GLONASS
space segment
STATUS & MODERNIZATION

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

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

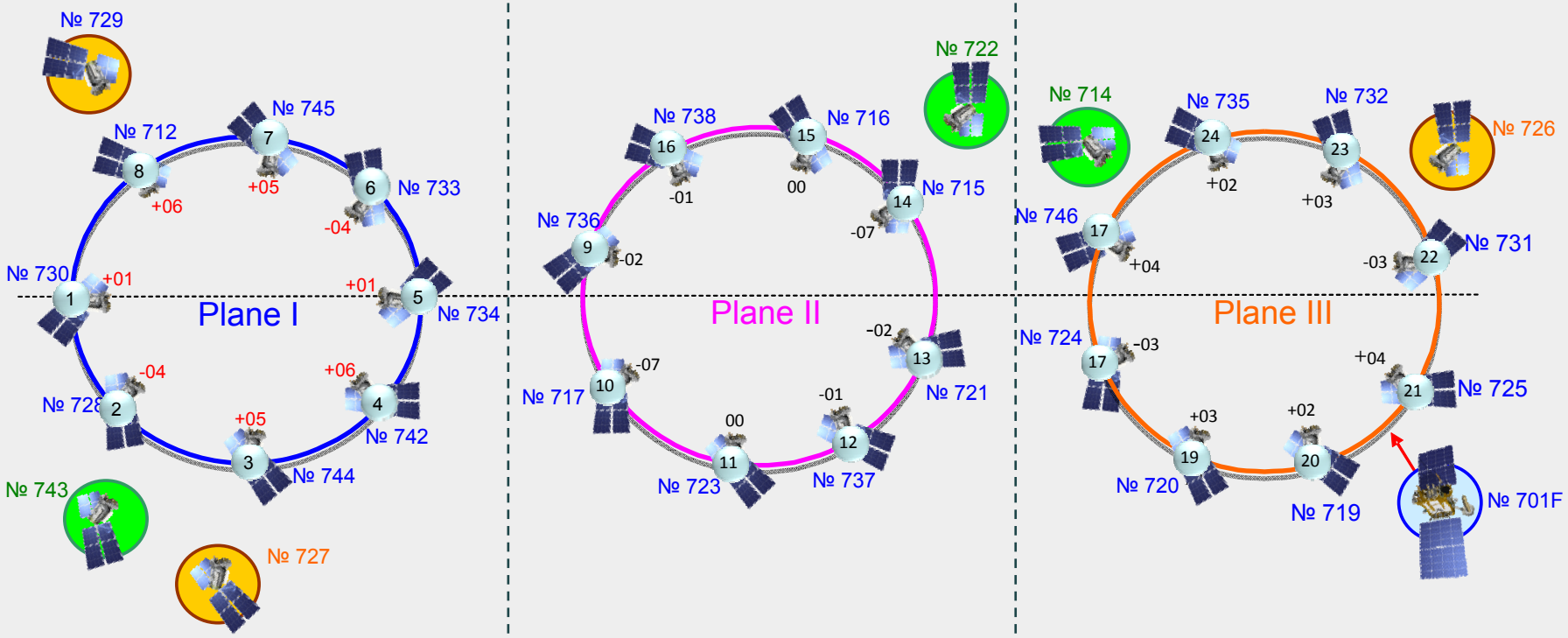
РОСКОСМОС

ЦНИИМАШ TSNIIMASH

ИАЦ

РЕШЕТНЕВ
ОАО «И С С»

Orbital constellation status
04.11.2012



24 SV — Nominal operation

1 SV — Flight tests («Glonass-K», № 701)

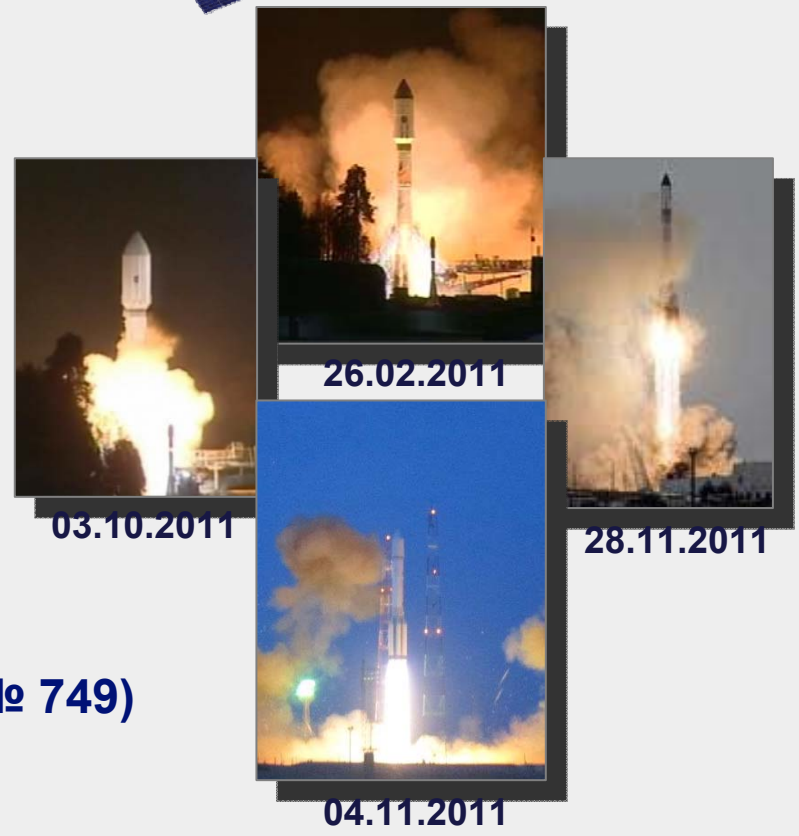
3 SV — Spare (№№ 714, 722, 743)

3 SV — In maintenance (№№ 726, 727, 729)

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»

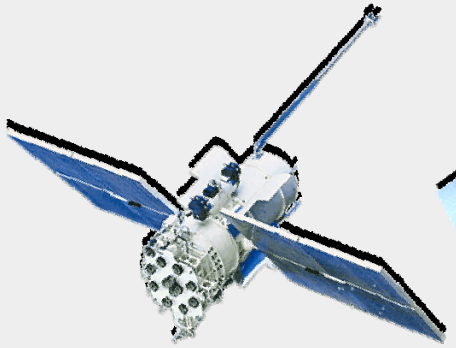


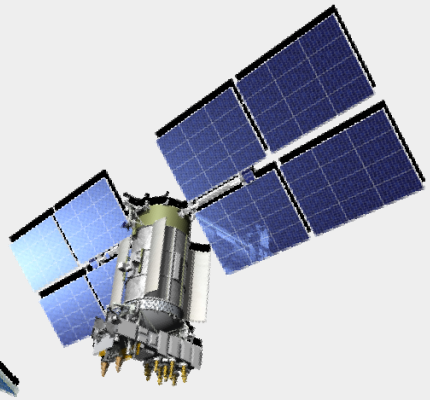
Ground store:

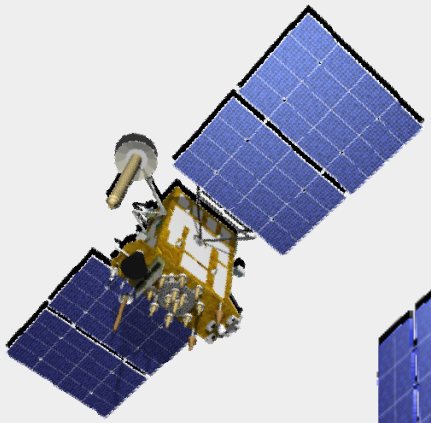
- 1 SV «Glonass-K» (№ 702F)
- 3 SV's «Glonass-M» (№ 747, № 748, № 749)

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

«Glonass-M»
MAIN FEATURES & MODERNIZATION

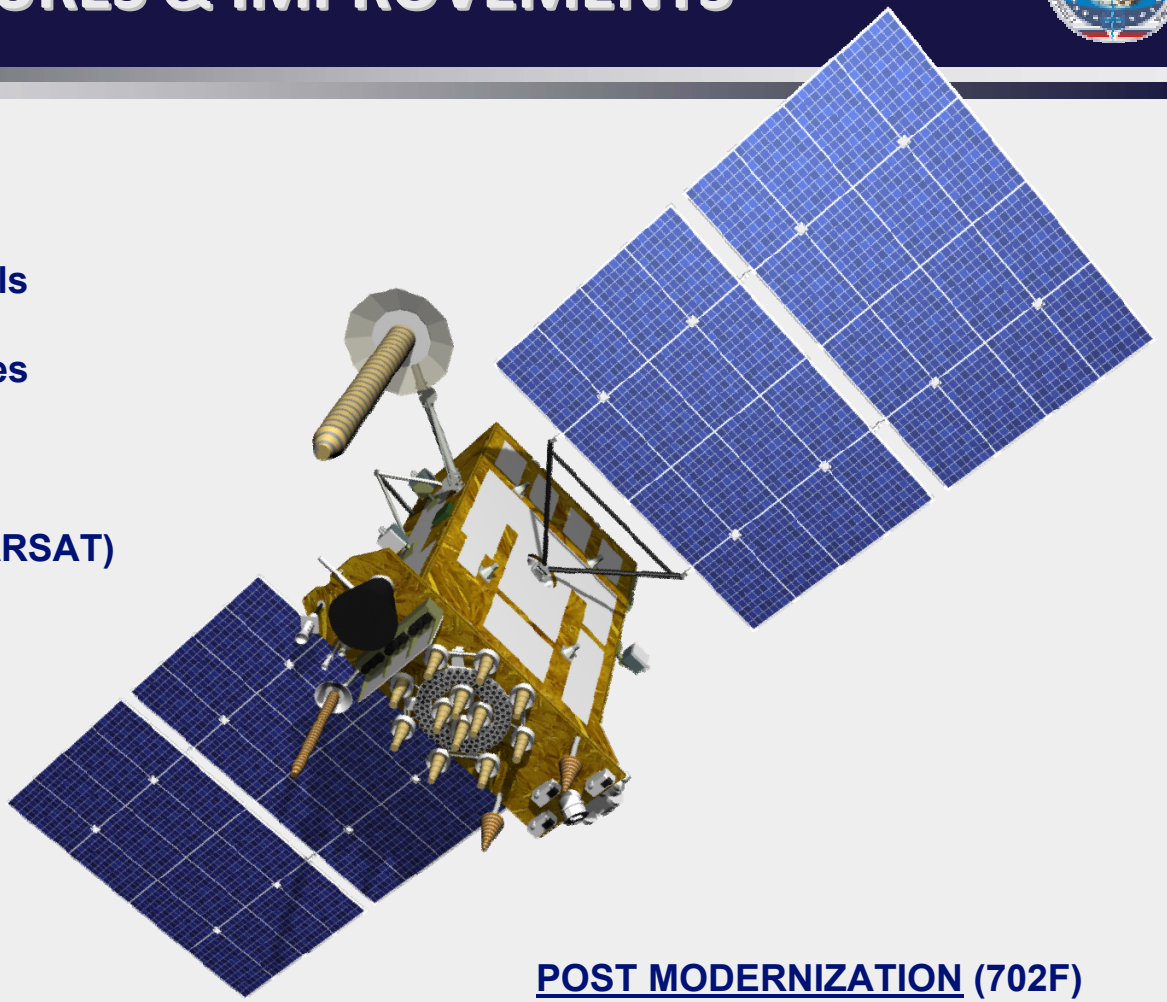
MAIN FEATURES
- 3 Cs clocks
- Ni-H Batteries
- Silicon solar cells
- 7 years design life
- Single / Triple launch capabilities
- Nav. signals transmission in frequency bands L1&L2
- Space Laser Ranging
- advanced technology demonstration capabilities

PRE - MODERNIZATION
- L1OF; L1SF; L2OF; L2SF

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

«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)



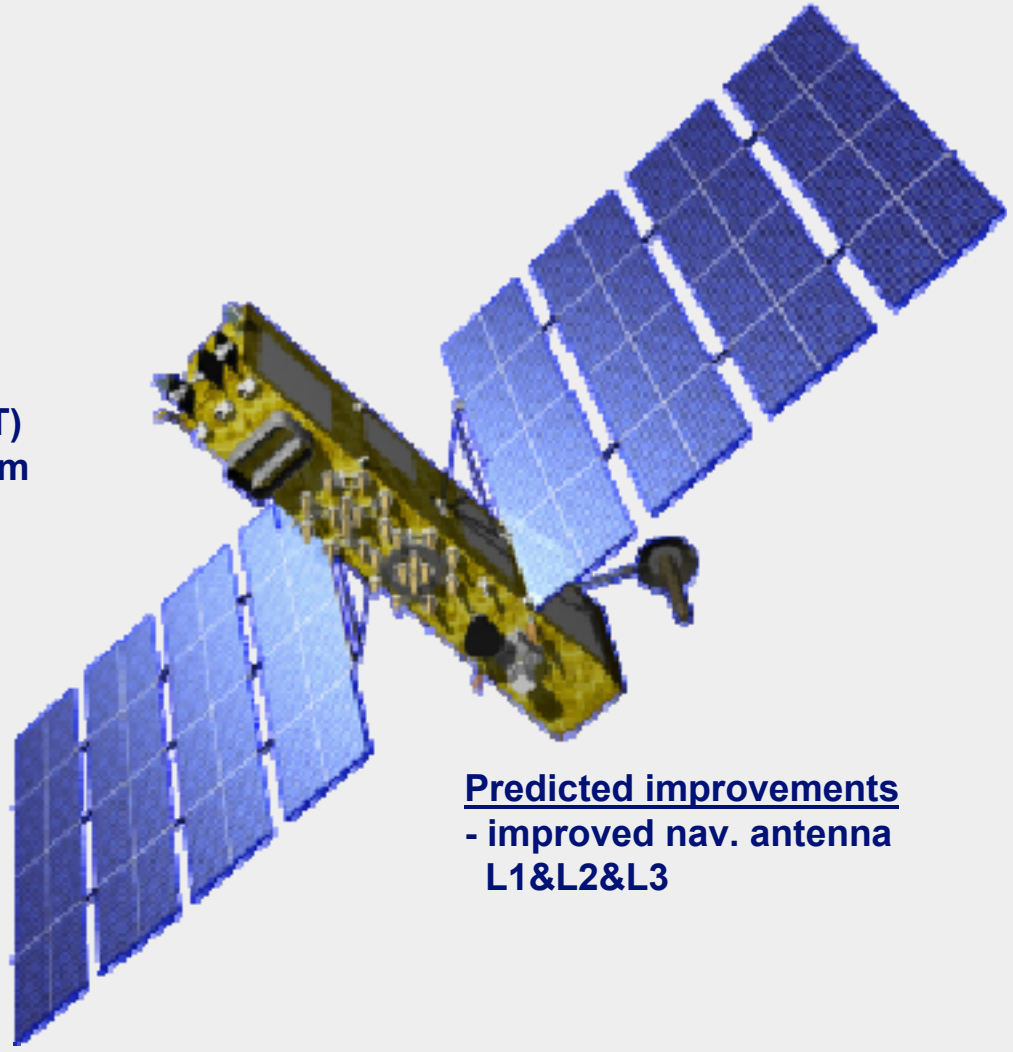
PRE – MODERNIZATION (701F)
- Nav. antenna (L1OF, L1SF, L2OF; L2SF)
- Nav. antenna (L3OC)
- Solar array
  (single-junction GaAs solar cells)

POST MODERNIZATION (702F)
- Improved nav. antenna
  (L1OF; L1SF; L2OF; L2SF, L3OC)
- Solar array
  (triple-junction GaAs solar cells)

«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

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

SUMMARY

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

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

Thank you for your attention!

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