FEDERAL RAILROAD ADMINISTRATION

ATIP

AUTOMATED TRACK INSPECTION PROGRAM

Department of Transportation
Federal Railroad Administration
Office of Safety

FRA DOTX 217 TRACK GEOMETRY CAR SYSTEM CAPABILITIES

Track Geometry Measurement System (TGMS) measures track geometry parameters, i.e., track gage, alignment, track surface (crosslevel, warp, profile) and calculate limiting train speed in curves. Fully equipped with non-contact sensors, the TGMS computes track geometry parameters at speeds of up to 125 miles per hour. Data can be processed to 200 miles per hour.

Differential Global Positioning System DGMS/LDS receivers typically provide position updates at a fixed rate, up to 5 times a second. However, when local terrain or foliage blocks the view of the satellites, DGPS position updates are not available or are not accurate. Other conditions also can interrupt or degrade DGPS performance, including electro-magnetic interference and multi-path conditions. This can cause very significant errors in GPS data. FRA addresses these problems with the help of DGPS/Inertial Navigator system, which combines information from DGPS and inertial sensors to provide accurate coordinates every foot even when DGPS signals are temporarily unavailable or inaccurate.

In addition to providing Geo-coordinates, Navigator includes an automated track feature detection module. The module utilizes a predefined route database to detect approaching Mileposts (or other features of interest like bridges, grade crossings and so on) and insert these marks into the data stream.

Ride Quality Measurement System (**RQMS)** is designed to collect technical data and evaluate ride quality and safety aspects of passenger rail. The RQMS is the result of research initiated by the FRA to evaluate the high-speed ride quality characteristics of passenger trains associated with *Federal Track Safety Standards* exceptions.

Transverse Rail Profile System (TRPS) is a high-performance system that can measure transverse rail profile and complete rail wear and rail cant analysis in real time at 1 foot sample rate up to the maximum speed of the car. Parameters such as rail wear and cant can be displayed along-side track geometry data in real time. The system also detects rail cant and rail wear exceptions in real time. TRPS has a very high rate of successful rail type recognition minimizing the need for rail profile post processing. The systems employ a new **Laser Gage Measurement System** the most technically-advanced measurement of rail gage and profile and can be used as a stand-alone product. The system is expandable to a full Rail Profile Measurement System.

Key Benefits:

- High-speed data collection at speeds up to 170 mph
- Real-time detection of rail type
- Dual camera system for better accuracy and sun immunity
- Uses the same sensors for both gage and profile measurements—a more cost effective solution
- Small, lightweight, portable design. (*NOTE: only onboard DOTX 220)*

Look Ahead Video is a digital video recording system that captures right-of-way images during operational surveys. The system provides FRA inspectors and Headquarters with a track structure image inventory, used for visual review of highway rail grade crossings, railroad bridges, and track locations and conditions associated with *Federal Track Safety Standards* exceptions. *(NOTE: only onboard DOTX 217)*

Mobile Broadband Internet System (MBIS) is an onboard deployable satellite-based broadband internet system that provides a means of post survey upload of measurement systems data and assorted reports to the **Track Data Management System** and FRA defined users. The system allows ATIP to increase the distribution frequency of data collected and makes the **Track Geometry Inspection Report** exception information available to FRA Track Inspectors the day after it is collected on the car.

Digital Survey Log (DSL) allows the user to log information regarding survey progress, delays, and quality-check data into a database that can be automatically queried and reported from. This process allows ATIP to reduce paper consumption during survey evolutions and reduce man-hours necessary for tallying report datum.

Track Quality Index (TQI) is a dimensionless indicator of track quality. TQI is derived from track geometry measurements. FRA's TQI computes the length of "space curves" which are generated by TGMS measured as one-foot intervals and characterized as an average 528 or 264-foot track segment.

Onboard Moving MAP is a near real-time mapping application that will display geographic information on-board the inspection car during a track survey operation. The application provides a map display with information on the car's current position and speed on the rail network as well as exceptions and track features collected during the current survey. As the inspection car moves along the track, the display automatically centers the map based on the GPS location of the inspection car.

ATIP Support Systems

Track Data Management System (TDMS) is an archive of over 275,000 miles of geometry data collected by ATIP geometry cars since 1998. The database system is available to FRA Inspectors through the Internet. Geometry data can be viewed as a Geographic Information map. Inspectors can create statistical reports, e.g., defects per mile by railroad, in their respective regions. The system integrates **GeoEdit™**

GeoEdit™ is a standalone Windows-based **Track Data Management System** program. It can be used to view or edit track geometry data, curve analysis, generate reports or strip charts, and assist in safety or maintenance management planning. It provides for quick access to exception, curve, and graphical data in a concise and user-friendly format.

Digital Track Notebook (DTN) is a portable reference library of regulations. FRA Track Inspectors have the ability to cite track exceptions and violations. The handheld computer is expandable to accommodate collecting digital images and utilizing **Global Position Systems** to collect and detect track geometry exception information in the field. It has a user friendly touch-screen interface and is able to synchronize reports and inspection information such as measurement data with the user's notebook computer.

Portable Track Loading Fixture (PTLF) simulates the loading condition of the **Gage Restraint Measurement System** (GRMS), providing objective, accurate track crosstie/fastener strength data that correlates directly with the full-size GRMS testing system.

FRA DOTX 217 Track Geometry Car

FRA DOTX 217 CAR SYSTEM

Type:	Self-Propelled Railcar (Specialized Maintenance Equipment) Compatible with AAR Interchange Rules
Brakes:	Knorr Disk Brakes with ABS; Parking Brake with Manual Override, Capable Service Brake Rate of 2.5 MPHPS, and an Emergency Rate of 2.8 MPHPS
Communications	Internal Public Address and Cellular Telephone, and (2) 100 Channel Clean Cab Radios. Direct Satellite Communication System, Portable Hand-held radios, Forward Observer's Control Console
Defect Marking	External; DGPS Reporting

DIMENSIONS AND WEIGHTS

Weight, w/ Fuel	210,000 pounds (105 tons)
Loading Each Axle	26.25 tons
Length Over Pulling Force of Couplers (PFC)	91' 10"
Truck Center Distance	65' 11"
Truck Wheelbase	8' 2 1/2"
Maximum Length Carbody (including plows)	89' 4"
Maximum Width Carbody	10' 0"
Maximum Height - Rail to Top of Air Conditioning Units, New Wheels, Light Car	15' 5 1/8"
Height, Rail to Top of Finished Floor	53 3/8"
Wheel Diameter (New)	35 1/2"
Fuel Capacity	1050 U.S. gallons

ACCOMMODATIONS

Safety Equipment	First Aid Kits; Evacuation Tools; Escape Rope; Fire Extinguishers; Derails; Wheel Chocks; Blue Flags and Lights; Personal Protection Equipment (safety vests, eyewear, hard hat, breathing apparatus, steel-toed shoes, etc.)
Seating:	Seating for 20 People (Including Engineer/Pilot); Rear Observation (3); Kitchen (6); Computer Room (3); Forward Area (4)
MISCELLANEOUS	Flammable Stores Locker; Track Illumination Lights, Undercar Instrumentation Lights Accommodations; Closets, six lockers, Lavatory, Galley and two large observation areas at each end of car