भारत सरकार Government Of India
रेल मंत्रालय Ministry Of Railways
(रेलवे बोर्ड) (Railway Board)

Minutes Of The Meeting Of
"Technology Mission For Indian Railways (TMIR)"

Held at R.D.S.O., Lucknow on Wednesday, 22nd July 2015

1. In terms of RDSO's letter no. R2/289/TMIR, dated 25.06.2015; meeting of the 'Technology Mission For Indian Railways' (TMIR) was held on 22.07.2015 at RDSO/Lucknow.

2. Following were present :

A. R.D.S.O.	B. 'MICC' Of Technology Mission For IR
1. Shri P.K. Srivastava *Director General / RDSO*	1. Prof. N.S. Vyas *Chairman, Technology Mission for Indian Railways*
2. Shri R.N. Mishra *Sr.ED/ED(CNG)/RDSO*	2. Shri Alok Kumar EDCE(G)/R.Bd. & Co-Chairman/TMIR
3. Shri Anup Kumar *ED/TI/RDSO*	3. Dr. Kalpana Dube *ED/Finance/RDSO & Member/TMIR*
4. Shri Nasim Uddin *ED/PS&EMU/RDSO*	4. Shri V.K. Agarwal *ED/Research/RDSO & Member/TMIR*
5. Shri D.N. Tiwari *ED/Tele/RDSO*	5. Dr. Anirudh Gautam *GM/RITES & Member/TMIR*
6. Shri Deepak Bansal *ED/Signal/RDSO*	
7. Shri Sanjay Kumar *ED/Wagon/RDSO*	
8. Shri S.K. Pandey *ED/Track-I/RDSO*	
9. Shri Indrajeet Singh *ED/Carriage/RDSO*	
10. Shri Madhusudan Rao *ED/Motive Power/RDSO*	
11. Shri Brijesh Kumar *ED/Geo.Tech.Engg./RDSO*	
12. Shri A.K. Dadarya *ED/B&S/RDSO*	

3. Address By Director General, RDSO

3.1 DG extended a warm welcome to the Mission Chairman and Members of 'TMIR', which has been set up in accordance with announcement of Hon'ble MR in budget speech 2015-16 and expressed happiness at holding the 2nd meeting of TMIR at RDSO.

3.2 Main objective of the Mission is to plan and implement R&D projects & associated activities, relevant to Indian Railways and to achieve synergy between Railways, Institutions of higher

learning and Industry. Specific relevance would be to facilitate execution of projects in such a manner that goals, especially in the fields of safety, reliability, higher throughput, better infrastructure and to economise unit cost of transportation are achieved in a time-bound manner.

3.3 During the 31st GCM held recently at RDSO, CRB instructed to take focussed projects in specific areas of activities to achieve desired objectives of Railways within a reasonable time frame.

3.4 Some of the important areas mentioned were : Safety, Reliability and Improvement of Assets; Reducing speed differential between goods traffic and passenger traffic, Passenger amenities - vacuum toilets, bio-toilets, clean water availability, waste management and a very good passenger information system. Projects may be taken up in these areas through TMIR in consultation with the stake-holders and rail users.

3.5 Certain areas of study were also highlighted in GCM, e.g. sensing of rail fracture, wheel shelling problems - which IR is experiencing in LHB coaches, on-board diagnostics, satellite tracking of railways assets and warning at unmanned level crossing gates, warning system for working personnel on track - as IR is losing around more than 350-400 persons per year.

3.6 RDSO have already identified certain projects based on the inputs received from the First Round Table Conference, held at RDSO in Feb '15 and also by taking inputs from Zonal Railways.

3.7 DG assured the Mission Chairman TMIR for full co-operation from RDSO side.

4. Address By Shri Alok Kumar, ED/CE (G) and Co-Chairman / TMIR

4.1 Many ideas were listed after deliberations by the participating dignitaries during first Round Table Conference, held at RDSO in Feb. 2015. With the approval of Hon'ble MR, TMIR has been approved in 2015-16. Now, it is the time to convert all these ideas into projects & opportunities, sanction, execute and implement these in field.

4.2 Prof. N.S. Vyas, Chairman/TMIR, was Co-ordinator of Railway's earlier technology mission - TMRS, when RDSO with IIT/Kanpur piloted 12 projects and 9 technologies could be developed successfully. So, with him as Chairman, TMIR will also progress towards success.

4.3 Dr. V.K. Saraswat, Member NITI Aayog and Chairman Designate to the Advisory Expert Group for 'Make in India' on Indian Railways, during a recent meeting mentioned that projects should be formulated in totality, i.e. concept, scope, deliverables, time frame, cost and final delivery in the form of end product for the users. So, not that technology is finalized per se, but whole of this is converted to actual use. Therefore, proper formulation of projects should be done after due consultation with the end users.

4.4 The sanctioned project cost of Rs.300 crore for the Mission should be put to best use through the consortium approach involving IR, MHRD, MoST and concerned industries. Additionally, research activities of the four new Railway Research Centers are also to be monitored by TMIR, which is expected to deliver the stated objectives for the advancement of the country.

4.5 As already advised, RDSO should get the estimate for TMIR sanctioned early.

5. Address by Prof. N.S. Vyas, Chairman / TMIR

5.1 RDSO has got transformed for the good over last 20 years, as any regular visitor to RDSO will appreciate.

5.2 Earlier, TMRS was successfully implemented, with completion of 9 projects out of 12 and TMIR is ten times bigger than TMRS with Pan-India scope. In TMRS, RDSO had identified projects to be taken up; similar methodology will be followed for TMIR also. RDSO has significant relevance, will continue to be so for the research ecosystem of Indian Railways with hub of TMIR activities and no parallel organisation has been envisaged through TMIR.

5.3 For every project of TMIR, a consortium approach is planned to be followed, with a Principal Investigator (PI) from academic/research institution, one from RDSO and one from Industry. If need be, in some projects, there can be additional Investigators. Provision may also be kept for international collaboration with specialized agencies, to take advantage of expertise.

5.4 All the PIs have to work synergistically; the industry partner will not be just recipient of technology developed, but will be associated in the R&D activity from day one and will assess its implementability - that it can be quickly productized. However, there may be some projects will be theoretical and analytical in nature, to serve specific needs.

5.5 Like earlier, Mission Management Manual (MMM), for the implementation of TMIR, will be framed by MICC in consultation with RDSO and will be presented for approval of the Railway Board. IPR issues will be explicitly addressed in this MMM.

5.6 TMIR also encompasses monitoring of activities which are being done in existing and will be taken up in the future Centres of Railway Research, RTCs and Professional Chairs. Essentially, all research needs to be brought under a unified umbrella of an overall vision and plan, work undertaken is complementary and there is no repetition. Even the railway related research being undertaken by DST and MHRD also should be brought under a unified umbrella of this TMIR.

5.7 Huge interest has been generated all over country for indigenous technology development, through TMIR. Wherever sectors have gone for indigenous developments, like Space, Nuclear and Defence, we have become world leaders. Similar model has to be adopted for Railway Research in Indian to bring at par with the World.

6. Presentations

6.(a) ED/Research gave brief presentation on recently undertaken/completed projects by RDSO :

(1) Train Collision Avoidance System
(2) Radio Based Advance Warning System for Unmanned Level Crossing
(3) Train Collision Avoidance System
(4) Radio Based Advance Warning System for Unmanned Level Crossing
(5) Smoke & Fire Detection System in AC passenger coaches
(6) Vehicle Borne Ultrasonic Flaw Detection System
(7) Ultrasonic Broken Rail Detection (UBRD) System
(8) Development of Improved AT Welding Techniques
(9) Development of Rail stress monitoring system
(10) Continuation of Long Welded Rails on Bridges & Curves
(11) Rail Free Fastening for Long Welded Rails on Girder Bridges
(12) SEJ over H Beam Sleepers
(13) New Track Machines / Technologies
(14) Bridge and Structures
(15) Dual cab EMD locomotives for improved visibility
(16) Fog Pass
(17) Satellite based Accident Site Communication system

(18) Communication between Station Master and Gateman
(19) Development of Double Decker Rake
(20) Design of Bi level auto car wagon BCACBM
(21) Special purpose wagon for transportation of salt
(22) Distributed Power Control
(23) Development of Distributed Power Wireless Control System
(24) Development of Hotel Load Converters for WAP-7 locomotive
(25) Development of WDG5 locomotive for increasing throughput
(26) Upgradation of Speed potential of WAP5 locomotive upto 200 kmph
(27) Upgradation of LHB Coaches for 200 Kmph
(28) Design & Development of High Rise OHE
(29) Development of V-Belt Driven 30 KW Permanent Magnet (PM) alternator for LHB and conventional coaches
(30) Indigenous Air-conditioned EMU with 3-phase propulsion system
(31) Design & Development of Ballastless Track / Washable Apron with indigenous fastenings
(32) Internet (Wi-Fi) on Trains Using Satellite
(33) Bio-Toilet
(34) Electronic fuel injection system
(35) Fuel Efficiency Initiative – Common Rail Electronic Direct injection system
(36) Mobile Emission Test Car (ETC)
(37) Introduction of Biodiesel over IR
(38) Fuel Additives and Fuel Catalysts
(39) Green Initiative - 80 KW Solar Plants

6.(b) Suggestions from Prof. Vyas during the presentation :

(1) Systems like TCAS, radio based warning system for unmanned level crossings, warning system for Trackman etc. should all be integratable in respect of software as well as hardware having the facility of plug and play type for multifarious uses. They should use identical protocol also, otherwise it may present difficulty in upscaling the whole system. Essentially, a Digital Backbone for IR needs to be developed, which can then be used to meet specific needs.

(2) It is also necessary to have RFIDs for all the railways assets for ensuring proper tracking, accountal and facilitating use of latest diagnostic devices.

7. Presentation on Projects Proposed to be taken up under TMIR was done :

7.(a) Areas Identified based on directives of Hon'ble MR :

SL	Areas of Research / Project
1.	Solutions for prevention of accidents on un-manned crossings : (i) Advance warning system to pre-warn road users for approaching trains; (ii) Procurement of TWS (Telecom Dte.)
2.	Satellite based system for monitoring of Railway track and other assets : GIS application for monitoring RAW / RATs & Development of effective flood control measures (B&S Dte.)
3.	Waste Management over Indian Railways with zero discharge philosophy (Carriage Dte.)
4.	Clean, waterless and odourless toilet : (i) Vacuum Toilet for LHB Coaches; (ii) Zero Discharge Toilet (Carriage Dte.)
5.	Pleasant, ergonomically superior interiors for better coach aesthetics retrofit able on existing

SL	Areas of Research / Project
	technologies : (i) Improvement in interior furnishing of coaches; (ii) Ladder Arrangement for upper berth (Carriage Dte.)
6.	Improving efficiency of operations especially to improve turnaround time of coaches and wagons : (i) Improving the efficiency by developing Hollow Axles (Wagon, M&C Dte.) (ii) Use of Indigenous High Speed Camera Based Vehicle Inspection System (Research Dte.)
7.	Introduction of cab signalling and latest signalling arrangements to prevent accidents and signal passing at danger (SPAD) : Development of Train Collision Avoidance System (TCAS) & Automatic Train Protection (ATP) System (Signal Dte.)
8.	Suitable on-board & way-side health monitoring system for predictive maintenance of Rolling Stock : Indigenous Acoustic Bearing Detector (Research Dte.)
9.	Reliable Technological solution to detect rail/weld failure (Track-II and M&C Dtes.)
10.	Development of LNG Based Gas Turbine Locomotive (Engine Development Dte.)
11.	Image Assistance System for train driver (Electrical Dte.)
12.	Fog Vision System (Motive Power Dte.)
13.	Noise mapping & noise source identification for both exterior and interior noise source identification and ranking in a HHP Locomotive (Motive Power & Electrical Dtes.)
14.	Fire Detection and Alarm system for non AC coaches (Carriage Dte.)
15.	SIMRAN and sms based Train information system (Telecom Dte.)
16.	Simulation system to validate various ATP systems (Signal Dte.)
17.	On-board Wi-fi system in trains (Telecom Dte.)

7.(b) 34 Projects identified by RDSO for taking up under TMIR

SL	Areas of Research / Project
1.	**Geotechnical Engineering Directorate** (i) Performance Enhancement of Ballasted Rail Tracks using Geosynthetics Reinforcement (ii) Landslide Monitoring System (iii) Effect of seismic forces on railway embankment and its remedy (iv) Design of railway embankment on soil prone to liquefaction
2.	**Telecom Directorate** (v) Development of LTE based broad band emergency communication system (vi) Study of LTE for deployment over Indian Railways (vii) Track vibration based unmanned L.C. gate warning system
3.	**Testing Directorate** (viii) Developing capabilities for high speed rolling stock testing & training as per international standards, viz. UIC-518 (ix) Complete instrumentation of two newly built coaches for various field trials
4.	**Engine Development Directorate** (x) Development of a gas turbine operated locomotive for Indian Railways
5.	**Electric Loco Directorate** (xi) Image processing based Driver Assistance System
6.	**Energy Management Directorate** (xii) Design of energy efficient lighting system for railway station of Indian Railways

SL	Areas of Research / Project
	(xiii) Standardization of power supply arrangement at Indian Railways station premises
7.	**Motive Power Directorate**
	(xiv) Noise mapping and Noise source identification for both exterior and interior areas and ranking in HHP Locomotive
8.	**Electrical Maintenance Directorate**
	(xv) Energy efficient models for various applications on Indian Railways
9.	**Track Design Directorate**
	(xvi) Development of simulation/mathematical model for working out stresses in rail & other track components and predicting service life on fatigue consideration for various loading requirement
	(xvii) Study of rail bridge interaction and development of simulation model for various cases of continuation of LWR on bridges
	(xviii) Development of suitable technology to detect Rail Fracture and its communication to the driver of an approaching train and central control
	(xix) Development of suitable system for non-destructive testing of rails and rail welds with improved reliability and speed
	(xx) Study of track and rolling stock tolerances for high speed (> 160 kmph)
	(xxi) Rail stress monitoring system to measure rail stress on real time basis
	(xxii) Improvement in specifications of rails to prevent sudden fractures and fixing service life of rail on fatigue considerations
	(xxiii) On-line non-destructive measurement of residual stresses in rails
10.	**Carriage Directorate**
	(xxiv) Solid Waste Management over Indian Railways
	(xxv) Comprehensive study of wheel shelling on LHB coaches of IR
	(xxvi) On Board Condition Monitoring and Condition Based Maintenance (CBM) for Rolling Stock
	(xxvii) Vacuum Toilets
	(xxviii) Zero Discharge Toilet System
	(xxix) Development of fire / smoke detection with alarm system for non-AC coaches
11.	**Wagon Directorate**
	(xxx) Development of alternate enhanced performance wagon designs using alternate & advanced materials like composites and to develop in-house capability of RDSO for mathematical and dynamic analysis alongwith identification & selection of alternate/advanced materials for various applications
	(xxxi) Design of advanced performance versatile multi axle/articulated, improved speed, higher axle load, low height, improved life and track friendly freight bogies as well as to augment in-house capability of RDSO for optimization and numerical analysis of freight bogie designs
	(xxxii) Design of advanced performance (Higher axle load, improved weighing speed, wireless communicated and user & maintenance friendly) weigh bridge by using advanced technologies (like optical fiber and peizo electric) and enhancing in-house capability of RDSO for developing designs and calibration norms
	(xxxiii) Development of optimized design and production protocol for a hollow 25t axle, suitable for "K" class Cartridge Taper Roller Bearing (CTRB)
12.	**Signal Directorate**
	(xxxiv) Setting up of Software validation centre for embedded system

8. Concluding Remarks

8.1 Presentation on 34 projects had been done today; but this list is dynamic and many more ideas may also come from users.

8.2 For better appreciation of the projects, it is necessary to include other details also like cost, time frame, agencies with whom tie-up is proposed, end use of the product, extent of use of the product over a period, say five years (year-wise), approximate cost in implementation etc.

8.3 Mission Management Manual (MMM) needs to be finalized in next one month. Meanwhile, a template covering all these aspects may be circulated to all Directorates, so that they can submit their complete project proposals. It will help in taking decision regarding their acceptance in TMIR. In next two months, MICC will finalise the projects to be undertaken by TMIR.

8.4 On website of RDSO an 'Idea Bank' of projects, grouped into various heads : Safety, Operational Efficiency, Passenger Amenities, Environment, Asset Reliability etc. need to be created for the benefit of all stake holders.

8.5 RDSO should have road map for technology on Indian Railways, each Directorate should do gap analysis and identification of Mission projects to be done accordingly.

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Distribution :

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- Dr. V.K. Saraswat, Chairman Designate of the Advisory Group of Experts for 'Make In India' on IR
- Chairman and all the Members of MICC to 'TMIR' (Technology Mission For Indian Railways)

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- EDPG/MR and PS/MR for kind information of Hon'ble MR please.
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