The hurdles to innovation in railways and how to tackle them

moblab 2016

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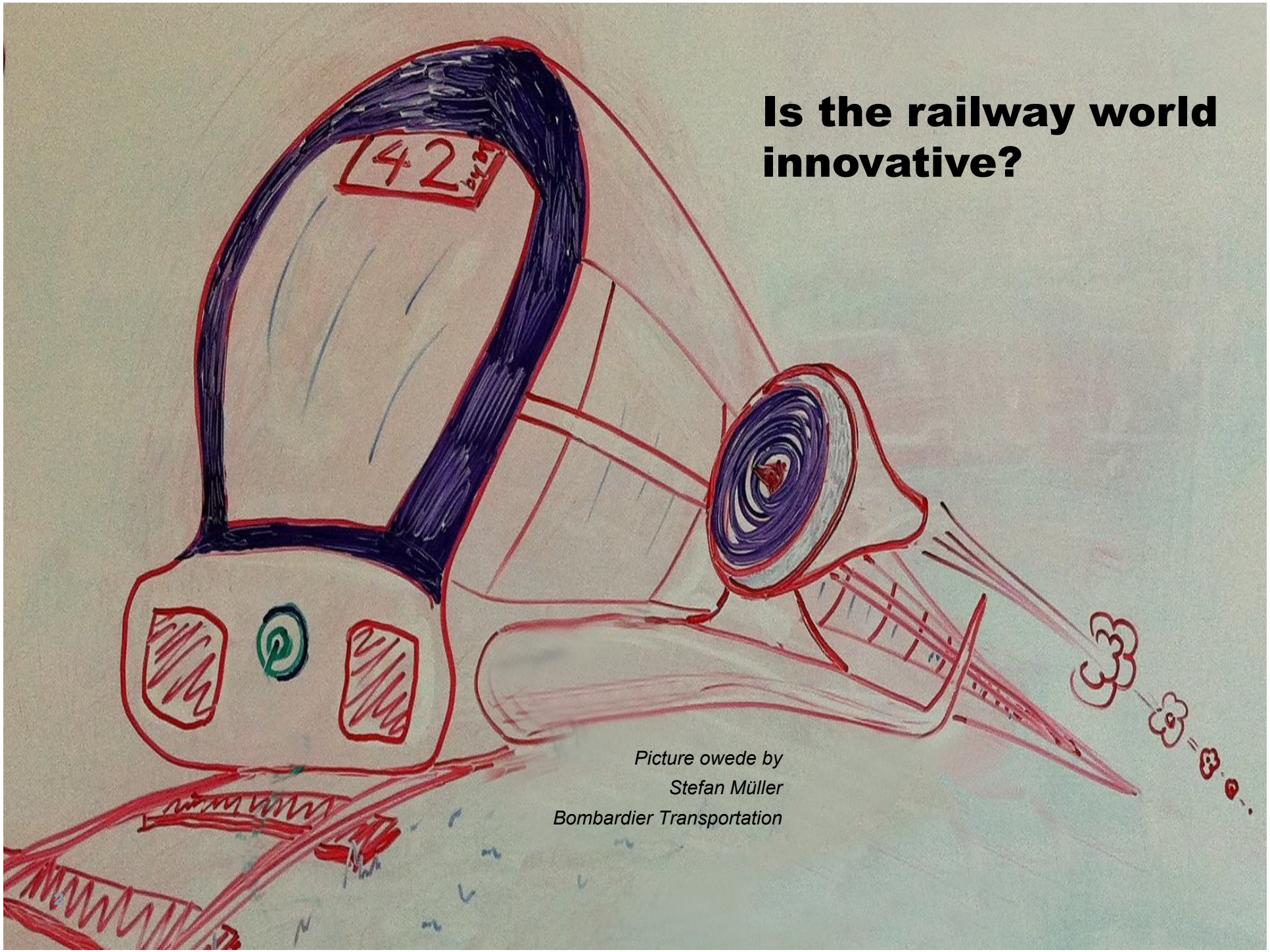

Is the railway world innovative?

Picture owede by
Stefan Müller
Bombardier Transportation

The hurdles to innovation in railways
General perception

- Usual comments on the street, in media:
  - Railway sector is not innovative and lags massively behind the competition
  - Railways is not sexy
  - Railways is too slow to adopt new technologies
  - Railways is too expensive
  - Railways is not flexible
  - Railways does not offer the last mile

- But is the world of railways really non innovative? This presentation is about hurdles to innovations, perception and reality, and possible ways to improve. .

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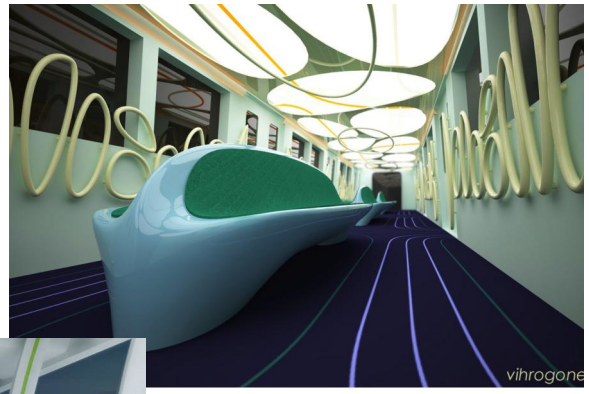
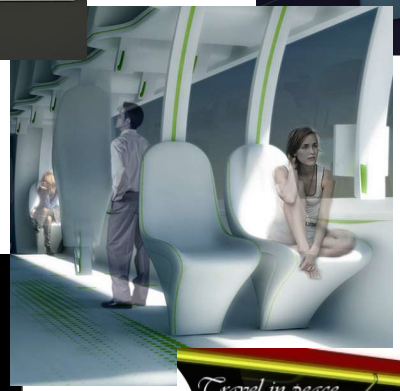
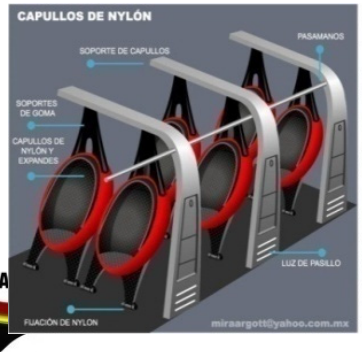
The hurdles to innovation in railways
BT Innovation Contests - YouRail: Some Pictures







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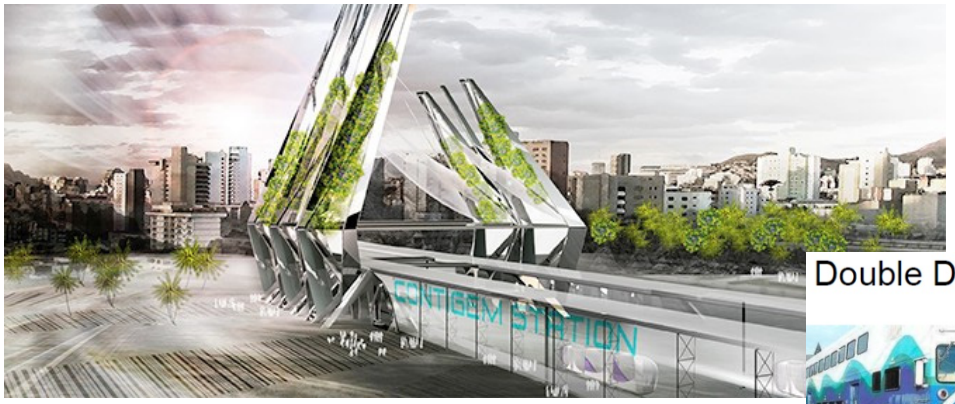
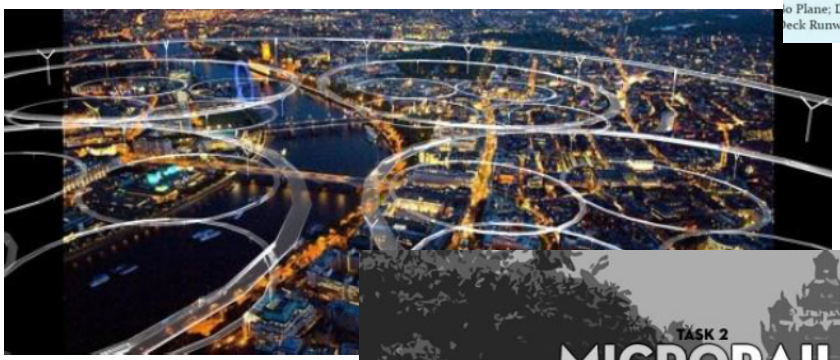
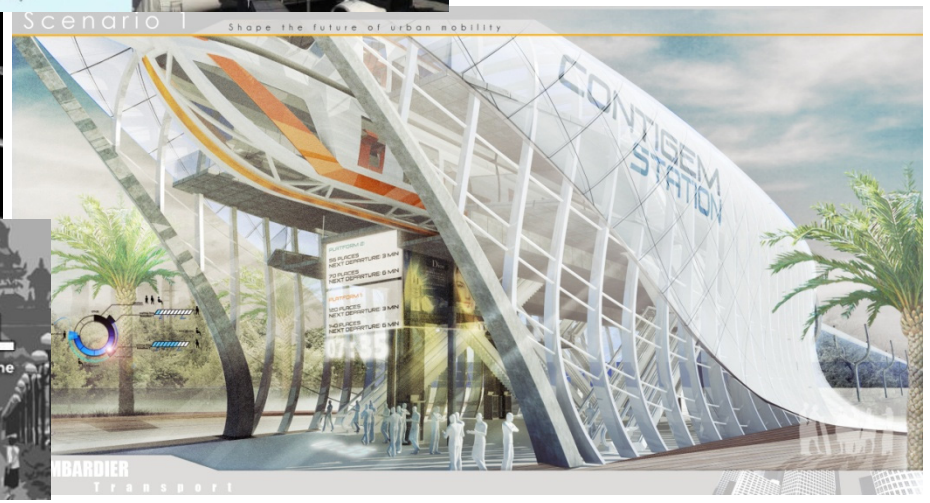
The hurdles to innovation in railways
BT Innovation Contests - YouCity: Some Pictures







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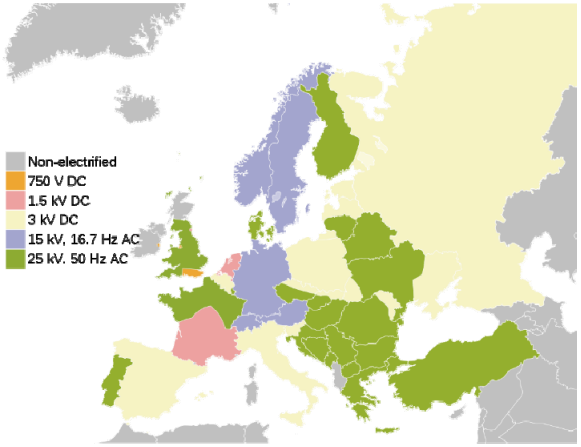
The hurdles to innovation in railways
A sheer list of hurdles (1/2)

- Large number of EU and national standard and norms
- Interoperability
  - 4 gauges of the track
  - 20 signaling systems
  - 5 different catenary voltages
  - 10 shapes of pantograph heads
  - 4 different contact strip materials
- Customers requirement
  - Sometimes thousands of technical requirements, in some cases even defining screws or bits & bytes
  - Sometimes, polar opposite requirements
  - Need for interoperability
  - Request to reach return on investment within a few years
  - Difficult payment condition (e.g. 20%/20%/60%)



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The hurdles to innovation in railways
A sheer list of hurdles (2/2)

- Few early adopters, many laggards
- Complex interfaces with the infrastructure
- Apparently no business case – or just not enough interesting
- Typical machinery and plant engineering: no big numbers, but also low margin.
- Platform concepts are required and requested. Difficulties in fulfilling all requirements.
- Variant management complex
- 5-10 years for development & integration of smaller innovations
- 20-30 years for the development & integration of larger, innovations, usually including the infrastructure.

The hurdles to innovation in railways
Rail transport facing fierce competition

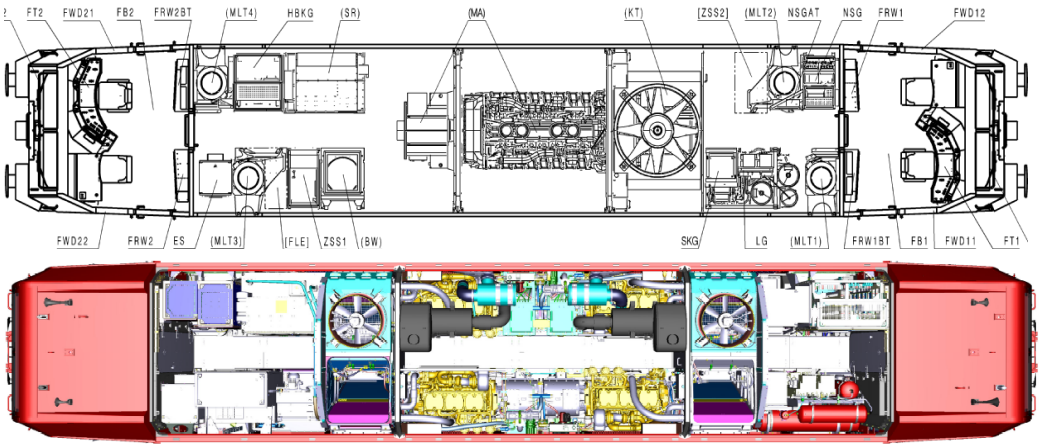
Rail transport is facing fierce competition, especially in the freight sector. The market situation in Europe can be summarized as follows:

- The market slowly starts to recover from the global recession of 2008, but still is not at that level.
- Profit margins in the railway sector have been falling throughout Europe.
- Competitors were able and continue to increase their capacity due to innovations. Some keywords: Energy efficient propulsion, digitalization and mobile applications, autonomous driving, connectivity, door to door transport
- Within the last 15 years, inland vessels have increased their transport capacity by 158%, truck transportation by up to 50%, while rail freight transportation only by 3% thanks to increasing the length of trains to 740 meters.
- Market is getting more and more saturated, due to a slow growing market (actual studies talk about 2% p.a., while competition grows faster, especially due to the entrance of new global players)

The hurdles to innovation in railways
5-10 years development time is standard – Some examples (1/3)

- TRAXX AC3 with last mile propulsion system:
  - Bridges the „last mile“ with own diesel-electric engine
  - No need for additional shunting of locomotives, resulting in a more uniform, smaller fleet
  - High efficiency due to time and cost savings for the last mile
  - Approx. 7 years from the idea to the first operational service

- TRAXX DEME – 4 small diesel gensets instead of one large one
  - Suitable for regional and freight transport
  - Meets Stage IIIB standards
  - Low noise emissions
  - Reduces fuel consumption significantly
  - Based on proven TRAXX platform
  - Approx. 5 years



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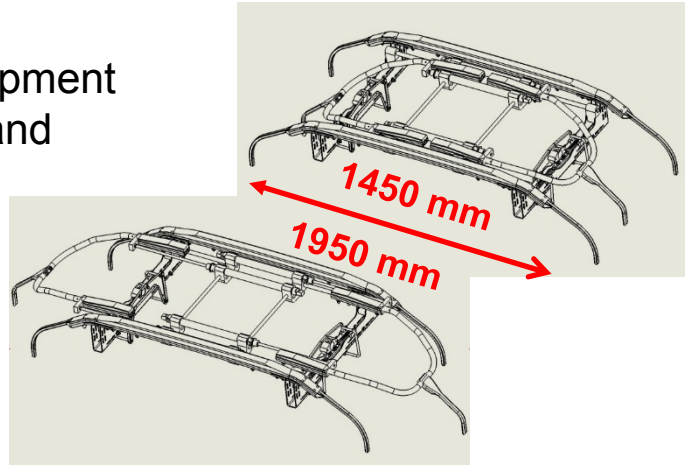
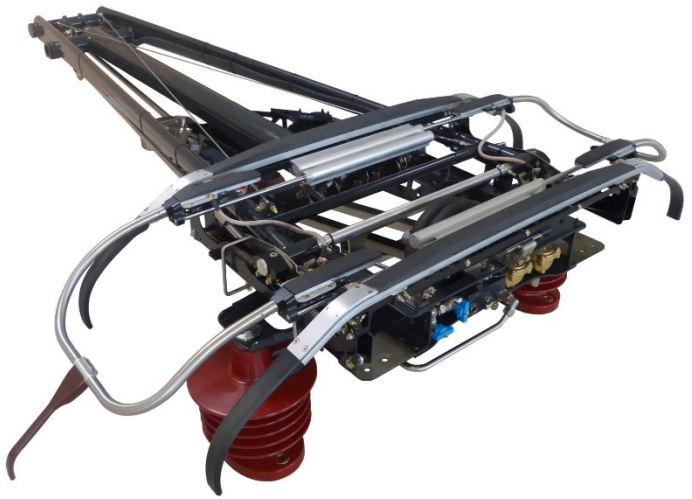
The hurdles to innovation in railways
5-10 years development time is standard – Some examples (2/3)

- The development of the Variopanto: Pantograph with adaptable collector head width by using movable end horns
  - Start of joint R&D in November 2009 with Development agreement between Bombardier Transportation and Stemmann Technik.
  - Variopanto was awarded as “Innovation of the year 2012” by BT
  - Variopanto has been presented during Innotrans 2012 (concept) and 2014 (product)
  - Three patens granted, four patents in application; Trademark for “Variopanto” granted
  - 2016: Testing on TRAXX AC3 locomotive
  - Tests in climate chamber
  - Pre-tests on SBB TWINDEXX
  - Homologation expected end 2016/2017
  - Approx. 7 years





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The hurdles to innovation in railways
5-10 years is development time is standard – Some examples (3/3)

- Doubling the train length to 1500m
  - Running two 750m trains coupled together.
  - Distributed power to be implemented (remote control of second locomotive, 750m behind the first one)
- Technical challenges
  - Radio remote control with only 0.5W transmission power
  - High speed
  - Longitudinal forces
  - Infrastructure must be adapted
- Various projects
  - First joint project with DB was setup in 2008 (GZ1500)
  - Within the FP7, the Marathon project (Alstom, Vossloh, SNCF) developed and tested distributed power, without reaching homologation
  - In Shift2Rail, building on the results of Marathon project, a further, hopefully last approach is being done → in operation in 2025?
- Time to market: 15-20 years

The hurdles to innovation in railways
The difference between perception and reality

- Again, the perception is:
  - Railway sector is not innovative and lags behind
  - Railways is not sexy and too slow
  - Railways is too expensive and does not really bring advantages.
  - Railways is not flexible
  - Railways does not offer the last mile

- Reality is:
  - In fact, it takes many years for some technologies to be successfully implemented
  - Still, innovations come on the market in fast cadence, if the whole rail sector is being considered
  - Filing of new patents happens on a daily basis
  - Railways uses state-of-the-art technologies in many areas
  - Railways can be flexible and must be, in order to tackle daily technical problems, operational interruptions, accidents, local events, etc.
  - Rail is the backbone of our society

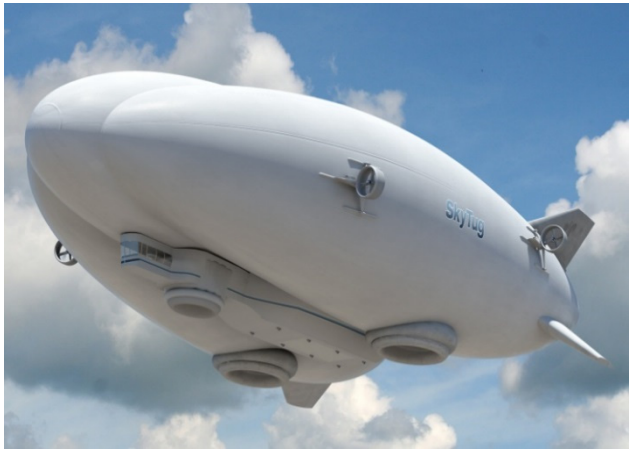
The hurdles to innovation in railways
How can the situation be improved?

- Set up innovation projects with joint effort of the various involved parties (e.g. infrastructure, subsystems and vehicle suppliers, operators, and final users)
- Involve accessors and homologation authorities from the early stages
- Secure long term financing
- Apply for funds in a more structured way
- Use these funds not only for basic research but also for developing demonstrators
- Continue standardizing on EU level, reducing national norms and standards to a minimum.
- Reduce to a minimum the technical requirements, if not part of the own business
- Accept failures and some more risks
- Implement a stable and well financed innovation management with clear mandates and targets

LOC Innovation Accelerator

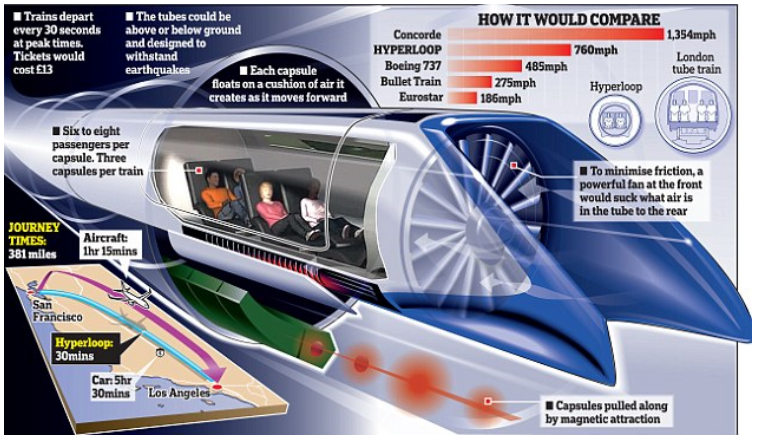
What is the next game changer in public mobility?

Clip-Air project, EPFL



Airship

Autoshuttle



Hyperloop

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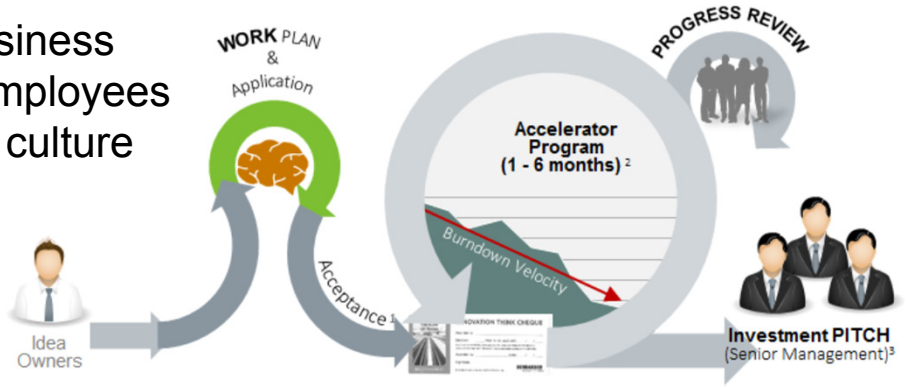
The hurdles to innovation in railways
The BT LOC Innovation Accelerator (1/2)

- Definition:
  - The LOC Innovation Accelerator is a platform and a network for innovative people working together on LOC strategic innovation resp. R&D projects across functional, site & divisional boundaries.

  - It is not a physical space concept (a lab, a garage) where things are presented / demonstrated, but a framework for attracting idea owners out of the business and supporting them (with processes, methods, tools and people) to mature their ideas into investment decision.

The hurdles to innovation in railways
The BT LOC Innovation Accelerator (2/2)

- Mandate:
  - Ensure competitiveness by running in a structured and concise way front end innovation management incl. idea generation and observation (technology, market, filling of the innovation pipeline) / formulation of concepts and experimental proof thereof, up to TRL/BRL3.
  - Secure financing for the innovation management
  - Secure budget for financing ideas, thus manpower for Innovation projects (using Innovation Think Cheques)
  - Ensure that innovation projects are executed in time and budget and matured along Technology Readiness
  - Set-up cooperation with start-ups / universities / suppliers and customers where applicable (Open Innovation)
  - Responsibility for securing IP
  - De-couple IM activities form daily business
  - Develop and mentoring innovative employees
  - Support the change to an innovation culture



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