



NATIONAL RAILWAY SAFETY INNOVATION MISSION (NRSIM)

A FLAGSHIP INITIATIVE OF THE RAIL SAFETY RESEARCH AND DEVELOPMENT FORUM (RSRDF)

DRIVING INNOVATION. ADVANCING SAFETY.
TRANSFORMING THE FUTURE OF RAILWAYS.



AI & MACHINE
LEARNING



IOT & SMART
SENSORS



DIGITAL TWINS &
SIMULATION



DRONES &
ROBOTICS



BIG DATA
ANALYTICS



SATELLITE
MONITORING



AUTONOMOUS
SYSTEMS



CYBERSECURITY &
DATA PROTECTION



INTELLIGENT
TRANSPORTATION

KEY FOCUS AREAS



FUTURE RAILWAY TECHNOLOGIES

Promote next-generation technologies including AI, ML, IoT, Digital Twins, Big Data, Robotics, Drones, Satellite Monitoring, Autonomous Systems and ITS solutions.



INFRASTRUCTURE SAFETY

Develop innovative methods for monitoring tracks, bridges, tunnels, stations, signalling, electrification, rolling stock and critical assets using predictive technologies.



HUMAN FACTORS RESEARCH

Study behavioural safety, fatigue management, ergonomics, competency, organizational culture and leadership for stronger human performance.



CLIMATE RESILIENT RAILWAYS

Encourage research on climate adaptation, flood resilience, energy efficiency, green technologies and environmental sustainability.



DIGITAL RAILWAY TRANSFORMATION

Support integrated digital platforms for real-time monitoring, predictive maintenance, cybersecurity, operational intelligence and safety performance management.

CORE AREAS OF RESEARCH

- ✓ Railway Safety Engineering
- ✓ Metro Rail Safety
- ✓ High-Speed Rail Safety
- ✓ Railway Operations Management
- ✓ Signal & Telecommunication Systems
- ✓ Artificial Intelligence Applications
- ✓ Railway Cybersecurity
- ✓ Smart Railway Infrastructure
- ✓ Disaster Risk Reduction
- ✓ Emergency Management
- ✓ Fire & Life Safety
- ✓ Occupational Health & Safety
- ✓ Human Factors Engineering
- ✓ Risk Assessment & Safety Analytics
- ✓ Railway Asset Management
- ✓ Intelligent Mobility Systems
- ✓ Sustainable Railway Technologies
- ✓ Energy Management
- ✓ Rolling Stock Safety
- ✓ Freight Transportation Safety
- ✓ Passenger Safety Enhancement



INNOVATION ECOSYSTEM

- Indian Railways & Metro Rail Organizations
- Railway PSUs & Production Units
- Research Institutions & Universities
- Engineering Colleges & Academic Centers
- Technology Startups & Innovators
- Manufacturing Industries
- International Railway Organizations
- Safety Professionals & Consultants
- Professional Associations & Think Tanks
- Young Researchers & Students

RESEARCH COLLABORATION

- Government Ministries & Departments
- Railway Organizations & PSUs
- National & International Research Labs
- Universities & Academic Partners
- Standards & Regulatory Organizations
- Technology Companies & Innovators
- Public & Private Sector Enterprises
- Multidisciplinary Research Teams

KNOWLEDGE DEVELOPMENT

- Research Publications & Journals
- White Papers & Policy Briefs
- Technical Standards & Guidelines
- Case Studies & Innovation Reports
- National Conferences & Seminars
- Digital Knowledge Repository



FLAGSHIP PROGRAMMES OF NRSIM



National Railway
Safety Innovation
Challenge



Smart Rail Technology
Accelerator
Programme



AI for Railway
Safety
Initiative



Railway Safety
Startup Incubation
Programme



National Railway
Research Fellowship
Scheme



Innovation Grants
for Young
Researchers



Digital Railway
Laboratory
Network



Railway Safety
Data Intelligence
Programme



National Safety
Analytics
Centre



Predictive Maintenance
Research
Initiative



Railway Disaster
Resilience
Programme



Railway Cybersecurity
Innovation
Centre



Railway Human Factors
Research
Programme



Green Railway
Technology
Mission

CAPACITY BUILDING INITIATIVES



Professional
Certification
Programmes



Technical Workshops &
Training



Executive & Faculty
Development



Online Learning Platforms



Research
Fellowships & Grants



Innovation Competitions



Student Innovation
Projects



Leadership Development



Internships &
Industry Exposure



Global Exposure &
Collaborations

NATIONAL IMPACT

- ✓ Reduction in railway accidents and operational risks
- ✓ Enhanced passenger & workforce safety
- ✓ Adoption of globally benchmarked safety technologies
- ✓ Strengthened research & innovation capabilities
- ✓ Improved infrastructure reliability & resilience
- ✓ Increased operational efficiency & service quality
- ✓ Development of indigenous railway technologies
- ✓ Enhanced disaster preparedness & emergency response
- ✓ Creation of high-value research & technical employment
- ✓ Promotion of sustainable & environmentally responsible railways
- ✓ Positioning India as a global centre for railway safety research and technological innovation



SAFE TRACKS
STRONG NATION
UNITED INDIA

INNOVATING TODAY FOR THE SAFE RAILWAYS OF TOMORROW



www.railsafety.co.in



www.railsafety.net.in

Aligned with





Dr. R. Padmanabhan
Chairman
All India Rail Safety Council (AIRSC)

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DRIVING INNOVATION. ADVANCING SAFETY. TRANSFORMING THE FUTURE OF RAILWAYS.

The National Railway Safety Innovation Mission (NRSIM) is a flagship strategic initiative of the Rail Safety Research and Development Forum (RSRDF), established to promote innovation, research excellence, advanced technologies, and collaborative solutions that strengthen the safety, security, reliability, and sustainability of railway transportation systems.

NRSIM brings together researchers, railway professionals, policymakers, academic institutions, technology companies, startups, manufacturers, industry experts, and government organizations to jointly develop practical and future-ready safety solutions for the railway and metro rail sectors.

As railway systems evolve through high-speed rail, metro rail expansion, artificial intelligence, digital transformation, predictive maintenance, intelligent signalling, autonomous inspection technologies, and integrated transportation networks, safety innovation has become one of the most important pillars of national development.

NRSIM accelerates this transformation by encouraging scientific research, indigenous technology development, applied engineering, and evidence-based policy recommendations that contribute to safer railway operations.

The mission supports India's vision of creating a globally competitive, technologically advanced and zero-accident railway ecosystem aligned with Viksit Bharat 2047, Atmanirbhar Bharat, Digital India, Make in India, and the United Nations Sustainable Development Goals (SDGs).



VISION

To establish India as a global leader in railway safety innovation by creating an integrated ecosystem of research, technology, education, policy development, and collaborative partnerships that continuously enhance railway safety, operational excellence, and public confidence.

MISSION

The National Railway Safety Innovation Mission seeks to:

- ✓ Promote world-class research in railway safety and transportation systems.
- ✓ Develop innovative technologies that prevent accidents and improve operational reliability.
- ✓ Support indigenous design, engineering, and manufacturing of railway safety solutions.
- ✓ Strengthen collaboration between academia, industry, government, and research organizations.
- ✓ Encourage evidence-based policymaking and international best practices.
- ✓ Build a future-ready workforce equipped with advanced technical knowledge and innovation capabilities.
- ✓ Foster a proactive culture where prevention, continuous improvement, and technological excellence are integral to railway operations.



STRATEGIC PILLARS

- Cutting-edge Research & Innovation
- Digital Transformation & AI Integration
- Predictive Maintenance & Asset Intelligence
- Autonomous Inspection & Robotics
- Cybersecurity & Data Protection
- Sustainability & Green Railways
- Safety Culture & Human Factors
- Global Collaboration & Knowledge Sharing

FOCUS AREAS



INFRASTRUCTURE SAFETY

- ✓ Track, Bridges & Tunnels
- ✓ Structural Health Monitoring
- ✓ Smart Materials
- ✓ Geotechnical Safety



OPERATIONS SAFETY

- ✓ Signalling & Train Control
- ✓ Kavach & ATP Systems
- ✓ Traffic Management
- ✓ Human Factors



TECHNOLOGY INNOVATION

- ✓ AI & Machine Learning
- ✓ IoT & Sensors
- ✓ Digital Twins
- ✓ Big Data Analytics



ROLLING STOCK SAFETY

- ✓ Brake & Traction Systems
- ✓ Fire Safety
- ✓ Crashworthiness
- ✓ Condition Monitoring



PASSENGER & PUBLIC SAFETY

- ✓ Station Safety
- ✓ Crowd Management
- ✓ Emergency Response
- ✓ Accessibility & Inclusion



ENVIRONMENT & SUSTAINABILITY

- ✓ Energy Efficiency
- ✓ Green Technologies
- ✓ Waste Management
- ✓ Climate Resilience

ENABLING ECOSYSTEM



EXPECTED OUTCOMES

- ✓ Significant reduction in railway accidents and incidents
- ✓ Enhanced operational reliability and efficiency
- ✓ Indigenous technologies & global competitiveness
- ✓ Skilled and future-ready workforce
- ✓ Sustainable, resilient & smart railway ecosystem

TECHNOLOGY ENABLERS





Dr. R. Padmanabhan

Chairman

All India Rail Safety Council (AIRSC)

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NRSIM serves as a national platform that brings together researchers, railway professionals, policymakers, academic institutions, technology companies, startups, manufacturers, industry experts, and government organizations to jointly develop practical and future-ready safety solutions for the railway and metro rail sectors.

As railway systems continue to evolve through high-speed rail, metro rail expansion, artificial intelligence, digital transformation, predictive maintenance, intelligent signalling, autonomous inspection technologies, and integrated transportation networks, safety innovation has become one of the most important pillars of national development. NRSIM is designed to accelerate this transformation by encouraging scientific research, indigenous technology development, applied engineering, and evidence-based policy recommendations that contribute to safer railway operations.

The mission supports India's vision of creating a globally competitive, technologically advanced, and zero-accident railway ecosystem aligned with Viksit Bharat 2047, Atmanirbhar Bharat, Digital India, Make in India, and the United Nations Sustainable Development Goals (SDGs).



KEY FOCUS AREAS OF NRSIM



RESEARCH & INNOVATION

Driving cutting-edge research for railway safety



ADVANCED TECHNOLOGIES

AI, IoT, Robotics, Digital Twins & Smart Solutions



SAFETY & RELIABILITY

Preventing accidents and enhancing operational safety



COLLABORATION & PARTNERSHIPS

Uniting academia, industry, government & global experts



CAPACITY BUILDING

Developing future-ready professionals and innovators



SUSTAINABILITY & GLOBAL VISION

Aligned with Viksit Bharat 2047, SDGs and sustainable mobility

VISION



To establish India as a **global leader** in railway safety innovation by creating an integrated ecosystem of research, technology, education, policy development, and collaborative partnerships that continuously enhance railway safety, operational excellence, and public confidence.

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SAFE RAILWAYS ★ STRONG NATION ★ SUSTAINABLE FUTURE



INNOVATE



INTEGRATE



INSPIRE