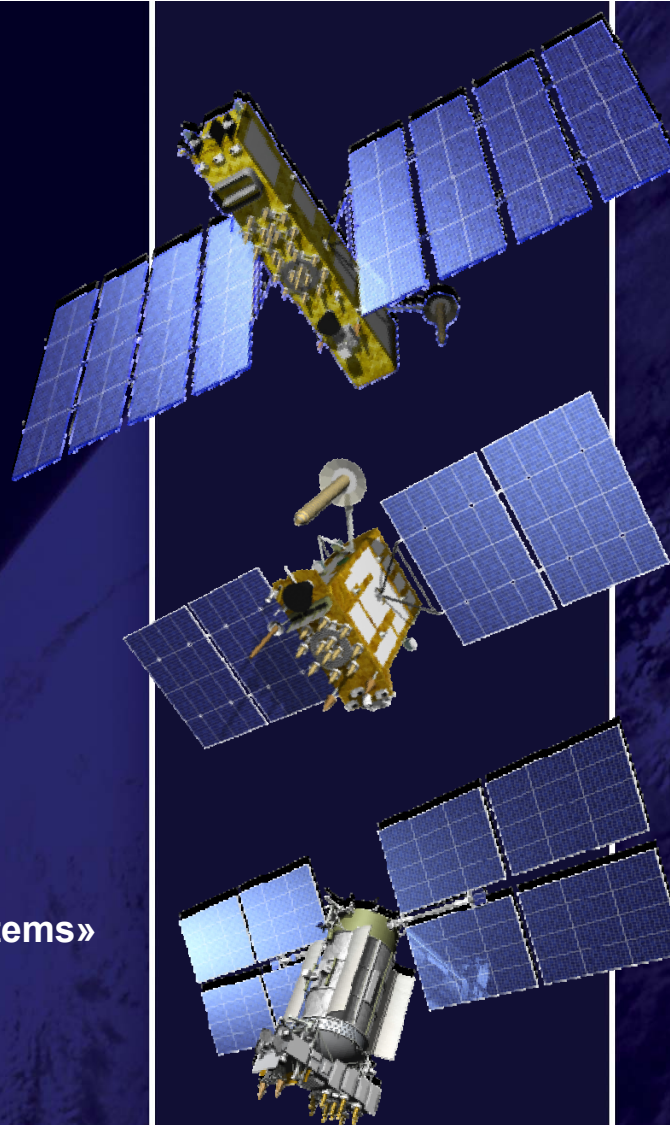




GLONASS space segment STATUS & MODERNIZATION

Joint - Stock Company
«Academician M.F. Reshetnev» Information Satellite Systems»

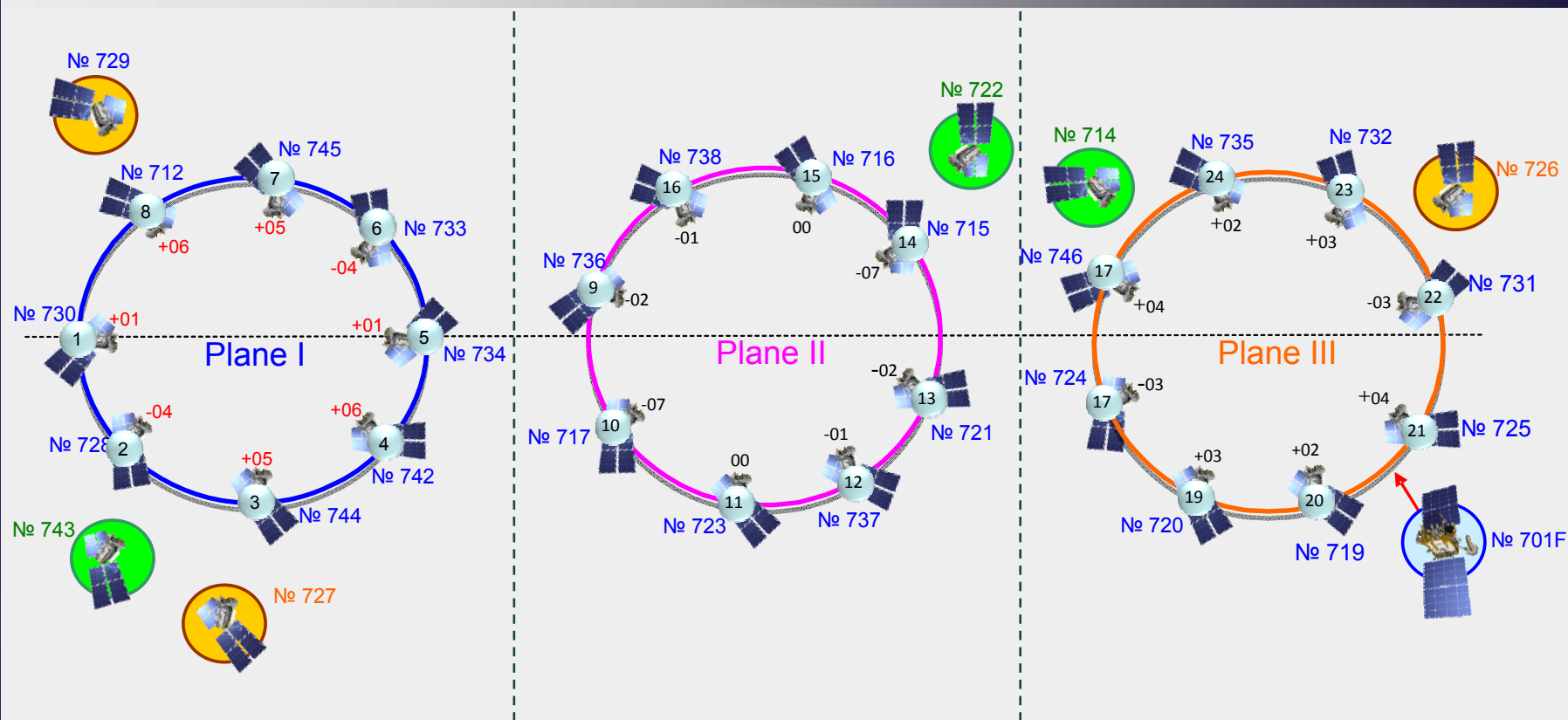
ICG-7, November 04-09, 2012 , Beijing, China





РОСКОСМОС

Orbital constellation status 04.11.2012



Nominal operation



Flight tests («Glonass-K», № 701)



Spare (№№ 714, 722, 743)



In maintenance (№№ 726, 727, 729)



РОСКОСМОС

Constellation maintenance

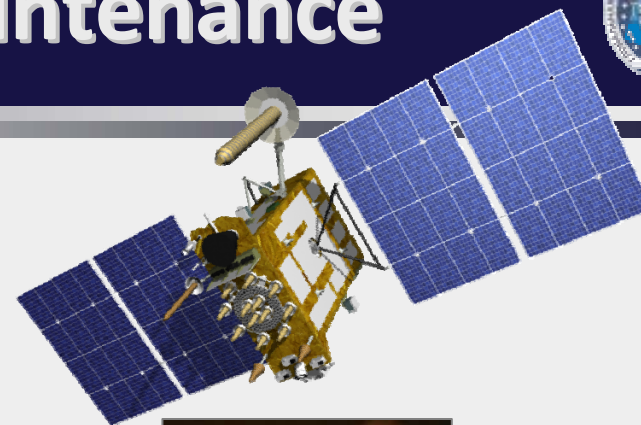


Launches in 2011

- 26.02.2011 the first «Glonass-K»
- 03.10.2011 – 1 SV «Glonass-M»
- 04.11.2011 – 3 SV's «Glonass-M»
- 28.11.2011 – 1 SV «Glonass-M»

Ground store:

- 1 SV «Glonass-K» (№ 702F)
- 3 SV's «Glonass-M» (№ 747, № 748, № 749)



03.10.2011



26.02.2011



04.11.2011



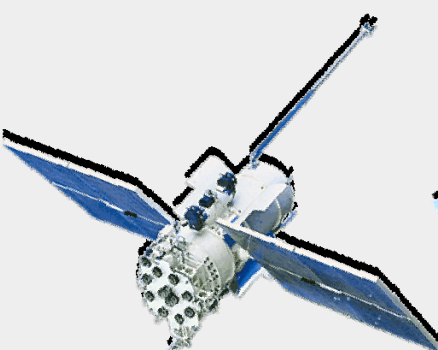
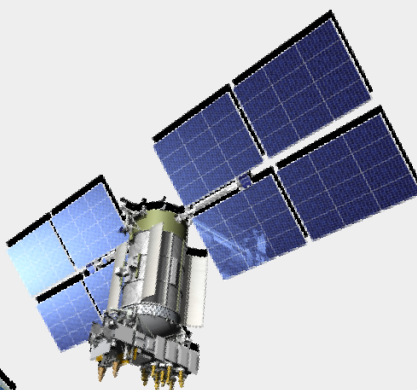
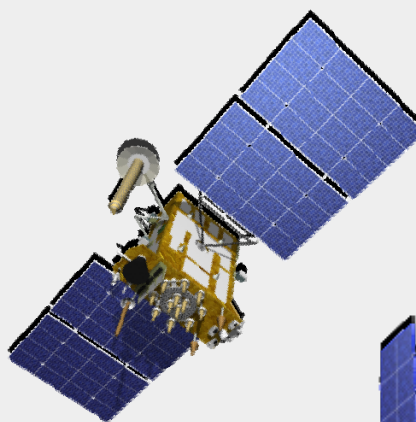
28.11.2011



РОСКОСМОС

GLONASS Modernization



first launch	first launch	first launch	planned launch
1982	2003	2011	2015
«Glonass»	«Glonass-M»	«Glonass-K»	«Glonass-K2»
			
HAVE BEEN DECOMMISSIONED	UNDER NOMINAL OPERATION	UNDER FLIGHT TESTS	UNDER DEVELOPMENT



РОСКОСМОС

«Glonass-M»



MAIN FEATURES & MODERNIZATION

MAIN FEATURES

- 3 Cs clocks
- Ni-H Batteries
- Silicon solar cells
- 7 years design life
- Single / Triple launch capabilities
- Nav. signals transmission in frequency bands L1&L2
- Space Laser Ranging
- advanced technology demonstration capabilities



PRE - MODERNIZATION

- L1OF; L1SF; L2OF; L2SF



POST MODERNIZATION

- L1OF; L1SF; L2OF; L2SF, L3OC (planned from 2014)



РОСКОСМОС

«Glonass-K» FEATURES & IMPROVEMENTS



MAIN FEATURES

- 2 Cs + 2 Rb clocks
- Ni-H Batteries
- single-junction Ga-As solar cells
- 10 years design life
- Single / triple launch capabilities
- Nav. signals transmission
in L1&L2&L3 frequency bands
- Space Laser Ranging
- Search & Rescue (COSPAS-SARSAT)



PRE – MODERNIZATION (701F)

- Nav. antenna (L1OF, L1SF, L2OF; L2SF)
- Nav. antenna (L3OC)
- Solar array
(single-junction GaAs solar cells)

POST MODERNIZATION (702F)

- Improved nav. antenna
(L1OF; L1SF; L2OF; L2SF, L3OC)
- Solar array
(triple-junction GaAs solar cells)



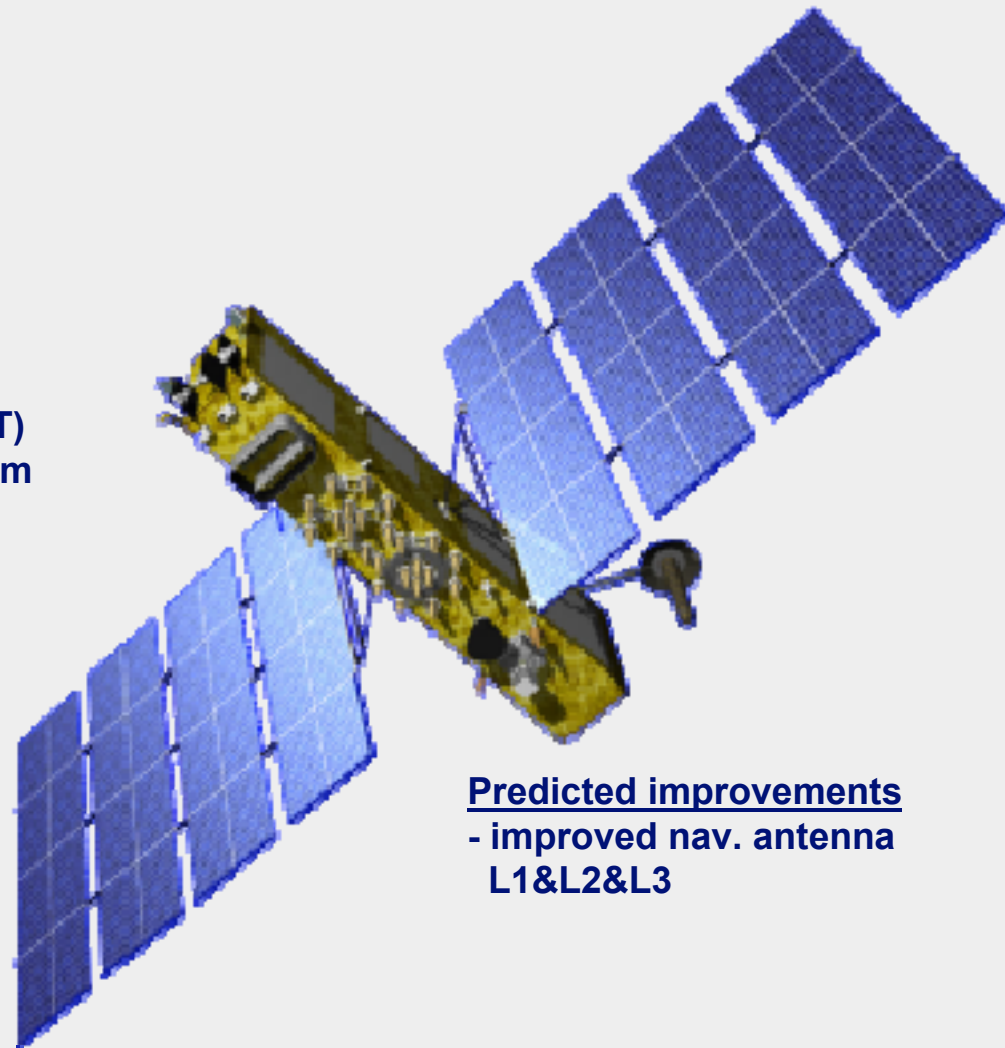
РОСКОСМОС

«Glonass-K2» FEATURES & IMPROVEMENTS



MAIN FEATURES

- 2 Cs + 2 Rb clocks
- Lithium-Ion batteries
- triple-junction GaAs solar cells
- 10 years design life
- Single / Triple launch capabilities
- Nav. signals transmission
in L1&L2&L3 frequency bands
- Space Laser Ranging
- Search & Rescue (COSPAS-SARSAT)
- Space Environment Detection System
- advanced technology
demonstration capabilities incl.
advanced clocks



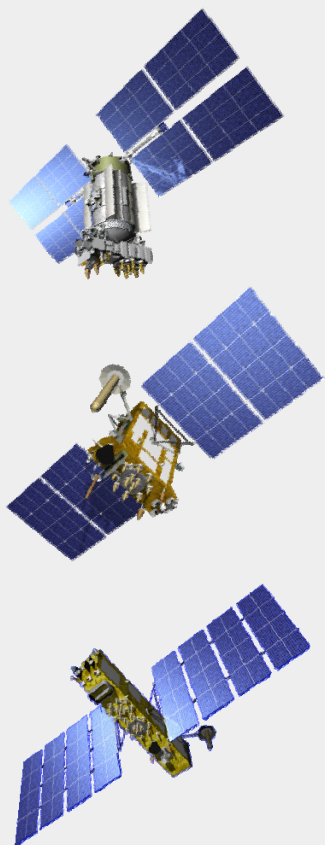
Predicted improvements

- improved nav. antenna
L1&L2&L3



РОСКОСМОС

GLONASS navigation signals modernization



Satellite	FDMA signals		CDMA signals		
	L1	L2	L1	L2	L3
«Glonass-M»	L1OF L1SF	L2OF L2SF	-	-	L3OC (from 2014)
«Glonass-K»	L1OF L1SF	L2OF L2SF	-	-	L3OC
«Glonass-K2»	L1OF L1SF	L2OF L2SF	L1OC L1SC	L2OC L2SC	L3OC L3OC



POCKOCMOC

SUMMARY



- Currently GLONASS system provides worldwide service
- Open signals are provided to users in three frequency bands L1&L2&L3.



РОСКОСМОС

The main indexes of space complex modernization in frames of new GLONASS Program 2012-2020



- Navigation signals (FDMA&CDMA) are transmitted in three frequency bands (L1OF, L1SF, L2OF, L2SF, L1OC, L1SC, L2OC, L2SC, L3OC)
- constellation includes 30 satellites
- 100 % availability is provided at the open territory
- 0,6 m user position accuracy
provided real time using only space complex service



РОСКОСМОС



Thank you for your attention!

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