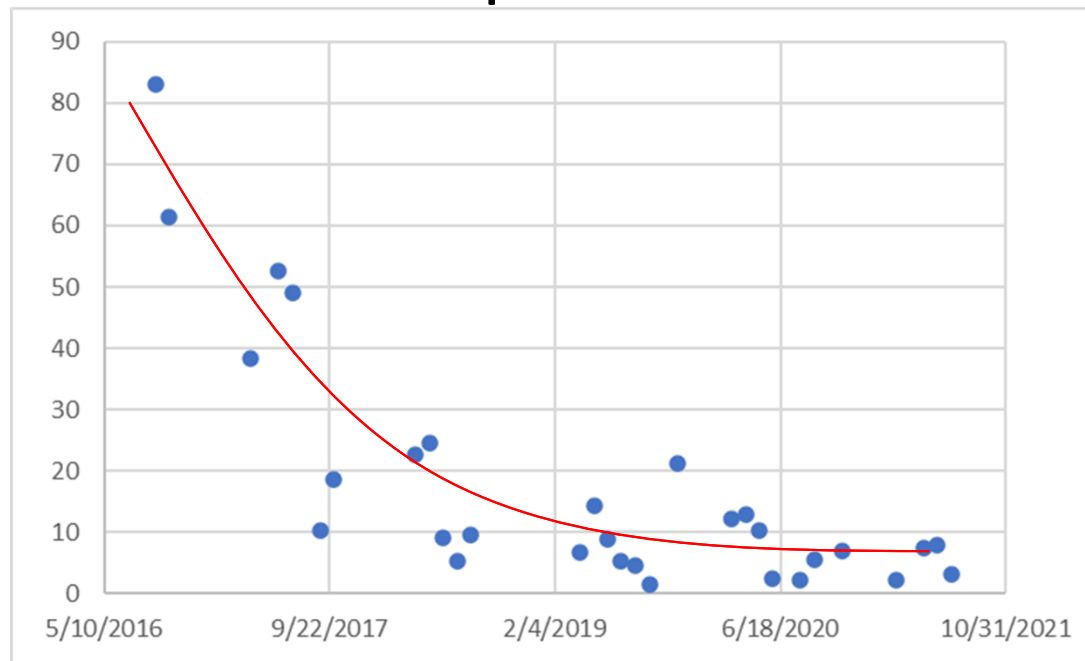
Tailored maintenance for the measurement vehicles



CASE STUDY: Introduction of ATGMS

Monthly Survey Maximums of Urgent Exceptions per 100 Miles on Example Subdivision

Regulatory Exceptions per 100 Miles

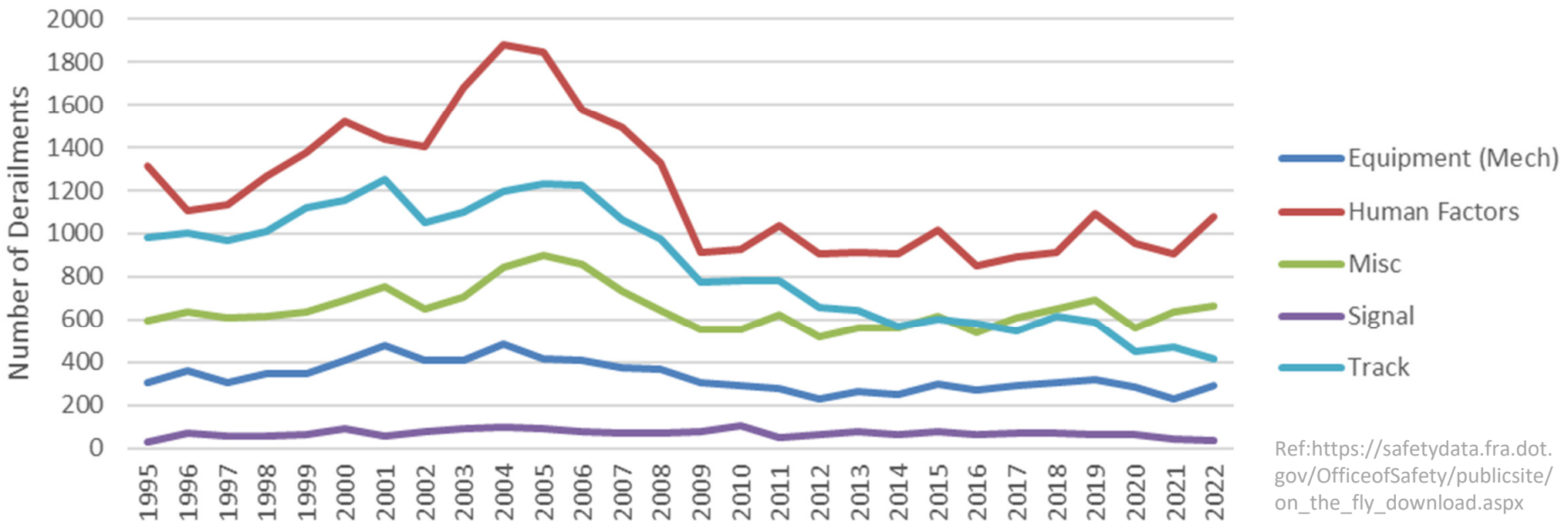


10X
Reduction



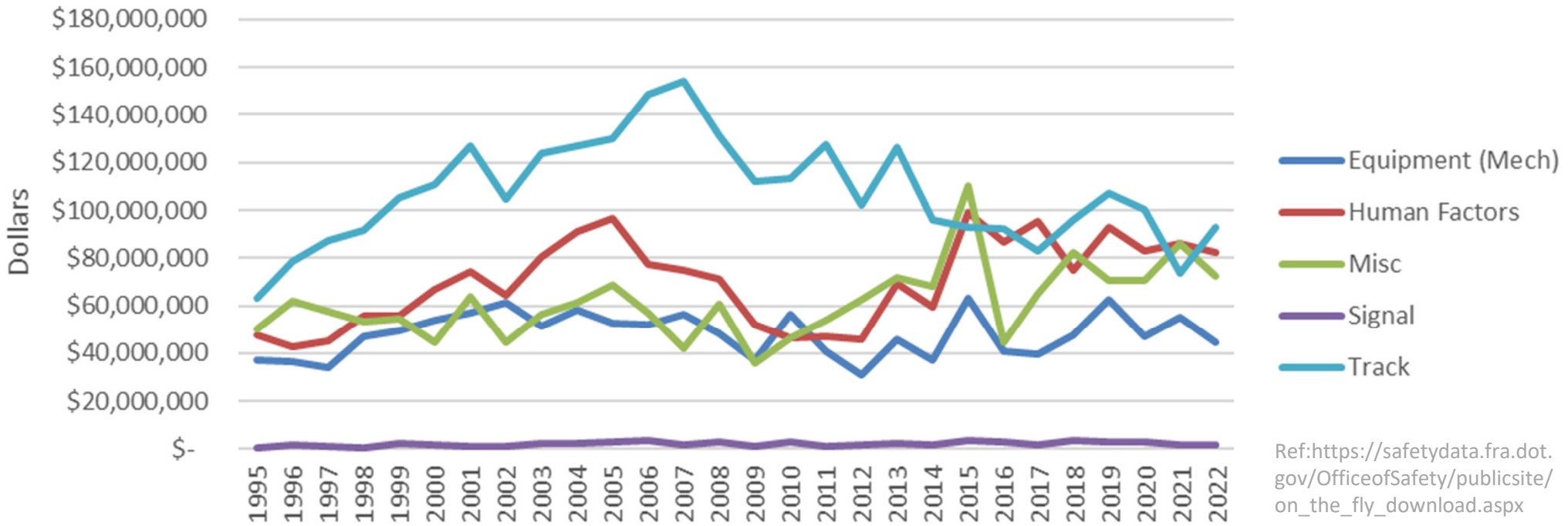
Derailment Stats

Number of Derailments by Cause Type



Derailment Stats

Damage Cost of Derailments by Cause Type



Questions?



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