



## Railway Accidents in India: Causes and Safety Measures

This editorial is based on [Railway safety – listen to the voices from below](#) which was published in The Hindu on 17/06/2023. It talks about the Railway Safety in India and highlights the need for better safety measures and infrastructure.

**For Prelims:** Rashtriya Rail Sanraksha Kosh (RRSK), [Interlocking System](#), [KAVACH](#), Ultrasonic Flaw Detection (USFD), Committees

**For Mains:** Railway Safety: Challenges, Measures taken and Way Forward

The Indian Railways is one of the largest railway networks in the world, with millions of people relying on it for transportation every day. Statistics show that over the last two decades, the number of derailments which constitute the majority of accidents has drastically declined from around 350 per year around the turn of the millennium, to 22 in 2021-22.

However, accidents like the one that occurred at Bahanaga Bazar railway station at Balasore highlight the need for better safety measures and infrastructure. The loss of so many lives is a tragic reminder of the importance of ensuring that the railways are safe for everyone who uses them.

In response to this incident, there have been calls for accountability from those in charge of the Railways, as well as a need to address the systemic issues that may have contributed to the accident. Experts are offering suggestions on how to prevent similar incidents from happening in the future, such as improving signalling systems and investing in better technology.

Furthermore, there have been comparisons made with Railway systems abroad, highlighting the need for India to improve its infrastructure and safety measures to match those of other countries. Overall, this incident has brought attention to the importance of ensuring that the Indian Railways are safe and reliable for everyone who uses them.

### What are the Primary Reasons behind Railway Accidents?

- **Infrastructure Defects:** The railway infrastructure, which includes tracks, bridges, overhead wires, and rolling stock, is often defective due to poor maintenance, ageing, vandalism, sabotage, or natural disasters.
  - Much of the infrastructure was built in the 19th and 20th centuries and has not been upgraded to meet the growing demand and modern standards.
  - The railway system also suffers from a lack of funds, corruption, and inefficiency, which hamper its development and maintenance.
  - Moreover, many routes are operating at over 100% capacity, which increases the risk of accidents due to congestion and overloading.
- **Human Errors:** The railway staff, who are responsible for operating, maintaining, and managing

the trains and tracks, are prone to human errors due to fatigue, negligence, corruption, or disregard for safety rules and procedures.

- Human errors can result in wrong signalling, miscommunication, over speeding, or overlooking defects or hazards.
- The railway staff also lack adequate training and communication skills, which affect their performance and coordination.
- **Signalling Failures:** The signalling system, which controls the movement and direction of trains on the tracks, can fail due to technical glitches, power outages, or human errors.
  - Signalling failures can lead to trains running on the wrong track, colliding with other trains or stationary objects, or overshooting stations.
  - For example, the recent train accident in Odisha was reportedly caused by a change in electronic interlocking that was not communicated properly to the drivers.
- **Unmanned level crossings (UMLCs):** UMLCs are places where railway tracks crossroads without any barriers or signals to regulate traffic.
  - UMLCs pose a high risk of accidents as vehicles or pedestrians may not notice the approaching train or may try to cross the track when the train is near.
    - In 2018-19, UMLCs accounted for 16% of all train accidents in India.
  - The railways have eliminated all the unmanned level crossings (UMLCs) on broad gauge routes, but there are still many manned level crossings (MLCs) that pose a risk of accidents.

## What has Railways Done to Reduce Accidents so far?

- **Rashtriya Rail Sanraksha Kosh (RRSK):** A safety fund for critical assets. It was established in 2017-18 with a corpus of Rs 1 lakh crore over a period of five years for critical safety related works such as track renewals, signalling projects, bridge rehabilitation, etc.
- **Technological Upgradation:** Improved design and features of coaches and wagons. This includes introducing Modified Centre Buffer Couplers, Bogie Mounted Air Brake System (BMBS), improved suspension design and provision of Automatic fire & smoke detection system in coaches. It also includes installing **KAVACH** - an indigenously developed Automatic Train Protection (ATP).
- **LHB Design Coaches:** Lighter and safer coaches for Mail/Express trains. These coaches are based on German technology and have better anti-climbing features, fire retardant materials, higher speed potential and longer service life than conventional ICF design coaches.
- **GPS based Fog Pass Device:** A device to help loco pilots navigate in foggy conditions. It is a GPS enabled hand-held device that displays the exact distance of the approaching landmarks such as signals, level crossing gates, etc. It also alerts the loco pilot with a loud buzzer when the train approaches a signal or a level crossing gate.
- **Modern Track Structure:** Stronger and more durable tracks and bridges. This includes using Prestressed Concrete Sleeper (PSC), higher Ultimate Tensile Strength (UTS) rails, fan shaped layout turnout on PSC sleepers, Steel Channel Sleepers on girder bridges, etc.
- **Ultrasonic Flaw Detection (USFD):** A technique to detect and remove faulty rails. It is a non-destructive testing method that uses high frequency sound waves to inspect the rails for cracks, defects or flaws that may cause derailments or accidents. The defective rails are then removed and replaced with new ones.
- **Mechanization of Track Maintenance:** A system to automate and optimize track maintenance. This includes using machines such as track tamping machines, ballast regulating machines, dynamic track stabilizers, etc to carry out track maintenance activities such as tamping, dressing, stabilizing, etc. This reduces human errors and improves track quality and safety.
- **Interlocking System:** A system to control points and signals centrally. It is a system that uses electrical or electronic devices to operate the points and signals from a central location. It eliminates the need for manual operation of points and signals by staff on the ground. It also reduces the chances of human failure and enhances safety.
- **Elimination of Unmanned Level Crossings (UMLCs):** UMLCs are being eliminated progressively by closing, merging, manning, or providing subways/road under bridges/road over bridges.

## What have the Various Committees recommended to ensure Railways Safety?

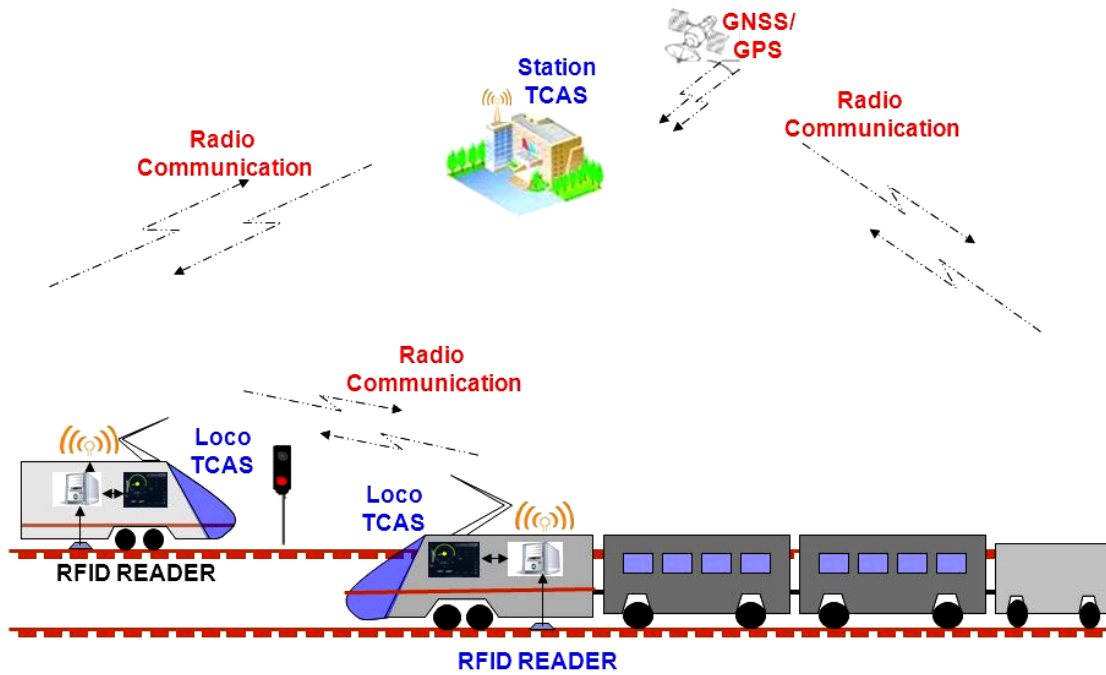
- **Kakodkar Committee (2012):**

- Creating a **statutory Railway Safety Authority**
- Setting up a non-lapsable **Rashtriya Rail Sanraksha Kosh (RRSK)** of Rs. 1 lakh crores over 5 years for safety works
- Adopting advanced technologies for track maintenance and inspection
- Improving human resource development and management
- Ensuring independent accident investigation
- **Bibek Debroy Committee (2014):**
  - Separating railway budget from general budget
  - Outsourcing non-core activities
  - Creating a **Railway Infrastructure Authority of India**
- **Vinod Rai Committee (2015)**
  - Establishing an **independent Railway Safety Authority** with statutory
  - Setting up a **Railway Accident Investigation Board** to conduct independent and impartial inquiries.
  - Creating a **separate Railway Infrastructure Company** to own and maintain railway assets
  - Introducing a **performance-linked incentive scheme for railway employees**

## What should be Done More to Enhance Safety in India?

- **Invest More in Safety-Related Works:** Allocate more funds for track renewal, bridge repair, signalling upgrade, coach refurbishment, etc.
- **Train Employees to Minimize Human Errors:** Provide regular and comprehensive training to the railway staff on the latest technologies, equipment, systems, safety rules and procedures.
- **Eliminate Level Crossings:** Construct Road overbridges (ROBs) or road underbridges (RUBs) to replace the unmanned and manned level crossings.
- **Adopt advanced technologies:** Install anti-collision devices (ACDs) such as [Kavach](#)/ Train Collision Avoidance System (TCAS), Train Protection Warning System (TPWS), Automatic Train Control (ATC), etc.
  - The railways are in the process of installing these technologies on some sections of tracks, but they need to be expanded to cover the entire network.
- **Introduce Performance-Linked Incentives:** Reward the railway staff based on their performance and compliance with the safety rules and procedures.
- **Outsource Non-Core Work:** Transfer the non-core activities such as maintaining hospitals, colleges etc to private or public sector entities, which can improve efficiency and reduce costs.
- **Create A Statutory Railway Safety Authority:** Set up a railway safety authority as a statutory body with powers to frame safety standards, conduct safety audits and inspections, enforce accountability and penalties for lapses, and investigate accidents.
- **Conduct Regular Safety Audits and Inspections:** Monitor, evaluate and audit the safety performance of the railway staff, infrastructure and equipment, and enforce strict accountability and penalties for lapses.
- **Enhance Coordination and Communication:** Improve the communication and coordination among the railway board, zonal railways, divisions, production units, research organisations, etc., which are involved in railway operations.
- **Establish a Confidential Incident Reporting and Analysis System (CIRAS):** It was developed by a British University; a similar mechanism should be implemented that encourages lower-level staff to report deviations in real-time while maintaining confidentiality.
  - This system should be supported by the necessary communication and information technology infrastructure, making it accessible and user-friendly for all staff members.
  - Simultaneously, transform the management mindset from a fault-finding and punishment-oriented approach to one that emphasizes shared commitment to safety, focusing on correction rather than punishment and actively listening to the voices of staff at all levels.
  - In matters of railway safety, there has to be an attitudinal change — from the conventional approach of fault-finding and punishment to one of shared commitment to ensure complete safety at all levels.
- **Rethink Indian Railways Management Service (IRMS) Scheme:** Conduct a thorough evaluation of the IRMS scheme and its impact on loyalty, ownership, and safety management. Consider revising or modifying the scheme to preserve a sense of specialization and loyalty towards specific disciplines or departments, promoting a stronger commitment to safety.

# TCAS - System configuration



## What are Some of the Best Global Practices?

- **United Kingdom:** The UK has one of the lowest rates of train accidents in Europe. The UK has implemented various safety measures, such as:
  - **The Train Protection and Warning System (TPWS)**, which automatically stops trains that pass signals at danger or exceed speed limits.
  - **The European Train Control System (ETCS)**, which provides continuous communication between trains and signalling centres.
  - **The Rail Accident Investigation Branch (RAIB)**, which conducts independent and impartial investigations of railway accidents and incidents.
- **Japan:** Japan is known for its high-speed trains, such as the Shinkansen or Bullet trains, which operate at speeds of up to 320 km/h. Japan has achieved a remarkable record of safety, with zero passenger fatalities since the Shinkansen started operating in 1964. Japan has adopted various safety measures, such as:
  - The **Automatic Train Control (ATC)** system, which monitors and controls the speed and braking of trains.
  - The Comprehensive **Automatic Train Inspection System (CATIS)**, which detects defects and faults in trains using sensors and cameras.
  - The **Earthquake Early Warning System (EWS)**, which alerts trains to stop or slow down in case of seismic activity.

### **Drishti Mains Question:**

Railway safety is a crucial issue for the Indian Railways, which is one of the largest and busiest rail networks in the world. Discuss the major causes of train accidents in India and the measures taken by the government to prevent them.

