

Rail E-Security & Safety Vision, Strategy, Research and National Commitment



RAIL e-SECURITY SOLUTIONS





ALL INDIA RAIL SAFETY COUNCIL (AIRSC)
A National Body for Rail & Metro Safety, Security,
Research and Capacity Development



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Azadi Ka
Amrit Mahotsav



**RAIL
E-SECURITY
& SAFETY**

VISION • STRATEGY • RESEARCH • NATIONAL COMMITMENT



**RAIL
e-SECURITY
SOLUTIONS**



RAILWAY
CYBER
SECURITY



AI POWERED
SURVEILLANCE



NETWORK
MONITORING



DATA
ENCRYPTION



SECURITY
OPERATIONS
CENTRE (SOC)



CRITICAL
INFRASTRUCTURE
PROTECTION



RAIL SAFETY
ENGINEERING



DIGITAL RISK
ASSESSMENT



EMERGENCY
RESPONSE



RAILWAY
COMMUNICATION



THREAT
INTELLIGENCE



DISASTER
MANAGEMENT

The All India Rail Safety Council is committed to strengthening safety standards, technological resilience, and operational excellence across India's railway ecosystem. In the era of digital transformation, the Council plays a vital role in integrating cybersecurity, safety engineering and innovation-driven research to safeguard railway infrastructure and passengers.

SAFE RAILWAYS • SECURE NETWORKS • SMART FUTURE

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Vision

To establish Indian Railways as a globally benchmarked, digitally secure, and safety-driven transportation system, ensuring zero-compromise on passenger safety, operational reliability, and national infrastructure protection.

Mission

To promote comprehensive Rail E-Security frameworks across all railway operations

To integrate cybersecurity with railway safety systems for holistic risk mitigation

To encourage research, innovation, and indigenous technology development

To build capacity, awareness, and skilled human resources in rail safety and cybersecurity

To develop standardized policies and compliance frameworks aligned with global best practices

Necessity of Rail E-Security & Safety

With the rapid adoption of digital technologies such as automated signaling, AI-based operations, IoT-enabled monitoring, and cloud-based railway services, the railway ecosystem has become increasingly complex and interconnected.

This transformation has made Rail E-Security a critical necessity due to:

Rising cyber threats targeting critical infrastructure

Increased dependency on digital control and communication systems

Need to protect passenger data and operational intelligence

Ensuring uninterrupted railway services and national security

Rail safety today is not only about physical infrastructure but also about securing digital and cyber-physical systems that directly influence train operations and passenger safety.

Council's Involvement in Rail E-Security & Safety

The All India Rail Safety Council actively contributes to strengthening rail e-security through:

Policy Advocacy & Framework Development

Formulating national-level rail cybersecurity guidelines

Promoting adoption of standards such as ISO 27001 and IEC 62443

Technical Collaboration

Partnering with government agencies, research institutions, and industry experts

Supporting implementation of advanced systems like Automatic Train Protection (Kavach)

Capacity Building

Conducting training programs, workshops, and awareness campaigns

Developing specialized certification programs in rail cybersecurity

Audit & Compliance

Facilitating security audits and vulnerability assessments

Encouraging continuous monitoring and compliance mechanisms

Innovation Promotion

Supporting startups and indigenous solutions under "Make in India"

Encouraging development of secure digital railway technologies

Rail Safety Research & Development Forum (RSRDF)

To further strengthen innovation and knowledge sharing, the Council promotes the Rail Safety Research & Development Forum (RSRDF) as a dedicated platform for advancing rail safety and e-security.

Key Objectives of RSRDF

To drive cutting-edge research in rail cybersecurity and safety systems

To facilitate collaboration between academia, industry, and government bodies

To develop future-ready technologies for smart and autonomous railways

To create knowledge repositories, standards, and best practices

Priority Research Areas

Cybersecurity for signaling and train control systems

AI-based predictive safety and threat detection

Secure communication networks (5G/FRMCS for railways)

IoT and sensor security in railway infrastructure

Blockchain applications for secure data management

Human factors and safety engineering

Simulation and cyber-range environments for training

Strategic Importance

The RSRDF serves as a national innovation hub, ensuring that India remains at the forefront of safe, secure, and technologically advanced railway systems.

Rail E-Security & Safety: Advanced Framework, Research, and Future Readiness

1. Integrated Concept of Rail E-Security & Safety

Rail e-security encompasses the protection of cyber-physical railway systems, including:

Signaling and train control systems

Communication networks (GSM-R, LTE, 5G)

Passenger and freight management systems

IoT-enabled smart infrastructure

A unified approach ensures safety, reliability, and resilience across railway operations.

2. Critical Risk Landscape

Railway systems face evolving threats such as:

Ransomware attacks on operational systems

Signal interference and communication spoofing

Unauthorized system access

Data breaches and service disruptions

These threats have direct implications on passenger safety and operational continuity, making cybersecurity a core safety concern.

3. Advanced Rail E-Security Architecture

Multi-Layer Security Approach

Network security (firewalls, IDS/IPS)

Application security (ticketing, databases)

OT security (SCADA, signaling systems)

Endpoint and device protection

Identity & Access Management

Multi-factor authentication (MFA)

Role-based access control (RBAC)

Digital signatures and PKI

Real-Time Monitoring

Security Operations Centers (SOC)

AI-driven threat detection

Incident response frameworks

4. Integration with Railway Safety Systems

Automatic Train Protection systems (e.g., Kavach)

Secure signaling and cab communication systems

AI-enabled surveillance and monitoring

These systems ensure real-time safety enforcement and cyber resilience.

5. Research & Development in Rail E-Security

Key Focus Areas

AI and machine learning for predictive security

Cyber-physical system protection

Secure next-generation communication systems

Autonomous train safety validation

Cyber simulation and testing environments

Innovation Ecosystem

Collaboration with universities and R&D institutions

Establishment of dedicated research centers

Public-private partnerships

6. Challenges

Integration of legacy systems

Lack of uniform cybersecurity standards

Skill gaps and awareness issues

Expanding digital attack surface

7. Strategic Roadmap

National Rail Cybersecurity Policy

Indigenous technology development

Continuous training and skill development

Real-time monitoring and threat intelligence

Strengthening R&D through RSRDF

8. Future Vision

A secure, smart, and resilient railway ecosystem powered by:

Digital innovation

Advanced cybersecurity frameworks

Intelligent safety systems

Continuous research and development

Rail E-Security & Safety is a national priority and strategic necessity. Through strong leadership, research-driven innovation, and collaborative efforts, the All India Rail Safety Council is committed to building a railway system that is secure, efficient, and globally recognized for excellence in safety and technology





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Rail E-Security & Safety

Vision • Strategy • Research • National Commitment

Building a Secure, Safe & Future-Ready
Railway Ecosystem for India



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SAFETY FIRST
People • Assets • Operations



TECHNOLOGY LED
AI • IoT • Analytics • Automation



COLLABORATION
Industry • Institutions • Government



SUSTAINABILITY
Net Zero • Green Rail • Resilience



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