



FEDERAL SPACE AGENCY OF RUSSIA

**NEW SPACE PROGRAM OF RUSSIAN FEDERATION
AND
SPACE DEBRIS PROBLEM**

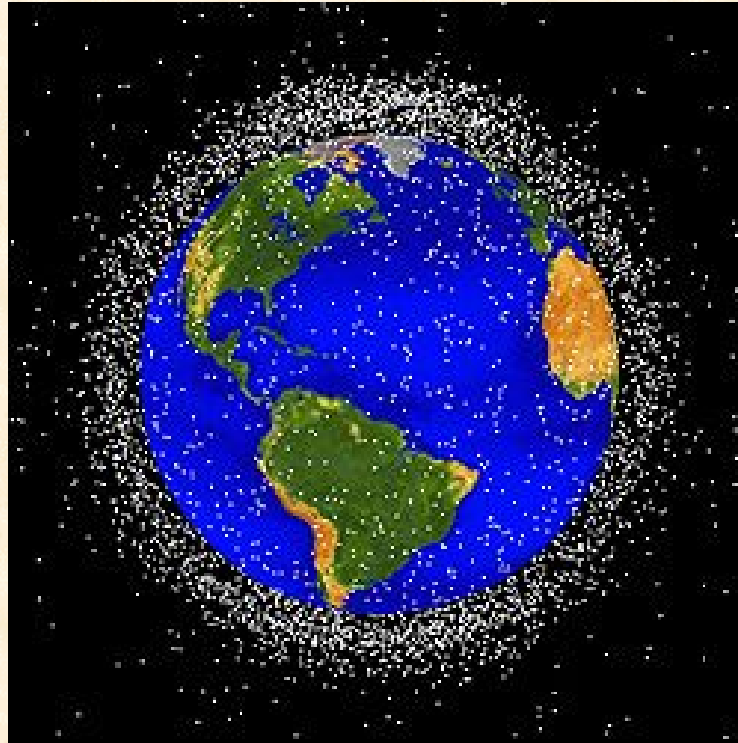
**43-nd session
of the Scientific and Technical Subcommittee
of the UN Committee on the Peaceful Uses of Outer Space (COPOUS)**

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Vienna, Austria



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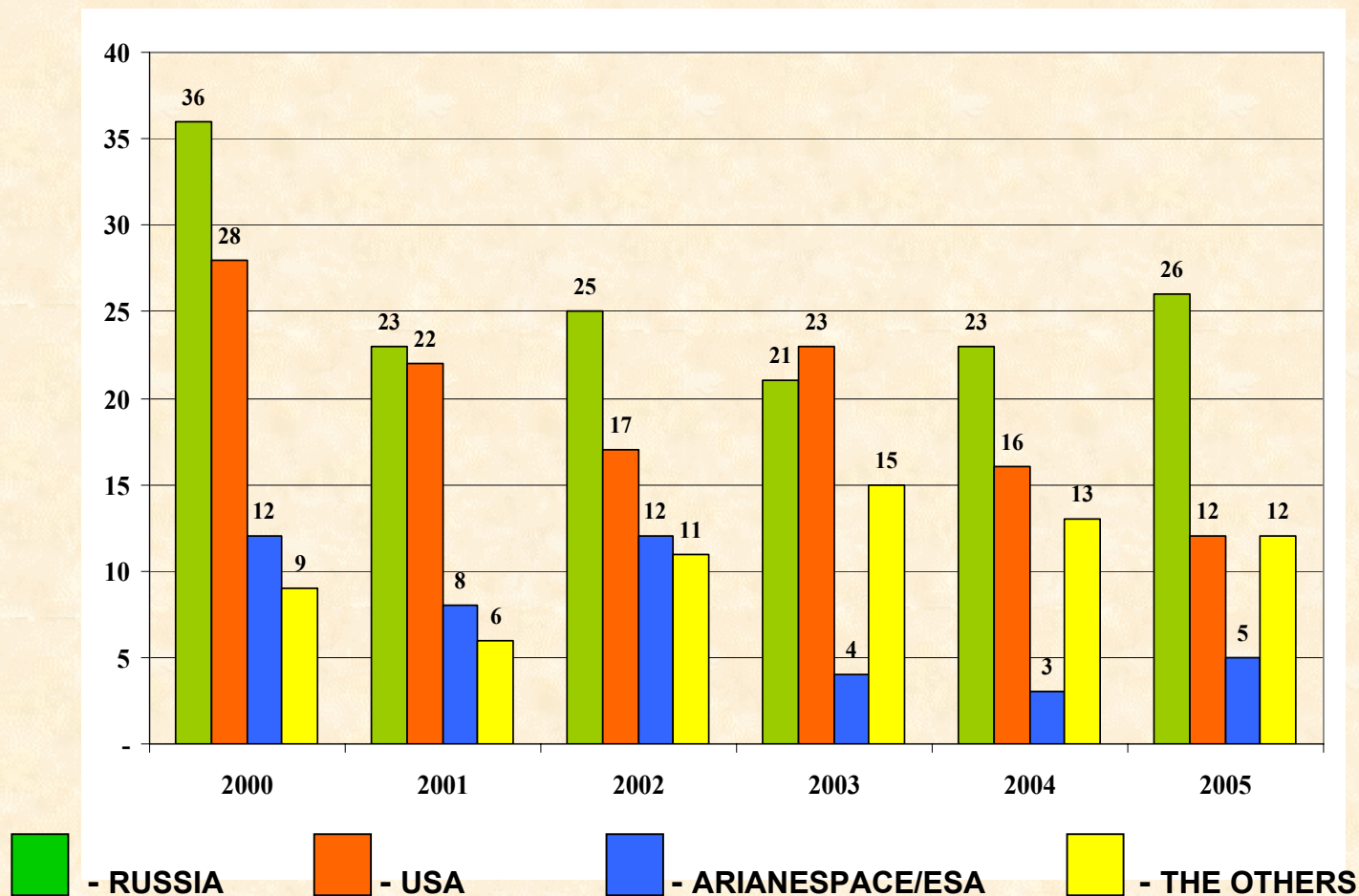
(NASA – Johnson Space Center)

- **Space activity is an essential part of overall mankind activity. The great number of useless objects had occupied near-Earth space thus forming space debris population.**
- **Risk of damage for functioning and future space systems, as well as to people and property on the ground is being increased consistently from year to year.**
- **Current practices of space faring nations in designing and operation of space systems need to be adapted in order to protect near-Earth space environment**



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DYNAMICS OF LAUNCHINGS IN RUSSIA AND THE OTHERS SPACE FARING STATES AND ORGANIZATIONS



The Russian Federation keeps leading positions in space activity on launches.



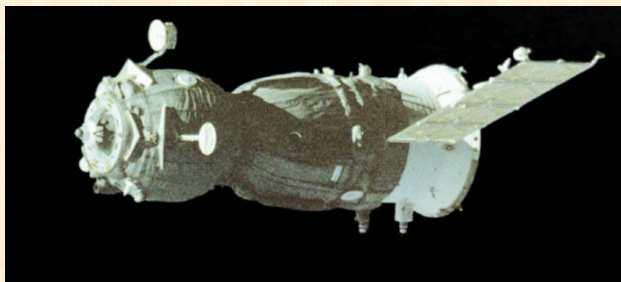
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Totally 26 launchings of various designations were realized by Russia in 2005
The launchers used in 2005 are listed in the table.

№/ №	Launcher Type	Apogee Motor	Number of Launchings	Number of Spacecrafts	Type of Orbit
1	“Proton-K”	DM	2	2	GEO
2	“Proton-K“	DM	1	3	MEO
3	“Proton-M”	“Briz-M”	4	4	GEO
4	“Soyuz-U”	-	6	6	Circular
5	“Soyuz-FG”	- “Fregat” “Fregat” “Fregat”	2 1 1 1	2 1 1 1	Circular GEO MEO Interplanet
6	“Molniya-M”	-	1	-	Emergency
7	“Kosmos-3M”	-	3	12	Circular
8	“Dnepr”	-	1	2	Circular
9	“Rokot”	-	1 / 1	1 / -	Circular / Emergency
10	“Shtil”		1	-	Emergency



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“Soyuz-TMA”



“Glonass”



“Express-AM”

Distribution of launchings among Russian space programs:

- 10 launchings under the Federal Space Program
- 1 launching under the Federal Program “National Navigation System”;
- 11 commercial launchings;
- 4 defense-oriented launchings.

Within the framework of the Federal Space Program the following spacecraft were launched :

- 2 Telecommunication Spacecraft “Express-AM2” and “Express-AM3”;
- 2 Manned Spacecraft “Soyuz-TMA”;
- 4 Cargo Spacecraft “Progress-M”;
- 1 Space Technology Spacecraft “Foton-M”;
- 1 Earth Remote Sensing Spacecraft “Monitor-E”.

Within the framework of Federal Program “National Navigation System” the spacecraft “Glonass” and two spacecraft of new generation “Glonass-M” were launched.



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THE RUSSIAN FEDERATION SPACE ACTIVITY PROSPECTS

RUSSIAN FEDERAL SPACE PROGRAM FOR 2006-2015

**Russian
Federal Space
Program
for 2001-2005**

**Federal Special
Program “Global
Navigation System”
(for 2002-2011)**

LAW OF THE RUSSIAN FEDERATION ON SPACE ACTIVITIES

**National Space Policy Concept of Russian Federation
Basis of Russian Federation Policy in Science and Technology Development up to
2010 and Further**

**Decrees of the President of the Russian Federation
Resolution and Orders of the Government of the Russian Federation**

**United Nations Documents on Space Activities
Interstate, Intergovernmental and Interagency Documents on Space Activity Cooperation**



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RUSSIAN FEDERAL SPACE PROGRAM FOR 2006-2015

PROGRAM PURPOSE

Meeting the public organizations, regions and people growing needs of space means and services

PROGRAM BASIS

Expansion and raise of outer space effective use for Russian economical, social, scientific, cultural and other problems solution

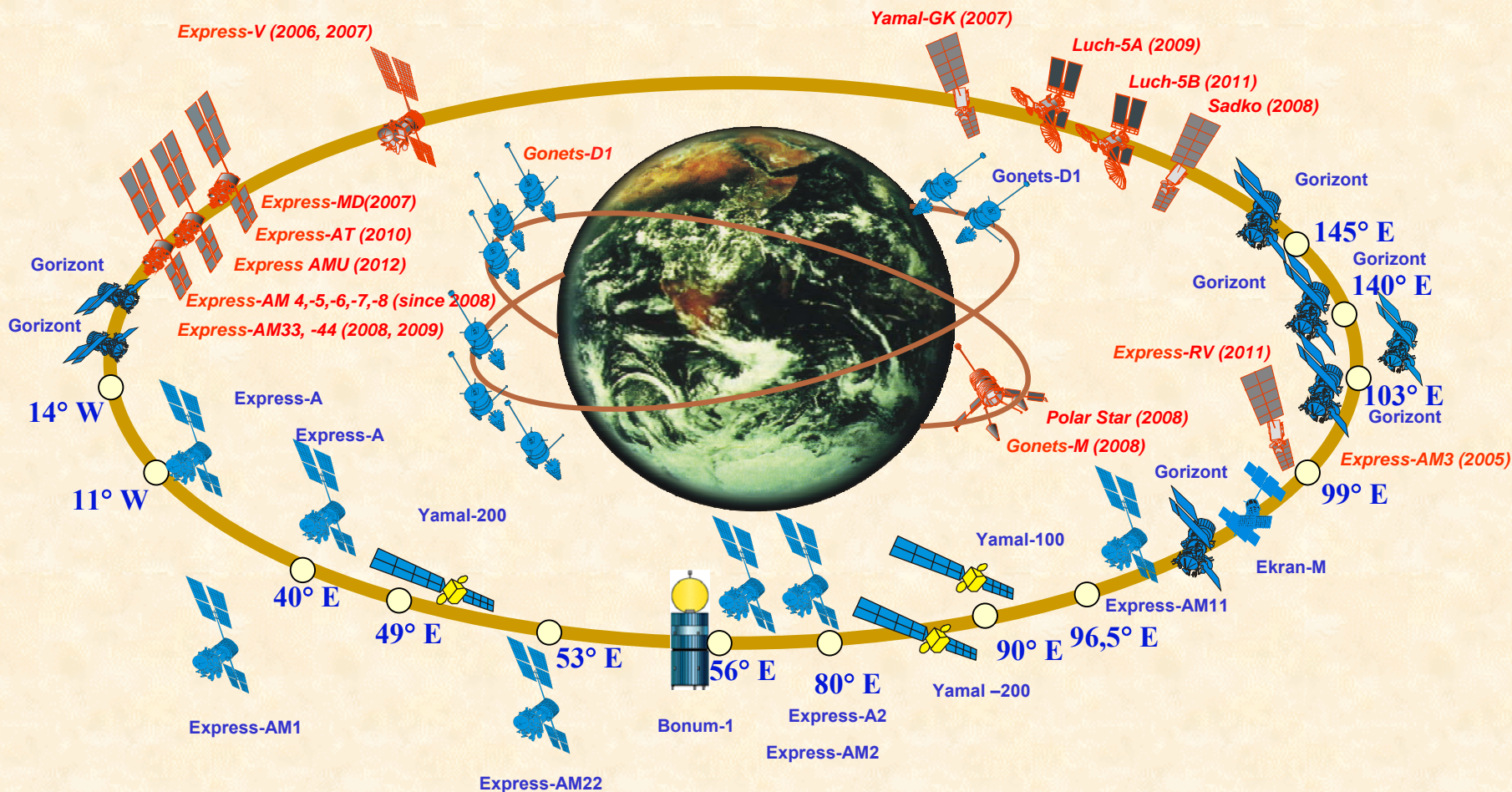
Integration and developing of the Russian Federation space potential ensuring building and use of required nomenclature of space systems competitive in the world space technologies and services market as well as guaranteeing access to and presence as required in outer space

Developing and expanding international space cooperation ensuring execution the Russian Federation international obligation in space area



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COMMUNICATION SPACE SYSTEMS



- operative spacecrafts

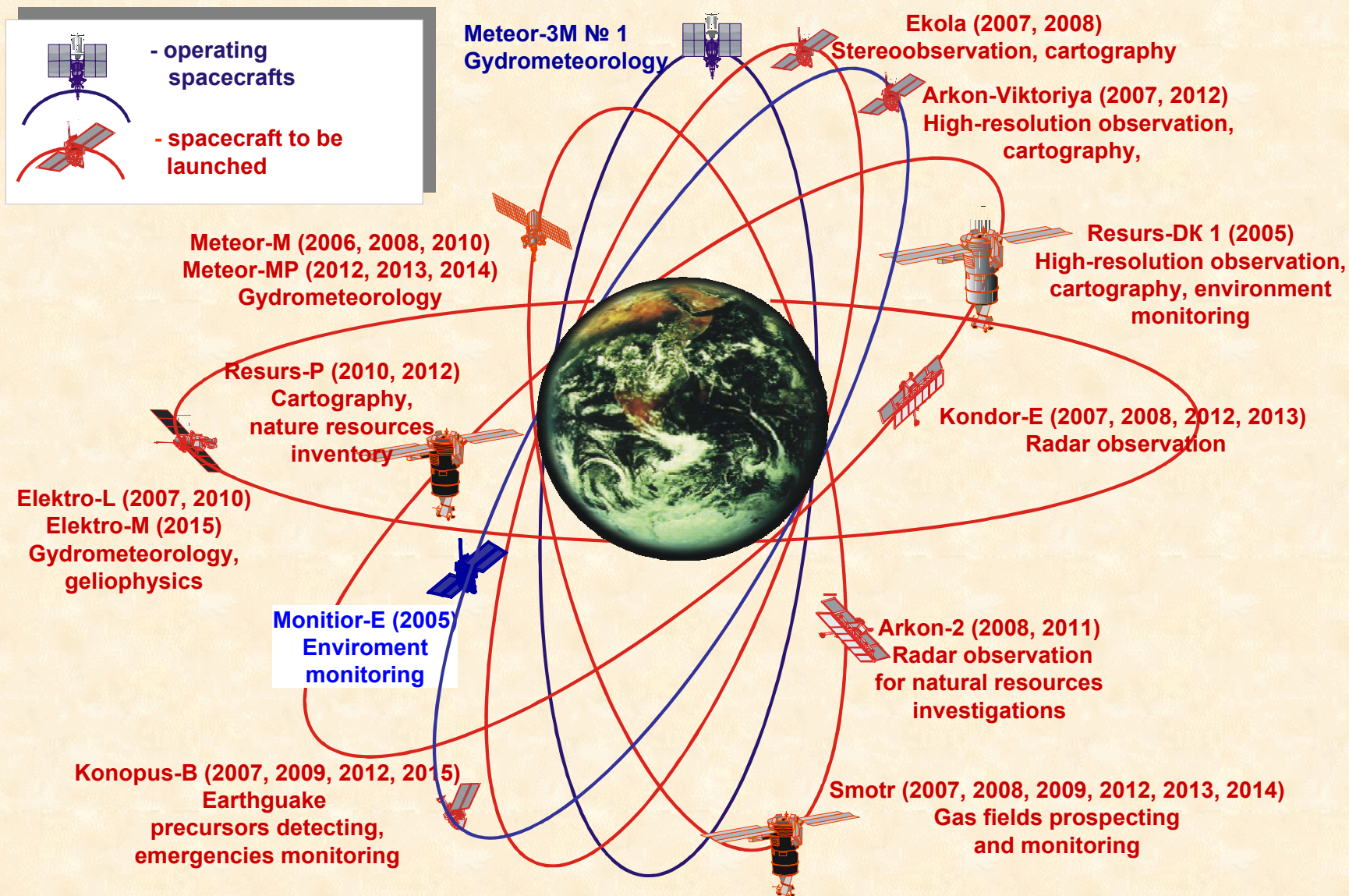


- spacecraft to be launched



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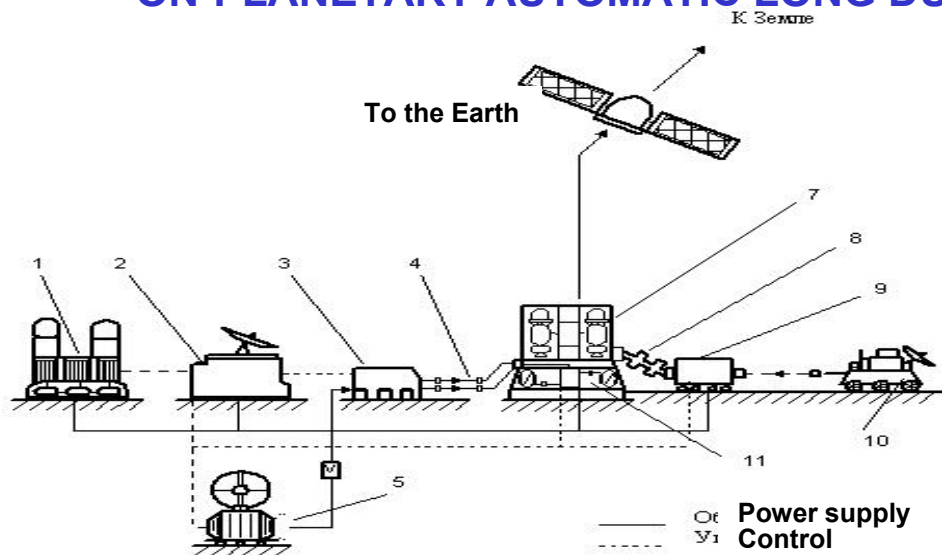
EARTH REMOTE SENSING, GIDROMETEOROLOGY, ENVIRONMENT MONITORING AND EMERGENCIES CONTROL





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ON-PLANETARY AUTOMATIC LONG DURATION BASE-STATION



1. Scientific platform with research balloons.
2. Guidance and control platform.
3. Local resources processing equipment.
4. Product of local resources processing.
5. Energetic module based on stationary gas turbine unit.
6. Spacecraft starting to the Earth.
7. "Mars-Earth" launch complex.
8. Conveyor for Martian specimen.
9. Preliminary review laboratory.
10. Martian rover.
11. Fuel storage cryogenic system.

Base 2050 Habitable area in crater (section)



General-purpose
conference hall

Adaptation-rehabilitation Center-the largest
domical area of the base



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Prediction of Russian Launchings till 2015 in According with the Federal Space Program and the Federal Program“ National Navigation System”

Type of Orbit	The Number of Launched Spacecraft / The Number of Launchings				
	2006 - 2010 yrs	2011 – 2015 yrs	Σ S/C / Σ Launch.	Σ S/C + Σ Launch.	%
LEO					
H < 600 km	46 / 42 *)	54 / 53 *)	100 / 95	195	51
600 km < H < 1000 km	8 / 5 *)	7 / 5 *)	15 / 10	25	6.5
1000 km < H < 1500 km	6 / 2 *)	12 / 4 *)	18 / 6	24	6.3
*) taken into account piggy-up launchings	60 / 49	73 / 62	133 / 111	244	63.8
Highly Elliptical					
600 - 1600 km/ 39000 – 40000 km	8 / 6 *)	4 / 4	12 / 10	22	5.7
500 – 2000 / 80000 km – 2000000 km	2 / 2	2 / 2	4 / 4	10	2.6
	10 / 8	6 / 6	16 / 14	46	8.3
MEO					
19000 km	21 / 8 *)	12 / 6 *)	33 / 14	44	11.5
GEO					
	16 / 11 *)	17 / 12 *)	33 / 23	56	14.6
Interplanet					
	1 / 1	2 / 2	3 / 3	6	1.8
Σ	108 / 77	110 / 88	218 / 165	383	100



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- Russian Federation applies consecutive efforts in field of space debris mitigation. This work is of especial meaning with respect to safety provisions of manned space flights and International Space Station.
- The Russian activity on debris mitigation is being carried out within the framework of the National Legislation, taking into account the dynamics of similar measures and practices taken by space-faring nations.
- In 2000 the Federal Space Agency Standard "Space Technology Items. General Requirements for Mitigation of Space Debris Population" had come into force.
- The requirements of the Standard are similar to the requirements of mitigation standards of organizations and agencies - IADC members. They are obligatory in case of space vehicles produced by the order of Roscosmos.
- Other normative documents have been developed:
 - "Russian National Standard. Model of spatial - temporary distribution of density of Space Debris" (2001);
 - "Space Technology Items. General Requirements on Spacecraft Shielding Against Space Debris and Meteoroids" (2003).



The requirements of the Standard extend to space systems of scientific, social-economic and commercial designation, excluding defense-oriented and dual-application space systems.

Russian National Standard on Space Debris Mitigation is now under development. The future Standard will include the following main directions of preventing space debris generation:

- preventing on-orbit break-ups;
- spacecraft and orbital stages removal from GEO at the end of mission;
- disposal of spacecraft and orbital stages in LEO region at the end of mission;
- limitation of space fragments separated during normal operations;
- collisions avoidance.



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MITIGATION MEASURES FOR RUSSIAN LAUNCHERS AND SPACECRAFT



“Soyuz”



“DM” Apogee Motor

- The reduction of pressure and venting the remaining propellant components from fuel tanks after engines shut down at the end of mission.
- For all commercial missions the jettisoning of SOZ engines of the "DM" Apogee Motors was prohibited.
- The propellant components remainders in SOZ engine tanks are burnt out in the regime of "negative stabilization" after the end of mission.
- Separation of operational elements is excluded or minimized.
- GEO spacecraft postmission disposal.
- Electric rocket engines are studied as for the spacecraft disposal from active orbits to burial zone
- On-board batteries are discharged.
- Self-destruction systems are prohibited.
- The flywheels and momentum wheels stop rotating due to self-deceleration.
- Separation of operational elements is excluded.



“Proton”



“Yamal”

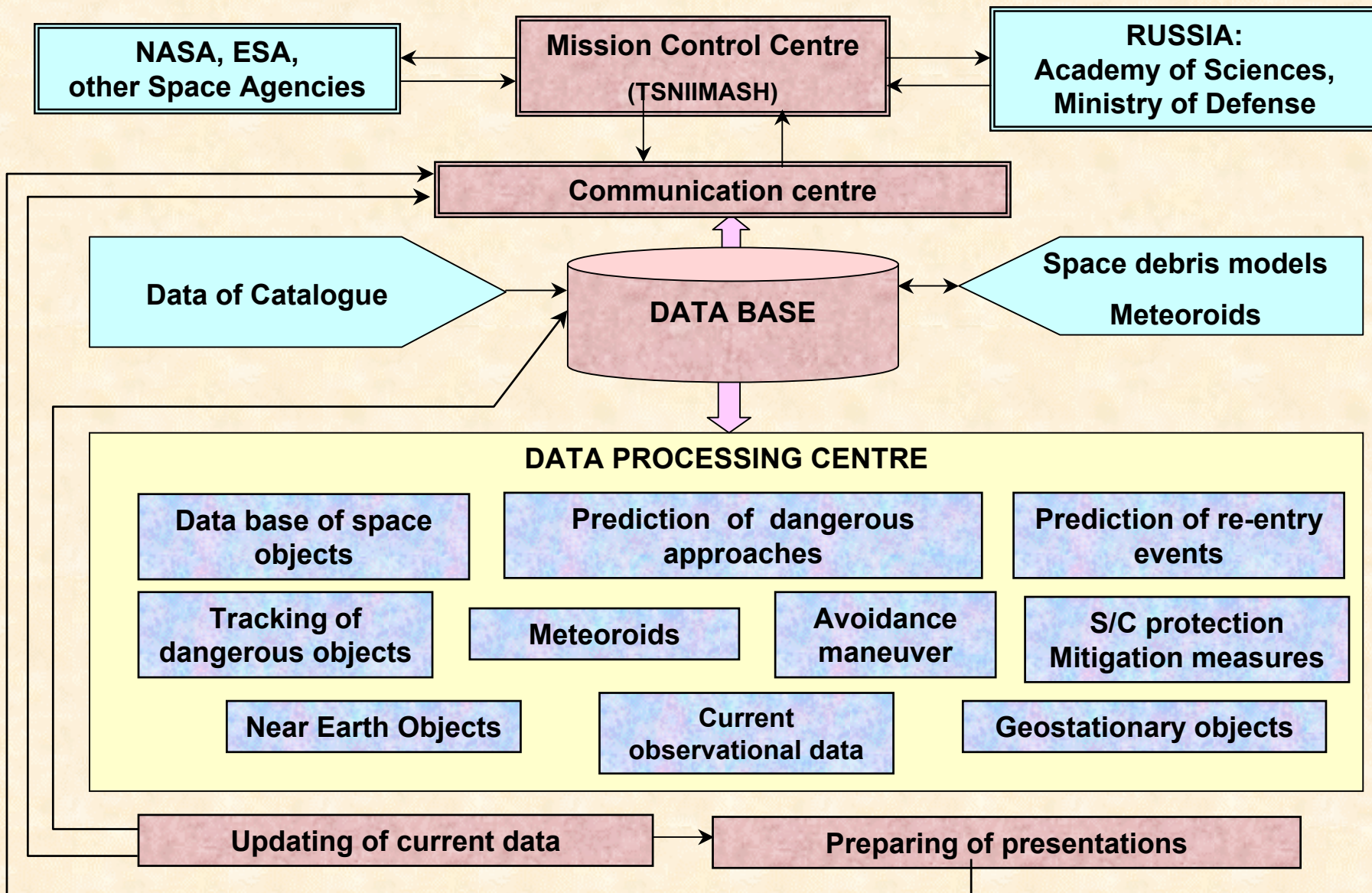


Stationary Plasma Engine



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RUSSIAN SYSTEM OF SPACE MONITORING





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FUTURE ACTIVITY ON SPACE DEBRIS PROBLEM

INTERNATIONAL COOPERATION

UNCOPUOS

IADC

ISO

Space Debris Mitigation Guidelines

Limitation of debris
released during
normal operations

Minimization of the
potential for on-orbit
break-ups

Post-mission
disposal

Prevention of
on-orbit collisions



The Main Problems of Future Activity



Implementation of
Internationally Approved
Mitigation Guidelines

International Monitoring
of Mitigation Guidelines
Fulfillment

International agreements
about the
“Rules on space roads”



Summary

- The Russian Federation is devoted to the international efforts on space debris problem resolution and it is already implementing practical steps on space debris mitigation on a voluntary basis within its own national mechanisms.
- Russian Federal Space Program up to period 2006-2015 was approved. The work on space debris problem is included in the appropriate provisions of Program.
- Russian National Standard on Space Debris Mitigation is under development.
- The Russian Federation is convinced that the most appropriate place for developing of an internationally approved measures to protect near-Earth space environment is the UN Committee on the Peaceful Uses of Outer Space.