Main GLONASS applications in the Russian Federation

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Essential GNSS Application Areas

Military force
- Monitoring of engineering structures, construction
- Enforcement of law
- EMERCOM
- Synchronization of communication and energy systems

Geodesy and mapping
- Geographic information system
- Geodesy and mapping

Science

Environmental protection

Agriculture
- Tourism
- Insurance
- Alarm system
- Personal car
- Freight
- Aviation
- Marine
- Passenger transportation
- Railway transport
- Transport

General applications
Effects of GNSS Adaption

**Social effect (ex.)**
- ensuring additional security of life
- social services improvement
- increase in quality of life

**Management Effect (ex.)**
- service quality control
- efficiency of social programs

**Economic effect (ex.)**
- reducing negative impacts on the environment
- saving 30% of funds for the maintenance of transport
- greater performance

Utilization of satellite navigation technologies provides increase in efficiency and competitiveness of national economy
• Improved availability in city canyons
• Increased robustness in interfering conditions
• Reduced risk of political dependence on the only provider

Benefits of Combined use

Availability increase in Moscow, 2009-2010

Use of GLONASS + GPS provides much better results for many applications than mono system use
Example of GPS/GLONASS module tests in Dallas, USA

**Advantages of GPS/GLONASS use:**
- "double proof" — double warranty of positioning when satellites of one system does not work;
- when the reception is bad;
- allow to «catch» the signal even in buildings near windows and in city;
- in northern hemisphere GPS may work worse then GLONASS;
- during mass production variation in prices will not exceed 10% of the price of GPS and GPS/GLONASS navigator;
- low price of GPS/GLONASS in future.
Directions of GPS/GLONASS civil technologies development

- Corporate vehicle monitoring system development (GMK Norilsk Nickel, FSUE Russian Post etc.)
- Regional projects: navigation and information systems development
- GPS/GLONASS telematics equipment mass production
- GPS/GLONASS car equipment development and installation (VAZ, GAZ, KAMAZ)
- PND (GPS/GLONASS) development
- Pilot projects in navigation and information system development for Russian government bodies
### GLONASS for State Transportation Industry

<table>
<thead>
<tr>
<th>Sector</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td><strong>Civil aviation</strong></td>
<td></td>
</tr>
<tr>
<td>equipped aircrafts</td>
<td>23%</td>
</tr>
<tr>
<td><strong>Marine and river fleet</strong></td>
<td></td>
</tr>
<tr>
<td>equipped vessels</td>
<td>87%</td>
</tr>
<tr>
<td><strong>Automobile transport</strong></td>
<td></td>
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<tr>
<td>equipped special vehicles</td>
<td>&gt;65%</td>
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- Monitoring of the location of trains on the adjacent railroad tracks
- Optimizing the management of shunting locomotives
- Navigation of river boats in the narrowsnesses
- Accurate and timely installation of condition signs
- Monitoring of road transport
GLONASS for commercial Transportation Industry

Increase in the service market for satellite monitoring of transport (per year)
- USA 50-70 %
- EU 50-70 %
- RUSSIA 100 %

Russian commercial automobile park: about 8,3 million units by the end of 2009
Emergency response system in case of accidents in transport, based on the installation of terminals in the cars, which determine the coordinates of the victim's car with the help of the GLONASS system and transmit data about the emergency to operator

**Main objectives of «ERA-GLONASS» system**

- Transmission of the information about the accident to emergency service
- Assurance of minimum set of data transmission from the terminal equipment to emergency service
- Providing two-way voice communication between emergency operator and driver involved in an accident
- Monitoring the status of the terminal equipment and response in case of emergencies
Functions of ERA GLONASS:
- Communication of accident location coordinates to control center
- Vehicle movement parameters control
- Theft prevention
- Navigation
- Loudspeaker communication

GLONASS spacecraft
GPS spacecraft
GSM, GPRS, P2P radio, satellite communication
Server
Control center
Signals to emergency services
Accident location and time
911
Telematics module
Police
Ambulance
Emergency repair service
GLONASS technology - the basis of intelligent transportation system (ITS) in Russia

- System identification and payment collection
- Traffic lights management system
- Vehicles information system
- Traffic control center
- Accident data processing system
- Telematics devices and systems
- Automatic control system of transport systems
- Intermodal transportation
- Vehicles movement management system
- Receiving and processing information system

- Visual data
- Internet
- Transport information
- Automat
- Phone communication
- Transport navigation
- Traffic lights control
- Information at the stops
- Forced vehicle management
- Accident data processing
- Transport movement control

- Sea ports
- Airports
- Railroads
Intelligent Transportation Systems (ITS) – main objectives

Punctual public transport movement schedule: delay no more than 5 minutes.

Reducing the time by public transport to 25-30%

Exact information about public transport timetable («intelligent stops»)/Wide choice of transport

ITS results
- High quality of public transport services
- Safety and quality of life
- More effective management

First aid time reduction to 30%

Ecology level improvement (reducing emission, less noise) 10%

Permanent public transport management in Moscow city and region.

The ITS targets:
- Reducing the number of road accidents: 52%
- Reducing the number of road accident deaths: 20%
- Travel time reduction: 20%
- Increase public transport average arrival time: 35%
- Reducing emission: 8%
The basic structure of the Intelligent Transportation Systems (ITS)

- Stationary objects monitoring data
- Mobile objects monitoring data
- Subsystem of traffic control means management
- Analysis center
- Subsystem of transport infrastructure status information

Software and hardware of ITS
ITS – Moscow project

2011-2012: 24 000 transport units

Phase 1
until 15.12.2011
- setting control center
- supply 7000 vehicles of SUE «Mosgortrans» with equipment
- 600 «intelligent stops»
- passenger traffic monitoring

Phase 2
until 30.06.2012
- further development of a control center
- supply 9000 commercial transport units with equipment
- +400 «intelligent stops»

Phase 3
until 15.12.2012
- further development of a control center
- supply 8000 transport units working on Moscow-Moscow region-Moscow route with equipment
- +200 «intelligent stops»

ITS Traffic control system improves safety of passenger transportation in Moscow
Examples of GLONASS/GPS equipment installation on commercial and state transport

- GLONASS
- GPS

Intellectual Transport System in city of Dubna

MMC Norilsk Nickel

System for mobile groups management in the city of Moscow
LBS market will increase from €12 billion in 2010 to €96 billion by 2020 (CAGR 24%)

LBS future—geotarget advertisement (LBA) and local search

By 2014 there will be 1.4 billion LBS users in the world, 780 mln. of whom will get LBA.

Russian market rapidly grows. The size forecast as $158 mln. in 2014.

LBS – the second largest segment (~43%) of the global navigation and information market. There is the explosive growth in LBS market in the next few years.
Social GLONASS Project

Social services quality improvement with the help of GLONASS technologies and monitoring systems application

- By 2015 the number of disabled people will exceed 15 million
  - The number of disabled people in Moscow exceeded 1,2 million, including 26 000 children. More than 60 000 people don’t leave their houses

Convention on the Rights of Persons with Disabilities was adopted in 2006 at the United Nations Headquarters. It was signed by 95 states, including Russia
Social GLONASS System Structure

Subsystem “Assistant”
Where is the help?
Who soon will it come?
...

Subsystem “Guide”
Where to go?
Which way to go?
...

Subsystem “Monitor”
How are you feeling?
What do you need now?
...

Subsystem “Inspector”
Is transportation done safely?
Have the kids left the zone of monitoring?
...
Social GLONASS Subsystem: “Assistant” Project

Navigational and informational support system + system of urgent assistance for disabled people

Computing infrastructure based on virtualization algorithms

- Operator
- Technical assistance
- Local medical institution
- EMERCOM services

People with weak vision
People with Alzheimer's disease
People with cardiac diseases
Children
Diabetics
Medical assistance group
Complex solution of social problems and transport safety challenges will decrease the number of road incident with disabled people participation.
Over 800 tons of goods transported annually
Mountain Slopes High Precision Positioning Monitoring System

- Remote monitoring of landslide processes in real time
- On-line communication of slope condition data to control center
- Immediate warning system about significant rock displacement
Fuel and Energy Complex Parameters Monitoring and Control

Systems:
- Antiseismic protection of reactor, fuel-handling machine control, reactor safety, turbine protection, backup diesel generator protection

Already implemented at:
- Nuclear power plants: Balakovskaya, Volgodonskaya, Kalininskaya, Novovoronezhskaya, Kurskaya, Leningradskaya, Kolskaya (Russia), Rovenskaya, Hmelnitskaya, Zaporozhskaya, Yuzhno-Ukrainskaya (Ukraine), Kozloduy (Bulgaria), Busher (Iran), Kudankulam (India), Tanvan (China)
- 80 gas transfer and 60 oil transfer stations
- 6 power generating units at Surgutskaya power plant

More than 100 sensor types including displacement transducers with GLONASS support
Russian GLONASS/GPS receiver Geos-3

Geos-3: modern characteristics and considerable advantages:
- High miniaturization level
- Low cost in mass production
- GLONASS/GPS mode

Technical characteristics

- Chipset 10x10mm, module 15x20 mm
- Power consumption less than 100mWt
- Cost ~15$
Benefits of GLONASS/GPS receiver Geos-3

Geos-3

• GLONASS navigation integrated with GPS navigation increases the reliability of navigation data
• Power consumption in GPS mode and in GLONASS mode are equally low
• Software was developed on the basis of the solution tested by previous generations of GLONASS / GPS receivers

Main Competitors

• The mode is applied in which the GLONASS and GPS are processed not simultaneously in FDMA
• Power consumption in GLONASS mode is doubled
• There is no tested software
The strategic goals of a company:

- facilitating the commercialization of the GLONASS;
- increasing use of GNSS technologies in the Russian market;
- modernization of the technological infrastructure of the state.

Main applications of products:

- geodetic and cadastral works
- precise control of machines and mechanisms;
- monitoring of engineering structures.

Examples of international cooperation in the field of satellite navigation:

- JSC «Russian Space Systems»
- Trimble Navigation, Ltd.
- RUSNAVGOSE

Rusnavgeoset CORS – modern GLONASS / GPS / Galileo / Compass receiver for reference stations
Rusnavgeoset CORS
GLONASS / GPS / Galileo / Compass
receiver for reference stations

JSC « Russian Space Systems»

Trimble Navigation, Ltd.

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The main goal: establish infrastructure of high-precision positioning for civil users in the territory of Russia and the CIS.

Rusnavgeoset

THANK YOU
Dr. Mark Shmulevich