



**FEDERAL SPACE AGENCY**



# **GLONASS Update**

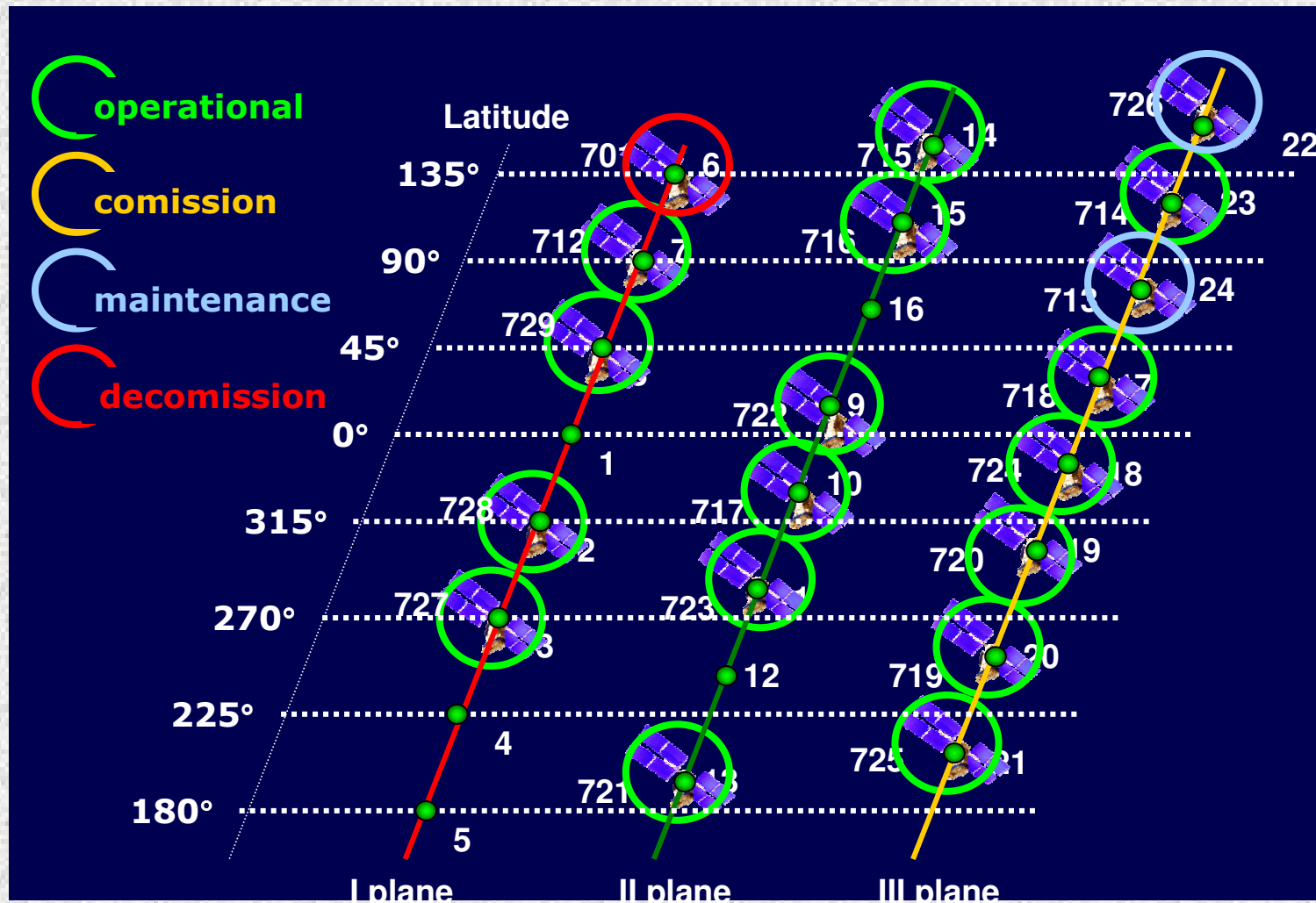
---

**ICG WG-A Interoperability Workshop.  
Gold Coast, Australia, 30 November 2009**

---



# GLONASS Constellation Status (26.11.2009)



**16 satellites operational**



# New launch schedule

**NEW!**



## ➤ **2009:**

**Block 41 (3 SV) – 14 December 2009**

**Block 40 (3 SV) – February 2010**

## ➤ **All other scheduled launches for 2010 – 2011 are without change**

**Launch program ensures the full constellation deployment (24 operational) by the end of 2010 and its sustainment at that level for future**

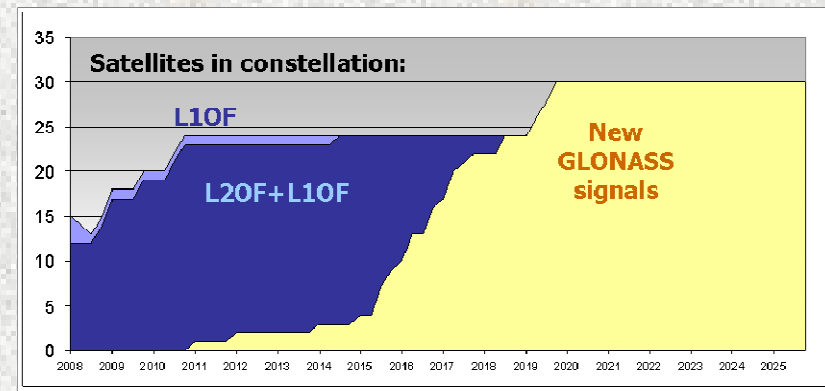
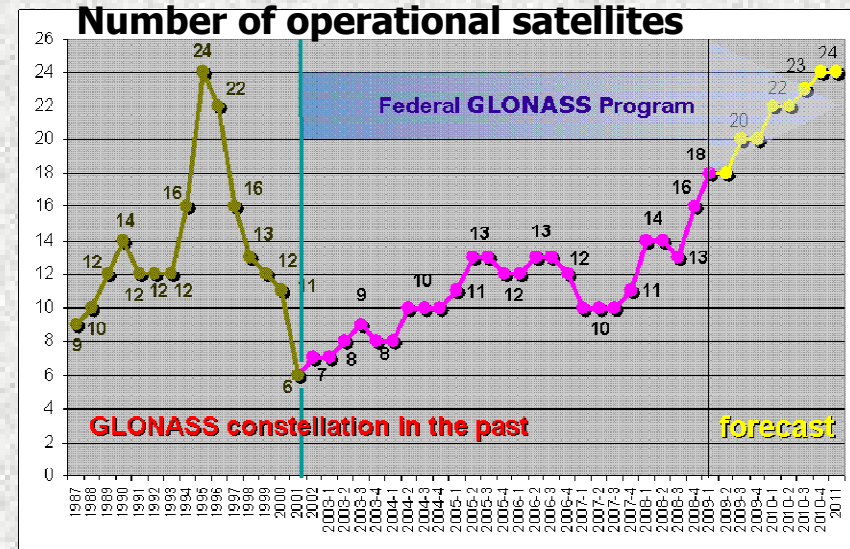


# GLONASS Strategy Planning



**NO CHANGES**

- Full constellation deployment in 2010
- Ground Control Segment modernization
- New GLONASS-K satellite (with improved performance) IOV start by 2010
- GLONASS will continue transmitting existing FDMA signals
- Additional new CDMA signals since GLONASS-K deployment
- GLONASS performance competitive ability provision plan
- GLONASS Federal Program extension until 2020



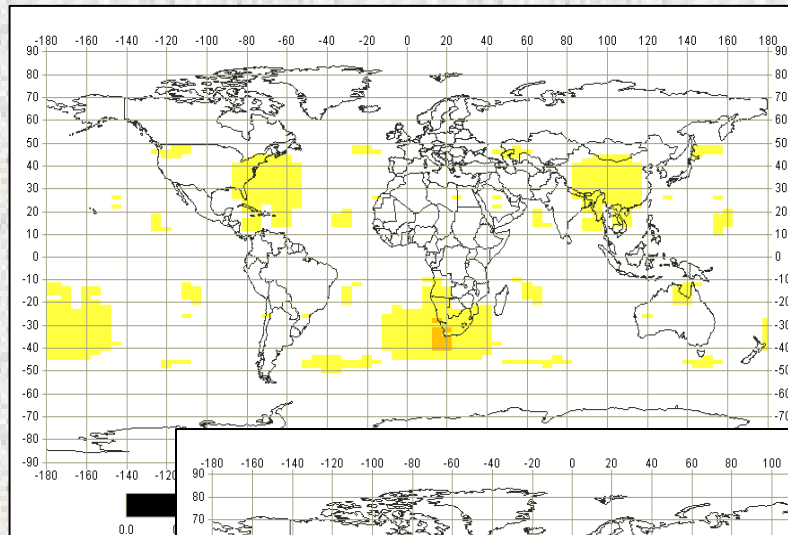
Constellation Update based on GLONASS-K  
 GLONASS-K Flight Tests



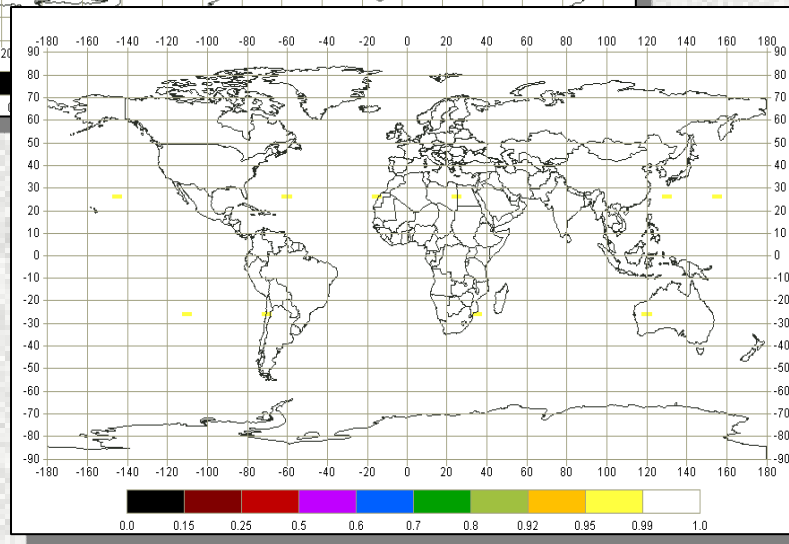
# GLONASS Deployment Program



**NO CHANGES**



**March, 2010**  
**22 satellites.**  
**99.7% global availability**



**December, 2010**  
**24 satellites.**  
**99.99% global availability**



# The direction of GLONASS navigation signals modernization



- Provide better potential accuracy for pseudorange and phase measurements
- Provide a better interference and multipath resistance of GLONASS signals
- Provide of greater interoperability with GPS and future GALILEO and other GNSS

**Introduction of new CDMA signals since GLONASS-K deployment**

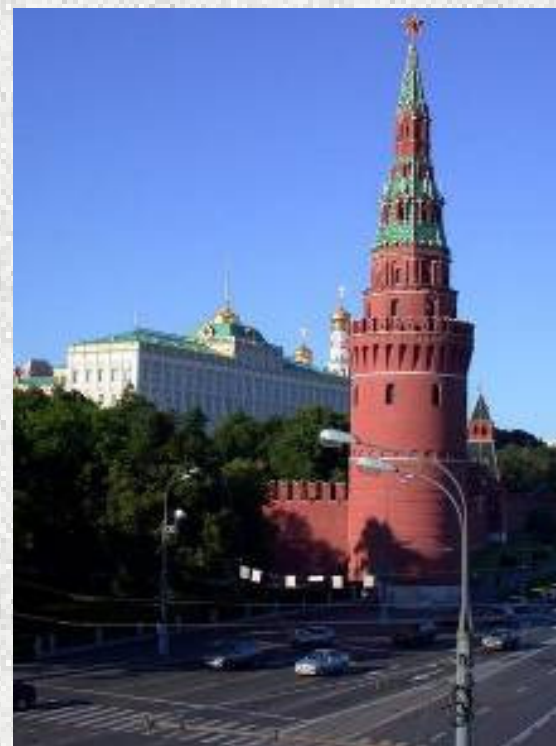
**NO CHANGES**



# State Policy Basic Principles



- **GLONASS is a part of the critical state PNT infrastructure providing national security and economy development**
- **Creating, developing and sustaining the PNT infrastructure is a State responsibility**
- **No direct user fees for civil GLONASS services**
- **Open, free access to GLONASS information necessary to develop and build user equipment**
- **GLONASS is used in combination with other GNSS, terrestrial radio navigation, other navigation means to increase reliability of navigation**
- **International cooperation on GNSS compatibility and interoperability**



**Federal GLONASS Program is a basis for GLONASS sustainment, development and use**

**NO CHANGES**



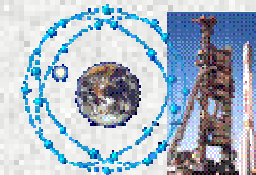
- Provide full constellation of 24 satellites by 2010
- Improve GLONASS performance
- Implement new GLONASS signals
- Encourage the GLONASS worldwide use

**NO CHANGES**

## Subprograms

1

GLONASS sustainment, development and deployment



2

User equipment development for civil users



3

Satellite navigation technique implementation in transport areas



4

Geodesy reference improvement



5

User equipment development for authorized users







# View on Interoperability



➤ **Interoperability** refers to the ability of global and regional navigation satellite systems and augmentations and the services they provide to be used together to provide better capabilities at the user level than would be achieved by relying solely on the open signals of one system

**NO CHANGES**

- ❑ **Interoperability of systems and augmentations and their services is provided by interoperability of signals, geodesy and time references**
- ❑ **Signal interoperability: depends on the user market both common and separated central frequencies of navigation signals are essential**
  - ✓ **Signals with common central frequencies provide minimal cost, mass, size, power consumption of the user equipment**
  - ✓ **Signals with separated central frequencies provide better reliability and robustness of the navigation service**
- ❑ **Geodesy: all GNSS geodesy references should be coordinated between each other to the maximum extent practical**
  - ✓ **PZ-90 used in GLONASS will continue improving in future**
- ❑ **Time: all national and system UTC realizations should be coordinated with the international standard of UTC to the maximum extent practical**
  - ✓ **GLONASS time scale will continue improving in future**
- ❑ **Co-location of ground control segment monitoring stations of different GNSS is important to provide geodesy and time interoperability**



# Summary



- **GLONASS Program is the high priority of the Russian Government policy**
- **GLONASS Program is in progress, will be extended to 2020**
- **GLONASS improvement is a major objective:**
  - ❑ **Performance to be comparable with GPS by the end of 2011**
  - ❑ **Full constellation (24 sats) by the end of 2010**
  - ❑ **New signals implementation to improve the service for both military and civil users**
- **Compatibility and interoperability are the goals of international cooperation, as well as the GLONASS worldwide use**



# FEDERAL SPACE AGENCY



**Thank you!**