# Foresight for aviation industry in Russia


Konstantin Vishnevskiy

Research Laboratory for Science and Technology Studies

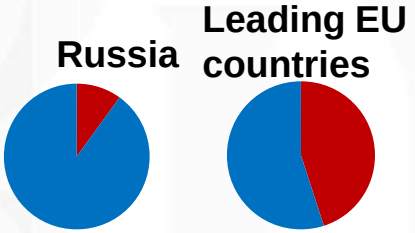
Head of Department for Private-Public Partnership in Innovation Sector, PhD
Research Lab for Science and Technology Studies
Institute for Statistical Studies and Economics of Knowledge
National Research University Higher School of Economics



HSE annual research conference Foresight and STI policy, 6 November 2014

# Prerequisites for using Foresight in Russia

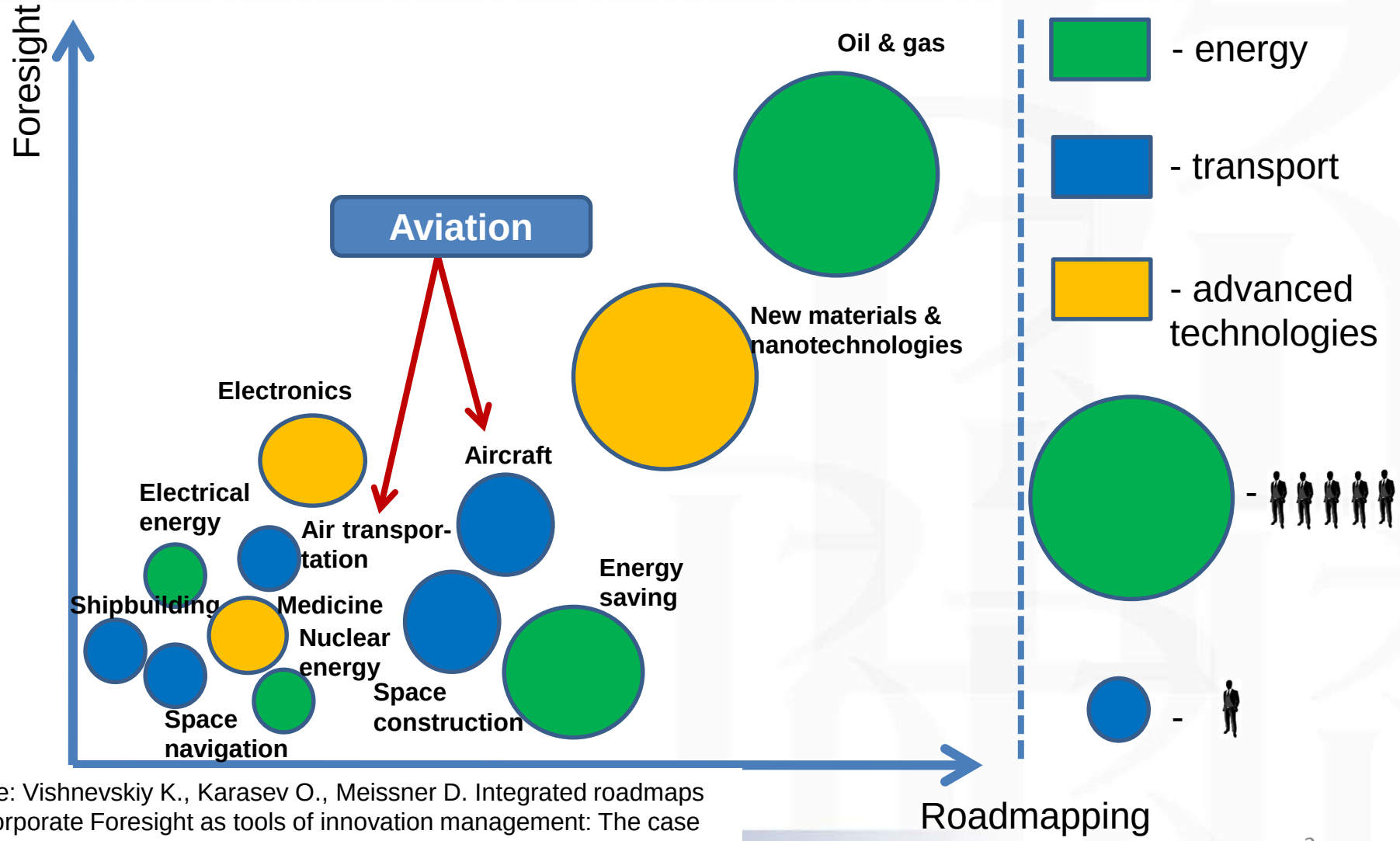
- "Russian economy is stagnating now" (*The Central Bank of the Russian Federation)*
- Technological gap between Russia and leading economies
- Restrictions for import in variety of sectors
- Relatively low innovation activity of Russian companies
- Lack of long-term planning at the sectoral level
- Shortcomings of action plans in the industry




Necessity of new forms of innovation activity stimulation – Foresight for "locomotive" sectors

*Source: HSE, OECD*

# Main fields for Foresight in Russia




Source: Vishnevskiy K., Karasev O., Meissner D. Integrated roadmaps and corporate Foresight as tools of innovation management: The case of Russian companies // Technological Forecasting and Social Change. 2014

# Aviation sector among top priorities

## Priority S&T directions & Critical technologies

УКАЗ

ПРЕЗИДЕНТА РОССИЙСКОЙ ФЕДЕРАЦИИ

**Об утверждении приоритетных направлений развития науки, технологий и техники в Российской Федерации и перечня критических технологий Российской Федерации**

В целях модернизации и технологического развития российской экономики и повышения ее конкурентоспособности п о с т а н о в л я ю:

1. Утвердить прилагаемые:

а) приоритетные направления развития науки, технологий и техники в Российской Федерации;

б) перечень критических технологий Российской Федерации.

2. Правительству Российской Федерации обеспечить реализацию настоящего Указа.

3. Настоящий Указ вступает в силу со дня его подписания.

Президент Российской Федерации Д.Медведев

Москва, Кремль
7 июля 2011 года
№ 899

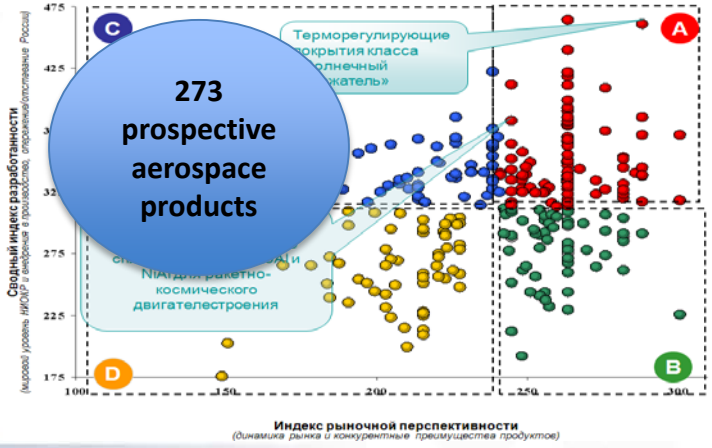
"Transport and space systems" and "Technologies of creating new generation rocket, space and transport system"

## State program "Development of aviation industry till 2025"

## Russian long-term S&T Foresight 2030


Special chapter "Transport and space systems"

## Long-term Foresight for nanotechnologies



# Aviation sector among top priorities: Roadmaps public domain selected by Phaal

| Area | Number of Roadmaps |
|---|---|
| Software, computing, information and communications technology | 385 |
| Energy | 242 |
| Science | 242 |
| Policy, government and community | 233 |
| Industrial, business and other organisational | 196 |
| **Transport** | **103** |
| Electronics | 94 |
| Materials | 62 |
| Defense | 61 |
| Manufacturing | 51 |
| Construction | 45 |
| Nanotechnology | 23 |
| Chemistry | 22 |

More than 50 public domain Foresight studies for aviation industry

# Example of Foresight: Flightpath 2050. Europe's Vision for Aviation

*Goal:* creation of future vision for aviation industry development in the European Union

*Task:* setting priority system for R&D for aviation

*Analysis:* current situation, challenges and opportunities

*Strategic fields of interest:*

- maintenance and expansion of industrial leadership
- satisfaction of social and market needs
- environmental protection
- use of safe energy
- providing security

# Example of roadmap for certain goal: Sustainable Aviation $CO_2$ Roadmap

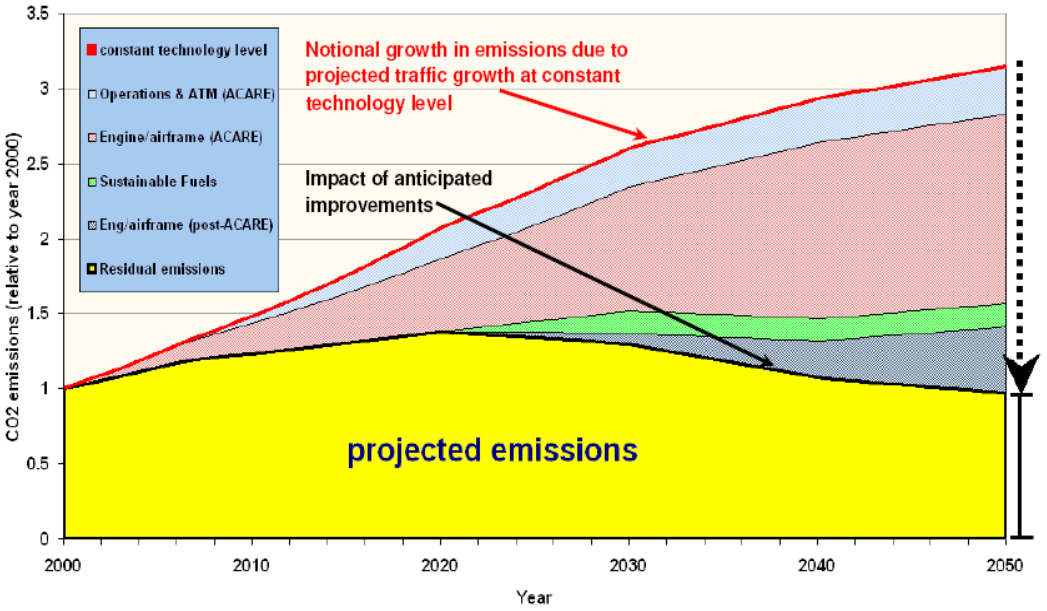
*Goal:* Providing sustainable development of aviation industry in Great Britain, identification of ways of reducing $CO_2$ emission in aviation

*Problem:* existing forecasts concerning $CO_2$ emission reduction don't take into account future technologies and S&T breakthroughs

8 key tasks and 34 necessary actions were identified

*Scenarios of $CO_2$ emission reduction:*

- Integration of new technologies, improvement of operational efficiency and new fuels
- Emissions trading
- Better flight planning, more direct flights and less delays
- Improvements of airplanes features



# Russian long-term S&T Foresight 2030: Results for “Transport and space systems”

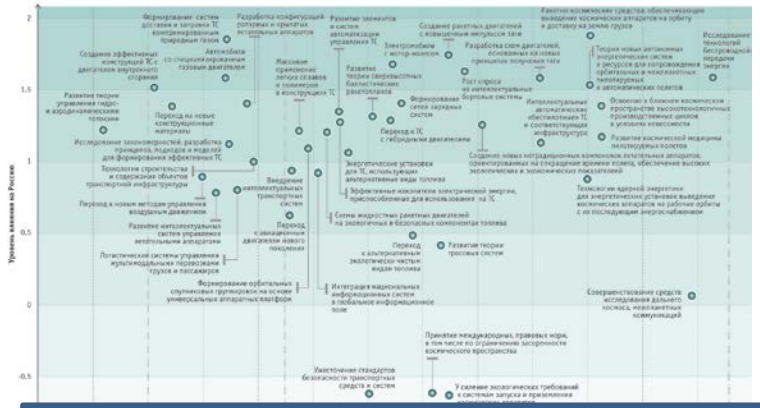
**Challenges**

**Threats**

**Windows of opportunities**

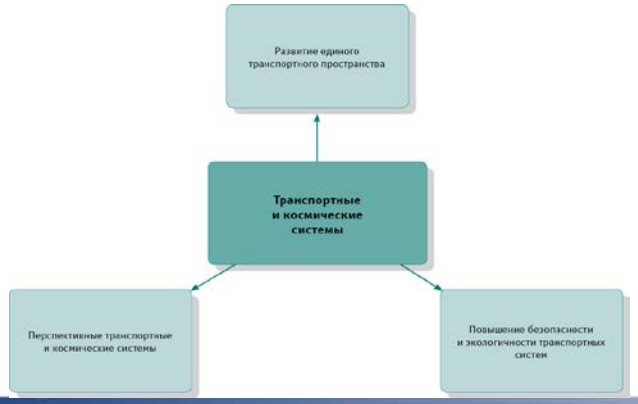
**Prospective markets**

**Innovation products and services**

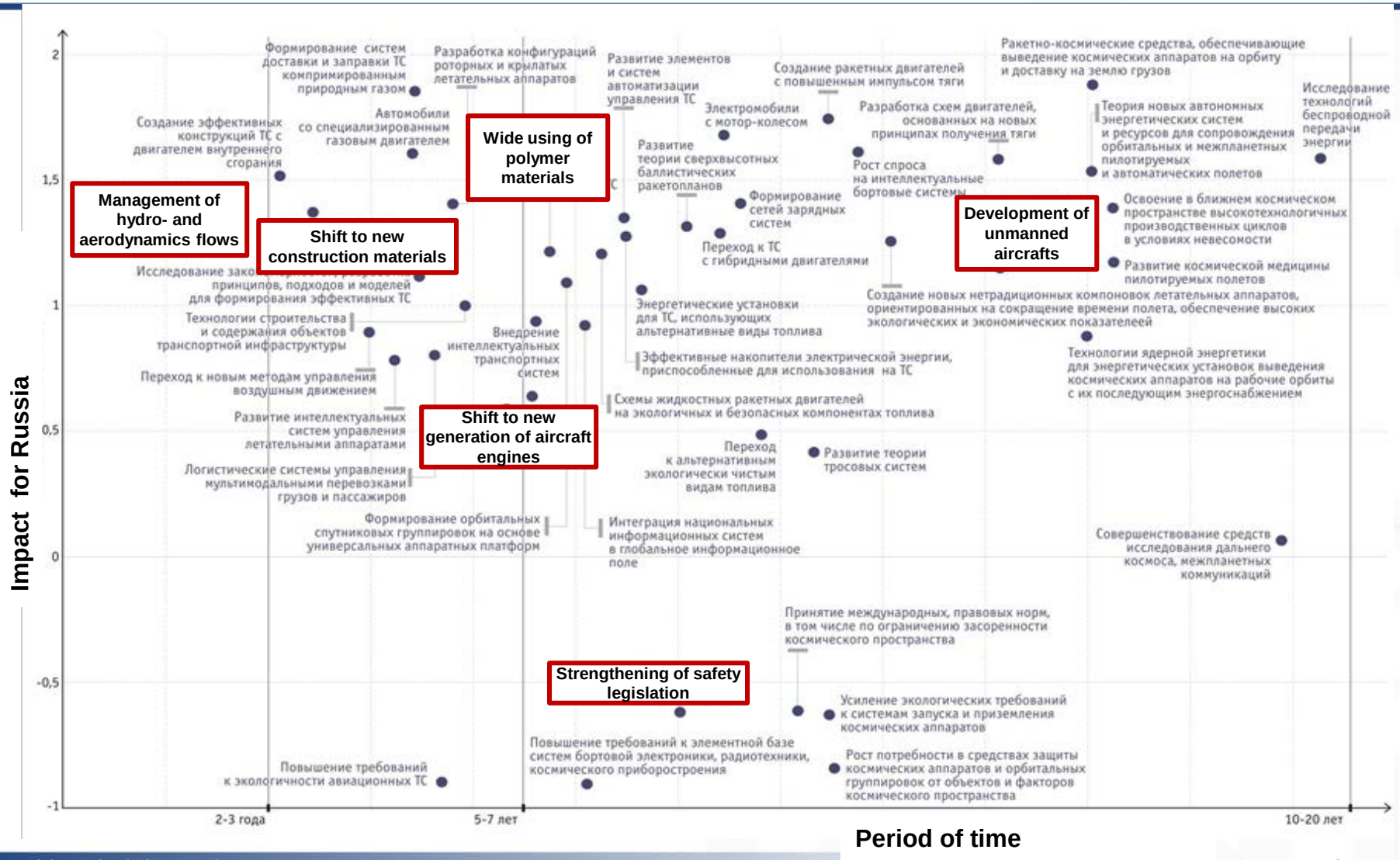


**Prospective directions of R&D**


**Estimation of level of Russian R&D**

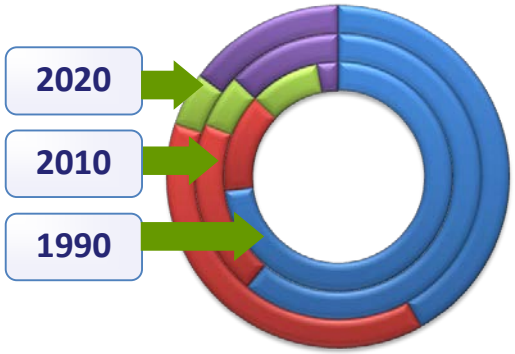



# Russian long-term S&T Foresight 2030: Main challenges for aviation industry



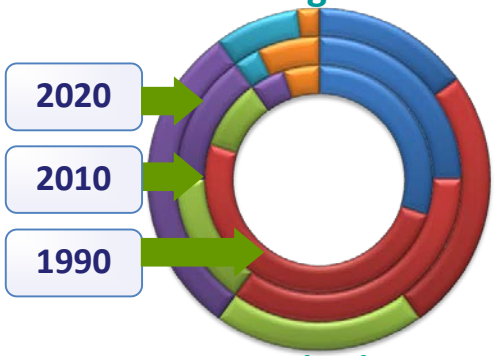
# Foresight & roadmapping for nanotechnologies: Key prospective directions

## Airframe




- Aluminium
- Polymers and composites
- Steel
- Other

## Engine




- Steel
- High-temperature steel
- Titanium alloys
- Composites
- Ceramics
- Other

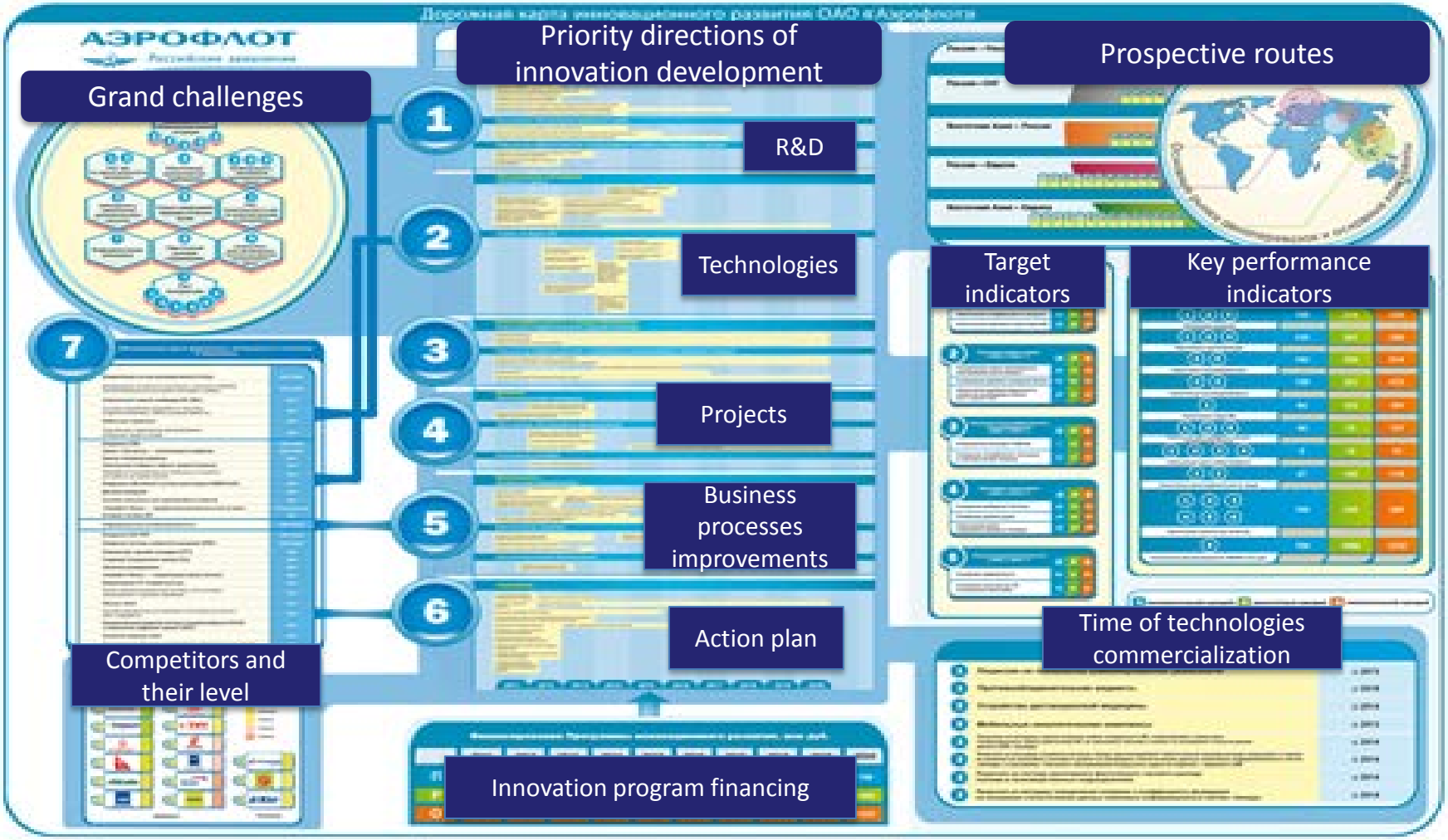
## Avionics


- Composites
- Thermoplastics
- Microelectronics
- Sensors
- Magnet materials
- Other

**Most promising areas of nanotechnology concern the development of polymer composites, thermoplastics, composite materials and metallic nanoalloys**

- Reduced structural weight, fuel economy, lower emissions
- Increased wearing qualities, reliability and durability
- Increased passenger comfort

# Example of corporate roadmap for air transportation industry






Source: Aeroflot's innovation development program. http://mintrans.eit.ru/upload/pr/oao_aeroflot.pptx

# Roadmapping as a post-Foresight activity

## Foresight

Methodological principles of Foresight for aviation industry

Aviation S&T Foresight 2030

## Roadmapping

Composition & configuration

Avionics

Materials

Engine

***Prospective S&T directions***

***Key technological tasks***

***Market forecasts***

***Detailed chains R&D – technology – product – market***

***Wild cards & weak signals***

***Key points for decision-making***

2011

2012

2013

2014

2015

NATIONAL RESEARCH UNIVERSITY

# Thank you for your attention!

Konstantin Vishnevskiy

kvishnevsky@hse.ru

http://issek.hse.ru/