GLONASS
Current Status, Modernization and Use
Contents

• GLONASS Government Policy
• GLONASS Program 2012-2020
• GLONASS Constellation Status
• Recent Events and Constellation Sustainment
• Modernization Plans and System Architecture
• Civil Use
• International Cooperation
• Summary
Government Policy

The Presidential Decree № 638 of May 17, 2007

On Use of GLONASS (Global Navigation Satellite System) for the Benefit of Social and Economic Development of the Russian Federation

• GLONASS is the core element of the national PNT infrastructure ensuring national security and economic development

• PNT infrastructure sustainment and development are Government’s function

• GLONASS civil services are free and unlimited globally

• Mandatory use of GLONASS for government applications and critical industries

• GLONASS Federal Program is the instrument for implementing national policy in PNT

• GLONASS Federal Program 2012-2020
  • Budget for 9 years secured
  • Most contracts awarded

Federal GLONASS Program is a basis for Russian Policy in PNT
GLONASS Federal Program Goals

• Improving system performance in terms of accuracy and integrity
• Ensuring guaranteed positioning, navigation and timing solutions in restricted visibility, interference and jamming conditions
• Enhancing current application efficiency and broadening application domains

Key Quality Indicator of Program – guaranteed provision of announced GLONASS performance characteristics
Four-fold accuracy improvement

by means of

• ground control segment modernization
• introduction of new onboard atomic frequency standards (2 CAFs + 2 RAFs)
• introduction of advanced satellite control and command, orbit and clock determination technologies based on crosslinks in RF and optical bands
• transition to PZ-90.11 Geodetic System aligned to ITRF with mm level
• synchronization of GLONASS Time Scale with UTC (SU) at less than 2ns while keeping UTC (SU) long-term stability at $10^{-17}$
The constellation provides global continuous navigation
Latest Launches and Short-term Sustainment

- 1 Glonass-M (#54) launched March 24, 2014
- 1 Glonass-M (#55) launched June 14, 2014
- 1 Glonass-K launched December 1, 2014
- 2015-2016 – up to 9 Glonass-M launches
- Further launches by Soyuz (1 satellite) or Proton (3 satellites in a batch) launch vehicles will be determined by operational necessity
GLONASS Architecture

Fundamental segment
UTC (SU), Earth Rotation Model and parameters, reference systems

GLONASS Space Complex
MEO orbit constellation
Ground control
Launch facilities

User Segment
Integrated user equipment
(communication, inertial sensors and other sources of navigation information)

GNSS Augmentations
Space-based systems
- High accuracy
- Integrity
Regional and local differential systems for transport and geodesy
GLONASS for Civil Use

Transport
- Traffic and transportation control

ERA-GLONASS Project
- Road accidents emergency response system

Construction
- High-rise buildings, bridges, roads construction

Oil & Gas Transportation
- Flowrate control

Agriculture
- High-accuracy tillage, Fertilization optimization, yield control

Power Production
- Power networks synchronization

Telecommunications and Data Transfer
- Data flows synchronization, capacity growth

Geodesy, Cartography and Land Regulation
- Land surveying, cadastral works, land mapping

Personal Navigation
- Positioning, routing

Power Production
- Positioning, routing

Telecommunications and Data Transfer
- Data flows synchronization, capacity growth

Power Production
- Power networks synchronization

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Transport
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Construction
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Oil & Gas Transportation
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Multi-GNSS user equipment is used (generally GLONASS/GPS)
International Cooperation on GNSS

- Provision of Compatibility and Interoperability GNSS
- Promoting Global Use of GLONASS
- Pursuing competitiveness of GLONASS
  Enhancing System Performance
Bilateral Cooperation

China
- 13 October 2014 – Signing Memorandum of Understanding
- Committee on Strategic Projects on Satellite Navigation
- Deployment of monitoring stations on mutual basis

Brazil
- Deployment of GLONASS tracking stations

USA
- 9 June 2012 - Renewed Statement of Cooperation between GLONASS and GPS

EU
- Consultations on Agreement on Cooperation in Satellite Navigation
Summary

- **GLONASS Program** is among priorities of the Russian Government Policy
- GLONASS open service is free for all users
- GLONASS Program (2002-2011) completed, goal achieved
  - Performance is comparable with GPS
  - Full constellation (24 sats) deployed
  - Government commitments for major performance characteristics
  - GLONASS sustainment, development, use
- **GLONASS will continue**
  - Keep the GLONASS traditional frequency bands
  - Transmit existing FDMA signals
  - Introduce new CDMA signals
- **International cooperation** aims at making GLONASS as one of the essential elements of the international GNSS infrastructure for worldwide user benefits
Thank you!