САМАРСКИЙ УНИВЕРСИТЕТ
SAMARA UNIVERSITY

Education through research like effective way for capacity building in space science and technique

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Samara, 2017

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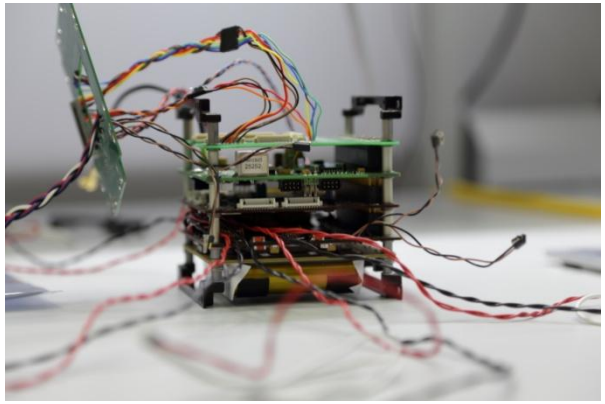
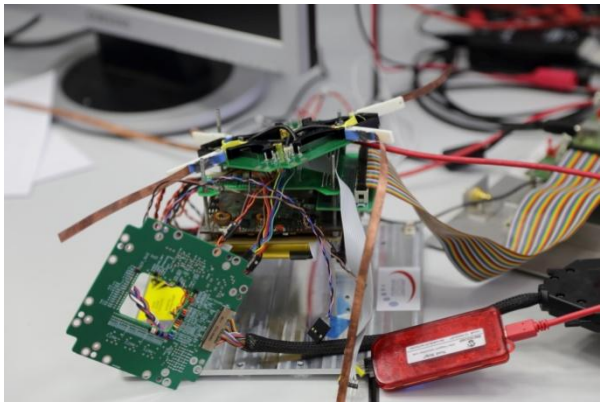
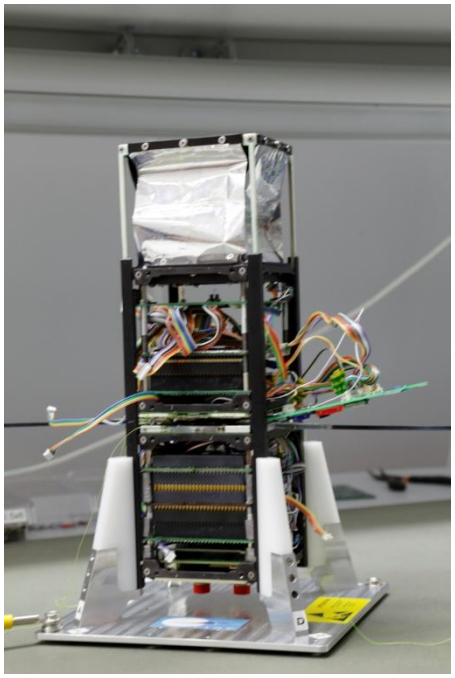
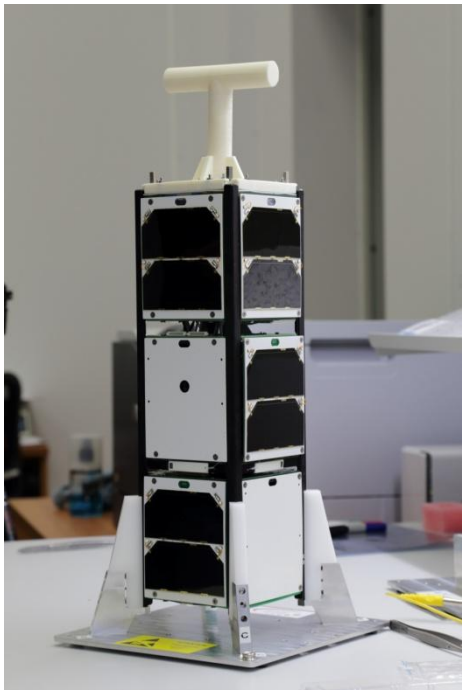








1 The characteristic of educational process at interuniversity department of space research

Institute of Space and Rocket Technology

Russia, Kazakhstan, Israel, Brazil,Chad, Tajikistan, Belarus

Bachelor training

Direction: «Rocket systems and cosmonautics»

Program: «Small-size spacecraft and nanosatellites»

Russia, Kazakhstan, Iran, Argentina, Peru

Magister training

Direction : «Rocket systems and cosmonautics»

Program : «Advance space technologies and experiments in space»

Plan: Russia, Kazakhstan

Magister training

Direction : «Motion control systems and navigation»

Program: «Nanosatellite information and control systems and equipment (new, start in 2018)

Postgraduate student training

05.07.09 «Dynamics, ballistics, aircraft motion control»

05.13.01 «System analysis, information control and processing (Technical systems and communication)»

Institute of Mathematics, Informatics and Electronics (Faculty of Electronics and Instrument Making)

Magister Training

Direction: «Applied Mathematics and Physics»

Program: «Space information systems and nanosatellites. Navigation and remote sensing»

Russia, Kazakhstan, Belarus

1 The characteristic of educational process at interuniversity department of space research

Institute of Space and Rocket Technology

Magister training

Direction : «Rocket systems and cosmonautics»

Program : «Advance space technologies and experiments in space» (new, start in 2018.)

Plan:
Sri Lanka

PhD Training (for foreigners)

- «GNSS Technology»(2 postgraduate students from India)
-«Space Science»
- «Space Engineers & Technology»

Institute of Mathematics, Informatics and Electronics (Faculty of Electronics and Instrument Making)

Magister training

Direction : «Applied Mathematics and Physics»

Program : «GNSS positioning algorithms and applications»

Russia, Kazakhstan, Mexico, Iran, Bolivia

Magister training

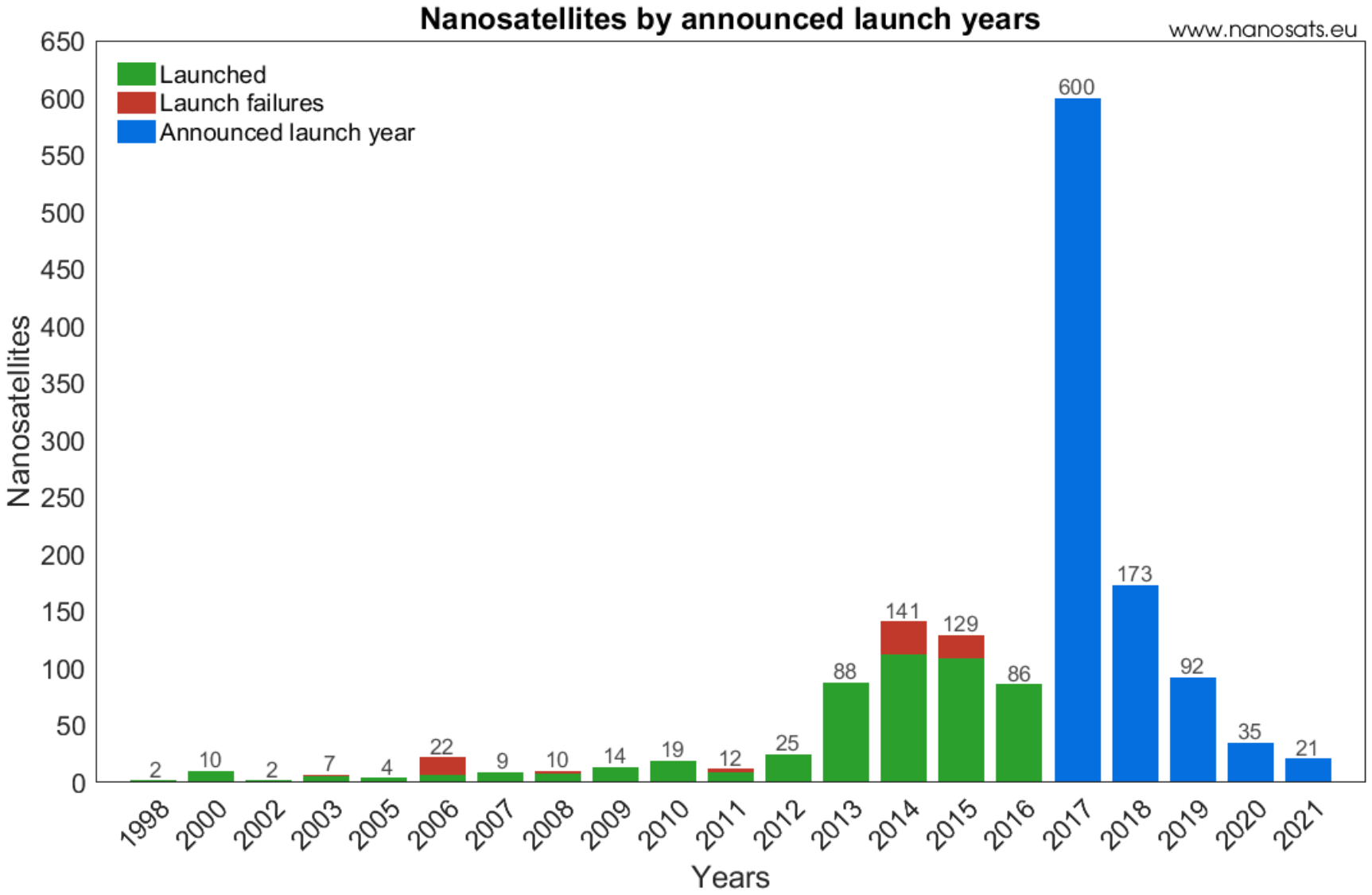
Direction : «Radioengineering»

Program :

«GNSS algorithms and hardware»,

Russia, Kazakhstan, Mexico, Ecuador, Columbia

Further information in report: «Teaching GNSS technologies at Samara University»
(Ilya Kudryavtsev, Session 7: Capacity Building for Space Technology and Applications)c


Nanosatellites by announced launch years
www.nanosats.eu
Launched
Launch failures
Announced launch year
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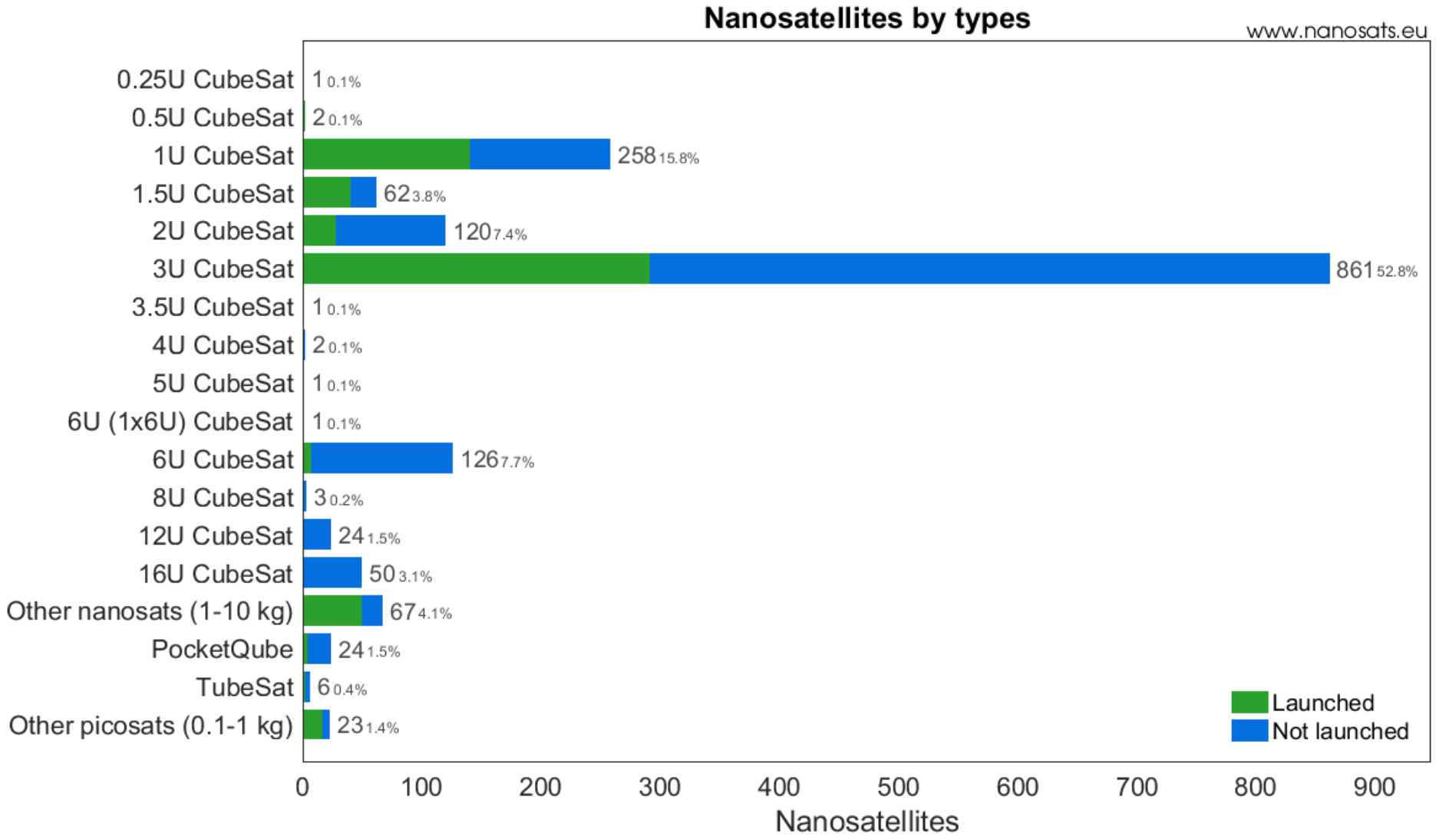
Nanosatellites by types
www.nanosats.eu
0.25U CubeSat 1 0.1%
0.5U CubeSat 2 0.1%
1U CubeSat 258 15.8%
1.5U CubeSat 62 3.8%
2U CubeSat 120 7.4%
3U CubeSat 861 52.8%
3.5U CubeSat 1 0.1%
4U CubeSat 2 0.1%
5U CubeSat 1 0.1%
6U (1x6U) CubeSat 1 0.1%
6U CubeSat 126 7.7%
8U CubeSat 3 0.2%
12U CubeSat 24 1.5%
16U CubeSat 50 3.1%
Other nanosats (1-10 kg) 67 4.1%
PocketQube 24 1.5%
TubeSat 6 0.4%
Other picosats (0.1-1 kg) 23 1.4%
Launched
Not launched
0
100
200
300
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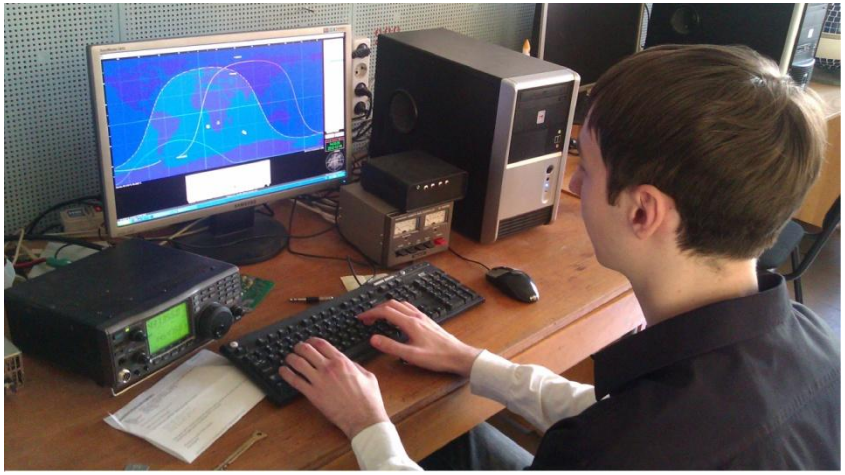
700
800
900
Nanosatellites

2. Nanosatellite as an object of research and training. Facilities and resources

- Center of nanosatellite system testing and complex development*
- Laboratories of digital design of the nanosatellite and its onboard systems
- Flight control station
- Satellite radionavigation laboratory



*Further information in report: «Samara center for nanosatellite testing: opportunities and services» (Alexander Ivliev, Session 7: Capacity Building for Space Technology and Applications)c

2.1 Nanosatellite SamSat-218Д (2014-2015 г) launched in 2016 г. from spaceport Vostochniy

Main purpose:

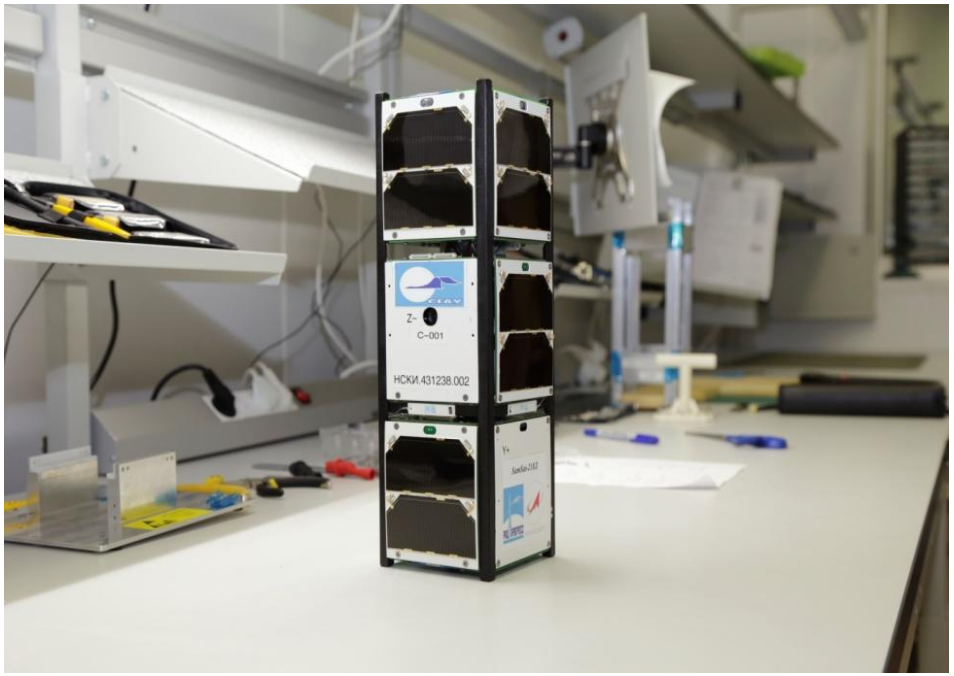
1. Developing of all stages of life cycle (design, creation, testing, operation).

2. Developing of system of launching transporting container (production of JSC Rocket and Space Centre "Progress").

3. Developing of onboard systems and control algorithms.

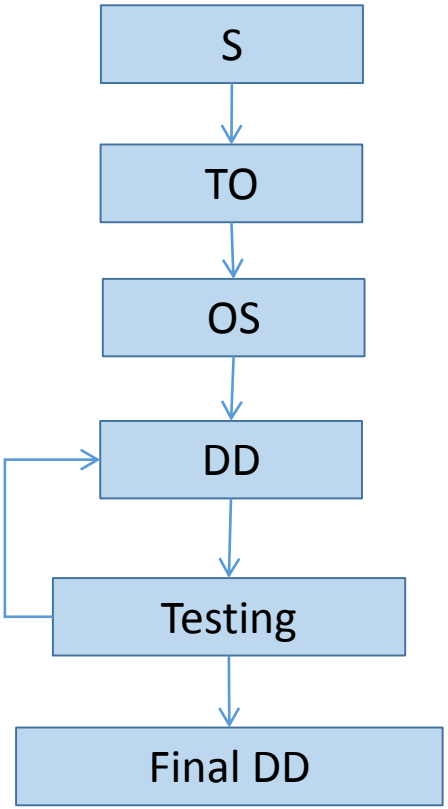
4. Developing of interaction with spacecraft "AIST" by means of the "Kontakt-Nanosatellite" equipment.

5. Developing of algorithm of reconstruction of the Earth atmosphere density by results of the motion trajectory analysis.



The main stages of nanosatellite design and creation within educational programs by technology of the Federal Space agency of the Russian Federation:

- development of the specification (S);
- development of the technical offers (TO);
- development of the outline sketch (OS);
- development of the design documentation (DD);
- development of the testing program and techniques;
- production of the nanosatellite supporting systems and payload;
- carrying out subsystem testing;
- nanosatellite assembly and complex testing;
- preparation of approval documents for launching (permission to use the radio frequencies, getting the safety certificate, etc.);
- development of the transport equipment;
- participation in final testing at the spaceport;
- nanosatellite flight control.



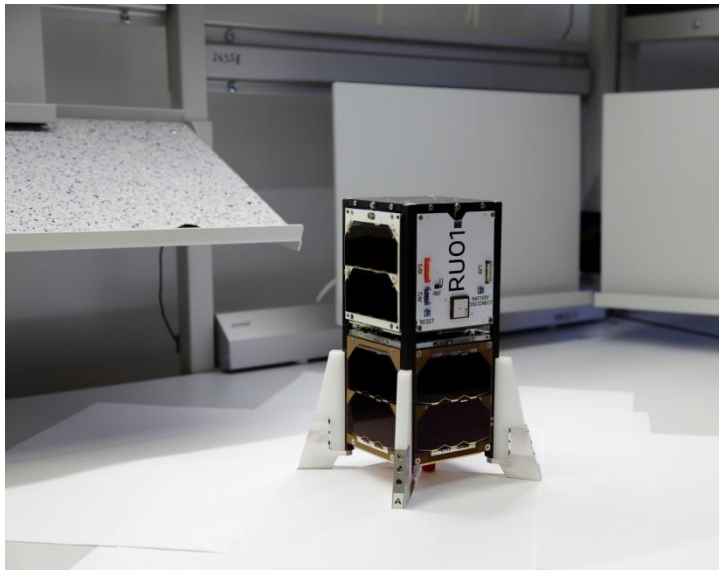
2.2 Nanosatellite SamSat-QB50 (2015-2016)

Main purposes:

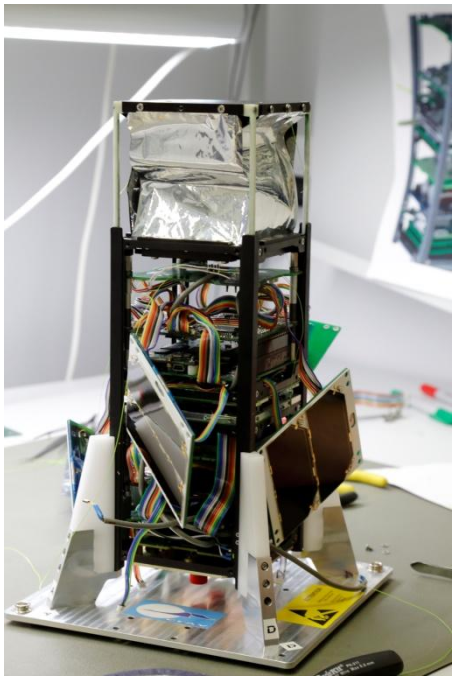
1. Participation in the international experiment on monitoring of the Earth top thermosphere.

2. Developing of technology of the passive aerodynamic attitude system for low-altitude nanosatellites.

3. Developing of technology of receiving information from group of nanosatellites by means of ground station network.



Further information in report: «Experience of participation in international scientific and educational space projects by the example of QB50 project» (D. Davydov, Session 5: Best Practices and Challenges of Promoting Space Education)c



3. Cooperation is the education high quality guarantee

1. Partners

1.1 Universities and research centers:
- Belarusian State University
- Delft Technical University (Netherlands)
- Julius-Maximilian's University of Würzburg (Germany)
- University of Lulea (Sweden)
- Sapienza University of Rome(Italy)
- University of Applied Sciences of Lessius (Belgium)
- ISAE SUPAERO University (France)
- Grenoble Alpes University (France)
- University of Vigo (Spain)
- Euroasian National University (Kazakhstan)
- Almaty University of Power Engineering and Communication (Kazakhstan)

I- nstitute of Modern Technologies named after A. Clark (Sri Lanka)

1.2 RAS Institutions:
- Keldysh Institute of Applied Mathematics (Moscow)
- Institute of Space Research (Moscow)

1.3 Industrial enterprises:
- JSC Rocket and Space Centre "Progress"
- JSC "Russian Space Systems"

3. Cooperation is the education high quality guarantee

2. Forms of cooperation

2.1 Training, student exchange

2.2 Lecturing by professors within the exchange program

2.3 Joint projects of space experiments and nanosatellites

2.4 Joint educational programs

4. The proposal on development of cooperation with developing countries under the UN auspices

Type	Requirement
The educational one-year master program in the field of design and creation of nanosatellites and their systems	Diploma of engineer or master in direction: radio electronics, general engineering, communication
The educational one-year master program in the field of control and navigation in space	Diploma of engineer or master in direction: applied mathematics and physics, mechanics

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SAMARA UNIVERSITY

Thank you for your attention

1. spaceresearch.ssau.ru – department website
2. http://spacetest.ru/ - website of the center of nanosatellite system testing and complex development
3. Department e-mail: space@ssau.ru

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