NavIC Applications for Enhancing Safety in Public Transport System of India

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09th December 2019
ICG-14, Bengaluru
NA VCOM for Indian Railways

ISRO having its own Navigation System (IRNSS) & SATCOM infrastructure has setup a dedicated MSS network for Indian Railways to support NA VCOM requirements & for enhanced Safety in Human Transportation:

- Real-time Train-tacking Information System (RTIS)
- Automatic Warning at Un-Manned Level Crossing (UMLC)

Objective and Salient Feature of the Network:

- Train Tracking (Periodic Train Position Reporting)
- Event Reporting (Arrival, Departure, Run-through, Unscheduled Stoppage etc.)
- Two-way Emergency Messaging
- SoS Feature (During accidents for awareness to other locomotives in vicinity)
- Emergency Warning Broadcast (From control station to all locomotives)
MSS Network for RTIS
(Real-time Train-tacking Information System)

Network Features:
- Hybrid SATCOM & Terrestrial N/W
- SATCOM Channel Access is D-TDMA
- Position Reporting every 30/40 Sec
- Two-way messaging in Aloha Mode
- Network designed for 16K locomotives
- Network implementation supports multi-beam network configuration

CRIS: Centre For Railways Information System
GPRS: General Packet Radio Service
RTIS Network Operations

Real Time Train Information System

Modem Bank
Network Management Software
Delhi Earth Station
Centre for Railway Information Systems

A Project by Space Applications Centre, ISRO in collaboration with CRIS, Indian Railways
Real-time Train-tacking Information System (RTIS)

(Deployment Pictures)

Installed Terminal - Side View

Installed Terminal – Top View

Primary Display in driver cabin (1)

Secondary Display in driver cabin (2)

Indian Railway Navigator (IRN)
Real-time Train-tacking Information System (RTIS)

Availability of Arrival/Departure/Run-through info 99.45%

<table>
<thead>
<tr>
<th>DEVICE ID</th>
<th>LOCO ID</th>
<th>Train Number/Name</th>
<th>Route</th>
<th>From Time</th>
<th>To Time</th>
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</thead>
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<table>
<thead>
<tr>
<th>Mode Of Communication</th>
<th>No. of A/D/R events Expected</th>
<th>No. of A/D/R events Reported</th>
<th>Percentage of Reported A/D/R</th>
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<tbody>
<tr>
<td>GPRS1</td>
<td>183</td>
<td>144</td>
<td>78.69</td>
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<tr>
<td>GPRS2</td>
<td>183</td>
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<td>58.47</td>
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<tr>
<td>MSS</td>
<td>183</td>
<td>181</td>
<td>98.91</td>
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<tr>
<td>Total A/D/R EVENTS</td>
<td>183</td>
<td>182</td>
<td>99.45</td>
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</tbody>
</table>
Automatic Warning at Un-Manned Level Crossings (UMLC)
Automatic Warning at **Un-Manned Level Crossings (UMLC)**

- Automatic Warning at UMLC & in Locomotive when train is 2 Kms away from UMLC
- SOS Feature to avoid follow on accidents
- Remote Health Monitoring of Equipment
- Emergency Broadcast to all
- Emergency small message communication to and from locomotive to control centre
- Navigational aid to loco-pilot

- Proof of Concept Pilot Project done with five (5) UMLC identified in East Central Railways (Hajipur Zone) in Aug-2017.

MSS Terminal & Network designed for IR supports both RTIS & UMLC Project
Field Trial: Automatic Warning at Un-Manned Level Crossings

Setup at UMLC
**Outcome of NAVCOM Applications for Indian Railways**

**Highlights of the NAVCOM Application by ISRO & IR:**

- ☺ **All weather Navigation System:** More than 2500 locomotives are being tracked in real-time and their Control charts are plotted automatically.

- ☺ **Improved Safety:** Emergency messaging from Loco Pilot to Control Room.

- ☺ **Improved Efficiency:** Accurate train running information leads to optimum crew booking & reduction in pre-departure detention (PDD). Punctuality Monitoring.

- ☺ **Improved User Experience:** Web based real-time loco tracking provided to Loco sheds, Zonal Railways and Passengers

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A Joint Initiative by ISRO & Indian Railways

**ISRO: In the pursuit to Harness Space Technology for Societal Applications…**
Thank You