ISS LOCATION
MORE THAN 50 YEARS EXPERIENCE IN SPACE

- **June 04, 1959**
  - The affiliate of OKB-1 is established in Krasnoyarsk-26

- **August 18, 1964**
  - The first launch of in-house developed and manufactured Launcher 11K65 (COSMOS) and three small-size satellites of COSMOS family (38, 39 and 40)

- **August 01, 1977**
  - Establishment of NPO PM

- **1997**
  - NPO PM is renamed to academician M. F. Reshetnev’s NPO PM

- **March 03, 2008**
  - Establishment of ISS-RESHETNEV COMPANY

M.F. Reshetnev
General Designer and General Director (1959-1996)

A.G. Kozlov
General Designer and General Director (1996-2006)

N.A. Testoyedov
General Designer and General Director (present time)
COMPANY STRUCTURE

INTEGRATED STRUCTURE

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

General Designer and General Director of JSC «ISS»

Shareholders

NPP «Geophizika-Cosmos», Moscow
ADCS sensors

SIC «Polyus», Tomsk
Reaction wheels, Battery electronic, Power Processing Unit

«GONETS», Moscow
Data relay service provider based on LEO system Gonets.

NPP «Kvant», Moscow
Solar arrays and batteries.

«TTS – NPO PM», Zheleznogorsk
EEE-parts screening and tests

NPP KP «Kvant», Rostov-na-Donu
ADCS optical sensors

SPS, Omsk
SADA, ADPM, control units

«Sibpromproekt», Zheleznogorsk
Design and construction industrial facilities.

«NPO PM – MKB», Zheleznogorsk
R&D in space and space application on the ground

«NPO PM – Razvitie», Zheleznogorsk
Ground antenna systems
MAIN ACTIVITIES

- design,
- development,
- manufacturing,
- tests,
- operational support

of space systems and satellites designed to provide TV-broadcasting, data-relay, navigation and geodetic services to the benefit of domestic security, social & economical and cultural development of the country and international contacts.
Since the foundation, the Company has developed more than 40 different types of satellites. Totally more than 1160 satellites were injected into different orbits.
DIFFERENT ORBIT TYPES
### LAUNCHED ISS GEO COMMUNICATION SATELLITES

<table>
<thead>
<tr>
<th>Satellite</th>
<th>Development start</th>
<th>Launched on</th>
<th>Total satellites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizont</td>
<td>1976</td>
<td>1978-2000</td>
<td>31</td>
</tr>
<tr>
<td>Ekran-?</td>
<td>1984</td>
<td>1987-2001</td>
<td>4</td>
</tr>
<tr>
<td>Potok</td>
<td>1979</td>
<td>1982-2000</td>
<td>10</td>
</tr>
<tr>
<td>Loutch</td>
<td>1982</td>
<td>1985-1994</td>
<td>4</td>
</tr>
<tr>
<td>Raduga-1</td>
<td>1985</td>
<td>1989-2009</td>
<td>9</td>
</tr>
<tr>
<td>Raduga-1M</td>
<td>2005</td>
<td>2009-2010</td>
<td>2</td>
</tr>
<tr>
<td>Express</td>
<td>1990</td>
<td>1994-1996</td>
<td>2</td>
</tr>
<tr>
<td>Express-?</td>
<td>1997</td>
<td>2000-2002</td>
<td>3</td>
</tr>
<tr>
<td>SESAT</td>
<td>1995</td>
<td>2000</td>
<td>1</td>
</tr>
<tr>
<td>Express-??</td>
<td>2001</td>
<td>2003-2009</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>124</strong></td>
</tr>
</tbody>
</table>
ISS SATELLITES LAUNCHED IN 2004 – 2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>GEO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>2005</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>2006</td>
<td>4</td>
<td>.</td>
</tr>
<tr>
<td>2007</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>2008</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>2009</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

All launches were successful
ISS RECENT ACHIEVEMENTS

- ISS on-going GEO civil programs

ISS

LOUTCH-5A 2011
TELKOM 3 2011
LOUTCH-5B 2012
YAMAL-401 2013
EXPRESS-AM5 2012
AMOS 5 2011
EXPRESS-AM6 2012
YAMAL-300K 2011

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ISS RECENT ACHIEVEMENTS

- ISS on-going GEO commercial programs

<table>
<thead>
<tr>
<th>Satellite</th>
<th>Customer</th>
<th>Launch</th>
<th>Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOUTCH- 5A</td>
<td>Roscosmos</td>
<td>05/2011</td>
<td>Express-1000A</td>
</tr>
<tr>
<td>AMOS- 5</td>
<td>Spacecom, Israel</td>
<td>06/2011</td>
<td>Express-1000H</td>
</tr>
<tr>
<td>Telkom- 3</td>
<td>Telekomunikasi TBK, Indonesia</td>
<td>07/2011</td>
<td>Express-1000H</td>
</tr>
<tr>
<td>Yamal- 300K</td>
<td>Gazprom-Space Systems</td>
<td>07/2011</td>
<td>Express-1000H</td>
</tr>
<tr>
<td>LOUTCH- 5B</td>
<td>Roscosmos</td>
<td>03/2012</td>
<td>Express-1000A</td>
</tr>
<tr>
<td>EXPRESS- AM5</td>
<td>RSCC</td>
<td>2012</td>
<td>Express-2000</td>
</tr>
<tr>
<td>EXPRESS- AM6</td>
<td>RSCC</td>
<td>2012</td>
<td>Express-2000</td>
</tr>
<tr>
<td>Yamal-401</td>
<td>Gazprom-Space Systems</td>
<td>2013</td>
<td>Express-2000</td>
</tr>
</tbody>
</table>
ISS GEO SATELLITES
FOR COMMERCIAL APPLICATION

EXPRESS-A4
14°W

EXPRESS-AM44
11°W

SESAT
36° в.д.

EXPRESS-AM1
40° E

EXPRESS-AM22
53° E

EXPRESS-AM2
80° E

EXPRESS-AM33
96.5° E

EXPRESS-AM3
140° E

GORIZONT
145° E

EKRA-N-M
99° E

EXPRESS-A2
103° E
ISS BUSINESS STRUCTURE

- Partners
  - ThalesAlenia Space
  - NEC/TOSHIBA
  - EADS Astrium
  - EADS Sodern
  - SAF
  - Vertex RSI

- Customers
  - AMOS by Spacecom
  - TELKOM INDONESIA
  - RSCC
  - eutelsat Communications
  - GAZPROM SPACE SYSTEMS
  - ROSCOSMOS
ISS & TAS COMMON PROJECTS

- Completed projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Launch Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SESAT 2000</td>
<td>30/03/2005</td>
</tr>
<tr>
<td>EXPRESS-A</td>
<td>24/06/2005</td>
</tr>
<tr>
<td>EXPRESS-AM22</td>
<td>20/12/2003</td>
</tr>
<tr>
<td>EXPRESS-AM11</td>
<td>27/04/2004</td>
</tr>
</tbody>
</table>

- Four satellites were launched during 2000-2002

- Current projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Launch Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOUTCH-5A</td>
<td>05/2011</td>
</tr>
<tr>
<td>AMOS-5</td>
<td>05/2011</td>
</tr>
<tr>
<td>LOUTCH-5B</td>
<td>03/2012</td>
</tr>
<tr>
<td>TELKOM-3</td>
<td>07/2011</td>
</tr>
</tbody>
</table>

EXPRESS-AM1  | 27/04/2004  |
EXPRESS-AM23 | 25/03/2004  |
EXPRESS-AM33 | 28/01/2008  |
EXPRESS-AM44 | 28/01/2009  |
COMPANY FACILITIES

- Shaker VEDS-10000T (pulling force 10T)
- Acoustic Chamber \( V = 660 \text{ m}^3 \)
- Coordinate Measuring Machine G-90CS
- Thermal Vacuum Chamber \( V = 120/400 \text{ m}^3 \)
- Honeycomb Panel Manufacturing Area
- Alignment test bench, laser-optical system RMS-2000 (F.Leica)
- CNC Machinery Area
- Anechoic Chamber
- Zero gravity simulation test
- Work place for SC assembly and electrical tests \( S = 1000 \text{ m}^3 \)
- Honeycomb Panel Manufacturing Area

All required facilities in the same place

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ISS DEVELOPMENT

- We have improved technology

Design and manufacturing of large shaped antennas

Area for manufacturing of honeycomb panels with aluminum and composite skins

Increased use of polymeric composite materials with winding and impregnation machinery
ISS DEVELOPMENT

- We have improved manufacturing facilities

New machining benches

Large scale structures machining benches

Highly efficient metal cutting machinery
ISS DEVELOPMENT

- We have improved test facilities

New Sun simulation lamp
Laser scanner for antenna measurement
Coordinate measuring machines
Working place for SA deployment tests
Improvement of test facilities with new vibration stand and near-field scanner
THERMAL VACUUM CHAMBERS

- Used for thermal-vacuum tests including full scale testing of the active fluid loop and spacecraft leakage tests
- Plasma thrusters firing tests
- Equipped with the heat flow simulator
- Automatic control system to perform thermal-balance tests of integrated spacecraft
- Equipped with video monitoring system

Useful volume – 120 m³
Operational pressure – from $2 \times 10^{-6}$ to $1 \times 10^{-4}$ mm Hg

Useful volume – 400 m³

KVU-400

KVU-120

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Vibration test of the spacecraft including:

- Sinusoidal vibration at fixed frequencies and resonance search within the 5 - 2500 Hz range;
- Narrowband and wideband random vibration within the 5 - 2500 Hz range;
- Simulation of transportation loads.

Static tests of spacecraft primary structure:

- Deformation measurement over 120 channels per each direction with step like loading;
- Load monitoring via 20 independent channels.
ACOUSTIC CHAMBER RC660

- Spacecraft test at the sound pressure of 150 dB, comparable with the levels inside the fairing at the active launch phase.

- Experimental verification of manufactured flight models quality.

Dimensions: 11 x 8.7 x 6.94 m
Volume: 664 m³
Frequency range: 45 - 4000 Hz
ELECTRICAL TEST BENCH
ELECTROMAGNETIC COMPATIBILITY TEST IN ANECHOIC CHAMBER

- Intended for antenna pattern measurement and alignment (diameter of 6000 mm).
- Frequency range - from 300 MHz to 50 GHz.
- Attenuation is not less than 50 dB in the 100 MHz-50 GHz range.

Workplace for performances measurement of super-wideband antennas.
ISS PLATFORMS EVOLUTIONS

- **MSS-727 PLATFORM (SESAT)**
  - Lifetime: 10 years
  - Power: 3.2 kW
  - Mass: 510 kg

- **MSS-740 PLATFORM (EXPRESS-A)**
  - Lifetime: 7 years
  - Power: 1.3-1.5 kW
  - Mass: 420-520 kg

- **MSS-767 PLATFORM**
  - Lifetime: 12 years
  - Power: 4.4 kW
  - Mass: 620 kg

- **EXPRESS-2000 PLATFORM**
  - Lifetime: 15 years
  - Power: up to 14 kW
  - Mass: up to 1300 kg

- **EXPRESS-1000A PLATFORM**

- **EXPRESS-1000K PLATFORM**

- **EXPRESS-1000H PLATFORM**

- **EXPRESS-1000SH PLATFORM**

- **GORIZONT**

- **Express-A1,2,3,1R Express-11,12**

- **Express-AM1 Express-AM2 Express-AM3 Express-AM11 Express-AM22 Express-AM33 Express-AM44 Express-AM5 Express-AM6 Express-AM8 Express-AT1 Express-AT2 Express-MD Amos-5 Telkom-3 Yamal-300K**
ISS GEO PRODUCT LINE
# ISS GEO PRODUCT LINE

<table>
<thead>
<tr>
<th></th>
<th>EXPRESS-1000</th>
<th></th>
<th>EXPRESS-2000</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000?</td>
<td>1000?</td>
<td>1000SH</td>
<td></td>
</tr>
<tr>
<td><strong>Orbit</strong></td>
<td>GEO</td>
<td>GEO</td>
<td>GEO</td>
<td>GEO</td>
</tr>
<tr>
<td><strong>Lifetime</strong></td>
<td>15 years</td>
<td>15 years</td>
<td>15 years</td>
<td>15 years</td>
</tr>
<tr>
<td><strong>Launch mass of Satellite based on platform</strong></td>
<td>up to 1200 kg</td>
<td>up to 1900 kg</td>
<td>up to 2200 kg</td>
<td>up to 3500 kg</td>
</tr>
<tr>
<td><strong>Payload mass</strong></td>
<td>up to 250 kg</td>
<td>up to 500 kg</td>
<td>up to 700 kg</td>
<td>up to 1300 kg</td>
</tr>
<tr>
<td><strong>Power allocated for Payload</strong></td>
<td>up to 3.0 kW</td>
<td>up to 5.6 kW</td>
<td>up to 8.0 kW</td>
<td>up to 14 kW</td>
</tr>
<tr>
<td><strong>Payload heat dissipation</strong></td>
<td>up to 1.8 kW</td>
<td>up to 3.5 kW</td>
<td>up to 5.0 kW</td>
<td>up to 7.5 kW</td>
</tr>
<tr>
<td><strong>Longitude and inclination station-keeping accuracy</strong></td>
<td>±0.05°</td>
<td>±0.05°</td>
<td>±0.05°</td>
<td>±0.05°</td>
</tr>
<tr>
<td><strong>Launch means:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- single launch</td>
<td>Zenit-3SLB LV</td>
<td>Zenit-3SLB LV</td>
<td>Proton-? LV with Briz-? Booster or with DM-03 Booster</td>
<td>Proton-? LV with Briz-? Booster or with DM-03 Booster</td>
</tr>
<tr>
<td>- group launch</td>
<td>3 Satellite Proton-? LV with Briz-? Booster or with DM-03 Booster</td>
<td>2 Satellite Proton-? LV with Briz-? Booster or with DM-03 Booster</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- joint launch with satellite another dimension</td>
<td>-</td>
<td>-</td>
<td>with Satellite mass 1200 kg Proton-? LV with Briz-? Booster or with DM-03 Booster</td>
<td>-</td>
</tr>
</tbody>
</table>
ISS would be pleased to propose its up-to-date products to European customers as well as procure different elements from European suppliers.

Thank you for your attention!

Sergey Seyvald
Head of strategic development division

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Tel: +7 391 97 6 45 91