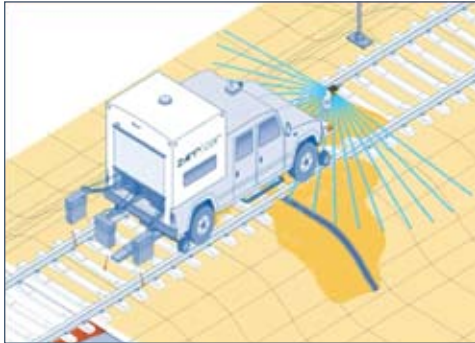


## Zetica's Railway Asset Scanning Car (RASC)

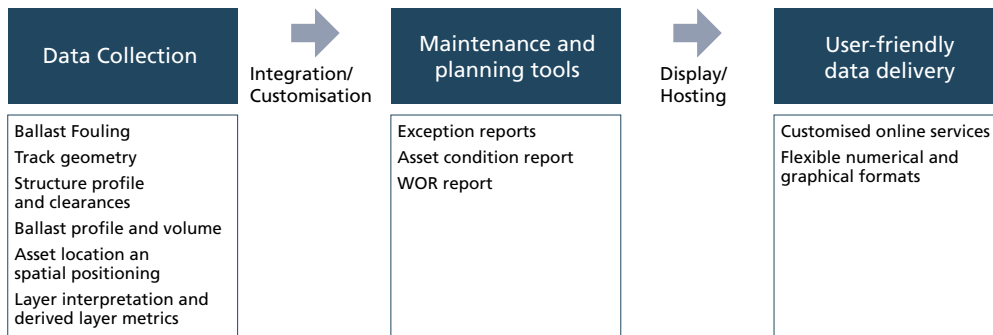
Zetica's RASC is a multi-sensor road rail (hy-rail) vehicle-based inspection system comprising track geometry, laser scanning, rail radar and video inspection systems. RASC allows simultaneous measurement of above and below ground railway assets at speeds of up to 60kph.

All gathered data is linearly aligned through GPS time stamping and on-board gyroscope systems. Significantly, this provides a synchronized and accurately located picture of the rail network.



Asger Eriksen, CEO at Zetica Rail says, "The RASC is the first fully integrated track geometry, laser, GPR and video hy-rail solution to be offered to railroad engineers and maintenance of way planners in the world. The system builds on Zetica's experience of collecting many tens of thousands of kilometres of data and delivering user-friendly results which management can utilise straight out of the box."

### Benefits of a RASC



- **Maximise track output** – a wealth of linked information is delivered in a single pass.
- Generate **exception reports** for track bed condition, ballast quality, structural clearances, track centres, ballast profiles and changes in the surface asset register.

- Provide route managers and maintenance engineers with an **integrated data solution**, to efficiently plan maintenance work strategies.
- Deliver results in **customised formats** to synchronise with existing management processes.
- Generate **work order recommendation reports** detailing which sections of track require specific types of maintenance.
- **Easy access to data** hosted on behalf of customers by live viewing on the web.

### RASC sub systems overview

**GPR sub-system:** Utilises up to 6 antennas to characterise ballast quality, the depth of the free draining layer, sub-grade erosion, wet beds, formation failure, and ballast pockets. All these factors significantly influence track bed performance and the optimum choice of maintenance method to extend the life of the track bed.

**Track geometry sub-system:** Utilises non-contacting transducers such as

- A laser sub-system for gauge and rail profile measurements
- Rate gyroscope sensors for monitoring vehicle roll and heading rotations
- Accelerometers for measurement of cross-level, alignment and gradient
- Displacement transducers to provide real-time profiles of: twist, dynamic cross-level, Cant and Cant deficiency, vertical profile, alignment, curvature, gauge and cyclic top.

**Laser profiling sub-system:** Provides accurate clearance measurements and survey data for a variety of applications such as ballast surface profiling, tunnel profiling and structural clearance measurements. The ballast surface profiling data can be used in conjunction with ballast profiling information provided by the GPR to enable ballast volume calculation. Clearances calculations can be performed by combining the captured structure profile cross-sectional data with the track geometry data. This can be used to identify both single structure and entire route(s) suitability for a given vehicle or vehicles.

**Video sub-system:** Used for track infrastructure inspection and for surface asset mapping.

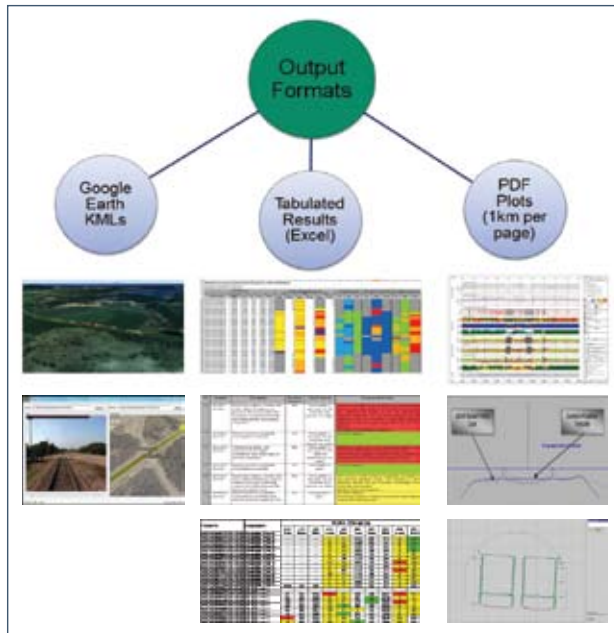
### Specific information provided by the RASC

- Ballast and formation profile (thickness and variance) in centre and both shoulders
- Ballast condition (fouling level) in centre and both shoulders
- Location of wet beds & areas of sub-grade erosion
- Track geometry profiles including rail wear
- Railhead profile
- Ballast surface profile for volumetric calculations of ballast to be replaced or good ballast to relay
- Cross-cutting services and culverts
- Map of surface assets
- Exception reports integrating track geometry and GPR metrics (ballast layer and fouling)
- Exception reports on surface assets and rail profiling



## Asset condition reporting

The reporting of information from the RASC has been developed such that it meets the needs and requirements for maintaining and monitoring the condition of railroad assets. The system also offers flexibility to accommodate a Client's specific requirements in a range of graphical and numeric formats.



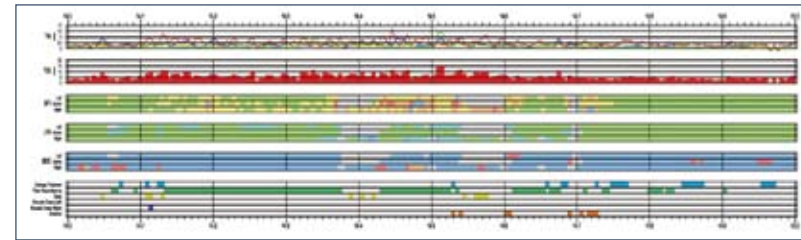
## Work Order Recommendation (WOR) report

Specialist engineering support can also be provided that uniquely combines the metrics gathered by the RASC to derive a series of rules for determining the most appropriate maintenance technique to apply to each section of track. These are summarised in the table below.

Work Order Planning & Recommendations						
Desktop Planning/ Track Inspections	Ballast undercutting/ Screening	Shoulder Cleaning	Surfacing/ Tamping	Trackbed Renewal	Drainage Works	Ballast Management

The result of the data integration is a Work Order Recommendation (WOR) chart that details the type and limits of the recommended maintenance type within each area.

The information available can also be used in undertaking other activities such as ballast management and desktop inspection activities and planning.



GPS coordinates are provided for the start and end of work areas and for spot problem areas such as wet-beds or ballast pockets. This information can be provided in a format that allows track engineers to accurately locate these sites through handheld GPS data loggers.



## Web hosting of results

Easy access to RASC data can be provided through a range of online services. Data can be provided in a variety of formats online, from a simple password-protected webpage that allows information to be viewed and downloaded, to a hosted data site, which can be configured for those clients who require a periodic inspection regime and ability to view data trends for the purpose of forecasting maintenance-planning activities.

