Robotics and Autonomous Systems for Rolling Stock Maintenance

20 October 2015
Exercise - Match your expertise to the challenges...

Other components:
- Drives/transmission, lighting, couplers, buffers, train borne signalling, draw gear, suspension, power systems/engine, electrics (generators, alternators etc.)

- Pantographs
- Doors
- Wheelset maintenance
- Shoe gear
- Toilets
- Axles
- Brakes

Organisation: 
Name: 
Expertise: 
Relevance to rail: 
Benefits to rail:
- Reduced maintenance costs
- Reduced maintenance time
- Increased reliability of inspections and maintenance
- Reduced risk to operators and staff
RAS for Rolling Stock Maintenance: Introduction
Horizon 2020 and Robotics

Margaret Adams
European Programmes Team
Outline

- Innovation
- European engagement @ RSSB
  - H2020 2016-17 call topics of interest
- Collaborating with RSSB
Innovation
The Rail Technical Strategy sets targets for the railway industry of 2040

- 50% reduction in Carbon emissions
- 50% reduction in Cost
- x2 increase in Capacity
- Increased Customer Experience
Horizon 2020

Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020).

Horizon 202 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe’s global competitiveness.

Aim:

- drive economic growth
- create jobs
- tackle societal challenges
- remove barriers to innovation
- make it easier for the public and private sectors to work together in delivering innovation.

Most importantly, Horizon 2020 is open to everyone.
Horizon 2020 work programmes (2016/17)

• Smart, green and integrated transport (Transport)

• Information and Communication Technologies - Information and Communication Technologies (ICT)

• Secure Societies – Protecting freedom and security of Europe and its citizens

• Nanotechnologies, Advanced Materials, Biotechnology, and Advanced Manufacturing and Processing

• Leadership in enabling and industrial technologies – Space

• Secure, clean and efficient energy
H2020 Collaboration – Priority Areas

- **ICT on railway**
  - Internet of Things
  - Big data
  - Cloud computing
  - Cyber security
  - *Robotics and autonomous systems*

- **Energy efficiency**
  - Energy infrastructure
  - Green energy sources

- **Skills and human factors**
  - Impact of new technologies
  - Skills and workforce development
  - Human behaviour, awareness raising
  - Socio economic factors

- **Multi modal transport**
  - Safety
  - Infrastructure
  - Logistics
  - ITS
Potential Use Cases

Example 1: Driverless trains and robotic repairs
Potential Use Cases...

Example 2: Rolling Stock body assembly

Image: The Railway Engineer
Potential use case

Example 2: Using robotics in maintenance procedures

Engineers at Thales UK simulate a train on London's underground rail network with CompactRIO and LabVIEW.
Other examples of topics for Robotics

- Maintenance – how robotics can make maintenance procedures safer.
- Access – how robotics can make access to hazardous areas safer.
- Working at height – how robotics can help.

Modified Bogie for Active Steering - Transport & Railway research at the University of Salford
H2020 2016-17 ICT Robotics and Autonomous Systems - Call

Topics of Interest (information taken from the draft WP)

ICT-25-2016-2017: Advanced robot capabilities research and take-up

The specific challenge here is to develop robots that respond more flexibly, robustly and efficiently to the everyday needs of workers and citizens in professional or domestic environments, and which will also maintain Europe at the forefront of global research and development. The actions will address the whole research value chain, whether generic technology, developing RAS building blocks in the form of key technical capabilities, or market-led prototypes directly involving end users.
ICT-26-2016: System abilities, development and pilot installations

The specific challenge here is to increase the system ability levels in terms of configurability, adaptability, motion, manipulation, decisional autonomy, dependability, interaction, perception and cognitive ability. Such system abilities provide a basis for setting performance metrics and for specifying desired levels of system performance. Reaching higher ability levels than currently available allows to advance the state of the art and to set future targets for robotic systems.
Collaborating with RSSB, European Programme

- Infrastructure owners, service providers, train operators etc.
- Robotics specialists and software developers
- SMEs and application developers able to innovate in Robotics on transport
- Universities and/or research centres for analysing, modelling and testing solutions for transport
- Not-for-profit organisations
- Standardisation and/or regulatory bodies on interoperable systems across modes, sectors and boarders
- Others
Robotics and Autonomous Systems for Rolling Stock Maintenance

Luisa Moisio
Head of R&D, RRUKA Co-Chair
Why are we doing this?

- Reduce maintenance time and cost
- Reduced down time due to maintenance.
- Improve reliability of inspections
- Reduce risk to train maintainers and operators and assist humans with labour intensive tasks

Technology - Reliability - Policy - Ethics
Call for Research

- £250,000 call for research to fund 3-5 projects
- Academic-led feasibility studies (important: industry support!)
- **Novel, blue-sky ideas**

<table>
<thead>
<tr>
<th>Key dates</th>
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<tbody>
<tr>
<td>Call document published</td>
<td>w/c 2 November 2015</td>
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<tr>
<td>Proposals due</td>
<td>15 January 2016</td>
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<tr>
<td>Successful proposal announced</td>
<td>1 February 2016</td>
</tr>
<tr>
<td>Feasibility studies due to start</td>
<td>1 March 2016</td>
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<tr>
<td>Dissemination</td>
<td>Early 2017</td>
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<tr>
<td>Presentation at the 6th RRUKA</td>
<td>November 2017</td>
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<tr>
<td>Annual Conference</td>
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The broad picture

Technology readiness levels

- **Fundamental research**
  - 2016-2017

- **Trials and demonstrations**
  - 2017 - 2019

- **Full scale testing and product acceptance**
  - 2019 +

- **Academic Feasibility Studies**
  - 3-5 studies

- **Horizon 2020**
  - Linked to ICT 25-26

- **Innovation trials**
  - Through industry schemes

- **Innovation in Franchising**
  - Working with franchises involved in IIF pilot

- **Full implementation**
  - Working directly with TOCs
Site visits

<table>
<thead>
<tr>
<th>Key dates</th>
<th>Location details</th>
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<tbody>
<tr>
<td>21 October 2015</td>
<td>TfL Stratford Market depot, London</td>
</tr>
<tr>
<td>28 October 2015</td>
<td>Hitachi’s Ashford depot, Ashford</td>
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<tr>
<td>30 October 2015</td>
<td>Chiltern Railway’s Wembley depot, London</td>
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<tr>
<td>30 October 2015</td>
<td>TfL Stratford Market depot, London</td>
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<tr>
<td>4 November 2015</td>
<td>Longsight Alstom depot, Manchester</td>
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Sign up today or via email: rruka@rssb.co.uk
Next steps

• Delegates will receive a copy of the competition pack, as soon as it’s published (1st week of November).

• The recording of today’s presentations will be available on the webinar hub (see QR code at the back on the programme)

• For any questions, contact rruka@rssb.co.uk
Networking & Consortia building