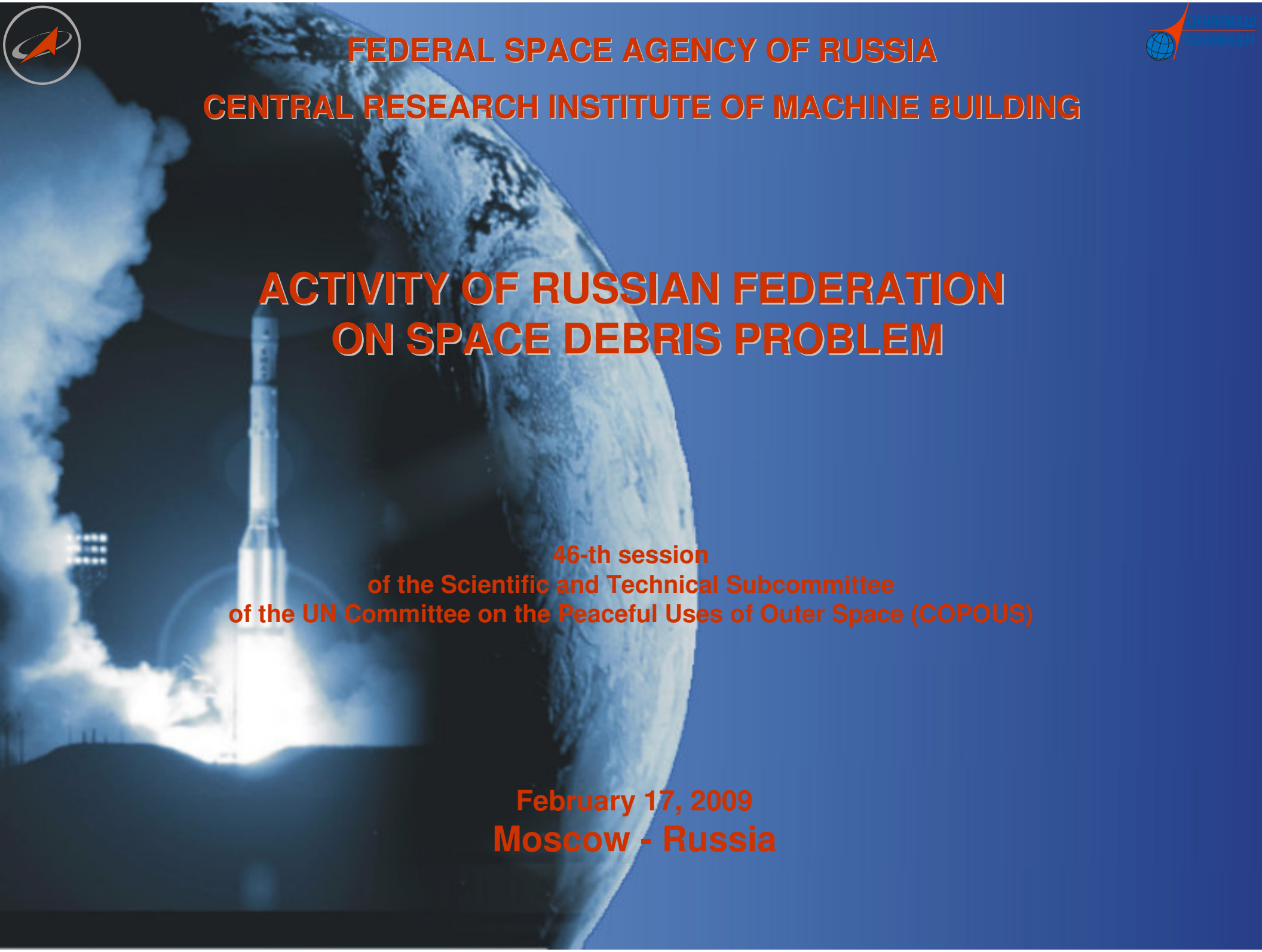


FEDERAL SPACE AGENCY OF RUSSIA

CENTRAL RESEARCH INSTITUTE OF MACHINE BUILDING

ACTIVITY OF RUSSIAN FEDERATION ON SPACE DEBRIS PROBLEM

46-th session
of the Scientific and Technical Subcommittee
of the UN Committee on the Peaceful Uses of Outer Space (COPOUS)

February 17, 2009

Moscow - Russia

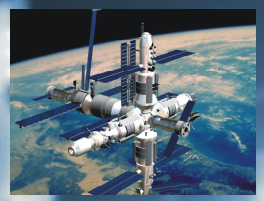
THE KEYSTONES OF THE RUSSIAN FEDERATION SPACE POLICY UP TO 2020 AND BEYOND

approved by the PRESIDENT of the RUSSIAN FEDERATION, April, 2008

Top Priorities of the Russian Federation Space Activity

Deployment of orbital satellite groupings for supporting communications, TV and radio broadcasting, navigation, ERS, hydrometeorology, basic space research, defense, thus satisfying the national security, social, economic and science sectors requirements as a result of the space activity implemented at the target level.

Assured space access and autonomy of the Russian Federation space activity within the whole range of the missions to be realized owing to construction of a launch site on the country's territory for operating science- and economy-oriented SC



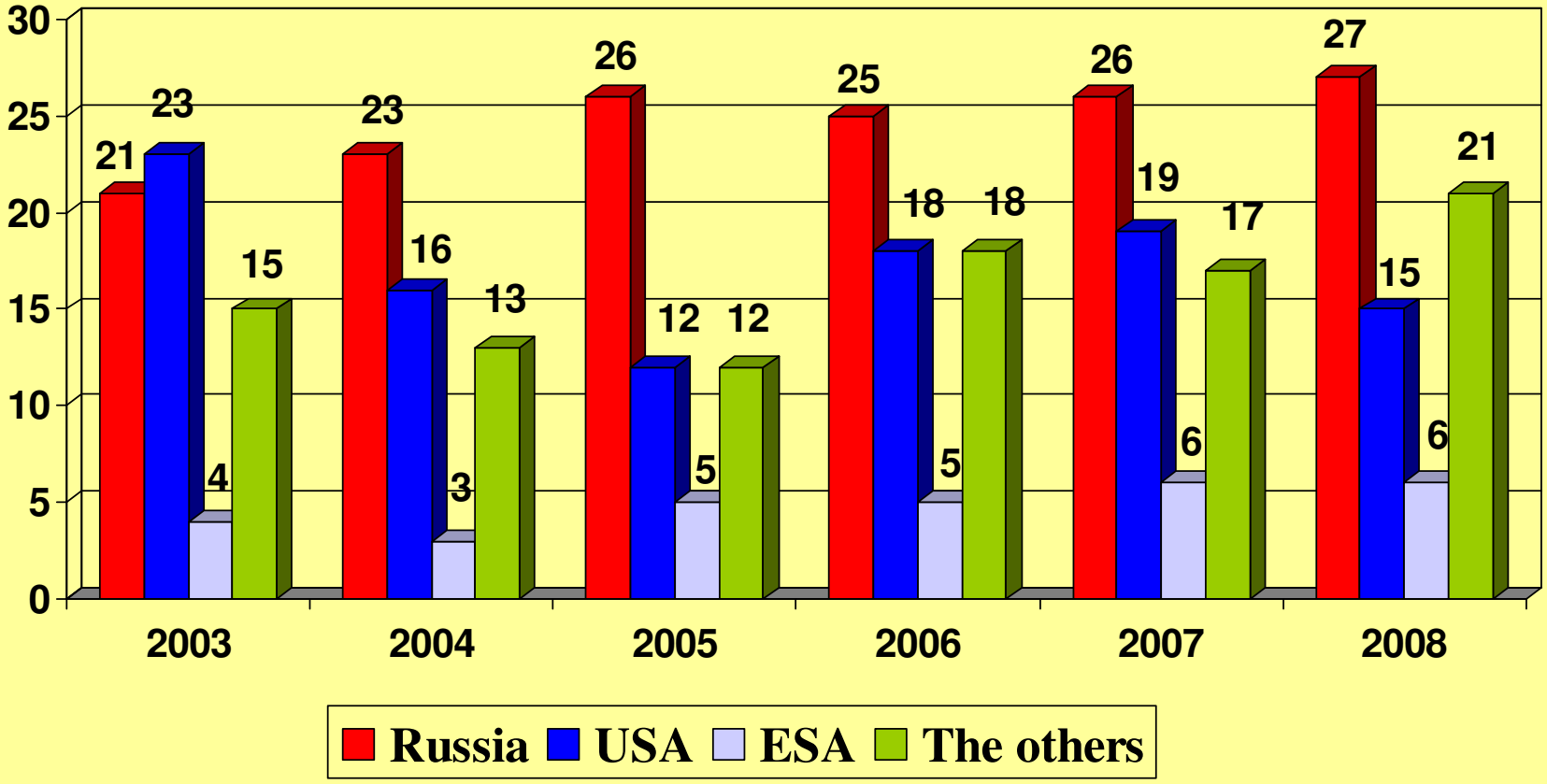
Fulfillment of international obligations including the ISS commitments, completion of the ISS Russian Segment buildup and enhancement of its scientific application payoff

Exploration of Solar system planets and celestial bodies focused on obtaining profound knowledge about the surrounding world, utilizing extraterrestrial resources, studying the Earth climate evolution mechanisms, searching for exobiota

Safety control of space activity

Assurance of ecological safety of space activity, implementation of technologies and the designs minimizing production of space debris at launch and operation of spacecraft and orbital stations

DYNAMICS OF LAUNCHES IN RUSSIA AND IN OTHER STATES AND ORGANIZATIONS



RUSSIAN LAUNCHES IN 2008

№/№	Type of Launcher	Accelerating Engine	Number of Launches	Type of Orbit
1	“Soyuz-FG”	-	2	Circular
2	“Soyuz-FG”	“Fregat”	1	Circular
3	“Soyuz-U”	-	5	Circular
4	“Soyuz-2.1b”	-	1	GEO
5	“Proton-M”	“Briz-M”	7	GEO
6	“Proton-M”	“DM-2”	2	Circular
7	“Proton-K”	“DM-3”	1	GEO
8	“Kosmosc-3M”	-	3	Circular
9	“Dnepr”	-	2	Circular
10	«Zenit-3SLB»		1	GEO
11	«Rokot»	“Briz-KM”	1	Circular
12	“Molniya-M”	-	1	Circular
Total number:			27	

ROSCOSMOS ACTIVITY IN SPACE DEBRIS MITIGATION

The main measures to mitigate space debris generation :

- **Proton and Soyuz stages propellant tank pressure release and fuel depletion;**
- **No structure elements separated from the DM-3 booster remaining on orbit; after booster separation from the SLV the medium adaptor is jettisoned in open reference orbit; the booster is safely removed from the spacecraft to exclude accidental in-orbit collisions; residual propellant and pressurization gas depletion from the propellant tanks and sustainer pipelines after SC orbit insertion; helium release from the sustainer submerged cylinders; onboard storage battery discharge after mission completion;**
- **No small-size operating elements remaining in the near-earth space after Briz-M booster separation; release of residual fuel and gases from the additional propellant tank at its separation from the Briz-M booster into the near-earth space environment;**
- **The Dnepr SLV upper stage structure prevents pollution of the near-earth space with small-size operating elements (explosive bolts, separation system elements and elements of other fittings remain inside the stage); at the end of a mission propellant components are burnt out for passivation;**
- **The Kosmos-3M SLV upper stage SC separation push-off springs have been modified in order to prevent ejection of fragments generated at their operation into the near-earth space environment.**

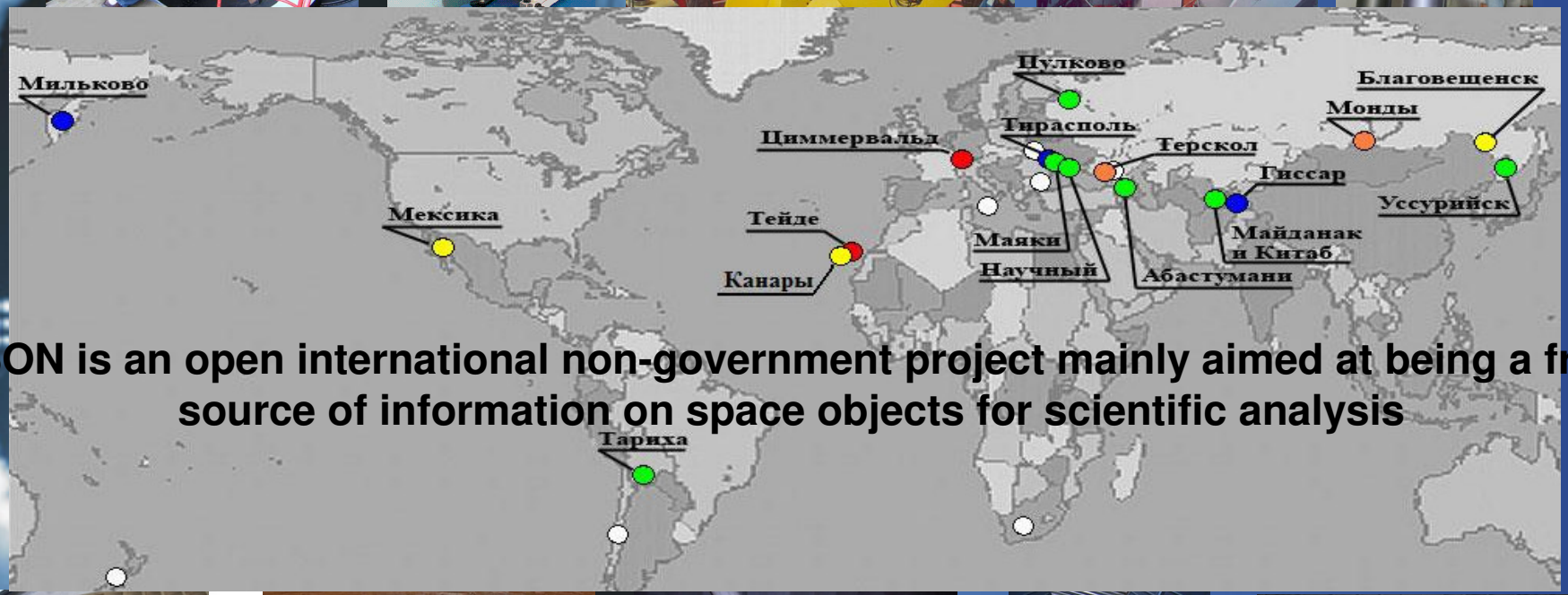
THE 26-th MEETING OF THE INTER-AGENCY SPACE DEBRIS COORDINATION COMMITTEE (IADC)

MOSCOW - 2008

INTERNATIONAL SCIENTIFIC OPTICAL NETWORK (ISON)

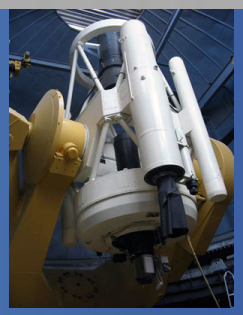




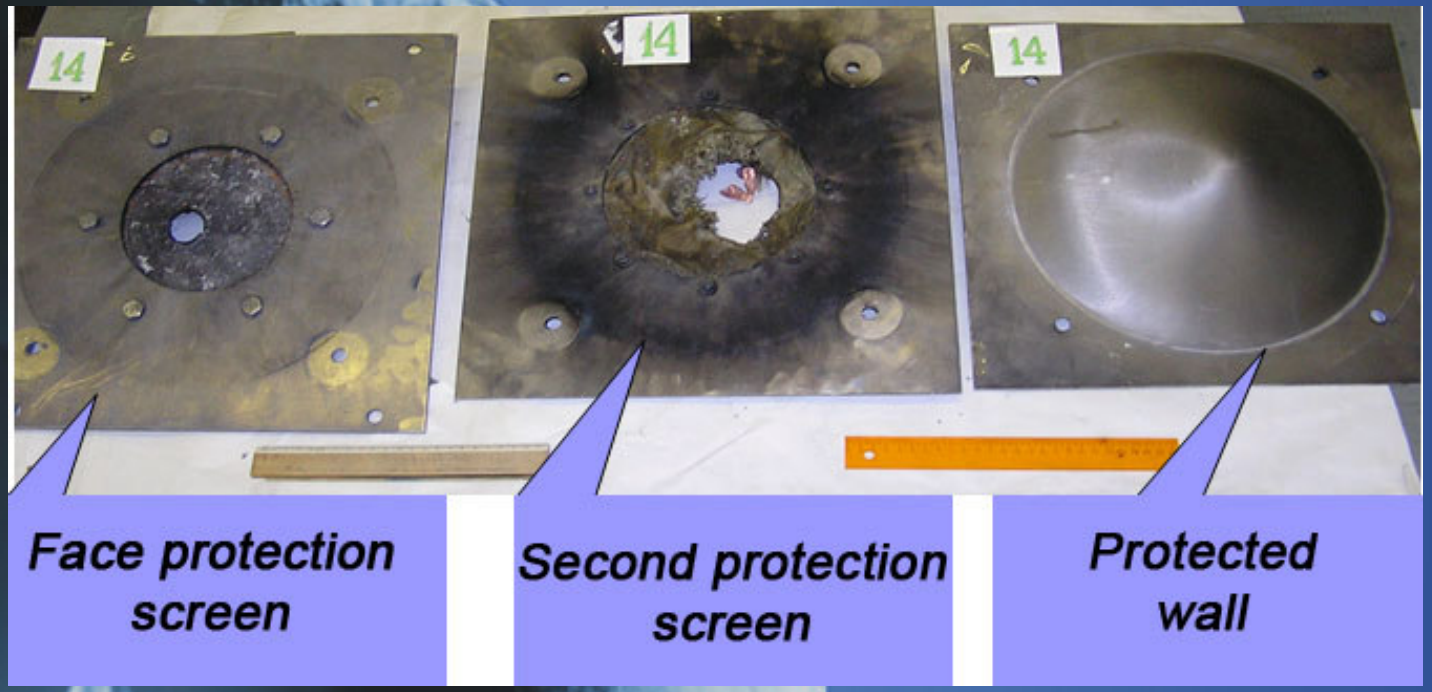


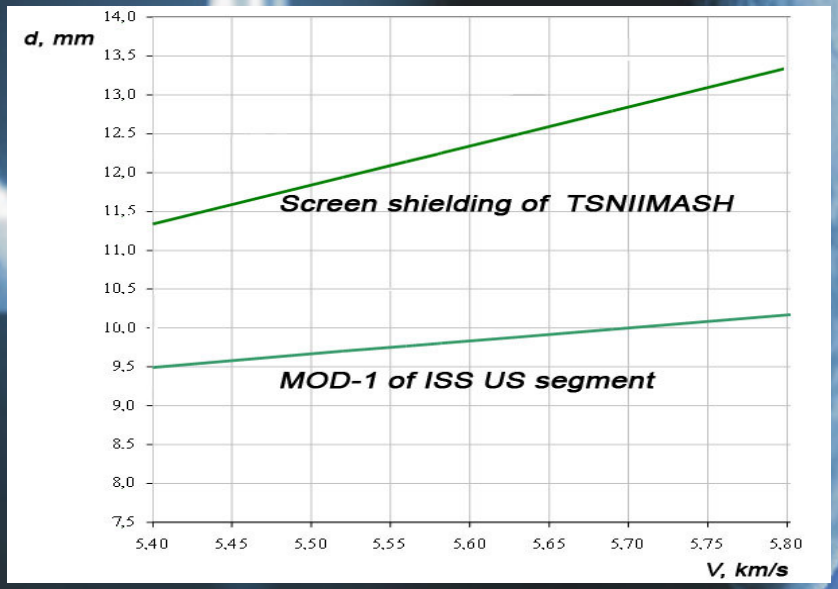
ISON is an open international non-government project mainly aimed at being a free source of information on space objects for scientific analysis




TYPICAL VIEW OF PROTECTED STRUCTURE (NO PENETRATION)





Experimental data comparison on ballistic limit curves of ISS US segment shielding MOD-1 and TSNIIMASH shielding

DEVELOPMENT OF RUSSIAN STANDARDS ON SPACE DEBRIS MITIGATION

NATIONAL STANDARD OF THE RUSSIAN FEDERATION

"General Requirements to Spacecraft and Orbital Stages on Space Debris Mitigation"

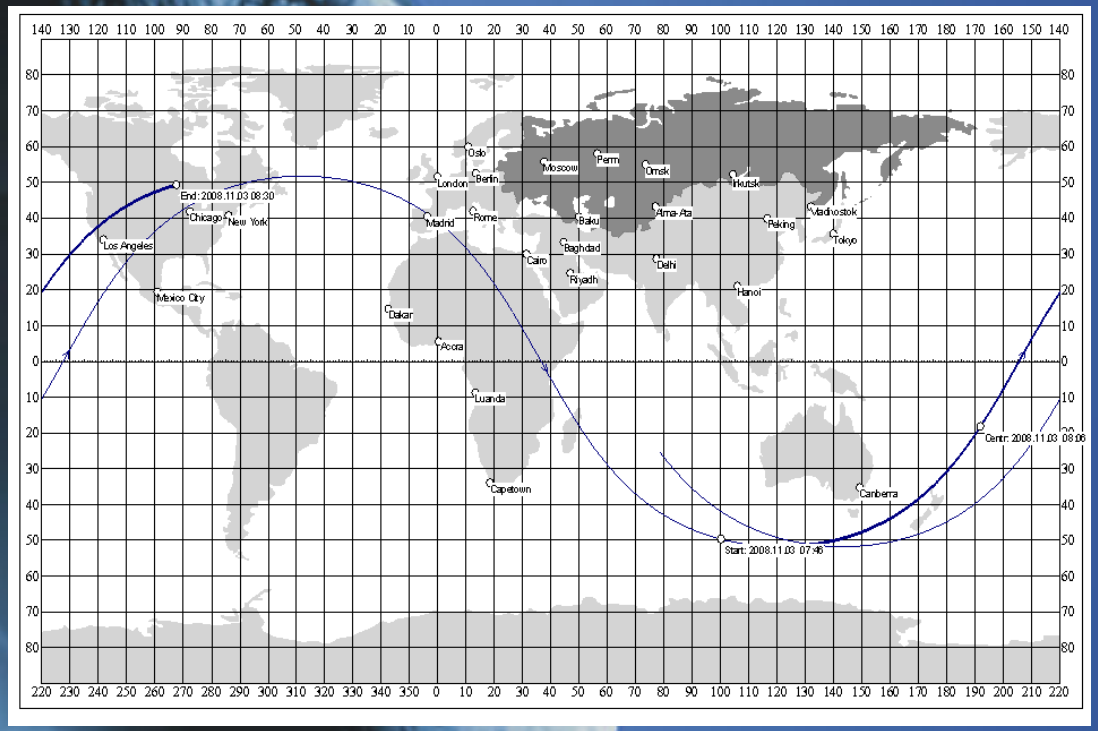
General requirements to design and operation of spacecraft and orbital stages to assure space debris mitigation .

(Came into force 2009/01/01)

- **The common requirements to space vehicles are established to limit the space debris population in Near Earth Space**
- **The requirements should be applied to new designed and updated space vehicles of different type: civil, science (including deep space investigations), commercial, military and manned missions.**
- **Application of the requirements of the standard must be putted into practice during the all stages of the life of space means: designing, manufacturing, launch, operation and utilization.**
- **The requirements of the NATIONAL STANDARD OF THE RUSSIAN FEDERATION were harmonized with the UN Mitigation Guidelines**

THE IADC TEST RE-ENTRY CAMPAIGN 2008

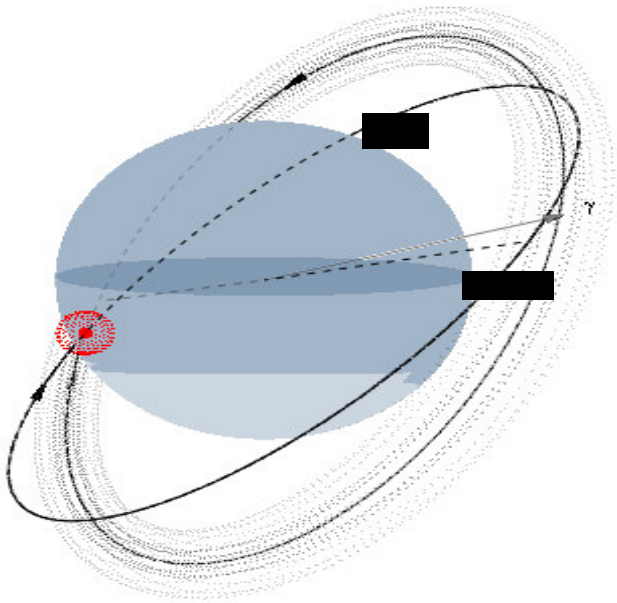
Tested object - USA Early Ammonia Servicer, № 98067BA



1. Roscosmos was the party in the 10-th test re-entry campaign:
   - 19 TLE data were produced by Russian Space Surveillance System;
   - 27 re-entry predictions were produced by Mission Control Center.
2. Predicted re-entry time*: 2008/11/03, 05:05 UTC.* .
3. Roscosmos re-entry prediction is in a fine correlation with the official data.

DANGEROUS APPROACHE OF SPACE OBJECT WITH ISS 2008/08/27

Object 33246
2006-026RU, DEB



	ISS orbit	Debris orbit
H_{min} [km]	351,2	356,0
H_{max} [km]	378,5	386,3
i, inclination	51,668º	65,083º

PREDICTED APPROACH IN ORBITAL SYSTEM OF COORDINATES:

Δr = 63,2 *m*; Δn = -861,7 m; Δb = -1,379 km

RELATIVE VELOCITY – 13 km/c (OUT OF VISIBILITY ZONE OF RUSSIAN SPACE SURVEILLANCE SYSTEM)

PROBABILITY OF COLLISION - $8{,}4 \cdot 10^{-3}$

AVOIDANCE MANEUVER: 27.08.2008-19:11:00
ISS DECELERATING BURN: ΔV = -1 m/c

SUMMARY

- The Russian Federation is devoted to the international efforts on space debris problem resolution and is already implementing practical steps on space debris mitigation on a voluntary basis within its own national mechanisms taking into account the UN Space Debris Mitigation Guidelines.

- The Russian NATIONAL STANDARD «General Requirements to Spacecraft and Orbital Stages on Space Debris Mitigation» came into force. The requirements of the STANDARD were harmonized with the UN Mitigation Guidelines.

- The Russian Federation believes that approval of the UN Space Debris Mitigation Guidelines would increase mutual understanding on acceptable activities in space and thus enhance stability in space-related matters and decrease the likelihood of friction and conflict.


Thanks for your attention!