



## Derailments in Indian Railways

**For Prelims:** [Comptroller and Auditor General of India \(CAG\)](#), **Derailment in India**, [Rashtriya Rail Sanraksha Kosh \(RRSK\)](#), [Kavach](#).

**For Mains:** Functionality of Kavach, Factors Responsible for Derailments.

### Why in News?

The tragic train accident that occurred on June 2, 2023, at **Bahanaga Bazar railway station in Odisha's Balasore district**, has highlighted the **urgent need for effective safety measures to prevent such devastating incidents**.

- The recent incident has brought attention to the **Kavach initiative**, which aims to enhance railway safety in India. However, the **Kavach system has not been implemented on the Odisha route**.
- [Comptroller and Auditor General of India \(CAG\)](#)'s 2022 report on 'Derailments in [Indian Railways](#)' flagged multiple shortcomings on the **causes of train accidents in the country**.

### What are the Major Highlights of the Report?

- **About:**
  - The CAG report reveals that nearly **75% of the consequential train accidents between 2017-18 and 2020-21 were caused by derailments**.
- **Derailments: The Leading Cause of Train Accidents**
  - Out of **217 consequential train accidents**, 163 (around **75%**) were caused by **derailments**.
  - Other causes of train accidents include **fire in trains (20 accidents)**, **accidents at unmanned level-crossings (13 accidents)**, **collisions (11 accidents)**, **accidents at manned level crossings (8 accidents)**, and miscellaneous incidents (2 accidents).

### Classification of Train Accidents:

- The Railway Board classifies train accidents into two categories: **Consequential Train Accidents and Other [Train Accidents](#)**.
- Consequential Train Accidents include accidents with significant repercussions, such as **loss of life, human injury, property damage, and interruption to railway traffic**.
- **Other Train Accidents** encompass all accidents that do not fall under the consequential category.
- **Factors Responsible for Derailments:**
  - Analysis of inquiry reports revealed **23 factors contributing to derailments in 16 Zonal Railways and 32 divisions**.
  - The major factor responsible for derailments was related to **maintenance of track (167**

cases), followed by **deviation of track parameters beyond permissible limits** (149 cases) and **bad driving/overspeeding** (144 cases).

▪ **Rashtriya Rail Sanraksha Kosh (RRSK):**

- The CAG also analysed the performance of **RRSK**, established in **2017-18 to strengthen safety measures on the rail network to prevent accidents with a corpus of Rs 1 lakh crore.**
  - The audit found that while the **Gross Budgetary Support of Rs 15,000 crore had been contributed**, the Railways' internal resources fell short of the target for funding the remaining **Rs 5,000 crore per year to RRSK.**
- This shortfall of funds from internal resources undermined the primary objective of creating RRSK to enhance safety in Railways.

▪ **Declining Allotment of Funds for Track Renewal:**

- The report highlighted a **decline in the allotment of funds for track renewal works**, from **Rs 9,607 crore in 2018-19 to Rs 7,417 crore in 2019-20.**
  - Furthermore, the allocated funds for track renewal works were not fully utilised.
  - Out of **1,127 derailments during 2017-21**, 289 derailments (**26%**) were linked to track renewals.

▪ **Recommendations and Pending Projects:**

- The CAG report recommended **strict adherence to scheduled timelines for conducting and finalising accident inquiries.**
  - Indian Railway (IR) may develop a **strong monitoring mechanism to ensure timely implementation of maintenance activities** by adopting fully mechanised methods of track maintenance and improved technologies.
- IR may prepare the '**Detailed Outcome Framework**' for each item of safety work as per the indicative outcomes to **gauge whether the benefits derived out of the RRSK funds are in the conformity with the objectives** behind the creation of the Fund

**Note:** Derailment refers to the situation when a train or any other rail vehicle goes off the tracks, resulting in a loss of stability and the inability to continue moving along its intended path. It is a critical safety incident that can lead to significant damage, injuries, and even fatalities.

## What is Kavach?

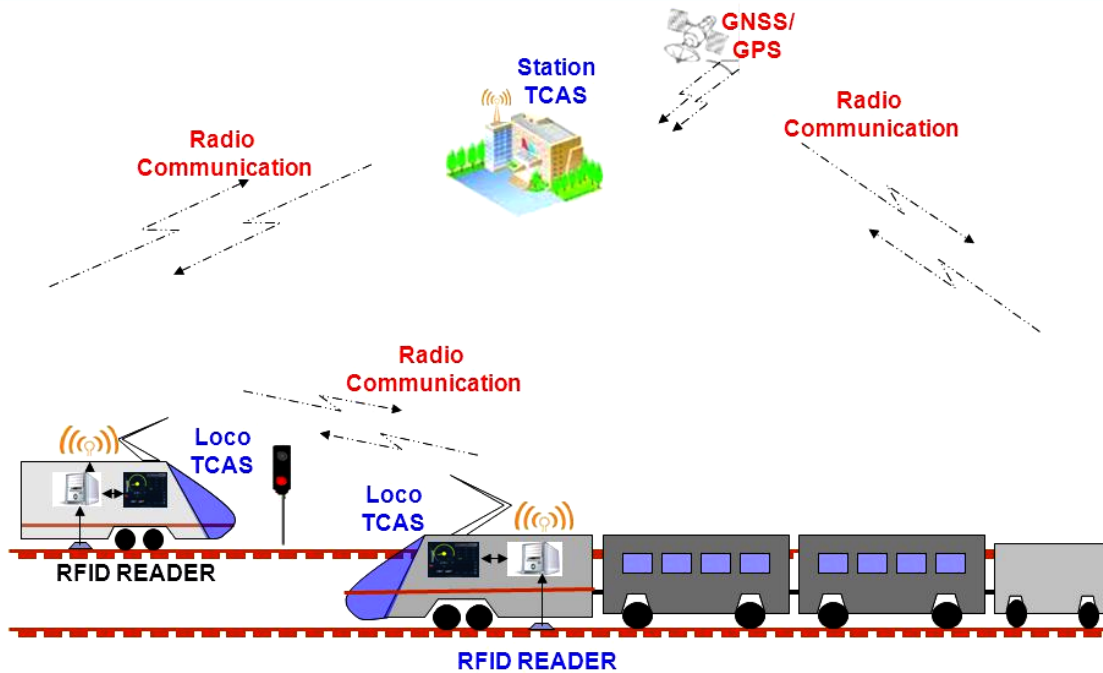
▪ **About:**

- **Kavach** is an **indigenously developed Automatic Train Protection (ATP) system** aimed at enhancing safety in train operations across the vast network of Indian Railways.
  - Developed by the **Research Design and Standards Organisation (RDSO)** in association with three Indian vendors, it has been adopted as our **National Automatic Train Protection (ATP) System.**
- The **Indian Railways Institute of Signal Engineering & Telecommunications (IRISET)** in Secunderabad, Telangana hosts the '**Centre of Excellence**' for Kavach.
  - IRISET is responsible for training in-service railway staff on Kavach through its dedicated Kavach lab.

▪ **Functionality:**

- The system meets **Safety Integrity Level-4 (SIL-4) standards**, signifying its high reliability.
- **Prevents trains from passing red signals** and enforces speed restrictions.
- Activates the braking system automatically if the driver fails to control the train.
- Prevents collisions between two locomotives equipped with Kavach systems.
- Relays **SoS messages during emergency situations.**
- Offers **centralised live monitoring of train movements** through the Network Monitor System.
- Utilises **Traffic Collision Avoidance System (TCAS)** for two-way communication between the station master and loco-pilot.

# TCAS - System configuration



## Implementation and Deployment of Kavach:

- Of the total route length of **1.03 lakh kilometres**, only 1,455 kilometres have been brought under Kavach yet.
  - The **South Central Railway (SCR) Zone** has been at the forefront of Kavach implementation.

## Way Forward

- Utilising Data Analytics and AI:** Utilise **big data analytics** and **artificial intelligence** to analyse vast amounts of data collected from **trains, tracks, and infrastructure**. This can help **identify patterns, detect anomalies, and predict potential safety risks**, enabling proactive interventions.
- Implementing Kavach Project:** It is crucial to **expedite the implementation of the Kavach project** on the **Howrah-Chennai line passing through at least four railway zones**.
  - Other railway zones should prioritise the installation of the Kavach system to **ensure enhanced safety measures across the entire route**.

**Source: IE**