Rostec

SCIENCE

Overcoming Technologic Barriers

ANNUAL REPORT

Rostec State Corporation
2019

Rostec

APPROVED
by the Supervisory Board
of the Rostec State Corporation
(minutes No. 3 dated April 30, 2020)

ANNUAL REPORT

OF THE ROSTEC STATE CORPORATION 2019

SCIENCE. *OVERCOMING TECHNOLOGIC BARRIERS*

CEO
of the Rostec State Corporation
S.V. CHEMEZOV

2020

Chief accountant
of the Rostec State Corporation
N.V. BORISOVA

2020

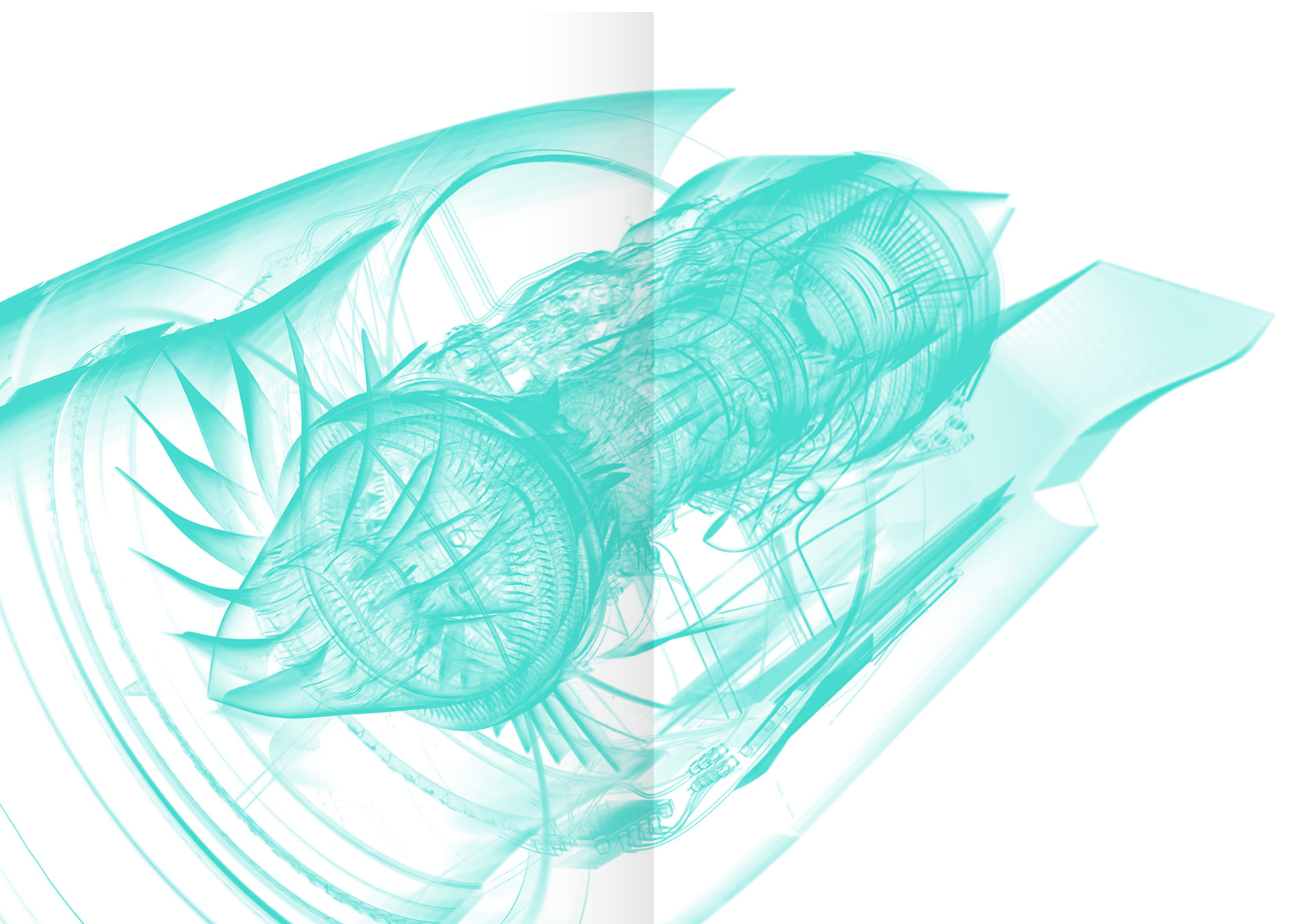


Table of Contents

1. Address by Chairman of the Supervisory Board of the Rostec State Corporation D.V. Manturov

Dear colleagues!

Today, the global competition in the high-tech market drives the work pace in this area, making it grow steadily. We understand that only our own advanced solutions will ensure Russia's sovereignty and national security. That's why furthering science, industry, innovations is one of our country's top priorities.

Russia has always been rich in talents. Many famous scientists and design engineers began once working at facilities which today make part of the Rostec State Corporation. Among them are: A. Pistolkors, physicist, whose discoveries underlie several branches of the modern radio electronics; A. Nudelman, who stood at the origins of the conversion and created not only tens of models of air guns and air defense systems, but also the first Russian cardiac pacemaker; also, A. Lyul'ka, design engineer, the creator of the first turbojet engine in our country, and other legendary names.

Nowadays, the Rostec State Corporation keeps resolving top-level tasks, uniting the leading staff, scientific, production potential of over 800 entities all over the country.

Being one of the system-building institutes of the Russian industry, the Rostec State Corporation is deeply involved in the deployment of key national programs ensuring scientific and technical advancement of the country, import phase-out, development of the defense industry, aircraft construction and radio electronics.

Over the year, Rostec entities have implemented about 400 projects for technical upgrade, capital construction, scientific research and development works. With active support from the Government, 26 retooling projects were completed at aircraft construction, engine building, radio electronics, various military-purpose production plants.

Deployment of projects making part of innovative development programs has boosted the creation of new and the upgrade of existing models of armaments and military hardware, the development of advanced special- and civil-purpose products and technologies. Total R&D expenditure of Rostec entities in 2019 amounted to RUB 169 billion. Rostec's total annual proceeds from sale of innovative products grew by 23% and exceeded RUB 700 billion. A significant portion (almost one third) of the amount falls upon the high-tech export which, within the same period, grew by 26%. These figures are record-setting for Rostec and confirm the competitiveness of Russian-made solutions highly demanded both domestically and abroad.

Moreover, participation by Rostec in the deployment of the national project named "International cooperation and export" is also a great opportunity. The project's ambition is to double Russia's presence in foreign markets as soon as by 2024, which will be a real drive for the growth of the Russian economy.

Rostec is also an active player of the national project "Science", which is aimed at ensuring that the country becomes one of the world's top-five in prioritized research areas.

As part of the "Digital economy" national project, in 2019, the Russian Government and some major State-owned domestic companies signed important agreements for the advancement of high technologies. In particular, Rostec's leading role in such areas as "Quantum sensors", "Blockchain technology", "New generations of narrowband wireless connection for the Internet of things and the short- and medium-range communication" was confirmed. Moreover, jointly with the Rostelecom PJSC, the Corporation is responsible for the development of the "New-generation wireless connection" branch.

Certainly, the development of high-tech branches will allow Russia to use the technical advance to improve people's life quality, will boost the growth of the Russian industry, increase the performance of the economy, and enhance the national security in various areas. A significant contribution to the resolution of these national-scale challenges is made by the Rostec State Corporation.

Denis V. Manturov

Chairman of the Supervisory Board of the Rostec State Corporation

Rostec is developing several hundreds of priority disciplines in science, technologies and engineering. A major part thereof relates to innovative research, creation of new-generation products with features unachievable ever before, first of all civil-purpose products.

Address by CEO of the Rostec State Corporation S.V. Chemezov

Rostec accumulates a great number of research and production focuses. The Corporation unites over 800 entities operating in such science-driven branches as aviation and space, radio electronics and digital technologies, car- and shipbuilding, novel materials and medicine.

Dear colleagues!

As before, our key mission is the improvement of people's life quality. We are implementing large-scale projects in healthcare, environment, digital technologies, energy security, etc.

The Corporation is steadily steering toward innovation-driven development. In our research and technology efforts, we prioritize the creation of competitive advanced products. Our plan for the next decade is to master over 800 industrial processes, to design almost 900 items, of which about a half are conceptually new products, mostly of civil grade.

In 2019 alone, Rostec entities completed 350 R&D projects, created 250 innovation-based products and technologies, obtained 865 patents and registered 570 know-how.

In the reporting period, we focused on the technologies underlying the digital economy. These include: smart city, artificial intelligence, Internet of things, wireless communication, blockchain, big data, etc. In particular, in 2019, Rostec has for the first time presented to the industry community end-to-end solutions for the development of domestic 5G technologies.

We kept building serious scientific and technical benchmarks in biomedical technologies: we were designing new models of medical diagnostic and treatment equipment, testing new medications and vaccines.

For example, in 2019, the Nacimbio holding company marketed a number of advanced vaccines at once, including the first domestic influenza tetravaccine complying with all guidelines of the World Health Organization. The Shvabe JSC holding company presented the first home-made HIFU appliance for cancer treatment. The legendary Zenit brand under which not only advanced optics, but also modern ophthalmic equipment is manufactured has been brought back to life.

While building the new technologic image of the Russian industry, we kept ramping up the research and production capacities. In 2019, we completed 75 retooling projects to integrate advanced digital systems into development, designing, production, logistics, service processes.

In addition to high-duty computer systems of the United Aircraft Corporation PJSC, United Engine Corporation JSC and Ruselectronics JSC, facilitating most sophisticated research and design calculations, the Center supercomputer has been put into operation at CNIITOCHMASH JSC.

In partnership with the Rosatom State Corporation, construction of a supercomputer center has been completed for the benefit of the entire domestic industry at the Era innovation technopolis in Anapa.

State-of-the-art facility for production of car frames was put into operation at KAMAZ PJSC. Production of turbine blades was launched at ODK-Saturn PJSC in Rybinsk. The specialized Center of additive technologies, formed on the basis of aircraft complex entities, started operation. There are many other examples.

The large-scale plans could not have been brought to life without state-of-the-art professionals. In 2019, we launched a number of corporate training programs for engineers, market researchers, senior management. Over 400 basic chairs are run at universities and colleges throughout Russia with direct involvement of Rostec entities, which graduate highly-demanded professionals for various industries.

I would note that we keep working successfully in an environment involving sanctions, complicated situation worldwide, sophisticated State-scale challenges for stabilization of distressed industrial assets.

The rate of Rostec entities' delivery on the State defense order is traditionally high — 99.5%. Civil income share exceeded 31%, which was boosted to a great extent by the marketing of new competitive high-tech products. Consolidated income of Rostec entities exceeded RUB 1.7 billion.

We kept developing Rostec's target markets. Over the last few years, Rosoboronexport's order portfolio remains a benchmark — about USD 50 billion per year.

Thus, in 2019, Rostec showed positive advancement again, furthering the fulfillment of major State commitments in the creation of new technologies, designing, manufacturing and export of competitive science-driven products.

Sergey V. Chemezov

CEO of the Rostec State Corporation

2. Key Performance Indicators in 2019*

CONSOLIDATED REVENUE, BILLION RUB — +7.8 %

AVERAGE NUMBER OF EMPLOYEES, K PERSONS — +11.6 %

SHARE OF NON-MILITARY GOODS IN THE REVENUE, % — +0.8 p.p.

CONSOLIDATED NET PROFIT (LOSS), BILLION RUB — +39.9 %

AVERAGE SALARY, K RUB/MONTH — +9.9 %

CONSOLIDATED NET PROFIT MARGIN, % — +2.3 p.p.

YIELD PER EMPLOYEE, K RUB/PERSON — −3.3 %

* Partnerships are excluded from calculation, according to the updated accounting procedure, in line with the IFRS.

Rostec

3. *OVERVIEW* OF THE ROSTEC STATE CORPORATION

590.6

THOUSAND persons

AVERAGE NUMBER OF ROSTEC EMPLOYEES IN 2019

3.1 General information

Rostec assists in the designing, production and export of high-tech industrial products, by supporting Russian entities — developers and manufacturers of high-tech industrial products — in the domestic and foreign markets.

THE ROSTEC STATE CORPORATION WAS FOUNDED AND OPERATES UNDER FEDERAL LAW NO. 270-FZ DATED 23 NOVEMBER 2007

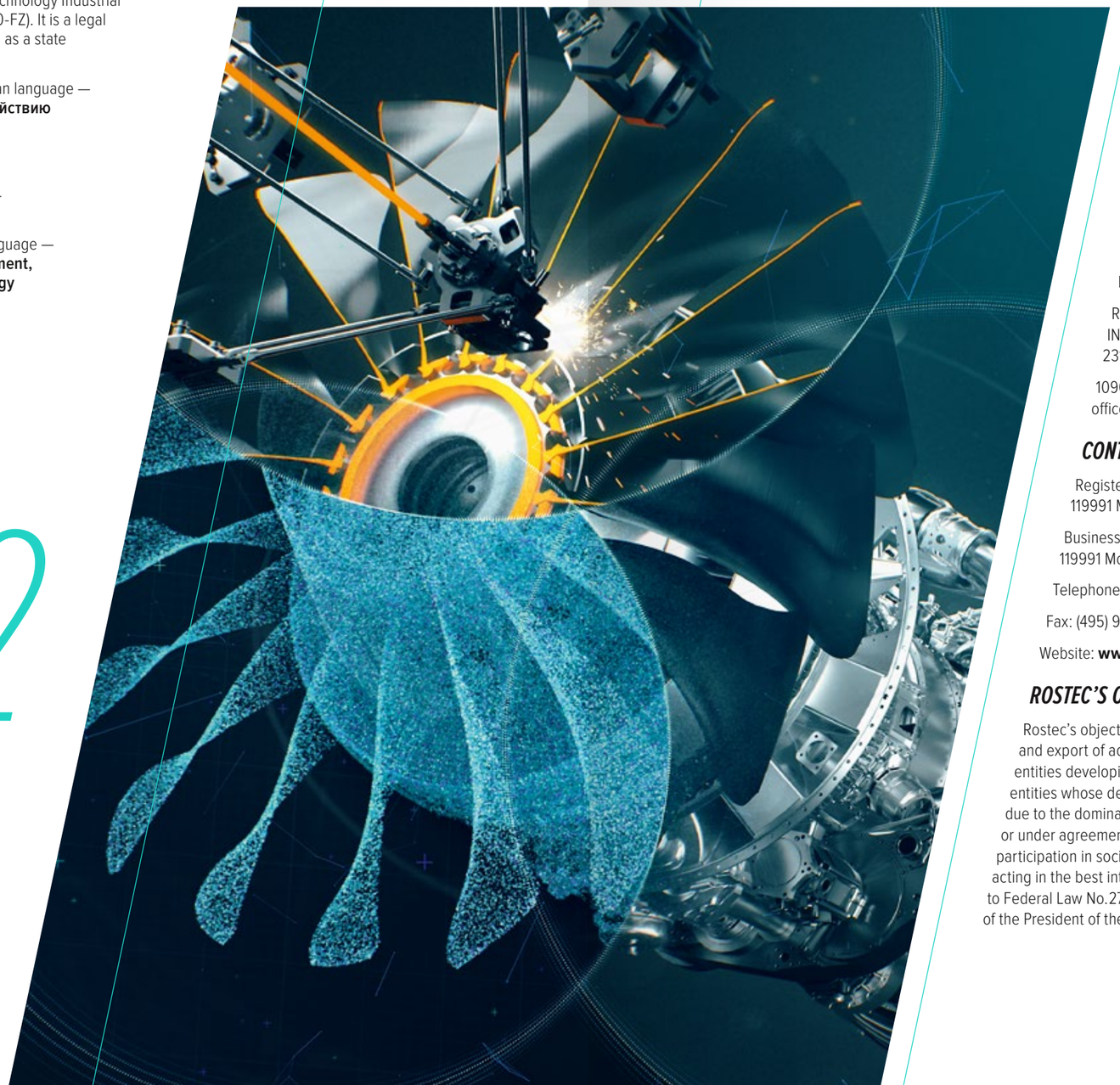
"On the State Corporation for Assistance to Development, Production and Export of Advanced Technology Industrial Products 'Rostec'" (Federal Law No.270-FZ). It is a legal entity formed by the Russian Federation as a state corporation.

Full name of the Corporation in the Russian language — **Государственная корпорация по содействию разработке, производству и экспорту высокотехнологичной промышленной продукции «Ростех».**

Abbreviated name in the Russian language — **Государственная корпорация «Ростех».**

Full name of the Corporation in the English language — **State Corporation for Assistance to Development, Production and Export of Advanced Technology Industrial Products 'Rostec'.**

Abbreviated name in the English language — **State Corporation 'Rostec'.**



REGISTRATION DETAILS

Certificate of state registration: series 77, number 011483840, issued by Moscow Federal Tax Service Directorate dated 3 December 2007

Registration Number (OGRN): 1077799030847, date of registration: 3 December 2007.

INN (Taxpayer Identification Number) / KPP (Tax Registration Code): 7704274402/770401001

AUDITOR'S DETAILS

Name: Gruppa Finansy limited liability company.

Registration Number (OGRN): 1082312000110, INN (Taxpayer Identification Number) / KPP (Tax Registration Code): 2312145943/772201001.

109052,Moscow, Nizhegorodskaya str., 70, building 2, office 16A, floor 1, prem 4.

CONTACT DETAILS

Registered office of the Corporation: 119991 Moscow, Gogolevsky b-r, 21, building 1.

Business address of the Corporation: 119991 Moscow, Gogolevsky b-r, 21, building 1.

Telephone: (495) 287-25-25.

Fax: (495) 987-65-74, 987-65-73.

Website: **www.rostec.ru**.

ROSTEC'S OBJECTIVES

Rostec's objectives are: to assist in the development, production and export of advanced technology industrial products by Russian entities developing and manufacturing such products, including entities whose decisions may be controlled by the Corporation due to the dominant participation in their authorised capitals, or under agreements executed with such entities, or otherwise; participation in social and other projects of public interest, while acting in the best interests of the State and the society, pursuant to Federal Law No.270-FZ, other federal laws, resolutions of the President of the Russian Federation.

179.2

BILLION rubles

ROSTEC'S CONSOLIDATED NET PROFIT IN 2019

3.2 Organizational Chart of the Rostec State Corporation

Organizational chart

Due to the formation of functional areas related to the Corporation's involvement in the implementation of national projects of the Russian Federation, digital transformation, and increasing efficiency of corporate governance, the organizational chart was modified in 2019. The current version of Rostec's organizational chart is approved by resolution of the Supervisory Board dated July 1, 2019 (minutes No. 7).

Assets management structure

As of December 31, 2019, total number of entities in which the Corporation is a shareholder: 266. Total number of entities included in the Rostec corporate group exceeds 800.

Rostec entities are consolidated into holding companies (integrated structures), broken down by sectors (including aviation, ammunition, special chemistry and conventional arms, radio electronics) of the defense and civil-purpose industries; some other entities are directly controlled by the Corporation. Communication with federal authorities is in course, concerning the transfer of Rostec's shareholdings owned by the Federation. Work on forming holding companies and transferring shares into share capitals of head entities of holding companies (integrated structures) is in progress.

3.3 Supervisory Board of the Rostec State Corporation

THE SUPERVISORY BOARD IS THE SUPREME MANAGEMENT BODY OF THE ROSTEC STATE CORPORATION AND IS ACCOUNTABLE FOR THE CORPORATION'S STRATEGIC DEVELOPMENT.

In particular, the Supervisory Board is empowered to approve the long-term Corporate development strategy. In 2019, the Supervisory Board held 13 meetings. As of 31 December 2019, the Corporation's Supervisory Board included the following members:

CHAIRMAN OF THE SUPERVISORY BOARD

Denis Valentinovich Manturov

MINISTER OF TRADE AND INDUSTRY OF THE RUSSIAN FEDERATION

2003–2007 — CEO of the Oboronprom United Industrial Corporation JSC

2007–2008 — Deputy Minister of Industry and Energy of the Russian Federation

2008–2012 — Deputy Minister of Industry and Trade of the Russian Federation

2012 – present — Minister of Industry and Trade of the Russian Federation

MEMBER OF THE SUPERVISORY BOARD

Dmitry Nikolaevich Kobylkin

MINISTER OF NATURAL RESOURCES AND ECOLOGY OF THE RUSSIAN FEDERATION

2010–2018 — governor of Yamalo-Nenets Autonomous District

2018 – present — minister of natural resources and ecology of the Russian Federation

MEMBER OF THE SUPERVISORY BOARD

Larisa Igorevna Brycheva

AIDE TO THE PRESIDENT OF THE RUSSIAN FEDERATION — HEAD OF THE STATE LEGAL ADMINISTRATION OF THE PRESIDENT OF THE RUSSIAN FEDERATION

1993–1999 — Head of the Department of the Administration of the President of the Russian Federation, Head of the Executive Office of the Plenipotentiary Representative of the President of the Russian Federation in the Federal Assembly of the Russian Federation, Deputy Director of the Main State Legal Administration of the President of the Russian Federation

1999 — Head of the Main State Legal Administration of the President of the Russian Federation

2004 – present — Aide to the President of the Russian Federation — Head of the State Legal Administration of the President of the Russian Federation

MEMBER OF THE SUPERVISORY BOARD

Veronika Igorevna Skvortsova *

MINISTER OF PUBLIC HEALTH OF THE RUSSIAN FEDERATION

2008–2012 — deputy minister of public health and social development of the Russian Federation

2012 – present — minister of public health of the Russian Federation

* Powers terminated on March 7, 2020. A.G. Siluanov appointed as member of the Supervisory Board (Presidential Executive Order No.167 dated March 7, 2020).

Supervisory Board of the Rostec State Corporation

MEMBER OF THE SUPERVISORY BOARD

Sergey Borisovich Ivanov

SPECIAL REPRESENTATIVE OF THE PRESIDENT OF THE RUSSIAN FEDERATION ON THE ISSUES OF ENVIRONMENTAL ACTIVITIES, ECOLOGY AND TRANSPORT

1999–2001 — Secretary of the Security Council of the Russian Federation

2001–2007 — Minister of Defense of the Russian Federation

2007–2008 — First Deputy Chairman of the Presidential Administration of the Russian Federation

2008–2011 — Deputy Chairman of the Presidential Administration of the Russian Federation

2011–2016 — Head of the Presidential Administration of the Russian Federation

2016 – present — Special Representative of the President of the Russian Federation on the Issues of Environmental Activities, Ecology and Transport

MEMBER OF THE SUPERVISORY BOARD

Igor Evgenievich Levitin

AIDE TO THE PRESIDENT OF THE RUSSIAN FEDERATION

2004–2012 — Minister of Transport of the Russian Federation

2012–2013 — Adviser to the President of the Russian Federation

2013 – present — Aide to the President of the Russian Federation

MEMBER OF THE SUPERVISORY BOARD

Vladimir Evgenievich Ostrovenko

DEPUTY DIRECTOR OF THE PRESIDENTIAL ADMINISTRATION OF THE RUSSIAN FEDERATION

2011 – present — Head of the Protocol of the Chairman of the Russian Government — Deputy Director of the Central Office of the Russian Government

2012–2016 — Head of the Protocol of the Russian President

2016 – present — Deputy Director of the Presidential Administration of the Russian Federation

MEMBER OF THE SUPERVISORY BOARD

Dmitry Evgenievih Shugaev

DIRECTOR OF THE FEDERAL SERVICE FOR MILITARY-TECHNICAL COOPERATION

2001–2008 — Deputy CEO of the Rosoboronexport Federal State Unitary Enterprise

2008–2009 — Head of the Central Office of the CEO of the Rostekhnologii State Corporation

2009–2017 — Deputy CEO of the Rostec State Corporation

2017 – present — Director of the Federal Service for Military-Technical Cooperation

MEMBER OF THE SUPERVISORY BOARD

Sergey Viktorovich Chemezov

CEO OF THE ROSTEC STATE CORPORATION

1988–1996 — Deputy CEO of the Sovintersport Foreign Trade Association

1996–1999 — Director of the Foreign Economic Administration of the Administrative Department of the President of the Russian Federation

1999–2001 — CEO of the Promexport Federal State Unitary Enterprise

2001–2007 — First Deputy CEO, CEO of the Rosoboronexport Federal State Unitary Enterprise

2007 – present — CEO of the Rostec State Corporation

3.4 Management Board of the Rostec State Corporation

THE MANAGEMENT BOARD IS A COLLECTIVE EXECUTIVE BODY OF THE ROSTEC STATE CORPORATION. ITS POWERS INCLUDE:

- *Preparing and submitting the long-term Corporate Development Strategy to Rostec Supervisory Board for approval;*
- *Preparing and submitting the Corporate financial plan of income and expense to Rostec Supervisory Board for approval.*
- *Based on the long-term Corporate Development Strategy, preparing and submitting Rostec's medium-term Action Program to Rostec Supervisory Board for approval;*

In 2019, the Management Board held 68 meetings. As of 31 December 2019, the Corporation's Management Board included the following members (as approved by the Supervisory Board):

Sergey Viktorovich Chemezov

CEO OF THE ROSTEC STATE CORPORATION

1988–1996 — Deputy CEO of the Sovintersport Foreign Trade Association

1996–1999 — Director of the Foreign Economic Administration of the Administrative Department of the President of the Russian Federation

1999–2001 — CEO of the Promexport Federal State Unitary Enterprise

2001–2007 — First Deputy CEO, CEO of the Rosoboronexport Federal State Unitary Enterprise

2007 – present — CEO of the Rostec State Corporation

Vladimir Vladimirovich Artyakov

FIRST DEPUTY CEO OF THE ROSTEC STATE CORPORATION

2000–2006 — Deputy CEO of the Rosoboronexport Federal State Unitary Enterprise

2005–2007 — Chairman of the Board of Directors of AVTOVAZ, CEO of the AVTOVAZ Group

2007–2012 — Governor and Chairman of the Government of the Samara Region

2012–2014 — Deputy CEO of the Rostec State Corporation

2014 – present — First Deputy CEO of the Rostec State Corporation

Nikolay Anatolievich Volobuev

DEPUTY CEO OF THE ROSTEC STATE CORPORATION

2004–2006 — Deputy Director of the Federal Customs Service

2006–2007 — Director for Special Commissions of the Rosoboronexport Federal State Unitary Enterprise

2007 – present — Deputy CEO of the Rostec State Corporation

Igor Nikolaevich Zavyalov

DEPUTY CEO OF THE ROSTEC STATE CORPORATION

1999–2002 — Deputy Chairman of the Bank for Development and Foreign Economic Affairs (Vnesheconombank) State Corporation

2002–2007 — Deputy Chairman of the Board of Vneshtorgbank

2007 – present — Deputy CEO of the Rostec State Corporation

Management Board of the Rostec State Corporation

Dmitry Yurievich Lelikov

DEPUTY CEO
OF THE ROSTEC STATE CORPORATION

2004–2012 — First Deputy CEO of the Oboronprom United Industrial Corporation JSC

2012–2016 — CEO of the Oboronprom United Industrial Corporation JSC

2016 – present — Deputy CEO of the Rostec State Corporation

Alexander Yurievich Nazarov

DEPUTY CEO
OF THE ROSTEC STATE CORPORATION

2010–2011 — Deputy Director of the Economic Security Department of the Ministry of Internal Affairs of the Russian Federation

2011–2014 — Adviser to the CEO of the Rostec State Corporation

2014–2015 — Managing Director for Distressed Assets of the Rostec State Corporation

2015 – present — Managing Director for Non-Core and Distressed Assets of the Rostec State Corporation

2017 – present — Deputy CEO of the Rostec State Corporation

Maxim Vladimirovich Vybornykh

DEPUTY CEO
OF THE ROSTEC STATE CORPORATION

2002–2004 — Deputy Director of the Inspectorate of the Moscow Chamber of Control and Accounts

2004–2006 — Head of the Economic Department of the Central Administrative District of Moscow

2006–2014 — Head of the Presidential Experts Directorate of the Russian Federation

2014–2019 — Official Secretary of the Rostec State Corporation

2019 – present — Deputy CEO of the Rostec State Corporation

Oleg Nikolaevich Evtushenko

EXECUTIVE DIRECTOR
OF THE ROSTEC STATE CORPORATION

2011–2012 — Director for Development of the VTS-Service LLC

2012–2013 — Undersecretary, Deputy Director of the Foreign Economic Relations Department, Ministry of Industry and Trade of the Russian Federation

2013–2016 — Head of the Central Office of the CEO of the Rostec State Corporation

2016 – present — Executive Director of the Rostec State Corporation

Natalya Vladimirovna Borisova

CHIEF ACCOUNTANT
OF THE ROSTEC STATE CORPORATION

2007 – present — Chief Accountant of the Rostec State Corporation

Management Board of the Rostec State Corporation

Sergey Borisovich Abramov*

INDUSTRIAL DIRECTOR OF THE CONVENTIONAL ARMS, AMMUNITION AND SPECIAL CHEMISTRY CLUSTER OF THE ROSTEC STATE CORPORATION

2006–2007 — Auditor of the Accounts Chamber of the Russian Federation

2007–2014 — Head of the Railway Stations Directorate of the Russian Railways OJSC

2015 — Adviser to the President of the Russian Railways OJSC

2015–2019 — Industrial Director of the Conventional Arms, Ammunition and Special Chemistry Cluster of the Rostec State Corporation

Sergey Stepanovich Sakhnenko

INDUSTRIAL DIRECTOR OF THE RADIOELECTRONICS CLUSTER OF THE ROSTEC STATE CORPORATION

2016–2017 — project manager for control of Rostec radioelectronic cluster's assets

2017–2018 — CEO of the “Avtomatika” Concern JSC

2018 – present — industrial director of the Radioelectronics Cluster of the Rostec State Corporation

* Excluded from the management board on March 13, 2020.

Anatoly Eduardovich Serdyukov

INDUSTRIAL DIRECTOR OF THE AVIATION CLUSTER OF THE ROSTEC STATE CORPORATION

2007–2012 — Minister of Defense of the Russian Federation

2012–2015 — CEO of the Federal Research and Testing Centre of Machine Engineering

2015 – present — Industrial Director of the Aviation Cluster of the Rostec State Corporation

Viktor Nikolaevich Kiryanov

MANAGING DIRECTOR FOR INFRASTRUCTURE PROJECTS OF THE ROSTEC STATE CORPORATION

2003–2005 — Head of the Main Directorate for Road Traffic Safety of the Ministry of Internal Affairs of Russia

2005–2011 — Chief Road Traffic Safety Inspector of the Ministry of Internal Affairs of Russia, authorized as Deputy Minister

2011–2015 — Deputy Minister of Internal Affairs of the Russian Federation

2016 – present — Managing Director for Infrastructure Projects of the Rostec State Corporation

Management Board of the Rostec State Corporation

Yuri Nikolaevich Koptev

MANAGING DIRECTOR FOR SCIENCE AND TECHNOLOGIES OF THE ROSTEC STATE CORPORATION

1992–2004 — CEO of the Russian Space Agency; CEO of the Russian Aviation and Space Agency

2004–2008 — Director of the Defense Industry Department of the Russian Federation's Ministry of Industry and Energy

2008–2009 — Head of the group of advisers for the Rostec State Corporation

2009 – present — Chairman of the Research and Technology Council of the Rostec State Corporation

2018 – present — Managing director for science and technologies of the Rostec State Corporation

Vladimir Zalmanovich Litvin

MANAGING DIRECTOR FOR DIRECTLY CONTROLLED ENTITIES OF THE ROSTEC STATE CORPORATION

2006–2008 — Senior Vice-President for Commercial Activities of AVTOVAZ OJSC

2008–2009 — Adviser to CEO of the Rostec State Corporation

2009–2015 — Head of the Department for Corporate Procedures and Property Portfolio Department, the Asset Management and Corporate Procedures Department of the Corporation, the Planning and Industrial Policy Department of the Rostec State Corporation, Industrial Director of the Directly Controlled Entities Complex

2016 – present — Managing Director for Directly Controlled Entities of the Rostec State Corporation

Elena Oduliovna Sierra

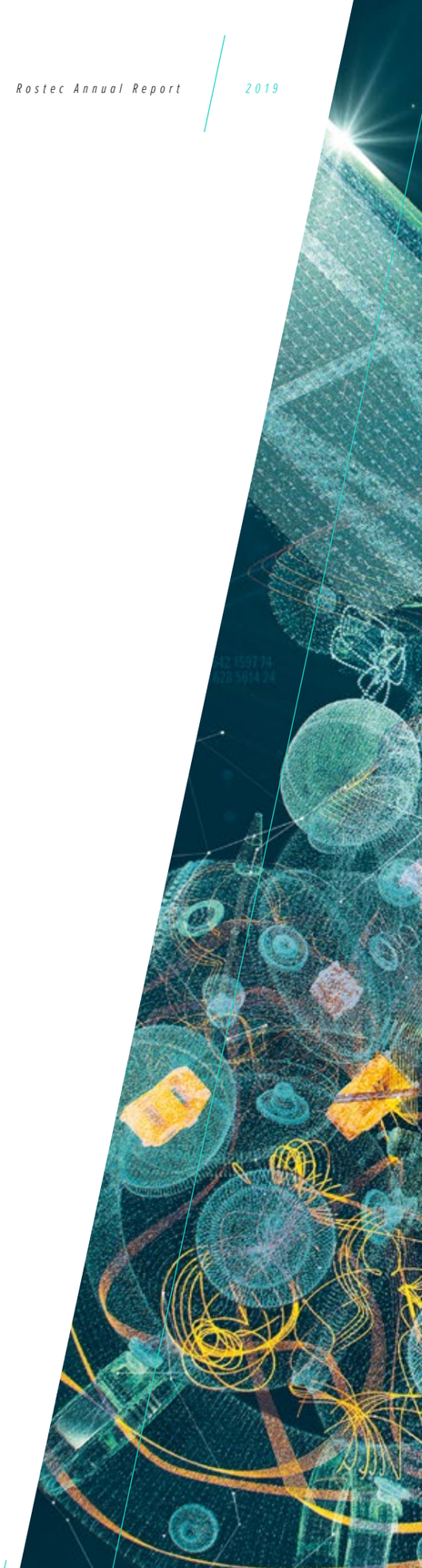
MANAGING DIRECTOR FOR CONSTRUCTION CONTROL OF THE ROSTEC STATE CORPORATION

2012–2013 — Deputy Director of the Department of State Policy for Construction and Architecture of the Ministry of Regional Development of the Russian Federation

2013 — Deputy Head of the Federal Agency for Construction, Housing and Utilities

2013–2017 — Deputy Minister of Construction, Housing and Utilities of the Russian Federation

2017 – present — Managing Director for Construction Control of the Rostec State Corporation



3.5 Key Events and Transactions of 2019

January

RUSELECTRONICS JSC SUPPLIED RADIATON-PROOF TELEVISION EQUIPMENT FOR THE TIANWAN NUCLEAR POWER PLANT

This is the first export supply of this kind of equipment. Earlier, the Rostec State Corporation has already supplied its solutions to the Tianwan NPP, such as: automated workplaces, industrial controllers, and radiation control systems.

AVTOVAZ SIGNED A SPECIAL INVESTMENT CONTRACT (SPIC) WITH THE MINISTRY OF INDUSTRY AND TRADE OF RUSSIA

The purpose of the agreement is to boost the advancement of the alliance brands in Russia (LADA, Renault, Nissan, Datsun and Mitsubishi), and to upgrade their production facilities. Under the 10-year contract, AvtoVAZ will invest about RUB 700 billion and will create 2,300 workplaces.

February

THE AVTOMATIKA CONCERN JSC DEVELOPED AN INTEGRATED SYSTEM OF UNIFIED ONLINE BUSINESS COMMUNICATIONS

The IVA AVES-S solution which is being developed can become an alternative to the Skype for Business. The novelty allows organizing a secured Full HD video conference. The solution has already been used by entities of Rostec's radio electronics cluster.

THE ROSTEC STATE CORPORATION IMPLEMENTED THE “DIGITAL SCHOOL” SYSTEM AT 350 INSTITUTIONS OF SECONDARY EDUCATION IN RUSSIA

The all-in-one solution digitizes all core processes — from school access control, to financial settlements and generation of various types of accounts.

THE ROSTEC STATE CORPORATION SUPPLIED THE FIRST LOT OF AVIATION EQUIPMENT TO THE NATIONAL MEDICAL AVIATION SERVICE (NMAS)

Rostec delivered the first eight helicopters to the service, including four Ansats and four Mi-8. In all, 87 medical helicopters will be supplied to the NMAS by 2021.

Key Events and Transactions of 2019

February

THE ROSTEC STATE CORPORATION AND LOMONOSOV MOSCOW STATE UNIVERSITY HAVE SIGNED A COOPERATION AGREEMENT FOR DEVELOPMENT OF TECHNOLOGIES TO FIGHT AGAINST CANCERS

Rostec will create a Cancer Treatment Center at the MSU facilities, organize the production and acquisition of required equipment, launch the center, ensure its operation and maintenance, provide medical services.

March

SHVABE JSC INSTALLED OVER 2.5 THOUSAND NEW COUNTDOWN LED TRAFFIC LIGHTS IN MOSCOW

About one thousand of them are also fitted with a sound alarm. In particular, cross-roads in downtown Moscow are equipped with the device.

ROSTEC DELIVERED UPGRADED A-50U SURVEILLANCE PLANES TO RUSSIAN AEROSPACE FORCES

The A-50U, an airborne early radar warning and control plane, was upgraded under an extensive program for upgrading the AEW&C fleet as part of the federal defense contract.

THE AVTOMATIKA CONCERN JSC ENSURED INFORMATION SECURITY OF POWER SUPPLY FACILITIES DURING THE XXIX WORLD WINTER UNIVERSIADE

The set of measures taken by FSUE Atlas Research Center, a subsidiary of the Avtomatika Concern, jointly with companies of PJSC Rosseti enabled prevention of over 2.5 threats.

April

ROSTEC CERTIFIED THE VK-2500 HELICOPTER ENGINE IN CHINA

The power unit can now be used in Russian-made civilian helicopters in China, which allows to geographically expand the sales and use of Russian Mi and Ka helicopters.

Key Events and Transactions of 2019

April

THE UNITED ENGINE CORPORATION OPENED A HELICOPTER ENGINE MAINTENANCE AND REPAIR CENTER IN VIETNAM

The Aviation Administration of the Socialist Republic of Vietnam certified the new center. The pilot repair project of the first engine at the new center was successfully completed.

ROSTEC SERIALIZES THE NEW RESUSCITATION SYSTEM FOR NEWBORNS

The open resuscitation system for newborns, part of the BONO line by Shvabe JSC, has been registered with the Russian Federal Heathcare Supervisory Service and is ready for serialization. This is the first time such equipment will be produced in Russia.

FIRST RUSSIAN PENTAVACCINE OBTAINED REGISTRATION

The vaccine for the prevention of diphtheria, tetanus, whooping cough, hepatitis B and hemophilic infection, based on the "five shots in one" principle, obtained registration of the Ministry of Healthcare of Russia according to the results of clinical tests. The vaccine was created by the Nacimbio holding company of Rostec State Corporation and is intended for children aged 6 months.

ROSTEC BECOMES THE ROAD MAP OPERATOR IN FOUR OF NINE END-TO-END DIGITAL TECHNOLOGIES MAKING PART OF THE DIGITAL ECONOMY NATIONAL PROJECT

Rostec structures will prepare federal-level development plans of such technologies as wireless 5G communication, industrial Internet of things (IIoT), Big Data and blockchain systems.

May

ROSTEC DESIGNED THE FIRST SUPERCOMPUTER BASED ON ELBRUS PROCESSORS

The supercomputer runs on 8-core Russian-made microprocessors, Elbrus-8C, and is intended to organize high-performance computations, big data processing, and tasks requiring the utmost level of information security.

AT THE DIGITIZATION OF INDUSTRIAL RUSSIA CONFERENCE, THE AVTOMATIKA CONCERN PRESENTED TECHNOLOGIES FOR 5G NETWORKS DEVELOPMENT

As a result of cooperation of the concern's research team, Rostec radio electronic cluster entities and technology partners, laboratory segments of 5G networks were designed.

Key Events and Transactions of 2019

May

AN ALMOST-THIRTY YEARS' BIGGEST EMERALD FOUND AT MARIINSKY FIELD

A rare emerald weighing 1.6 kg was found at the Mariinsky deposit, the only emerald deposit in Russia (part of the Rostec State Corporation). This is the country's largest find in almost 30 years — an emerald weighing more than 2 kg was discovered in 1990, since then the biggest one (1,540 grams) was found in 2018.

KAMAZ LAUNCHED A PLANT FOR THE PRODUCTION OF CABIN FRAMES

The grand opening of a new plant for the production of cabin frames for KAMAZ and Mercedes-Benz trucks took place in Naberezhnye Chelny. The facility will be operated by Daimler KAMAZ Rus — a joint venture between KAMAZ PJSC and the international automobile consortium Daimler AG. The production capacity is up to 55 thousand cabins per year.

June

ROSTEC ANNOUNCES THE OFFICIAL LAUNCH OF ZENIT M CAMERA SALES

Shvabe holding of Rostec State Corporation announced the start of sales of the Zenit M rangefinder camera — the very first model released since the revival of the legendary brand. The camera was developed on the basis of Leica M (Type 240) camera using high-tech domestic optics. The camera production batch is 500 units.

FOR THE FIRST TIME, RUSELECTRONICS JSC PUBLICLY DEMONSTRATES THE FLIGHT OF THE CUTTING-EDGE KORSAR DRONE

The premiere of the UAV took place at the International Military-Technical Forum ARMY-2019. The Korsar drone system is designed for all-weather aerial terrain reconnaissance, patrol and observation flights, and aerial photography.

July

ROSTEC PREPARED THE FIRST ISSUE OF BONDS TO BE TRADED AT MOSCOW EXCHANGE

The securities will have a maturity of up to 15 years. Up to RUB 100 billion is expected to be raised in all through the issue of the bonds. The funds will be used to finance civil-purpose products manufacturing programs.

THE SHVABE HOLDING CREATED AN EXPERIMENTAL TRAFFIC LIGHT MODEL WITH A LASER "WALL"

The laser unit of the device projects a barrage signal onto the air, warning drivers of approaching a pedestrian crossing at a distance of up to 200 meters. The device will help reducing the number of accidents at regulated pedestrian crossings.

Key Events and Transactions of 2019

August

ROSTEC INTRODUCES THE LATEST MULTIPLE ROCKET LAUNCHER SYSTEM “TORNADO-S” INTO THE INTERNATIONAL MARKET

The novelty is the result of modernization of MRLS “Smerch”. Compared with its predecessor, it has improved tactical and technical characteristics, in particular, significantly increased firing range and accuracy.

TWO RUSSIA'S LEADING RATING AGENCIES, ACRA AND EXPERT RA, CONFIRMED ROSTEC'S AAA (RU) CREDIT RATING ON THE NATIONAL SCALE, WITH A “STABLE” FORECAST

Thus, Rostec's ratings are in line with the sovereign credit rating of the Russian Federation.

ROSTEC SENT SPECIAL VEHICLES TO IRKUTSK REGION FOR FLOOD RELIEF PURPOSES

The RT-NEO LLC being a member of the Corporation supplied 150 units of special vehicles to Tulun town, to eliminate consequences of a flood. The vehicles cleared the debris, demolished ruined buildings and erected dams to protect dwelling houses against flooding and landfall. In addition, with the support of Rostec and personally Sergey V. Chemezov, a charitable project was launched: the Corporation raised RUB 1 billion for the construction of a settlement for those affected by the flood.

THE RUSSIAN HELICOPTERS JSC HAS FOR THE FIRST TIME PRESENTED AN ANSAT HELICOPTER WITH A LUXURY CABIN IN STYLE OF THE AURUS BRAND AT THE MAKS-2019 AIR SHOW

The cabin was designed by the teams of the Russian Helicopters JSC and the Automobile and Auto-Motor Research Institute FSUE.

September

ROSTEC ENABLED THE FUNCTIONING OF 30 BALLOT STATIONS IN MOSCOW ON THE SINGLE VOTING DAY

Electors from regions where additional election of deputies to the State Duma and of district heads were held, were able for the first time to vote in Moscow at stations fitted with voting terminals supplied by the Avtomatika Concern.

ROSTEC SUCCESSFULLY COMPLETED TROOP TRIALS OF THE UDAV PISTOL SYSTEM

All documents required for the pistol to be accepted for service were delivered to the Ministry of Defense. Earlier, in January, the civil-purpose version of the pistol, intended for professional sport shooters taking part in international contests, was launched. The developer also considers designing an export civil-purpose version of the pistol.

Key Events and Transactions of 2019

September

AT THE BIOTECHMED FORUM, ROSTEC PRESENTED FOR THE FIRST TIME AN ULTRASOUND CANCER TREATMENT COMPLEX

The unique diagnostic & therapeutic medical complex is intended for the treatment of neoplasms using the focused ultrasound (the HIFU treatment). As of today, this is one of the safest methods of fighting cancers.

THE GIPROTSVETMET JSC SIGNED AN IMPLEMENTATION AGREEMENT FOR MINING PROJECTS IN AFRICA

The Giprotsvetmet JSC, together with the Afreximbank, the V Holding group, and the Russian Export Center JSC, signed an agreement for creation of a transnational platform for implementation of mining projects in African countries. The agreement was signed in Sochi, at the Russia — Africa economic forum.

THE NACIMBIO JSC COMPLETED CLINICAL TRIALS OF THE FIRST DOMESTIC VACCINE FOR PREVENTION OF THE ROTAVIRUS INFECTION

The new vaccine's distinguishing feature is that it contains simultaneously five serotypes of rotavirus, in line with the World Health Organization's guidelines. The pentavalent composition will ensure protection against 93.8% variations of the disease.

IN PERINATAL CENTERS WHICH HAD BEEN BUILT AND EQUIPPED UNDER ROSTEC CONTROL IN 15 REGIONS OF RUSSIA, THE 100-THOUSANDTH BABY WAS BORN

The jubilee baby was a girl in Orenburg. She came to life with her twin sister.

October

RT-INVEST JSC LAUNCHED THE FIRST LINE OF RUSSIA'S BIGGEST WASTE RECYCLING FACILITY IN MYACHKOVO

It is expected that up to 650 K ton waste per year will be sorted, of which over 50% will be recycled and reused. The launch of the WRF in Myachkovo will allow closing the 22-hectare Volovichi landfill.

November

THE NACIMBIO SIGNED THE FIRST CONTRACT WITH THE RUSSIAN MINISTRY OF HEALTH, FOR THE SUPPLY OF THE ULTRIX QUADRI INFLUENZA TETRAVACCINE

In 2019, regions will receive over 5.4 million doses under the contracts.

Key Events and Transactions of 2019

November

ROSTEC TEAM WON 39 MEDALS AT THE WORLDSKILLS HI-TECH 2019 CHAMPIONSHIP

Rostec team took 15 gold, 11 silver and 10 bronze medals in the main ranking of the VI National championship of worker professions WorldSkills Hi-Tech 2019. Moreover, the corporate employees obtained another three awards in the Eurasian ranking of the WorldSkills Hi-Tech 2019.

ROSTEC TO PRODUCE COMPOSITES FOR SERIAL SU-57

ORPE Technologiya and PJSC Sukhoi Company signed the first production cooperation contract for designing serial Su-57. In all, 74 sets of composite items will be delivered between 2020 and 2028.

THE AVTOMATIKA CONCERN PRESENTED THE CUTTING-EDGE SYSTEM FOR COUNTERING UNMANNED AERIAL VEHICLES NAMED “RUBEZH-AVTOMATIKA” AT DUBAI AIRSHOW

The system was presented to potential customers for the first time. One of its key advantages is the intelligent control system, able to detect and neutralize drones without human involvement.

December

THE "POWER OF SIBERIA" GAS PIPELINE, OPENED BY RUSSIAN PRESIDENT VLADIMIR PUTIN AND CHINESE PRESIDENT XI JINPING, IS POWERED BY ROSTEC ENGINES

18 gas turbine units of various capacities have been delivered for the "Power of Siberia" gas pipeline facilities.

ROSTEC OPENED RUSSIA'S LARGEST CENTER PRODUCING TURBINE BLADES FOR AIRCRAFT, MARINE, AND INDUSTRIAL ENGINES

The innovative facility will allow manufacturing components for over 2 thousand aircraft engines per year, both home- and foreign-made. The project investment exceeded RUB 3 billion.

FIRST TEST RUNS OF THE UNMANNED KAMAZ-4308 TRUCK BEGAN ON KAMAZ PLANTSITE

The driverless truck will learn the logistics of cabin supply from the press-frame plant to the automobile plant. The project of components transportation using robot trucks was named “Odysseus”.

3.6 Rostec's Corporate Development Strategy

Rostec's Development Strategy through 2025 (hereinafter "the Strategy") was approved by resolution of the Supervisory Board No.9 dated December 23, 2015. It was prepared according to methods used by reputable international strategic consulting companies. The strategy consists of five items.

Item 1. **Growth.** Average annual growth of 17% in rubles through 2025, in order to achieve the global competitors' level.

Item 2. **Markets:** from "hardware" to "software". Achieving the increase in revenue by concentrating resources in fast-growing world markets of smart civil-purpose products, such as electronics, IT, automation, control systems, robotics, novel materials, etc. Target is 50% share of non-military products in the revenue by 2025.

Item 3. **Operating performance.** By deploying initiatives for improvement of the operating performance, Rostec will be able to finance the investment program required for the growth, minimizing the use of funds from the federal budget.

Item 4. **Partnerships**. By procuring the smart capital, Rostec will be able to raise additional finance, acquire the required competences, and access new markets.

Item 5. **Implementation mechanism.** The Strategy implementation mechanism is based on two key elements:

- Strategic initiatives covering all business aspects;
- Cascading the Corporate Strategy down to strategies of holding companies (integrated structures) (HC (IS)) and directly controlled entities (DCE), action programs of HC (IS)/DCE, and the Corporation's action program.

Thus, the Corporate Development Strategy is put in place, on the one hand, through development strategies of Rostec HCs (ISs), and on the other hand — through activities based on strategic initiatives approved in the Rostec's Development Strategy.

To focus on the implementation of strategic initiatives, Rostec Supervisory Board approved a consolidated list containing eight strategic initiatives (minutes No.13 dated December 26, 2018). The decision of Rostec Supervisory Board on strategic initiatives consolidation boosted the focus on the fulfillment of the Strategy, allowed expanding cooperation for the purpose of the Strategy planning and fulfillment synchronization, and to increase the motivation of those involved in its fulfillment.

The success of the Strategy implementation depends on Rostec HCs (ISs) and entities. In order to achieve the figures planned in the common Strategy, development strategies of HCs (ISs) were prepared. They detail goals, define markets and set vectors of activities in markets and their segments, including non-military and export ones.

Pursuant to the corporate planning system, medium-term action programs were prepared for HCs (ISs) and DCEs. They decompose the lines defined in HC (IS) and DCE development strategies by breaking them into individual projects, in line with approved development strategies.

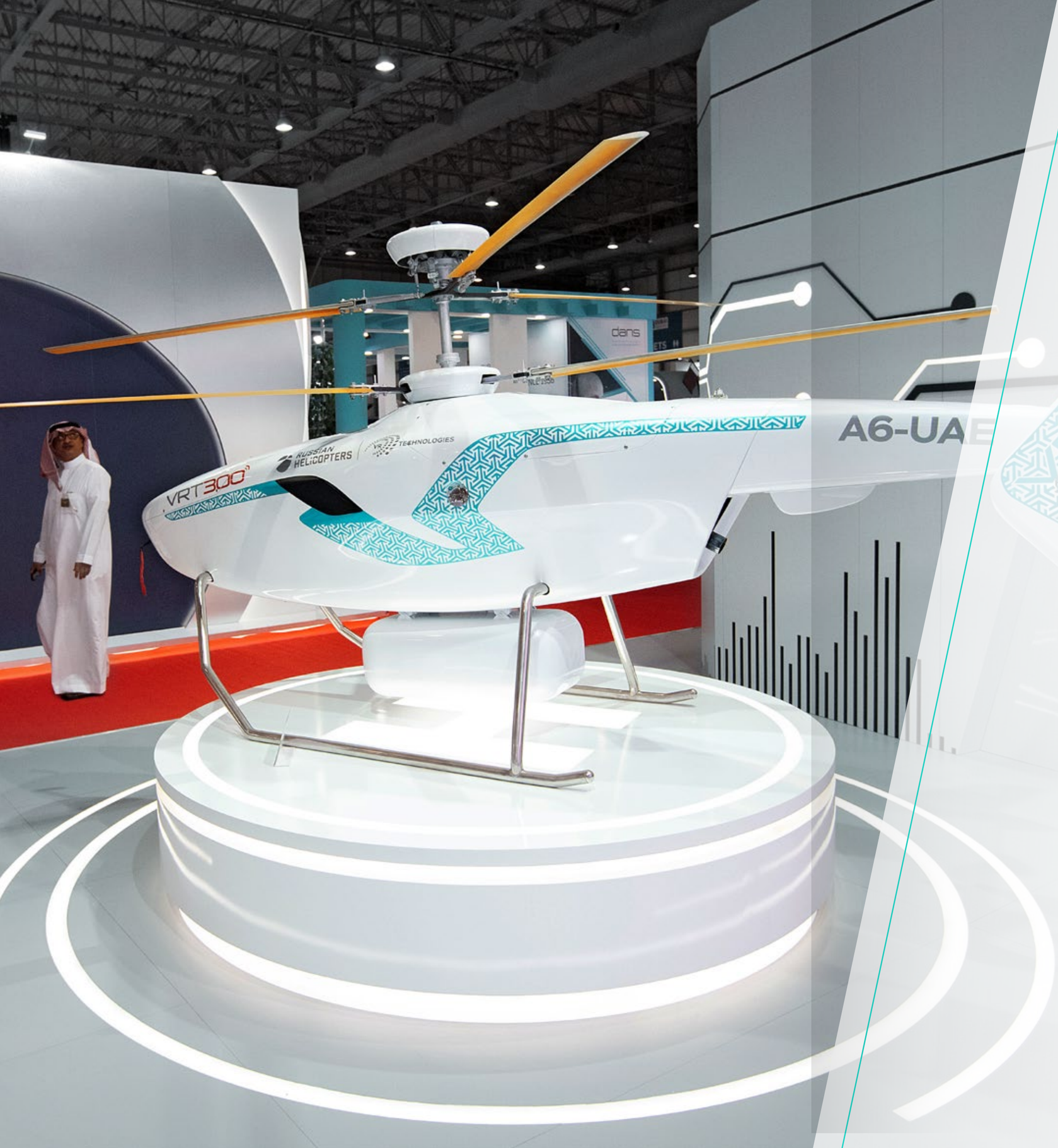
In the medium term, activities for the implementation of strategic initiatives and most significant projects of HCs will be integrated into the Corporation's Acton Program.

1.45

TRILLION rubles

TOTAL BUDGET OF PROJECTS APPROVED BY ROSTEC IN 2019

Rostec's Development Strategy through 2025 is prepared according to methods used by reputable international strategic consulting companies.



Rostec

4. SCIENCE. OVERCOMING TECHNOLOGIC BARRIERS

169

BILLION rubles

TOTAL EXPENDITURE OF ROSTEC ENTITIES FOR RESEARCH AND DEVELOPMENT IN 2019

(including funds from the federal budget)

TABLE OF CONTENTS

Science. Overcoming Technologic Barriers

4.1 Science. Overcoming Technologic Barriers

Science as a National Project

Today, the economic growth and the leading position in the world economy depend not only on the country's geographic location or availability of natural resources, but also on such factors as the intellectual capacity, the use of advanced technologies in the production, commercialization of scientific developments and innovative solutions in various sectors. In the post-industrial world, science is an intrinsic part of the production process and the immediate productive force — economic advancement is impossible without science. Today, the intellectual labor becomes the key element of any innovation, and the share of research and development works (R&D) in the end product is at least 70%.

The process of turning an intellectual product into an industrial one involves at least three tools: science, industry and the State. Zhores Alferov, an outstanding scientist and a Nobel laureate, noted more than once that the Russian science's problem is the lack of demand for it on the part of the business and the Government, and the main challenge is to make science be highly demanded: "This is the only way we will be able to attain a breakthrough in technologies, develop our own high-tech economy, and achieve not only economic, but also social progress".

Today, the Government has assumed the task of building the scientific capacity. For the first time, science has been declared a national project. The "Science" priority project will be implemented from 2019 to 2024. It consists of three subsections: "Developing the Scientific and Scientific-Production Cooperation", "Building an Advanced Research and Development Infrastructure in the Russian Federation" and "Research and Development Talent Pool Building" federal projects.

Before 2024, our country should enter the world's top five in scientific areas prioritized by Russia, and become an attractive work place for Russian and foreign scientists. In addition, the growth rate of domestic research costs shall outrun that of the gross domestic product.

The "Science" national project includes seven performance targets:

- Russia to become the 5th in terms of the specific weight of research articles in fields prioritized by the scientific and technology development, in periodicals indexed in international databases;
- Russia to become the world's 5th in terms of the total number of patent applications for inventions in priority fields;
- Russia to become the 4th in terms of the number of researchers on a full-time equivalent basis among the world leaders;
- To increase the number of scientists working with Russian organizations and publishing articles in first- and second-quartile scientific periodicals indexed in international databases, up to 30.8 thousand persons by 2024;
- Growth rate of domestic research and development costs against the growth rate of the gross domestic product to rise up to 1.02;
- Share of researchers below 39 y. o. to increase up to 50.1% in the total number of Russian researchers;
- Domestic research and development costs out of all sources to increase up to RUB 1 trillion 847.61 billion.

Many specialists believe, the targets are very ambitious, if start figures are considered. For example, today Russia is the 11th in terms of articles in leading international databases, and the 8th in terms of patents. Our country is the 8th as well in terms of domestic research and development costs. The only figure to be absolutely in line with the plan is that Russia is already the 4th in terms of the number of researchers.

The "Science" national project proposes advancing to the target values in several lines at once. First of all, this is the establishment of 15 world-class research and educational centers (REC). Each of them shall unite not only leading specialized higher education institutions, but also real sector enterprises as strategic industrial partners. In close cooperation, they will design and commercialize competitive technologies and products, develop the talent pool.

The RECs shall become the basis for the development of science and high-tech industries, primarily in regions. In 2019, the Government provided support to research and educational centers established in Perm Territory, Belgorod, Kemerovo, Nizhny Novgorod and Tyumen regions. In 2020 and 2021, the Ministry of Education and Science will select research and educational centers and finance grants. Tens of regions pretend to host RECs. Among them is Samara region, where a regional center, preceding a federal one, was launched in 2019. Rostec has become the first strategic industrial partner of the REC in Samara region, and can also become a strategic partner of the REC to be established in Bashkiria. The republic pretends to accommodate a development center of digital technologies and novel materials in the oil and gas industry in 2020.

Rostec is very actively involved not only in the deployment of the "Science" national project, but also of projects under the National Technologic Initiative (NTI) — a governmental program of subsidies for the development of upcoming industries in Russia, which will define the world economy's structure in the next 15-20 years. These are, in particular, artificial intelligence, quantum technologies, robotics, new energy sources, wireless communication, neurotechnologies, biotechnologies.

Under the NTI, Rostec is deeply involved in the following upcoming areas:

- AeroNet (designing unmanned helicopters and their control, navigation and search systems; manufacturing unmanned helicopters and their control, navigation and search systems; purchasing ultralight unmanned aerial vehicles to be used to transport cargoes on plant sites);
- EnergyNet (development and production of chemical sources of current and accumulators; purchase of autonomous power supply systems);
- SafeNet (development and production of cybersecurity solutions for control systems of military and civil-purpose vehicles, sensors);

Boris Andreevich Belobragin

BORIS ANDREEVICH BELOBRAGIN —
deputy managing director — chief design engineer of the research-production assosiation "Splav" named after A. N. Ganichev, Doctor of Engineering, academician of the Russian Academy of Missile and Ammunition Sciences (RAMAS), author of over 130 research articles and inventions.

Laureate of the USSR and Russia State Awards, holder of the IV degree order "For Merit to the Fatherland", medals "300th anniversary of the Russian Navy", "For Strengthening Military Cooperation", II degree "For Strengthening the State Information Security System", V. V. Bakhirev medal. Awardee of honorary titles "Honorable Design Engineer of the Russian Federation" and "Honorable Worker of the Ammunition and Special Chemistry Industry".

With his direct participation and under his direct guidance, over 40 research and development projects were completed, principles and methods of design engineering, experimental testing and serialization of advanced weapons were elaborated and implemented.

Pavel Arkadievich Storozhenko

PAVEL ARKADIEVICH STOROZHENKO —
CEO of the State Research Institute of Chemistry and Technology of Organoelemental Compounds (holding company: RT-Chemcomposite), academician of the Russian Academy of Sciences, Doctor of Chemistry, professor. Specialist in chemistry, industrial production and application of hydride organoelemental compounds and materials for special and aerospace vehicles and equipment.

Under his guidance, technologies were developed for production of high-temperature composite materials and coatings (plastics, resins and adhesive compositions), preceramic polymers — polycarbosilanes, heat-resistant fibers based on organoelemental coatings.

Science. Overcoming Technologic Barriers

Vladimir Stepanovich Verba

VLADIMIR STEPANOVICH VERBA —
general designer, first deputy CEO of the Vega Radio Engineering Concern (holding company: Ruselectronics JSC). Under his guidance, air-, land- and space-based radar equipment is being developed and produced.

Corresponding member of the RAS, deputy academic-secretary of the nanotechnologies and information technologies department of the RAS, professor, head of the basic chair of Moscow State Institute of radio engineering, electronics and automatics, member of the guardianship board of the South Federal University. Chairman of the board of directors of the radio electronics sector enterprises at the Ministry of industry and trade of the Russian Federation. Author and co-author of more than 430 research works, 61 invention and utility model patents.

Awardee of orders "For military merits" and "Honor Badge", Certificate of Merit of the Russian President, Certificate of Merit of the Russian Government, laureate of the State Prize of the Russian Federation named after Marshal of the Soviet Union G.K. Zhukov, prize named after USSR Minister of the radio industry V.D. Kalmykov, National prize named after Peter the Great among defense enterprises of the country "For efficient enterprise management and achievement of financial and economic stability". Honored Scientist of the Russian Federation.

- NeuroNet (development and production of medical systems and simulators using neurotechnologies; purchase for neuroeducation and neuromedicine needs);
- HealthNet (development and production of portable medical equipment);
- TechNet (advanced production technologies).

NTI's tasks and opportunities are integrated in the "Science" national project. The both programs are being deployed in close cooperation, using the same research infrastructure. RECs and competence centers created as part of the NTI are expected to have engaged at least 250 Russian companies in the development of new technologies by 2024. In addition, these participants of the national project shall submit at least 1,500 patent applications, and deliver at least 140 new patented technologies for implementation in the economy.

Developing the Talent Pool: Uniting Traditions and Innovations

While the Russian science stands behind in terms of the number of articles and patents, however, our country is among the world's top five in terms of the number of researchers. Russia is the 4th in this segment: about 365 thousand people are engaged in research and development, or 111 people per 10 thousand employed.

Despite the difficulties, the science has never experienced any shortage in talented scientists and inventors. Historically, many of them began working at entities which now form part of Rostec. Among them are: Alexander Pistolkors, physicist, whose discoveries are the cornerstone of entire sectors of the modern radioelectronics; Alexander Nudelman, design engineer, who stood at the origins of conversion and created not only tens of models of air guns and air defense systems, but also the first Russian cardiac pacemaker; also, Arkhip Lyul'ka, design engineer, the creator of the first turbojet engine in our country, and many other legendary names. Their researches not only form the basis of scientific schools, but also are the solid foundation of the domestic industry. But even more valuable heritage is an entire constellation of prominent design engineers — researchers working at present-day design bureaus. Today, they develop ideas of their famous teachers and keep contributing to the science. In particular, Pistolkors' followers are working in the field of active phased antenna arrays (APAA) at the facilities of the Vega Radio Engineering Concern (holding company: Ruselectronics JSC). Also, the country's only research school for aerospace monitoring is organized here as well, headed by **Vladimir Verba**, general designer of the Concern, corresponding member of the Russian Academy of Sciences.

Arkhip Lyul'ka is one of the founders of UEC Saturn's design engineering school and Russian engine building in general. The famous AL aircraft engines created under his guidance are still used on hundreds of aircraft. The unique AL-318 is often called by designers a "perpetuum mobile" of the front-line aviation, noting its considerable development reserves. The Saturn UEC is continuously upgrading the engine. By decision of the Military-Industrial Board of the Russian Federation, the country's priority sector of the Engine Building

Valeriy Alexandrovich Geykin

VALERIY ALEXANDROVICH GEYKIN —
deputy CEO of the UEC — head of the priority technologic sector "Engine Building Technologies", Doctor of Engineering, professor.

Under his guidance and with his direct participation, over 50 technical processes and 15 types of special equipment were developed and implemented at over 30 aircraft industry enterprises. Member of two special doctor boards, chairman of the State examination commission in the "Machines and technologies of high-efficiency processing operations" specialty of the "Metal technology" chair of Moscow Power Engineering Institute. Published over 220 research works, including two monographs, obtained over 80 invention patents and authorship certificates.

Full member of the Academy of aeronautics sciences, laureate of A.G. Ivchenko prize of the international Aircraft Engine Building Association (AEBA), awardee of AEBA medal "For Commitment", N.D. Kuznetsov medal, II degree medal of the "For Merit to the Fatherland" order. Honored aircraft industry worker.

Science. Overcoming Technologic Barriers

Technology is today headed by **Valeriy Geykin**, deputy CEO of the UEC. The corporation also employs a great number of other outstanding professionals, who had created many legendary models of domestic engines. Among them is **Alexander Inozemtsev**, Russian scientist, specialist in bypass aircraft engines, gas-turbine power units and gas-turbine power plants, corresponding member of the Russian Academy of Sciences (RAS) (2016). He used to be the chief design engineer of the PS-90A engine for the first Soviet long-range wide-body aircraft IL-96.

Mitrofan Stelmakh, creator of the Russian laser industry, was the founder and the first director of the Polyus Research and Development Institute, currently part of the Shvabe holding company of Rostec. Under his guidance, designs unbelievable for that time were created at the institute. So, here was designed the first Russian "laser scalpel". Today, the Polyus RDI is the country's biggest laser center, and bears the name of its outstanding founder. Since 2019, the priority technology sectors (optoelectronics and photonics) at the holding company are headed by **Sergey Popov**, Doctor of Engineering, deputy CEO of Shvabe for R&D and innovative development.

Other Shvabe enterprises continue as well a number of advanced developments in laser technologies, which in the foreseeable future will play the core role in the country's technologic advancement. For example, S. I. Vavilov State Institute of Optics (SIO) produces virtually all crystals now existing in the optics industry. By the way, the department of physical optics at the S. I. Vavilov SIO was headed for more than 25 years by Alexey Mikhailovich Bonch-Bruevich — a prominent physicist after whom a minor planet in the Solar System was named. He was a worthy successor of his father — Mikhail Bonch-Bruevich, founder of the Russian radio tube industry, whose researches had boosted the development of radio broadcasting, radio location, television. The most productive period of his research activity was connected with the Nizhniy Novgorod radio laboratory. In the 1920es, here was designed the "New Comintern" radio broadcast station, which was then installed on Shabolovka. At that time point, the radio transmitter designed by Bonch-Bruevich was the most powerful in Europe. Today, the legendary radio laboratory bears the name of M. V. Frunze NSPA, and is part of the Radio Electronic Technologies Concern (KRET JSC) of Rostec.

In all, the KRET unites over 70 facilities operating in the design and manufacturing of radio electronic products. The concern is Russia's leader and the leading designer and producer of avionics for all types of airborne vehicles (over 80% market share). Eminent design engineers work here. One of the most renowned names, not only for the KRET, but also for the entire Russian aviation instrument-making industry, is **Givi Djandjgava**, author of over 200 research works and of over 120 inventions.

His works in the theory and design methods of navigation aids using the Earth's physical fields, autonomous and adjustable avionic systems boosted the creation of strike aerial complexes in the 1980-es. Today, Givi Djandjgava holds the office of the general designer of the Concern, deputy CEO for R&D of on-board equipment.

Alexander Alexandrovich Inozemtsev

ALEXANDER ALEXANDROVICH INOZEMTSEV —
managing director — general designer of UEC Aircraft Engine JSC, Doctor of Engineering, member of the RAS, specialist in bypass aircraft engines, gas-turbine power units and gas-turbine power plants.

Author of 114 research works, holder of 3 authorship certificates and 61 patents. He developed principles of conceptual design of aircraft engines with high bypass ratio for medium- and long-range aircraft, designing methods of gas-turbine equipment using multi-level mathematical modeling of physical processes, methods and strategy of gas-turbine equipment resource control without preliminary bench trial.

Since 2000, heads the "Aircraft Engines" chair of Perm State Technical University; chair professor since 2008. Laureate of the State Prize of the Russian Federation in science and engineering, laureate of N.A. Kosygin prize, laureate of the prize of the Russian Government in science and engineering, laureate of A.N. Tupolev international prize. Awardee of the II degree order medal "For Merit to the Fatherland", order of Honor, "Honored worker of aircraft industry" badge, corresponding member of the Academy of technologic sciences of the Russian Federation, corresponding member of the RAS.

Sergey Viktorovich Mikheev

SERGEY VIKTOROVICH MIKHEEV —
general designer of Kamov JSC, Hero of Russia, Doctor of Engineering. Specialist in helicopter engineering. Under his guidance, all state-of-the-art co-axial helicopter models were designed: Ka-27, Ka-28, Ka-29, Ka-31, Ka-32, Ka-50, Ka-52.

Professor of Moscow Aircraft Institute, corresponding member of the RAS, academician of the RAS, honored scientist of the Russian Federation. Created the scientific school of ship-borne aircraft, originated the sector unmanned helicopter systems designing with artificial intelligence elements. Author of 138 research works, including 8 monographs, 76 authorship certificates and patents.

Member of the Research Board under the Security Council of the Russian Federation, member of the Cross-Agency Commission of the Security Council of the Russian Federation for issues of the defense industry. President of the Russian Helicopter Society and of the Helicopter industry Association. Awardee of Lenin order, order of the October Revolution. Laureate of the Lenin Prize and of the State Prize of the Russian Federation. Laureate of A. N. Tupolev prize by the RAS for a set of research and development works on the creation of combat and civil helicopters.

Rostec holding companies possess a vast scientific base and competences, leading in their areas. For example, for over 45 years, the Avtomatika Concern has been the leading developer and manufacturer of data encryption tools. The Concern's most significant projects for creation of special-purpose automated control systems were guided by **Sergey Bukashkin** who headed the enterprise for two decades. Over the years of his leadership, about 50 special communication systems using the cyber protection technology were developed. Today, Sergey Bukashkin holds the office of the Avtomatika Concern's general designer in the "Quantum sensors" sector.

Another famous scientist and information security officer at the Corporation is **Nikolay Turko**. Today, he is senior advisor to Rostec CEO. Nikolay Turko was among the first in the country to address the information warfare problem. He created his own research school specialized in information research and in the improvement of the efficiency of military-technical cooperation with foreign states.

Today, Rostec ecompasses entire industries in the country, for example, aircraft construction. Upon integration with the United Aircraft Corporation (UAC), Rostec became one of the world's biggest aircraft builders. At Rostec's aviation cluster facilities, where used to work such prominent Russian aircraft designers as Tupolev, Sukhoi, Kamov, Mil', and many others, works on cutting-edge helicopters and airplanes are in progress. For example, in 2019, the MS-21-300 civil aircraft was for the first time presented to the general public. Among helicopter novelties is the medium-sized multi-purpose Ka-62 designed by Kamov JSC. The Ka-60/62 helicopters were conceived under the guidance of **Sergey Mikheev,** a Soviet and Russian aircraft designer, nowadays general designer of Kamov JSC (part of the Russian Helicopters holding company). He also guided the designing of such famous vehicles as the search-and-rescue Ka-27, strike combat helicopters Ka-50 "Black Shark", Ka-52 "Alligator", light multi-purpose Ka-226, etc.

Latest rotary-wing vehicles widely use cutting-edge technologies, including polymer composite materials. Thus, the share of composites in the volume of the structure of the Ka-62 helicopter can reach 60%. The industry's novelties are created in wide cooperation with Rostec enterprises. As far as composite materials are concerned, the RT-Chemcomposite JSC is primarily involved. One of the holding company's outstanding professionals specialized in the chemistry of materials for special and aerospace vehicles is **Pavel Storozhenko**, Doctor of Chemistry, academician of the RAS (2019). The State Research Institute of Chemistry and Technology of Organoelemental Compounds headed by him is engaged in seven priority science, process and technology development sectors, and in more than ten critical technologies of the Russian Federation.

Rostec links up almost all significant industry enterprises of Russia, where renowned scientists and designers conceived best models of weapons in all areas of the military industry. Now, these enterprises are not only loaded with ongoing production, but also design new items, taking the cause over from the outstanding designers.

Science. Overcoming Technologic Barriers

Sergey Anatolievich Bukashkin

SERGEY ANATOLIEVICH BUKASHKIN — *deputy CEO of the Avtomatika Concern, head of the priority technologic sector "Cyber Security Technologies", Doctor of Engineering, professor, full member of the Academy of cryptography of the Russian Federation.*

Under his direct guidance, some most significant projects for creation of automated control systems were put in place. Over 20 years of his guidance, the enterprise designed about 50 special communication systems using the cyber protection technology.

Head of the Avtomatika Concern's basic chair at Moscow Institute for Radioelectronics and Automatics, member of the special board. 52 candidates and 7 doctors of engineering sciences graduated under his guidance.

Awardee of the medal "In memory of the 850th anniversary of Moscow", order of Peoples' Friendship, medal "For Strengthening Military Cooperation", laureate of the prize of the Russian Government in science and engineering. In 2019, was awarded the Order of Honor by Decree of the Russian President.

Thus, as far back as in 1963, the Splav RPA delivered the Grad system to the Russian army, which is now in operational service with armies of more than 50 countries all over the world. In subsequent years, Uragan and Smerch — multiple launch rocket systems (MLRS) were created. Today, the Russian rocket-launching artillery is still being enhanced. A considerable contribution to the design of new-generation ammunition, which improves the combat performance of the MLRS, was made by **Boris Belobragin**, deputy managing director — chief designer of the Splav RPA, Doctor of Engineering, academician of the Russian Academy of Missile and Ammunition Sciences (RAMAS), author of over 130 research articles and inventions.

Not only the MLRS, but also tanks are an important element in the Ground Forces' system. They also require upgrading to meet today's needs. One of the leading experts in armored vehicles is **Andrey Terlikov**, CEO — chief designer of the Ural design bureau of transport engineering. With his direct participation, tanks were developed, tested and serialized: T-72Б and its modifications, T-90, T-90K (Sambuk project), T-90C (export modification of T-90), T-72Б2 (Rogatka project). Andrey Terlikov is a laureate of the prize of the Russian Government for the creation of the export modification of the T-90 tank.

The accumulated scientific and technical capacity of Rostec enterprises allows resolving efficiently the challenging task of the conversion development, by deploying the production of science-driven civil-purpose items based on military technologies. In this area, the Corporation is focused on the medical equipment and pharmaceuticals sectors. Nacimbio, Rostec's holding company, is the leader in the production of immunobiological medications. One of the company's leading enterprises is the Microgen RPA. The enterprise features a position of responsibility — R&D director. Currently, the office is held by **Elena Sakanyan**, Doctor of Pharmacy, professor. She is the author of 16 invention patents, and the official observer from the Russian Ministry of Public Health at the Committee on Specifications for Pharmaceutical Preparations of the World Health Organization in the European pharmacopoeia; chair of the Pharmacopoeia Council of the Eurasian Economic Union.

One of Rostec's brightest, in the proper sense, civil-purpose products are fireworks. In our country, most pyrotechnicians work at the Research Institute of Applied Chemistry (RIAC) in Sergiev Posad, part of Rostec. The RIAC is the provider delivering on major orders of the Salute Division of the Russian Ministry of Defense, in charge of all fireworks on public holidays and at other major events, such as the Olympic Games in Sochi, World Cup final, New Year celebration. Managing director of the RIAC, **Nikolay Varenykh**, is the president of the Russian Pyrotechical Associaton, candidate of engineering sciences, corresponding member of the RAMAS. Author of research works and inventions in issues of pyrotechnical ammunition, protective equipment for military hardware, and pyroautomation facilities.

Rostec was able to preserve the school, traditions, and heritage of the great scientists. Their cause is running on in a modern way, using advanced technological capabilities. The Corporation unites over 800 research and production entities in 60 regions of the country. As experts state, Russian defense enterprises benefit from clear priority in the implementation of innovations, as compared to other economic sectors. Their key advantages may include the existence of research and technical best practices, as well as high-end professionals. Today, Rostec entities employ over 600 thousand people. The Corporation focuses on investment in the human capital and on the preparation of the new generation of Russian professionals.

As of today, Rostec holds over 400 chairs at major universities and institutes. Cooperation agreements have been signed, among others, with Lomonosov Moscow State University, Bauman Moscow State Technical University, Moscow State University of International Relations of the Russian Ministry of Foreign Affairs, Plekhanov Russian University of Economics, Far Eastern Federal University, and other leading universities of the country.

Cooperation with the Scientific Community: Focusing on "Open Innovations"

As far back as in 2012, Rostec set the course for "open innovations"; this implies broad interaction with the external innovation community, including universities and research organizations. In particular, universities are engaged as co-contractors in R&D under national programs and own initiatives. In 2019 alone, universities delivered research and development under Rostec entities' orders for RUB 2.2 billion.

In 2019, Rostec agreed on cooperation in innovative projects with a number of leading Russian universities. In particular, the UEC signed an agreement with Moscow Aircraft Institute for creation of digital twins of gas-turbine engines. The Corporation will also develop hybrid power units with the Institute of problems of chemical physics at the RAS.

The Shvabe JSC, jointly with Bauman MSTU, creates and studies worldwide-unparalleled optic fibers, while in partnership with Moscow Institute of Physics and Technology (MIPT) the company prepares artificial intelligence projects. In particular, the Research Center for optoelectronics, medical technology and artificial intelligence has already been established for this purpose.

At the facilities of Lomonosov Moscow State University, Rostec is establishing a cancer treatment center. The research center will engage in the development of innovative technologies for cancer diagnosis and treatment, in particular, will search for technical application of the scientific knowledge in the area of proton therapy being one of the latest methods of cancer treatment.

Rostec actively cooperates directly with the Russian Academy of Sciences (RAS). In April 2019, the parties signed an agreement providing for efforts joining for the purpose of creating innovative products, including joint conduct of scientific research and development, as well as the expert review of innovation technologies. They will also join up in matters of building and implementing the State's scientific, technical, industrial and innovative policy.

Rostec and the RAS have already implemented some joint projects. Among them is the creation of the National heliogeophysical complex meant to broaden our knowledge about the Sun. This is one of the biggest projects in the modern Russian science; its findings will be of global importance. Rostec enterprises have all required competences

Science. Overcoming Technologic Barriers

and state-of-the-art production capacities to implement this exceptionally challenging project in cooperation with the RAS.

Science-Driven Technologies at Rostec Enterprises

Upgrading production facilities implies not only putting new equipment into operation, or infrastructure renewal. Today, this means primarily in-depth technologic transformations, including integration of digital economy elements into the production process. The digitization will bring the facility onto a new level, providing a lot of competitive advantages.

The use of new production technologies allows improving the labor efficiency, the merchantability, while reducing the production cost. An important result of the upgrade is the creation of new commercially successful products.

The armament is traditionally a driver of technology development; digital technologies are no exception. An engineering center has been established within the conventional arms, ammunition and special chemistry cluster; it will use cutting-edge software solutions and will integrate market competences in the preparation and deployment of comprehensive projects for production of weapons, military hardware, and civil-purpose items.

The radioelectronic cluster facilities manufacture hundreds of products with a digital component, including items used to digitize Rostec entities. These are electronic elements and components, software and cyber security solutions.

The aviation cluster widely uses latest designing and modeling principles, state-of-the-art mathematical program systems, powerful computers and supercomputers. “Digital factories” created at aircraft building enterprises allow designing and manufacturing items and structures on a conceptually new level. Timelines for product designing and global marketing are reduced considerably.

One of the most sophisticated and high-tech industries is the full-cycle creation of aircraft engines. Here, it is crucial to be on the edge of the technical progress. The UEC is the leader in innovative technologies implementation within Rostec.

The UEC entities were the first to use the industrial 3D-printing technology in the production of gas-turbine engines. Prior to this, the Integrated Center of Additive Technologies had been established at UEC-Saturn in Rybinsk. The share of parts made with the 3D-print method will reach 20% in the new engines’ total volume. The implementation of additive technologies will allow reducing time by 3, and cost by 2 times, as required to manufacture serial parts. This technology can be used not only in aircraft engines, but also in the aircraft building, in the production of space vehicles, in science-driven medicine and car manufacturing.

By 2021, the Kuznetsov PJSC will deliver over 50 elements for state-of-the-art gas-turbine engines, using the 3D-printing. The Russian Helicopters also will serialize about 30 parts re-designed using the 3D-printing technologies. The Ruselectronics holding company, jointly with the Institute of synthetic polymer materials of the RAS, are developing a production technology of electronics and photonics devices made of organic polymers using the 3D-printing. The project implies the technology of “growing” electronic items of organic polymer materials using the 3D-print method.

Elena Ivanovna Sakanyan

ELENA IVANOVNA SAKANYAN —
R&D director of Microgen research and production association. Doctor of Pharmacy, professor.

Areas of professional interest: development of formulations, technology and methods of standardization of medicines of natural and synthetic origin, and of bioactive food nutrients.

Member of the Dissertation Board at the Mendeleev University of Chemical Technology of Russia. 3 doctors and 32 candidates of pharmacy graduated under her guidance. Author of 9 monographs, 243 research articles, 16 invention patents.

Official observer from the Russian Ministry of Public Health at the Committee on Specifications for Pharmaceutical Preparations of the World Health Organization in the European pharmacopoeia; deputy chair of the State Pharmacopoeia Council of the Russian Ministry of Public Health; chair of the Pharmacopoeia Council of the Eurasian Economic Union.

Awardee of the “Excellent Worker of Public Health” badge and the medal “For Merit to the National Public Health”.

Nikolay Ivanovich Turko

NIKOLAY IVANOVICH TURKO —
senior advisor to Rostec CEO, Doctor of Military, Candidate of Engineering, professor, Major General.

He was among the first in the country to address the information warfare problem at the strategic level, justified the promising consolidation vectors of the State’s information resource for the purpose of building Russia’s geopolitical space, revealed the transformation laws of the schemes of aggression containment by power.

He created his own research school for the study of advanced turboprops, forms and methods of fight in the aerospace and in the information sphere, improvement of the efficiency of military-technical cooperation with foreign states. Author of more than 200 printed scientific publications and guidelines, including five monographs, two invention authorship certificates. Laureate of the prize of the USSR Cabinet, of the prize of A.V. Suvorov Academy of Military Sciences. Awardee of orders “For Service to the Motherland in the Armed Forces of the USSR” III degree, Order of Honor, and ten medals. Vice-President of the Academy of Military Sciences. Director of the research, development and educational Center for defense issues of the Academy of Military Sciences.

The UEC-Permskie Motory implements some smart production technologies. The equipment fitted with special gauges and bar code scanners will track data of the condition and operability of the entire machinery fleet in the online mode. The use of new technologies will allow forecasting any trouble in the equipment, and switch from the scheduled repairs to the “as-is” preventive maintenance.

Another Rostec’s “digital factory” is the UEC-UMPO, Ufa. Here, single digital environment for the production of PD-14 aircraft engine components is implemented; the engine will be mounted on the MS-21 airliner. The key element of the digital space is the production operations planning and recording system using the bar coding of supporting documentation related to parts and assembly units of the PD-14. The system allows optimizing the schedule of a product manufacturing, reducing losses due to rejects, accelerating the production and marketing cycle. The digitization is estimated to improve the labor efficiency required to manufacture a PD-14 by over 15%.

Rostec engine manufacturers use the digital twin technology, where a dynamic model of a real article is created in the digital environment. All the current products of the UEC design bureaus are by now completely digitized. Digital twins are used in particular in the designing, manufacturing and operation of engines SaM146, PD-14, advanced increased thrust engine PD-35, gas-turbine marine engines, and other articles.

In addition to the handling digital copies of engines, the virtual reality (VR) technology is used. The pilot project for VR implementation in the creation of a gas-turbine engine’s digital twin is being deployed under partnership of A. M. Lyul’ka experimental design bureau and Sarov Engineering Center.

The VR provides better visualization of data received using digital twins. Designers and operators can “view” the physical engine not just as a 3D model, but in the virtual or augmented reality mode. At the designing stage, this allows quickly finding and correcting errors in the parts’ geometry, and in the course of operation — efficiently detecting risks of potential troubles and failures, and reducing maintenance costs.

Other Rostec holding companies are also deploying new production technologies. The Technodinamika JSC is implementing a digital platform at its 17 entities, intended for engineering and process preparation of the AWS SWR production. The system will allow creating digital twins of products and processes and building a knowledge base. The AWS SWR includes a project management system; item designing and upgrading system; integration of all product, machine and tool guides of each enterprise. The deployment of the new platform will boost the Technodinamika JSC’s switchover to paperless designing technologies, replacement of field tests with mathematical modeling, reduction of product development timelines and costs.

Innovative technologies help weaponry designers as well. In designing weapons and ammunition, CNIITOCHMASH professionals use the software and hardware complex “Center”. The complex is intended for physical and mathematical modeling of product field tests. Its capacity exceeds 50 trillion operations per second, i. e. it is categorized as a supercomputer. The “Center” allows calculating not only the bullet’s ballistic properties, but also the weapon’s condition. This is helpful to determine, at the “paper” designing stage, prior to making the item in metal, how worthwhile is the novelty and how long will be its life.

Science. Overcoming Technologic Barriers

Givi Ivlianovich Djandjgava

GIVI IVLIANOVICH DJANDJGAVA —
deputy CEO of KRET for on-board equipment R&D — general designer. Professor, Doctor of Engineering, full member of the Academy of Technologic Sciences of the Russian Federation and of the International Informatization Academy.

Author of 450 printed publications and of over 300 inventions. His works on navigation aids, aviation instrumentation, functionally and structurally integrated complexes and systems of on-board radioelectronic equipment of aerial vehicles boosted the creation of airborne strike systems. Under his guidance, the digital navigation target acquisition system for the MiG-29 aircraft, avionics for ship-borne planes and helicopters, for Su-27 battle planes were created. With his direct participation, the Federal research and production center "Technocomplex" was established, uniting a number of enterprises — developers and manufacturers of avionics.

Awardee of the USSR State Prize, State Prize of the Russian Federation for the elaboration of the scientific basis and of a system of new process operations and equipment for state-of-the-art instrumentation; B.N. Petrov prize of the RAS, A.N. Tupolev prize of the RAS, Peter the Great's National Prize, as well as the order of Friendship, "Glory of Russia" order, "300th anniversary of the Russian Navy" medal, "In memory of the 850th anniversary of Moscow" medal.

Innovative Products: from Idea to Implementation

Rostec's mission is to improve people's life quality by creating high-tech products, competitive technologies and services. Today, the Corporation is creating innovative products based both on its own scientific research and development, and in cooperation with Russia's leading universities, research institutes and enterprises. These include state-of-the-art weapons, environment-friendly vehicles, world-class aircraft engines, advanced optics, medical equipment, cutting-edge medications, etc. It is difficult to name a sector where no Rostec's item or technology would be present.

In some sectors, Rostec holds a monopolistic position in Russia. These include, for example, the designing of helicopters, gas-turbine aircraft engines, integrated on-board radioelectronic systems, aerial vehicle equipment, various kinds of ammunition, precision weapons, etc.

In 2019, experts defined some of Rostec's technological projects intended for the civil market. One of the advanced technologies is remote objects' data collection and processing using laser radars — lidars. These devices read data through active optic systems using such phenomena as light reflection and diffusion. The technology can be used in the robotics, industrial design and architecture, and in the control of land-, water- and airborne unmanned vehicles.

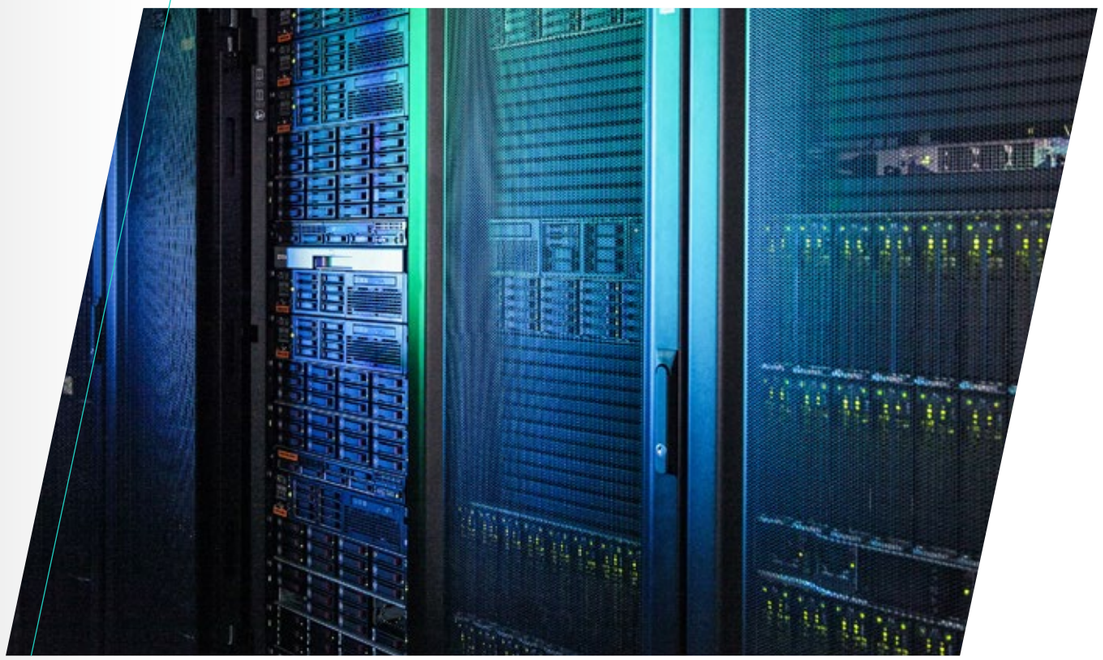
The multi-purpose modular lidar complex created by Vavilov Institute of Optics (Shvabe holding company) will be used for remote detection of hydrocarbon gases from board of a helicopter or drone. The use of lidars will simplify the monitoring of associated gas emission, search for gas emissions in the Arctic, and offshore prospecting. The lidar has already passed a number of tests on the Urengoy — Novopskov main gasline and on a gas condensate field, jointly with the All-Russian Geological Research Oil Institute.

Rostec holding companies conceive **computer equipment** which is not inferior by its features to items marketed by world's giants, and has an important advantage — high-level domestic protection against unauthorized access to data. Such equipment is intended for entities with increased information security requirements, but can also be used for typical workstations.

The Avtomatika Concern designed a computer named Elbrus-801M, having capacity of 120 gigaflops, resistant against most kinds of cyber attacks. The computer runs on an eight-core microprocessor Elbrus-8s. The same processor underlies the Elbrus-804, a server of highest processing power, with a peak computation capacity of 920 gigaflops. The use of domestic microprocessors together with the Russian operation system Elbrus guarantees the absence of concealed "flags" for data theft and unauthorized interference with the operation of the equipment.

High-performance computers capable of processing huge volumes of data and of making most complicated calculations are much needed in the science. Among other Russian entities, Rostec holding companies contribute to the creation of the Russian scientific cyber infrastructure.

In 2019, the Ruselectronics holding company launched the Fisher supercomputer, with a virtually infinite scalability.



Sergey Viktorovich Popov

SERGEY VIKTOROVICH POPOV —
deputy CEO of Shvabe for R&D, head of the priority technological sector of optoelectronics and photonics. Associate professor, Doctor of Engineering.

With his coordination and direct participation, were formed and are being deployed: Shvabe's innovative development program; cross-agency comprehensive target program "Optics-2025"; activities for the creation of industrial basic and critical technologies and process refitting of the holding company's enterprises, as part of the "Development of the Russian defense industrial complex 2025" national program; activities of the 2017–2020 cross-agency research and development program in photonics.

Took part in over 50 R&D projects. Has over 120 research works, 3 monographs, 7 invention patents.

Laureate of the prize of the Russian Government in science and engineering for the development of technology and creation of industrial production of big-sized precision active elements made of new-generation phosphate glass for optical channels of superpower thermonuclear laser systems. Awardee of 15 medals.

Science. Overcoming Technologic Barriers

The machine was designed for the Joint Institute for High Temperatures of the Russian Academy of Sciences. The new supercomputer helps physicists in creating digital models of substances and in forecasting materials' behavior in extreme conditions.

Implementation in the immediate future of the 5G, the new-generation communication technology, will provide wide opportunities for the expansion of the Internet of things, where electronic devices in a single network will be able to exchange data at high speeds. In Russia, the first chip has already been designed by the Ruselectronics. The microcircuit can be built into various smart devices, such as household electric meters, industrial gauges, electronic kids' bracelets, etc. Using Russian-made chips will ensure data transfer without any risk of unauthorized intervention.

The vector toward the production of civil-purpose goods was especially beneficial for the promotion of Rostec's **medical sector**. At once several holding companies of the Corporation manufacture science-driven medical equipment which competes successfully with foreign counterparts, and sometimes is even unrivalled worldwide. Rostec participates in a number of major projects deployed under the "Healthcare" national project. These are: construction and fitting of perinatal centers across Russian regions, participation in the establishment of hadronic therapy centers, and other projects involving the most advanced solutions of Rostec entities.

In cooperation with universities, colleges and research institutes, Rostec entities design and manufacture top-needed medical equipment. Thus, Ruselectronics orders serial production of solutions provided by Samara State Medical University: Russia's first navigated surgical system, Autoplan; and neuro-exerciser ReviVR, intended for rehabilitation of apoplectic patients using the virtual reality technology.

The Shvabe JSC and Peter the Great Saint-Petersburg Polytechnic University have designed a HIFU system for tumor diagnosis and treatment. This is Russia's first system for fighting against neoplasms using the safest technology — focused ultrasound. As soon as in 2021, the jointly designed solution can be delivered to healthcare facilities.

The Schvabe entities have designed and manufacture a wide range of neonatal equipment for newborn care, including premature or pathologic infants. These include intensive care couveuses, artificial lung ventilators, phototherapeutic irradiators, and other equipment fighting against infant mortality, delivered to perinatal centers built under Rostec's guidance.

Another Rostec holding company, the Nacimbio, deals with immunity protection matters. It supplies 86% (by volume) of immunobiological medications under the order of the Russian Ministry of Health for the National Preventive Vaccination Schedule. In 2019, the Nacimbio delivered 65.4 million doses of influenza vaccines produced in Russia under full cycle. Also, last year, the Russian Ministry of Health issued registration certificates for three new cutting-edge vaccines developed by the holding company in full compliance with international requirements: a combined DTaP+HepB+Hib pentavaccine; Vactrivir — a combined trivaccine against measles, rubella and parotitis; and Ultrix Quadri — an influenza tetravaccine.

The Nacimbio incorporates the country's only manufacturer of bacteriophages — the Microgen RPA. Here, 19 kinds of bacteriophages are produced, helping fight against dysentery, salmonellosis, dyspepsia, dysbacteriosis, etc. At the Microgen RPA facilities, Russia's first Biologic Resource Center was launched, for in-depth study of bacteriophages, where a collection of microorganisms including over 10 thousand strains will be stored.

Vladimir Alexandrovich Aparinov

VLADIMIR ALEXANDROVICH APARINOV —
head of the 1st department of the Parachute Research Institute (Technodinamika JSC), colonel, Doctor of Engineering, professor. Specialist in mathematical modeling of non-linear aerodynamics.

Jointly with other authors, conceived a modification of the discrete vortex method — the vortex currents method. Based on it, he elaborated a software for calculating non-linear aerodynamic properties of airborne vehicles at voluntary movement in pre- and post-stall conditions, with a vortex trail, which was subsequently complemented with a block of non-linear dynamics.

Researcher at Military Aircraft Engineering Academy named after prof. N.E. Zhukovskiy. Author and co-author of over 150 research works and inventions. Graduated 14 candidates of sciences. Awardee of numerous medals.

Nikolay Mikhailovich Varenykh

NIKOLAY MIKHAILOVICH VARENYKH —
managing director of the Research Institute of Applied Chemistry. President of the Russian Pyrotechical Associaton, candidate of engineering sciences, corresponding member of the RAMAS.

Design engineer, scientist in the design of special articles and organization of their serialization. Head and participant of development, testing and organization of serial production of special articles.

Author of research works and inventions in issues of pyrotechnical ammunition, protective equipment for military hardware, and pyroautomation facilities. Laureate of State prizes. Honorary citizen of Sergiev-Posad district.

Science. Overcoming Technologic Barriers

Andrey Leonidovich Terlikov

ANDREY LEONIDOVICH TERLIKOV —
CEO — chief designer of Ural design bureau for transport engineering. One of the leading experts in armored vehicles.

With his direct participation, tanks were developed, tested and serialized: T-72B and its modifications, T-90, T-90K (Sambuk project), T-90C (export modification of T-90), T-72B2 (Rogatka project).

Author of more than ten inventions. Currently, he is working on a dissertation for the degree of a candidate of engineering sciences.

Has many letters of award and appreciation. He is a laureate of the prize of the Russian Government for the creation of the export modification of the T-90 tank.

Composite materials, low- and medium-tonnage chemistry, and synthetic fibers by RT-Chemcomposite are used in the defense industry, space, aviation, power, oil and gas industries, medicine, transport, and other branches of economy. Two leading facilities of the holding company are State research centers of the Russian Federation. In 2019, the UNICHIM & EP designed a unique dielectric heat-conducting paste for use in computer and electric devices, excelling most analogues by its properties. Also, during the reporting year, the facility manufactured the first pilot batch of the boron carbide for light and extra strong ceramics. Armored structures made of the domestic boron carbide can be used for the protection of personnel and military hardware against bullets of various gauges.

The A. G. Romashin Obninsk Research and Production Enterprise Technologiya (ORPE Technologiya) is designing novel glazing of MS-21 aircraft cockpits. The innovative material created by Obninsk scientists — the high-strength pentaplex based on the monolithic polycarbonate — allows increasing the glazing's dynamical strength by 1.5 times, while reducing its weight by 15% as compared to analogues. The ORPE Technologiya has also designed a novel heat-resistant glass-fiber reinforced honeycomb, which can resist temperatures of up to 500 °C. The material will be used in creating high-speed aerial and space vehicles.

In 2019, the United Aircraft Corporation (the UAC) 's stage-by-stage merger with Rostec continued. Once it is completed, Rostec will become the biggest manufacturer of civil- and military-purpose aircraft and aviation equipment. But, even if such a global process as the merger with the UAC is left beyond brackets, Rostec enterprises make a great contribution to the development of the **Russian aviation**. Aircraft engines, advanced materials, electronic control and navigation systems, security systems, parachute systems, oxygen supply equipment, weapons are supplied by Rostec holding companies to Russian aircraft and helicopters.

Among aviation premieres 2019 is the MS-21-300 passenger aircraft. The aircraft was first demonstrated to the wide public at the International Aviation and Space Salon MAKS-2019, and thereafter completed successfully its first cross-border flight to Istanbul, to take part in the Teknofest-2019 festival. Currently, the fifth test item of MS-21-300 is being assembled, which will be tested with the latest Russian engine PD-14. Major efforts are being undertaken in terms of the airliner certification in Russia and in Europe. First serial airplanes will be manufactured in 2021. The MS-21 program will bring the Russian aircraft industry onto an absolutely new technologic level.

Another big event of the year in the aircraft industry is the presentation to the general public of the Su-57 — a fifth-generation Russian battle plane — at the Aviation and Space Salon MAKS-2019. In 2019, serial production of the battle plane was launched, a major contract for the supply of 76 planes to the Russian Ministry of Defense was signed. Surely, this is a new chapter in the history of the national military aviation.

The Russian Helicopters holding company also presented a number of premieres. The Ansat, a light multi-purpose helicopter, was the first in the last 30 years Russian-made civil-purpose helicopter exhibited at the famous air show in Le Bourget. In Russia, the Ansat is widely used as part of the sanitary aviation development program. The new helicopter is marketed abroad as well: contracts have been signed for the supply of 20 vehicles to China starting from 2020; supplies to Mexico are planned.

In 2019, Kazan helicopter plant launched serial production of Mi-38 — a medium-heavy cargo and passenger helicopter, being the world's only helicopter able to climb as high as the plane. In the same year, the Mi-38's world premiere took place as well. In August, the first serial vehicle of the type appeared at the aviation and Space Salon MAKS-2019, and in November, it made its debut abroad: Mi-38 took part in Dubai Airshow.

At MAKS-2019, the advanced helicopter Ka-62 hit the skies over Zhukovskiy for the first time with its first flight program. Currently, the vehicle is going through a program of certification flight tests, its serial production will be launched in 2020. The Ka-62 is distinguished through the use of composite materials in its structure: they make up to 60% of the helicopter's weight, due to which, the vehicle's weight is reduced, while its speed, maneuverability and bearing capacity increase, and the fuel consumption is decreased.

Another Rostec's special focus is **engine manufacturing**. One of the last decade's most challenging projects is the PD-14, a turbofan engine. It is being created in cooperation of all entities of the engine building industry. The PD-14 is the basic engine of the future family, and will be installed first on the cutting-edge civil airliner MS-21-300. The PD-14 incorporates 16 advanced technologies and 20 novel materials. As soon as in 2020, the engine will pass its first tests on the wings of the new aircraft.

In 2019, works were in progress on the PD-35 unit, based on the PD-14 engine. The PD-35 program implies the creation of a high-thrust engine, with R&D works to be completed in 2027. The engine was designed, among other things, for the CR929, an advanced Russian-Chinese aircraft. 18 critical technologies will be designed, mastered and implemented as part of the R&D.

Another crucial solution of the UEC is the engine for Su-57, a fifth-generation battle plane. The unit under the "article 30" conventional name is a completely new engine, rather than an upgraded predecessor. "Article 30" is a bypass turbojet engine with a tailpipe chamber. Its designing is guided by A. M. Lyul'ka design bureau. Now, "article 30" is at the fly-out stage on the Su-57 test aircraft, and will be serialized in the immediate future.

Together with the RAS, Rostec participates in **megascience grade projects**. These are big world-class research units expanding the boundaries of today's knowledge. One of domestic megascience projects is the National Heliogeophysical Complex in Irkutsk region and in Buryatiya. It will help scientists study the activity of the Sun and forecast its impact on the human and the equipment. The Shvabe holding company will not only design and manufacture advanced optical and radio telescopes, radar sets, and other unique astronomical instruments for the complex, but also build all required infrastructure.

The UEC participates in the project of designing a deep-water neutrino telescope of a multimegaton scale on Baikal. The telescope can catch neutrinos, finest cosmic particles, which carry information on the earliest stages of evolution of the Universe. Under the order of the United Institute for Nuclear Research, the Salyut production complex in Moscow manufactures protective shields for the telescope's optical modules. The shields play an important role as they protect sensors from the impact of the Earth's magnetic field.

In 2019, the ORPE Technologiya (holding company: RT-Chem-composite) finished manufacturing products for the ExoMars, an international space program. This is a joint Russian-European project for the study of the Red Planet. Russia is responsible for the appliance which will bring the Mars rover and the landing platform down onto Mars' surface. In all, the ORPE Technologiya delivered under the ExoMars program four sets of the landing module's elements, temperature control panels to maintain the thermal conditions required for the operation of its instrumentation, and solar cell carriers.

The ORPE Technologiya was also involved in the work on one of the last years' most famous scientific projects — the Large Hadron Collider. The enterprise created unique carbon fiber support structures of the unit. To carry this task into effect, Russian scientists had to summarize all the available experience in the handling of composites.


Source: Irkutsk Today

Rostec

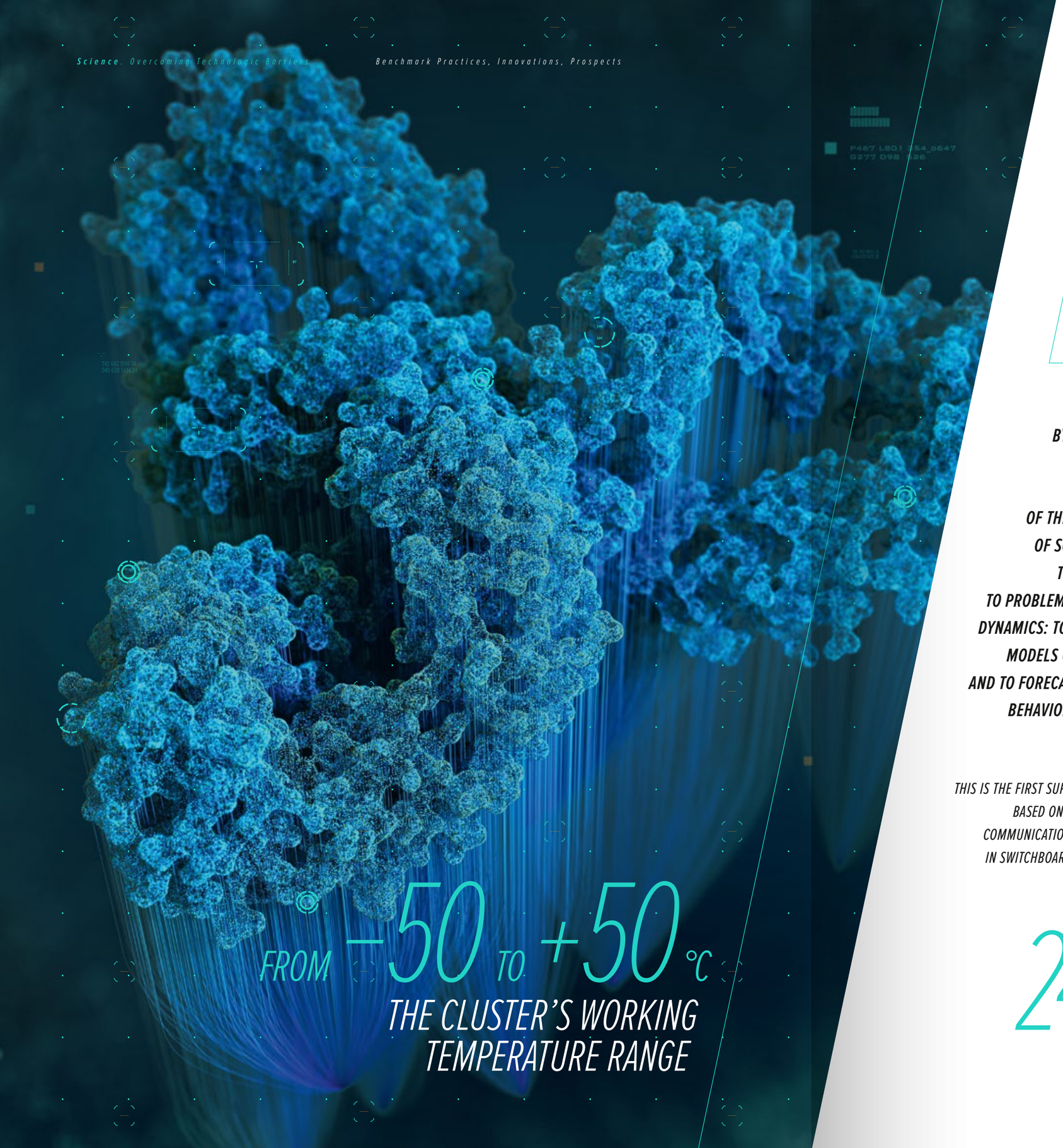
4.2

BENCHMARK PRACTICES, INNOVATIONS, PROSPECTS

270

BILLION rubles

ROSTEC'S REVENUE FROM EXPORT OF INNOVATIVE PRODUCTS IN 2019



FROM −50 TO +50 °C
THE CLUSTER'S WORKING TEMPERATURE RANGE

NICEVT JSC (HC: Ruselectronics JSC)

Supercomputer "Fisher"

USED IN RESEARCH AND IN MOLECULAR DYNAMICS SOLUTIONS

"FISHER" IS USED BY RESEARCHERS OF THE UNITED INSTITUTE OF HIGH TEMPERATURES OF THE RUSSIAN ACADEMY OF SCIENCES (UIHT RAS) TO FIND SOLUTIONS TO PROBLEMS OF MOLECULAR DYNAMICS: TO CREATE DIGITAL MODELS OF SUBSTANCES AND TO FORECAST MATERIALS' BEHAVIOR IN EXTREME CONDITIONS

THIS IS THE FIRST SUPERCOMPUTER BASED ON THE ANGARA COMMUNICATION NETWORK IN SWITCHBOARD VERSION

SPECIFICATION

- NUMBER OF COMPUTATION NODES: 24
- COMMUNICATION NETWORK: ANGARA SWITCHBOARD VERSION
- PROCESSOR TYPE: AMD EPYC 7301 (16 CORES; 2.2 GHZ)
- OPERATION SYSTEM: SUSE LINUX ENTERPRISE SERVER 12 SP4
- CLUSTER'S WORKING TEMPERATURE RANGE: FROM −50 TO +50°C

"Fisher" consists of 24 computation nodes with 16-core processors. The computing cluster uses an immersion cooling system, ensuring regular and energy-efficient temperature control at any computational load. Due to such solution, the computer does not require any special premises, and the cluster's working temperature range is from −50 to +50°C.

24 COMPUTING NODES

NIIMA Progress JSC (HC: Ruselectronics JSC)

Microcircut for the Internet of Things

THE FIRST RUSSIAN-MADE CHIP FOR IOT — INTERNET OF THINGS

PROVIDES FOR DIGITAL COMMUNICATION AT A RANGE OF UP TO 30 KM.

THE MICROCIRCUIT HAS NO EQUALS IN RUSSIA.

THE MICROCIRCUIT'S MAIN ADVANTAGE IS ITS SECURITY AGAINST OUTSIDE INTERVENTION

The device will also be used in industrial solutions of the Internet of things, transport, communication, agriculture, as well as in smart household appliances.

SPECIFICATION

- *BANDWIDTH: FROM 100 TO 2.5 GHZ*
- *COVERAGE: UP TO 30 KM*
- *DIMENSIONS: 5×5 MM*

A TRANSCEIVER CIRCUIT OPERATING IN THE MICROWAVE BAND (UHF)

No ready foreign circuit solution was used in its design.

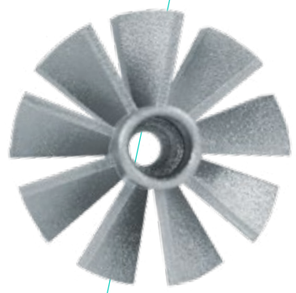
UP TO 30 KM
COVERAGE

100–2.5 GHZ
BANDWIDTH

United Engine Corporation JSC

Additive Technologies

LAYER-BY-LAYER BUILDUP AND SYNTHESIS OF OBJECTS USING 3D-PRINT



THE UEC ENTITIES WERE THE FIRST TO DEPLOY THE INDUSTRIAL 3D-PRINT TECHNOLOGY IN THE MANUFACTURING OF GAS-TURBINE ENGINES.

FOR THIS PURPOSE, THE CORPORATION HAS ESTABLISHED A SINGLE CENTER OF ADDITIVE TECHNOLOGIES AT UEC-SATURN, RYBINSK. PARTS MANUFACTURED USING THE 3D-PRINTING METHOD WILL MAKE UP TO 20% IN THE TOTAL VOLUME OF THE NEW ENGINES

The deployment of additive technologies will allow cutting down by 3 times the time required to manufacture serial parts, and by 2 times — their cost. This technology can be used not only in the engine manufacturing, but also in the aircraft engineering, production of space equipment and vehicles, in science-driven medicine and car construction.

ADDITIVE TECHNOLOGIES ARE BEING WIDELY IMPLEMENTED AT ROSTEC PRODUCTION FACILITIES, FIRST OF ALL IN THE ENGINE MANUFACTURING, WHERE THE 3D-PRINT ENSURES UNCONDITIONAL ADVANTAGES AND A NEW LEVEL OF OPPORTUNITIES.

ADDITIVE TECHNOLOGIES ALLOW REDUCING THE PRODUCTION CYCLE BY MORE THAN 2 TIMES, CUTTING DOWN THE NUMBER OF ELEMENTS OF THE FINAL STRUCTURE. THEY ARE MORE COST-EFFICIENT AND ENVIRONMENT-FRIENDLY

By 2021, the Kuznetsov PJSC will have manufactured over 50 elements for advanced gas-turbine engines, using the 3D print method. The Russian Helicopters JSC also intends to serialize in 2020 about 30 parts re-designed using the 3D technology. The Ruselectronics JSC, jointly with the Institute of Synthetic Polymer Materials of the RAS, are elaborating the technology of manufacturing electronics and photonics devices of organic polymer materials using the 3D print method.

The heat processing technology of optical module shields conceived by:
Salyut RPC for gas-turbine engine building
(HC: United Engine Corporation JSC)

BAIKAL-GVD Telescope

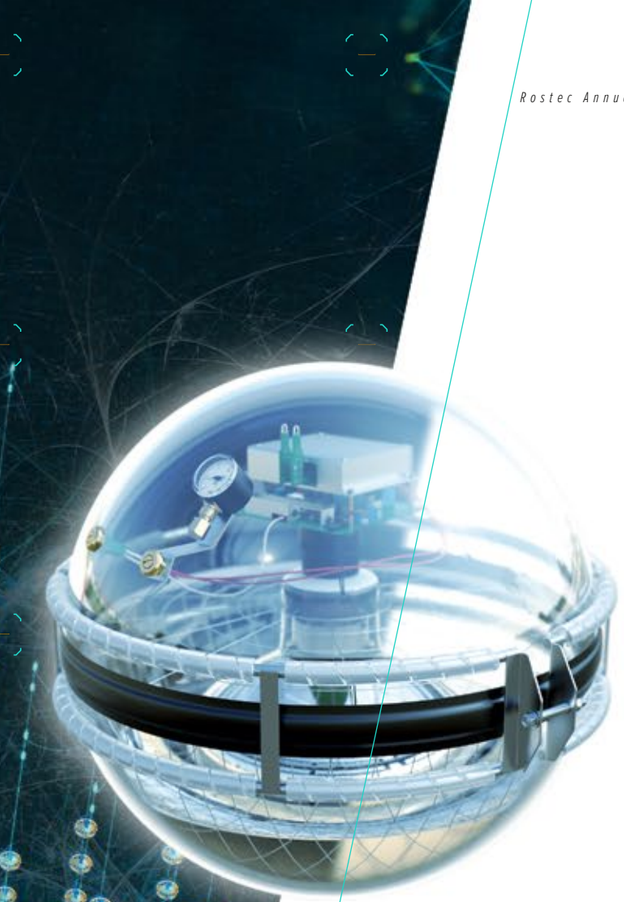
BAIKAL DEEP-WATER NEUTRINO TELESCOPE

THE UNIQUE RESEARCH PROJECT, WHERE ROSTEC TAKES PART, STUDIES THE NATURAL FLOW OF HIGH-ENERGY NEUTRINOS.

THE UNITED ENGINE CORPORATION PARTICIPATES IN THE PROJECT OF CREATION OF A DEEP-WATER NEUTRINO TELESCOPE OF MULTI-MEGATON SCALE ON BAIKAL.

THE UEC HAS CONCEIVED A HEAT PROCESSING TECHNOLOGY OF THE TELESCOPE'S OPTICAL MODULE SHIELDS

THE BAIKAL DEEP-WATER NEUTRINO TELESCOPE IS A UNIQUE RUSSIAN-MADE RESEARCH UNIT MAKING PART OF THE GLOBAL NEUTRINO NETWORK (GNN), BEING ITS KEY ELEMENT IN THE NORTHERN HEMISPHERE OF THE EARTH AND THE FIRST STEP TOWARD CREATION OF A SINGLE INTERNATIONAL CONSORTIUM, THE GLOBAL NEUTRINO OBSERVATORY (GNO)



Under order of the United Institute for Nuclear Research, the Salyut production complex in Moscow (member of the UEC) manufactures protection shields for optical modules.

In all, over 2 thousand special shields will be made for the deep-water neutrino telescope project.

The Baikal-GVD telescope is intended for study of the natural flow of high-energy neutrinos. As a result of neutrinos interaction, charged leptons and cascade showers appear in Baikal's water, which generate the Cherenkov radiation recorded by optical modules of the unit.

The telescope's electronic system measures the radiation record times by optical modules to within parts per billion of second, which allows recovering the moving particles' path direction to within parts of degrees.

>2,000
SPECIAL SCREENS
WILL BE MANUFACTURED FOR THE BAIKAL-GVD PROJECT

18 NEW TECHNOLOGIES TO BE USED IN THE PD-35

UEC-Aviadvigatel', UEC-Permskie Motory (HC: United Engine Corporation JSC)

Engine PD-35

ADVANCED ENGINE WITH 35 TONS THRUST

THE UNITED ENGINE CORPORATION IS WORKING ON CREATION OF A FAMILY OF AIRCRAFT ENGINES WITH EXTRA-STRONG THRUST.

18 TECHNOLOGIES WILL BE DESIGNED, MASTERED AND IMPLEMENTED AS PART OF RESEARCH AND DEVELOPMENT OF THE PD-35 ENGINE

THE PROJECT OF AN ADVANCED BYPASS TURBOFAN ENGINE WITH EXTRA-STRONG THRUST, AND A FAMILY OF ENGINES ON ITS BASIS

THE ENGINE IS INTENDED PRIMARILY FOR THE WIDE-BODIED LONG-RANGE AIRCRAFT CR929.

THE PD-35 ENGINE IS INSPIRED BY THE PD-14 ENGINE DESIGN FOR THE MS-21-300 AIRLINER

The technologies are critical to achieve the customer's product requirements, and at the same time they form a new process basis for the UEC.

The project will incorporate the most advanced design solutions: composite fan blades, high-efficiency high-pressure compressor, low-emission combustion chamber, high-pressure turbine with extended temperature range, digital control system.

THE PD-35 PROGRAM IMPLIES THE CREATION OF A STRONG-THRUST ENGINE, WITH DEVELOPMENT WORKS TO BE COMPLETED IN 2027

NOVEL MATERIALS AND PRODUCTION METHODS WILL BE USED AS WELL: ADDITIVE TECHNOLOGIES, ROTATIONAL FRICTION WELDING, COMPLEX MOULD CASTING

Parachute Engineering RI (HC: Technodinamika JSC)

Chance Parachute System

EMERGENCY RESCUE PARACHUTE SYSTEM

INTENDED FOR EVACUATION OF PEOPLE FROM ULTRA-LOW HEIGHTS.

THE CHANCE PARACHUTE SYSTEM ALLOWS AIRDROPPING WITHOUT ANY SPECIAL SKILLS FROM A 9-FLOOR BUILDING'S HEIGHT — 33 METERS OR HIGHER

ADVANCED MATERIALS ARE USED IN THE PARACHUTE, SUCH AS POLYAMIDE FIBER-BASED FABRIC WITH LOW AIR-PERMEABILITY.

ITS DESIGN INCORPORATES A NUMBER OF INNOVATIVE SOLUTIONS WHICH PREVENT THE PARACHUTE CANOPY FROM FOLDING WHEN TOUCHING THE BUILDING

In addition, the Chance stabilizes automatically the body position of the dropping person, and does not require any parachute-steering skill.

The system includes: a harness backpack, three canopies maintaining the assigned landing speed, and an anchor line to close side flaps and to pull canopies out. The harness can be adjusted according to the body height and build, to ensure maximum parachuting safety.

33 M

MINIMUM AIRDROPPING HEIGHT

Parachute Engineering RI (HC: Technodinamika JSC)

Three-Canopy Parachute

MAIN PARACHUTE OF THE "FEDERATION" ADVANCED SPACE VEHICLE

MAIN THREE-CANOPY PARACHUTE OF AN AREA EXCEEDING 3.6 KM² IS ABLE TO CARRY A SPACE VEHICLE WEIGHING UP TO 9 T.

THE SYSTEM WILL BE DEPLOYED AT A HEIGHT OF 4.5 KM

SPECIFICATION

- TOTAL AREA: 3,600 M²
- PARACHUTE DEPLOYMENT HEIGHT: 4,500 M
- LIFTING WEIGHT: UP TO 9 T

THE REUSABLE PILOTED SPACE VEHICLE "FEDERATION" WILL REPLACE THE PILOTED "SOYUZ" VEHICLES AND THE "PROGRESS" SERIES AUTOMATIC CARGO SPACECRAFT.

THE SPACECRAFT IS EXPECTED TO DELIVER CREW AND CARGOES TO THE NEAR-EARTH ORBIT AND TO THE MOON

4,500 M

PARACHUTE DEPLOYMENT HEIGHT

HC: Technodinamika JSC

Emergency & Rescue Equipment

FOR ADVANCED CIVIL AND MILITARY HELICOPTERS

THE SOLUTION WAS AWARDED THE FSMTC NATIONAL PRIZE “GOLDEN IDEA-2019”

Время готовности к полной загрузке

до 30 секунд

THE EMERGENCY & RESCUE EQUIPMENT WILL BE USED IN LATEST MODIFICATIONS OF MI-8/17/171, MI-38, KA-226T HELICOPTERS, AND IN ADVANCED COMBAT HELICOPTERS

The equipment includes a rescue raft and a system of emergency airbags.

The design of the raft ensures its self-reset to operating position when inflating from any position afloat. Such properties as self-drainage, stability and heat conservation were taken into account. Convenience and comfort inside the raft are of particular importance for the psychological condition of the distressed. The side entrance is equipped with a boarding ramp and is adapted for use together with the marine evacuation system.

The helicopter’s emergency airbag system is intended to ensure safe ditching and to maintain the helicopter’s floatability and stability during the time required for people to leave it and to take seats on rescue rafts. The system is a set of inflatable industrial-rubber structures containerized and fixed on the outer side of the hull.

Все системы работают в штатном режиме

Диапазон температур

от - 30° до + 65° С

THE INFLATION OF THE RESCUE RAFT, WHICH IS USED AS A SUPPORT, TAKES 10 S, AND FULL LOAD UPTIME DOES NOT EXCEED 30 S AT A TEMPERATURE BETWEEN –30 AND +65°C

30 SECONDS FULL LOAD UPTIME

A.G.Romashin Technologiya ORPE
(HC: RT-Chemcomposite JSC)

Glass-Fiber Reinforced Honeycomb

MATERIAL BASED ON GLASS TEXTILE AND POLYMER BINDING AGENTS, USED IN THE AEROSPACE INDUSTRY

THE NEW HEAT-RESISTANT GLASS-FIBER REINFORCED HONEYCOMB CAN WITHSTAND TEMPERATURES UP TO 500°C.

THE MATERIAL WILL BE USED IN HIGH-SPEED AERIAL AND SPACE CRAFT.

THE SOLUTION HAS NO EQUALS IN RUSSIA

THE UNIQUE MATERIAL BASED ON THE QUARTZ FABRIC INSTEAD OF TRADITIONAL FIBER GLASS ALLOWED IMPROVING THE PRODUCT'S STRENGTH BY 40–50%

Combination of perfect strength, heat resistance and dielectric performance makes the newly designed honeycomb promising in terms of head-on cowl manufacturing for aircraft and rockets, as well as elements of radar station antenna systems.

up to 500 °C

TEMPERATURE EXPOSURE LEVEL

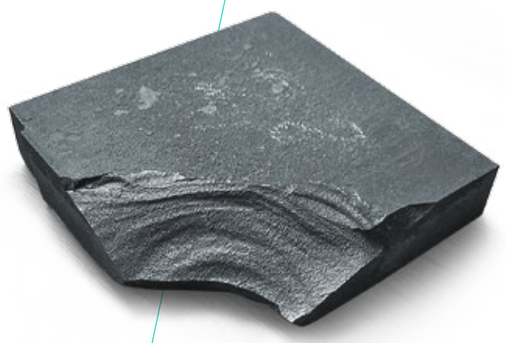
UNICHIM & EP JSC
(HC: RT-Chemcomposite JSC)

Boron Carbide

USED IN MACHINE BUILDING AND NUCLEAR POWER INDUSTRY

IN 2019, THE FIRST PILOT LOT OF BORON CARBIDE WAS PRODUCED FOR THE MANUFACTURING OF LIGHT AND EXTRA STRONG CERAMICS, WHICH ALLOWS CREATING HIGHLY EFFICIENT WORLD-CLASS NEW-GENERATION ARMORED PROTECTION WITH IMPROVED PERFORMANCE

ARMORED STRUCTURES MADE OF THE RUSSIAN BORON CARBIDE CAN BE USED FOR THE PROTECTION OF PERSONNEL AND MILITARY HARDWARE AGAINST BULLETS OF BOTH WIDELY USED SMALL-ARM MEDIUM CALIBER OF 7.62 MM, AND LARGE CALIBER OF 14.5 MM USED IN SNIPER RIFLES AND MACHINE GUNS



A.G.Romashin Technologiya ORPE
(HC: RT-Chemcomposite JSC)

Cockpit Glazing of MS-21 Aircraft

NEW GLAZING TYPE BASED ON INNOVATIVE RUSSIAN-MADE MATERIALS

RESEARCH & DEVELOPMENT WORKS ON NEW MS-21 AIRCRAFT COCKPIT GLAZING WERE LAUNCHED.

THE USE OF INNOVATIVE MATERIALS WILL ALLOW INCREASING THE GLAZING'S DYNAMIC STRENGTH 1.5 TIMES, WHILE REDUCING ITS WEIGHT BY 15%, AS COMPARED TO ANALOGUES

IMPROVED STRENGTH AND WEIGHT PERFORMANCE WILL BE ACHIEVED BY USING THE HIGH-STRENGTH PENTAPLEX, DESIGNED BY THE ORPE TECHNOLOGIYA ON THE BASIS OF MONOLITHIC POLYCARBONATE

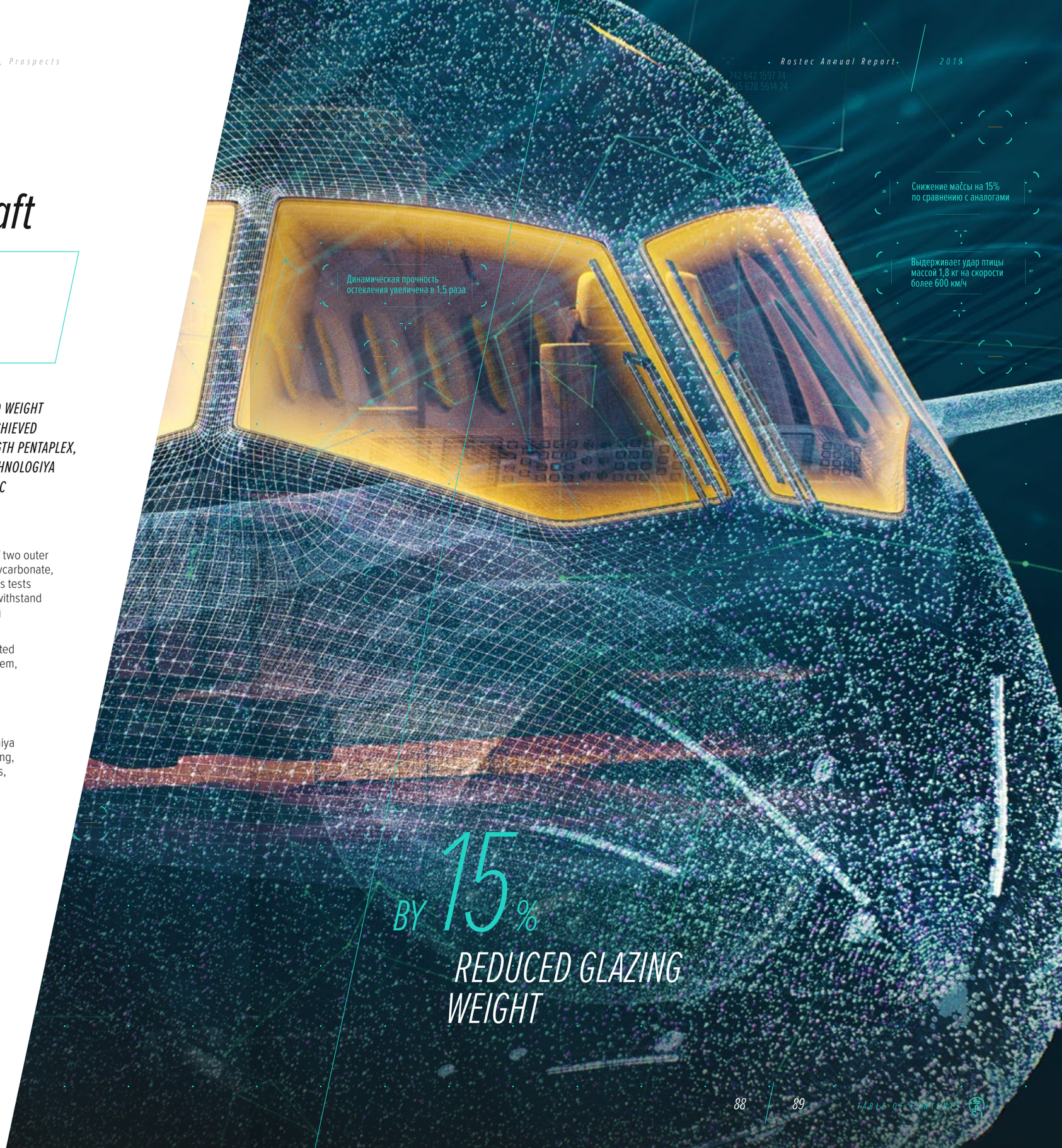
This multilayer material consists of two outer silicate glass sheets, a layer of polycarbonate, and two adhesive layers. In previous tests the pentaplex showed its ability to withstand a blow against a bird weighing 1.8 kg at a speed exceeding 600 km/h.

The new MS-21 cockpit glass will be fitted with a regulated electrical heating system, precluding any icing or fogging even under extreme weather conditions.

Moreover, the entity will produce an alternative silicate glazing option. As part of R&D works, the ORPE Technologiya will carry out over 20 tests of the new glazing, including strength, bird resistance, tightness, impact of high and low temperatures, lightning, static electricity test, etc. The entity will launch the serial production of the new MS-21 glazing in 2021.

x1.5 TIMES
INCREASED DYNAMIC STRENGTH

BY 15%
REDUCED GLAZING WEIGHT

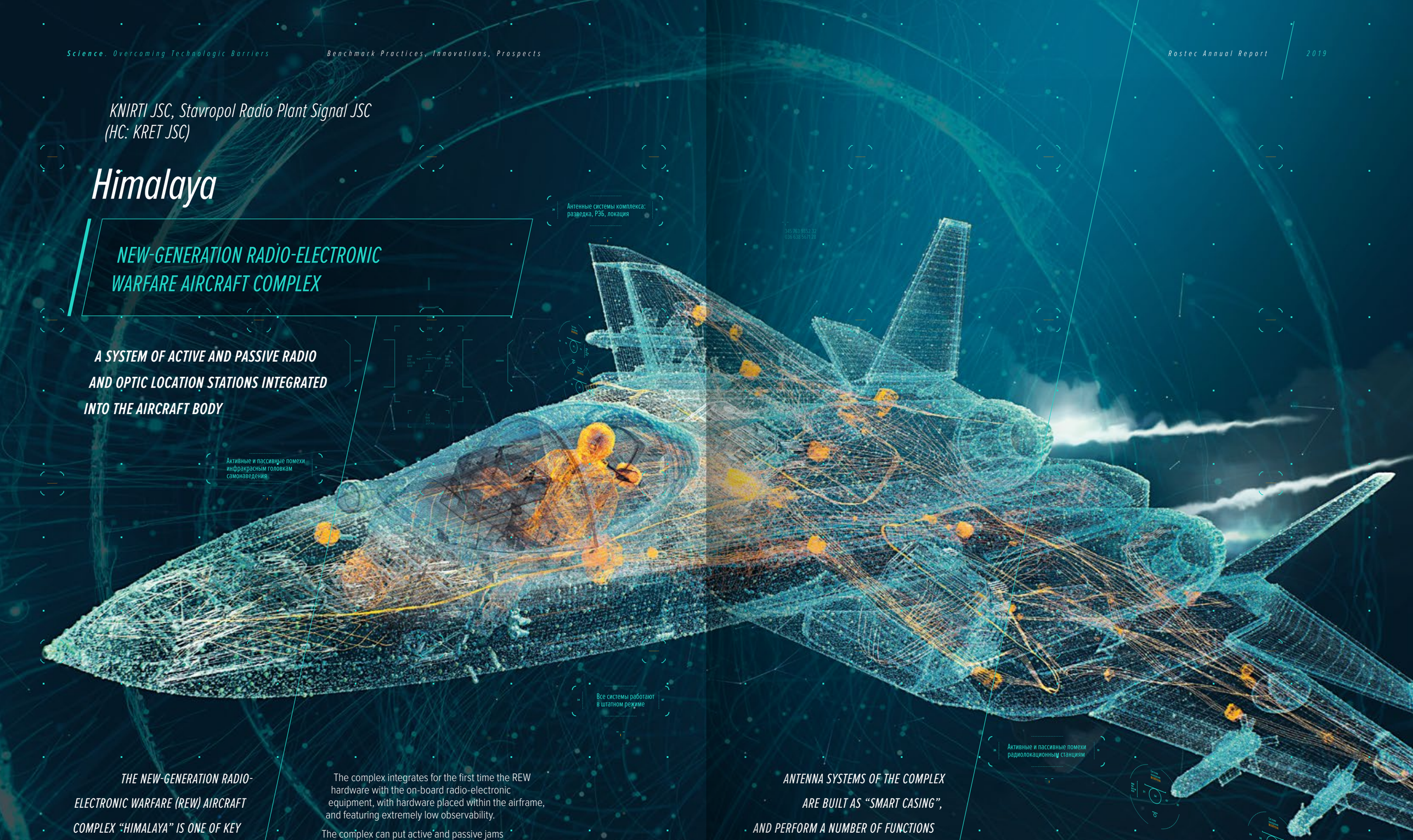


KNIRTI JSC, Stavropol Radio Plant Signal JSC (HC: KRET JSC)

Himalaya

NEW-GENERATION RADIO-ELECTRONIC WARFARE AIRCRAFT COMPLEX

A SYSTEM OF ACTIVE AND PASSIVE RADIO AND OPTIC LOCATION STATIONS INTEGRATED INTO THE AIRCRAFT BODY



THE NEW-GENERATION RADIO-ELECTRONIC WARFARE (REW) AIRCRAFT COMPLEX "HIMALAYA" IS ONE OF KEY ELEMENTS OF THE FIFTH-GENERATION RUSSIAN BATTLE PLANE SU-57

The complex integrates for the first time the REW hardware with the on-board radio-electronic equipment, with hardware placed within the airframe, and featuring extremely low observability.

The complex can put active and passive jams to infrared target seekers of modern missiles, and to modern or advanced radio location stations.

The complex' data is confidential.

ANTENNA SYSTEMS OF THE COMPLEX ARE BUILT AS "SMART CASING", AND PERFORM A NUMBER OF FUNCTIONS AT ONCE: RECONNAISSANCE, REW LOCATION, ETC.

Нейраминидаза

Капсидный белок

Протонный канал

Гемагглютинин

60 MCG
HEMAGGLUTININ CONTENT

FORT LLC (HC: Nacimbio JSC)

Ultrix Quadri

INACTIVATED SPLIT INFLUENZA TETRAVACCINE

THE ULTIRX QUADRI VACCINE IS PRODUCED BY THE FORT RESEARCH AND PRODUCTION COMPLEX IN RYAZAN REGION (MEMBER OF NACIMBIO AND MARATHON GROUP)

THE FIRST RUSSIAN-MADE INFLUENZA PREVENTION TETRAVACCINE COMPLYING WITH ALL WORLD HEALTH ORGANIZATION'S RECOMMENDATIONS.

THE ADVANCED MEDICATION CREATED BY THE MEMBER OF THE NACIMBIO PHARMACEUTICAL HOLDING COMPANY INCORPORATES FOUR CURRENT INFLUENZA STRAINS AND MEETS ALL RECOMMENDATIONS OF THE WHO, IN PARTICULAR IN RESPECT OF THE ANTIGEN CONTENT

FOR PEOPLE AGED
6–60
Y.O.

Ultrix Quadri's distinctive features are the absence of any adjuvant and preservative, and hemagglutinin content of 15 μg per each influenza virus strain (60 μg in all), which composition is recommended by the WHO for influenza vaccines. The vaccine is used in Russia under the State program for transition to influenza prophylaxis by quadrivalent vaccines. The Ultrix Quadri is indicated for active annual preventive immunization against seasonal influenza to people aged from 6 to 60 y. o.

Novosibirsk Instrument Making Plant JSC (HC: Shvabe JSC)

DIATER

ULTRASOUND NEOPLASM DIAGNOSIS AND TREATMENT COMPLEX

RUSSIA'S FIRST COMPLEX FOR NEOPLASM FIGHTING USING THE SAFEST TECHNOLOGY — FOCUSED ULTRASOUND (HIFU).

DESIGNED BY PETER THE GREAT SAINT-PETERSURG POLYTECHNICAL UNIVERSITY (SPBPU) JOINTLY WITH NOVOSIBIRSK INSTRUMENT MAKING PLANT (SHVABE JSC).

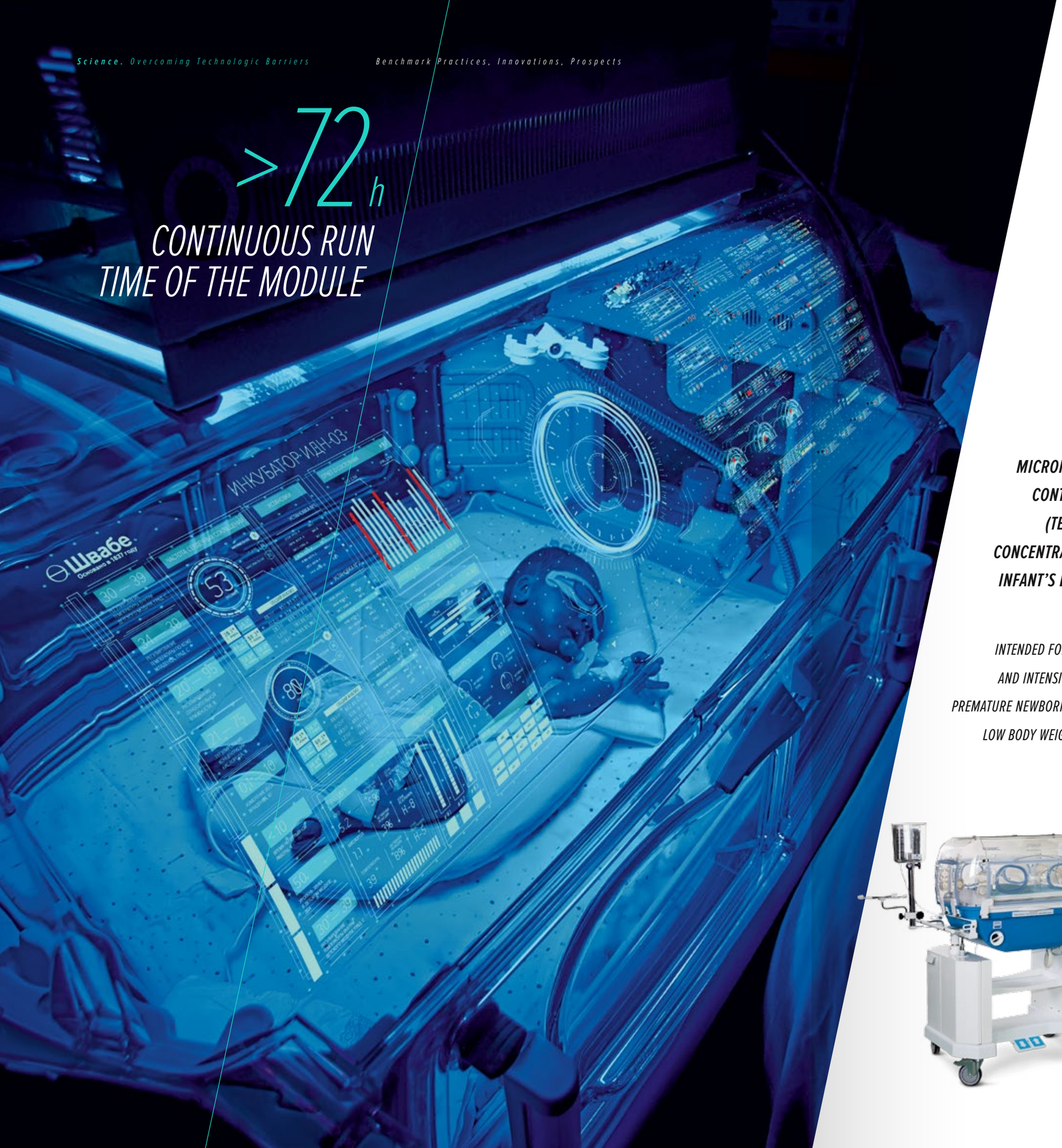
THE DEVICE ACTS UPON NEOPLASMS AND BIG MAMMA TUMORS TO HIGH PRECISION

It can be successfully used in patients with both malign and benign processes, local or generalized impact, both in operable and inoperable condition.

The first commercial prototype of the complex has been designed for treatment of mamma neoplasms. Subsequently, appliances will be created for treatment of the varicose vein disease of lower limbs and uterine myoma, neoplasm ablation (separation of a part of tissues by irradiation) in the thyroid gland, prostatic gland, abdominal structures.

THE DIATER COMPLEX COMBINES THREE TECHNOLOGIES: HIFU-ELASTOGRAPHY, ULTRASOUND THERMOMETRY, AND ELECTRONIC CONTROL OF THE ABLATION FOCAL REGION

The complex generates a three-dimensional model of the tested object, which simplifies the identification of the region to be irradiated, and the control of the operation. It is possible to install a telecommunication system enabling remote surgical operations and teleconferences with colleagues.



>72 h
CONTINUOUS RUN TIME OF THE MODULE

PA Ural Optical and Mechanical Plant JSC (HC: Shvabe JSC)

Incubator IDN-03

INFANT INTENSIVE CARE INCUBATOR

INFANT INTENSIVE CARE INCUBATOR WITH MICROPROCESSOR PARAMETER CONTROL AND MONITORING (TEMPERATURE, OXYGEN CONCENTRATION, AIR HUMIDITY, INFANT'S BODY TEMPERATURE AND WEIGHT).

INTENDED FOR NEWBORN NURSING AND INTENSIVE CARE, INCLUDING PREMATURE NEWBORNS WITH CRITICALLY LOW BODY WEIGHT (500+ GRAMS)

SPECIFICATION

- *TEMPERATURE CONTROL INSIDE THE INFANT MODULE: 30–39°C*
- *TEMPERATURE CONTROL OF THE INFANT'S SKIN: 34–39°C*
- *RELATIVE HUMIDITY CONTROL: 20–95%*
- *OXYGEN CONCENTRATION CONTROL: 21–75%*
- *INFANT'S WEIGHT MEASUREMENT: 0.1–10 KG*
- *CONTINUOUS RUN TIME: OVER 72 H*
- *SOUND LEVEL IN THE INFANT MODULE: 50 DBA*

The incubator is intended both for nursing and efficient resuscitation of newborn and fragile infants with extremely low body weight (500+ g) and pathologies, and for basic care in neonatal pathology units, resuscitation departments, intensive care units of specialized medical centers.

The IDN-03 is fitted with an automatic leveling system of the infant module. The built-in camera enables video monitoring of the newborn's condition, displayed on the personal computer.

The self-test system controls the functioning of the incubator. There are six access holes to the newborn and hinged panels on both sides.

S.A. Zverev Krasnogorsk Plant
(HC: Shvabe JSC)

ALSC-01-Zenith

AUTOMATED LASER SURGICAL COMPLEX

INTENDED FOR BEAUTY MEDICINE AND TREATMENT OF SOME DISEASES.

THE AUTOMATED LASER SURGICAL COMPLEX HAS ALREADY BEEN REGISTERED AND IS USED BY RUSSIAN MEDICAL CENTERS.

THE ALSC-01-ZENITH IS BASED ON A POWERFUL CO_2 LASER WITH WAVE LENGTH OF 10.6 MCM.

THE COMPLEX IS DISTINGUISHED FROM ITS FOREIGN ANALOGUES BY ITS CAPABILITY TO TREAT ARBITRARY-SHAPE SURFACES

SPECIFICATION

- *WORKING LASER RADIATION SOURCE: CO_2 LASER*
- *WAVE LENGTH: 10.6 MCM*
- *PILOT LASER RADIATION SOURCE: LASER DIODE WITH WAVE LENGTH OF 0.635–0.650 MCM*
- *MAXIMUM SCANNING FIELD SIZE: 15×15 MM*
- *SCANNING PITCH: 0.3–1 MM*

The Zenith complex is also fully automated, i.e. the operator pre-programs the laser, which then by itself conducts all manipulations required.

The laser complex by Shvabe is 1.5 to 2 times cheaper than its foreign analogues.

10.6 MCM
LASER WAVE LENGTH

PA Ural Optical & Mechanical Plant JSC
(HC: Shvabe JSC)

Microscope MIM-340

ALLOWS EXAMINING A LIVING CELL WITH THOUSAND-FOLD OPTICAL MAGNIFICATION

THE DEVICE IS ONE OF THE WORLD'S BEST MICROSCOPES WITH SUPERFLAT LONG-RUN X-Y TABLE OF NANOMETRIC RESOLUTION

and can be used in a wide variety of applications — from medicine to precision mechanical engineering, optical industry, material engineering, and aerospace industry.

The microscope allows examining right the live cell, without using any coloring agent and without destroying the object being studied. This approach is crucial in the medicine and in biotechnologies.

SPECIFICATION

- *OPTICAL MAGNIFICATION: 1,000×*
- *VIEWING FIELD: 7–150 MCM*
- *VERTICAL RESOLUTION: 0.1 NM*
- *XY PLANE RESOLUTION: 100–10 NM*
- *FRAME SIZE: 1024×1024 PIXELS*
- *SHOOTING SPEED: 3–30 FRAMES PER SECOND*
- *OPTICAL POWER SOURCE: LASER 405 NM*

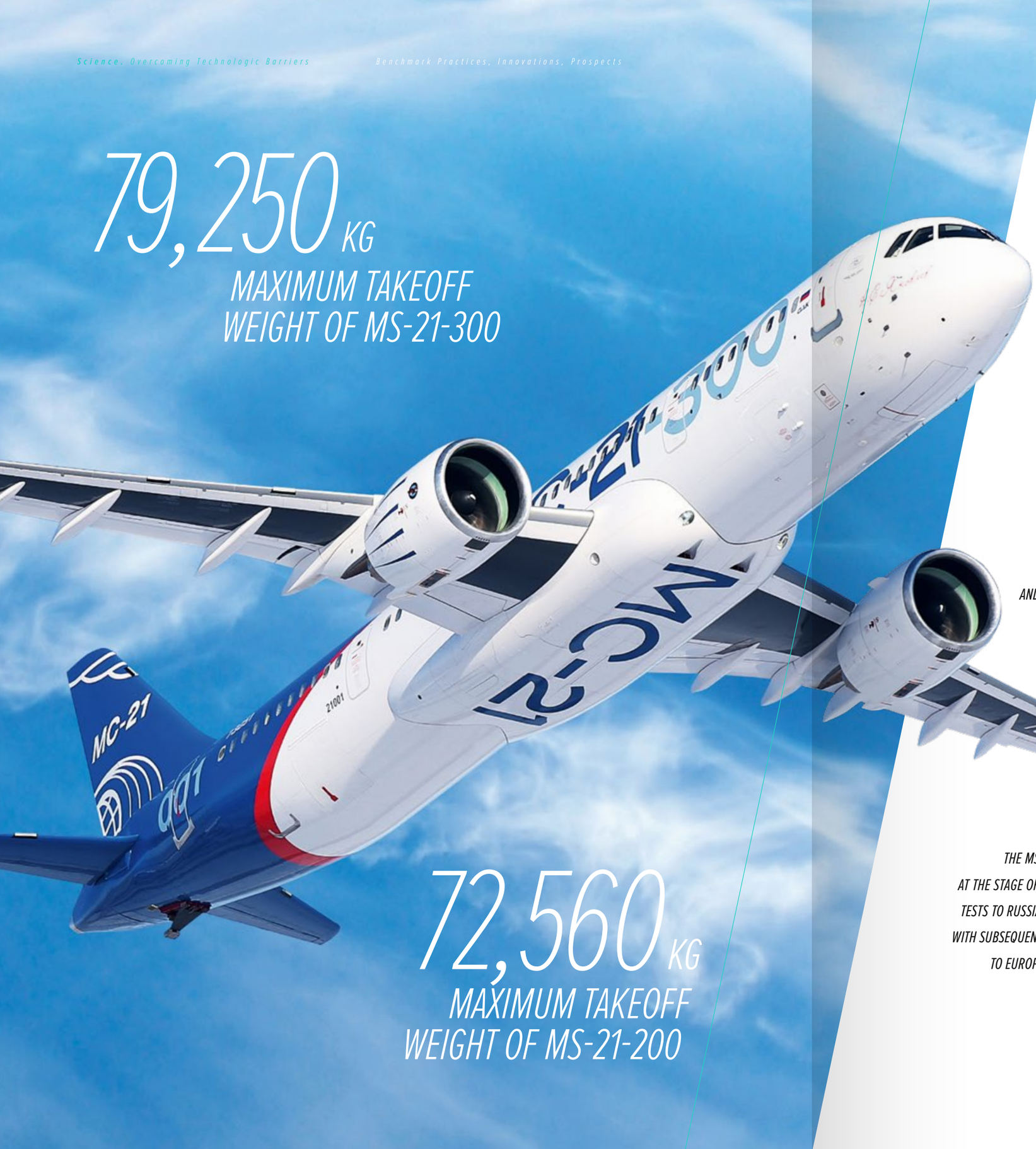
THE MIM-340 IS UNIQUE AS IT ALLOWS EXAMINING A CELL WITH THOUSAND-FOLD OPTICAL MAGNIFICATION, MAXIMUM VERTICAL RESOLUTION UP TO 0.1 NM, AND XY PLANE RESOLUTION UP TO 10 NM

In addition, it can film the object under examination at a speed of 3 frames per second.

MIM-340's key advantages:

- Obtaining full frame 1280×1024 pixel in only 0.3 s;
- Contactless measurement, simple operation, metrological accuracy;
- Visualizing the optically anisotropic region of the microstructure of less than 100 nm;
- Nanodynamics and "nano-cinema" recording.

1,000×
OPTICAL MAGNIFICATION OF THE MICROSCOPE



79,250 KG
MAXIMUM TAKEOFF WEIGHT OF MS-21-300

72,560 KG
MAXIMUM TAKEOFF WEIGHT OF MS-21-200

Research & Production Corporation IRKUT
(HC: United Aircraft Corporation JSC)

Airliner MS-21

MID-RANGE NARROW-BODIED PASSENGER AIRCRAFT

NEW-GENERATION AIRCRAFT IN THE FASTEST-GROWING MARKET SEGMENT.

CURRENTLY, THE PROGRAM INCLUDES MS-21-300 (163–211 SEATS) AND MS-21-200 (132–165 SEATS)

SPECIFICATION

	MS-21-200	MS-21-300
Basic two-class capacity	132 seats	163 seats
Max. capacity	165 seats	211 seats
Max. takeoff weight	72,560 kg	79,250 kg
Max. landing weight	63,100 kg	69,100 kg
Max. payload	18,900 kg	22,600 kg
Max. flight range in two-class version	6,400 km	6,000 km

THE MS-21 PROGRAM IS AT THE STAGE OF CERTIFICATION TESTS TO RUSSIAN STANDARDS, WITH SUBSEQUENT VALIDATION TO EUROPEAN NORMS

The use of advanced technical solutions in aerodynamics and engine building, installation of latest-generation aircraft systems, and new comfort solutions ensure competitive advantage of this aircraft family as compared to existing and upgraded aircraft of other manufacturers.

At the customer's option, the MS-21-300 is fitted with one of the two types of new-generation power units: PW1400G-JM by Pratt & Whitney (the USA) or PD-14 (Russia). The both unit options reduce fuel consumption, noise level, hazardous emission, and lifecycle cost.

Sukhoi Civil Aircraft JSC
(HC: United Aircraft Corporation JSC)

Airliner Superjet 100

SHORT-RANGE NARROW-BODIED PASSENGER AIRCRAFT

NEW-GENERATION REGIONAL-RANGE AIRCRAFT INCORPORATING ADVANCED AIRCRAFT ENGINEERING TECHNOLOGIES.

ABLE TO CARRY 98 PASSENGERS TO A DISTANCE UP TO 3,000 KM (BASIC MODEL) AND UP TO 4,500 KM (INCREASED RANGE MODIFICATION)

This efficient high-tech commercial aircraft was conceived on the basis of advanced knowledge of aerodynamics, aircraft power plant and systems.

The aircraft can be operated within a wide range of weather conditions at temperatures between –54 and +45°C. The aircraft is equipped with two turbofan jets SaM146, which were designed specifically for this type of aerial vehicles.

The SSJ family complies with all current and advanced requirements of the Russian and world market of civil aircraft. The SSJ 100 has a type certificate issued by the aircraft register of the Interstate Aviation Committee (IAC), and a type certificate issued by the European Aviation Safety Authority (EASA).

The aircraft provides increased comfort to passengers, considerable economic benefit to carriers, convenience to the crew, and maximum environmental safety to the ecology.

SPECIFICATION

- MAX. TAKEOFF WEIGHT:
  45.8 T *(basic configuration)*
  49.4 T *(increased range)*
- MAX. LANDING WEIGHT:
  41 T
- MAX. PAYLOAD:
  12.245 T
- CRUISING SPEED:
  830 KM/H
- PAYLOAD RANGE:
  3,048 KM *(basic configuration)*
  4,578 KM *(increased range)*
- MAX. FLIGHT ALTITUDE:
  12,200 M
- NUMBER OF PASSENGER SEATS: 98

SUPERJET 100 IS THE ONLY AIRCRAFT FAMILY TO OFFER PASSENGERS A LEVEL OF COMFORT COMPARABLE TO LONG-HAUL AIRCRAFT.

4,578 KM
MAXIMUM FLIGHT RANGE

710 KM/H
FLIGHT SPEED

12,000 KG
WEIGHT OF WATER
RECEIVED IN TANKS

Beriev Aircraft Company
(HC: United Aircraft Corporation JSC)

Airliner Be-200

MULTI-PURPOSE AMPHIBIAN AIRCRAFT

A UNIQUE AIRCRAFT, UNPARALLELED WORLDWIDE IN SOME PARAMETERS

THE BASELINE CONFIGURATION OF BE-200 IS INTENDED FOR FOREST FIRE EXTINGUISHING WITH WATER OR FIRE-EXTINGUISHING LIQUIDS FROM THE AIR.

IN ADDITION, THE AIRCRAFT CAN PERFORM CARGO AND PASSENGER CARRIAGE, SEARCH AND RESCUE OPERATIONS, ENVIRONMENTAL MONITORING, PATROLING OF THE EXCLUSIVE ECONOMIC ZONE AND MARITIME BOUNDARIES

SPECIFICATION

- MAX. TAKEOFF WEIGHT: FROM LAND — 37,900 KG, FROM WATER — 37,200 KG
- MAX. PAYLOAD (WEIGHT OF WATER TAKEN BY TANKS): 12,000 KG
- MAX.COMMERCIAL LOAD: 7,500 KG
- FLIGHT SPEED: 710 KM/H
- MAX. FLIGHT RANGE: 3,600 KM
- MAX. FLIGHT RANGE WITH MAX. PAYLOAD: 1,400 KM
- FLIGHT ALTITUDE: 8,000 M

The Be-200 has been used since 2003 for forest fire extinguishing both in Russia and abroad.

The Be-200 can be retooled, quickly and with minimum labor effort, into a transport, passenger (Be-210), search & rescue, or sanitary modification. All fire extinguishing capabilities are preserved in this case. Works are in progress on the designing of a business jet modification.

The Be-200 can take aboard up to 12 t water. It can be refilled either at the airdrome, or from open waters in the hydroplaning mode within 14 s. Due to high flight speed, the Be-200 has higher performance in terms of the number of water discharges per hour.

Kazan Helicopter Plant
(HC: Russian Helicopters JSC)

Helicopter Mi-38

HEAVY-CLASS HELICOPTER

CAN BE USED TO TRANSPORT CARGOES AND PASSENGERS, INCLUDING VIP, AS A SEARCH & RESCUE HELICOPTER, OR AS A FLYING HOSPITAL.

THE MI-38 IS DESIGNED AS A SINGLE-ROTOR HELICOPTER AND IS EQUIPPED WITH A TWO-ENGINE UNIT OF HIGH POWER AND IMPROVED COST EFFICIENCY

Key elements of the body structure are made of aluminum alloys, some minor components of steel, titanium, and composite materials.

Two Russian-made TB7-117B engines are mounted on the helicopter. The engines are fitted with dust protectors ensuring high degree of air cleaning. The advanced design of the six-bladed rotor ensures improved thrust and low level of vibrations. The blades are fitted with an anti-icing system, and the X-shaped antitorque rotor ensures excellent steering of the helicopter and a low noise level.

The Mi-38 is equipped with a state-of-the-art piloting & navigation system and a satellite navigation system. The cockpit's instrumentation incorporates five multi-purpose color LED displays to monitor information.

The flight range of the new Mi-38 in transport configuration is up to 1,200 km (with extra fuel tanks). With its maximum takeoff weight of 15.6 t, the helicopter can take aboard or on sling 5 t of payload.

SPECIFICATION

- MAX. SPEED: 300 KM/H
- CRUISING SPEED: 250 KM/H
- MAX. FLIGHT RANGE WITH MAIN FUEL TANKS: 880 KM
- FLIGHT RANGE WITH A 5 T LOAD: 420 KM
- SERVICE CEILING: 5,900 M
- MAX. TAKEOFF WEIGHT: 15,600 KG
- ENGINES: GAS-TURBINE, 2×TB7-117B (UEC-KLIMOV)
- POWER IN TAKEOFF MODE: 2,800 HP
- POWER IN EMERGENCY MODE: 3,850 HP
- CREW: 2 PERS.

NUMBER OF PASSENGERS:

- ECONOMY CLASS: UP TO 30 PERS.
- VIP CABIN: UP TO 12 PERS.

15,600 KG
MAX. TAKEOFF WEIGHT

Bruk INEUM PJSC (HC: Avtomatika Concern JSC)

Elbrus-801M

MONOBLOC COMPUTER

THE OVER-PROTECTED HIGH-DUTY COMPUTER, FITTED WITH ELBRUS-8C, AN EIGHT-CORE MICROPROCESSOR.

THE NOVELTY PROVIDES CAPACITY AT A LEVEL OF 120 GIGAFLOPS.

THE USE OF THE RUSSIAN-MADE CENTRAL MICROPORCESSOR INCREASES THE MONOBLOCK'S PROTECTION CONSIDERABLY, AS COMPARED TO ITS ANALOGUES INCORPORATING FOREIGN-MADE PROCESSORS

ELBRUS-801M IS A FULLY RUSSIAN-DESINGED, PROACTIVE SOLUTION

The Elbrus-801M withstands most types of cyber attacks, therefore, it can be used to organize both top-secrecy, and basic workstations.

The computer is user-friendly and compatible with operation systems designed for foreign-made microprocessors with the x86 command system.

1.3 GHZ
PROCESSOR CLOCK RATE

120 GIGAFLOPS
MICROPROCESSOR POWER

TABLE OF CONTENTS

Avtomatika Concern JSC

Pischal-PRO

MAN-PORTABLE DRONE-COUNTERING SYSTEM

THE SYSTEM IS INTENDED TO FOIL FLIGHT MISSIONS OF UNMANNED AERIAL VEHICLES (UAV) BY SUPPRESSING THE DRONE'S COMMUNICATION, CONTROL AND NAVIGATION CHANNELS FROM UNPREPARED SITES OF THE SECURED SECTOR.

THE PISCHAL-PRO AFFECTS SIMULTANEOUSLY THE UAV'S COMMUNICATION, CONTROL AND NAVIGATION SUPPORT CHANNELS

SPECIFICATION

- *SUPPLY VOLTAGE: 16 V*
- *BATTERY CAPACITY: 10 A·H*
- *TYPE OF INTERFERENCE GENERATED: NOISELIKE, TARGET-DIRECTED*

Key features of the system include:

- High performance in countering drone abuse, combined with the operator's health safety;
- The device can be operated from fixed or mobile positions;
- No need for special preparation, ready for combat use in a near-real-time mode.

≥2,000 M
SUPPRESSION RANGE AT DIRECT VISIBILITY

SPECIFICATION

- *RUN TIME (ON 2 BATTERIES): 1 H OR MORE*
- *OPERATING TEMPERATURE RANGE: FROM –20 TO +40°C*
- *DIMENSIONS (W×H×L): 200×240×903 MM*
- *WEIGHT: 4 KG OR BELOW*
- *SUPPRESSION RANGE: 2,000 M OR MORE AT DIRECT VISIBILITY*

Omsk Transport Machinery Plant (HC: Uralvagonzavod Concern JSC)

BREM-1M

ARMORED RECOVERY VEHICLE

INTENDED FOR RECOVERY AND REPAIR OF WRECKED TANKS AND OTHER ARMORED VEHICLES IN THE FIELD.

BREM-1M IS AN UPGRADED VERSION BASED ON THE T-90 TANK.

THE BREM-1M CAN RECOVER WRECKED TANKS, INCLUDING OUT OF THE ENEMY FIRE AREA, TO COLLECTING POINTS OR TO A HIDEOUT

The device is also used to recover stuck armored vehicles, such as armored troop carrier, infantry fighting vehicle, armored assault vehicle, and others; and to assist crews in tank repair and maintenance in the field.

SPECIFICATION

- ENGINE: FOUR-CYCLE LIQUID-COOLED TURBOCOMPRESSOR-INFLATED MULTI-FUEL DIESEL B-92C2
- ENGINE POWER: 735 KW (1,000 HP)

OBSTACLES TAKEN:

- TRENCH WIDTH: 2.6–2.8 M
- WALL HEIGHT: 0.85 M

ARMAMENT:

- ANTI-ARICRAFT MACHINE GUN
- 12.7-MM MACHINE 6P50

- WEIGHT WITH SPTA CONTAINERS ON THE CARGO PLATFORM: 45 T
- CREW: 3 PERS.
- CARGO PLATFORM CAPACITY: 1,500 KGF
- CRANE CAPACITY: 20,000 KGF

735 KW (1,000 HP) ENGINE POWER

1,500 KGF CARGO PLATFORM CAPACITY

N.A. Ganichev RPA Splav (HC: RPC TECHMASH JSC)

GPK-MP Cable

FLEXIBLE PRINTING CABLE

THE GPK-MP HAS UNIQUE PROPERTIES: IT CAN WITHSTAND THERMAL SHOCKS, VACUUM, RADIATION, IS IRREPLACEABLE IN MOBILE ELECTRIC WIRING.

THE ARTICLE CAN WITHSTAND OVER 2 MILLION BENDS PER 15-MM RADIUS, SUSTAINS BEND WITH UNLIMITED RADIUS AND RECOVERY OF INITIAL CONDITION

Besides the instrument-making, the solution can be helpful in designing Arctic-purpose articles, cryogen power engineering, robotics; as well as to reduce the volume and size of on-board cable networks.

The product is already being used in both defense and civil industries. In 2016, flexible printing cables manufactured by the RPA SPLAV JSC were used in the spacecraft sent to Mars.

ADVANCED ELECTRIC WIRING ELEMENT FOR THE EQUIPMENT CABLE NETWORK.

THE PRODUCT HAS NO DOMESTIC OR FOREIGN-MADE ANALOGUE.

ITS KEY MISSION IS TO REDUCE THE WEIGHT AND DIMENSIONS OF ON-BOARD WIRING

THE PRODUCT CAN BE OPERATED AT EXTREMELY LOW TEMPERATURES OF DOWN TO –269°C.

THE GPK-MP RUNS FOR 1 000 H AT A TEMPERATURE OF UP TO 300°C, WHILE SHORTLY EVEN UP TO 600°C. MOREOVER, THE CABLE IS LIQUID NITROGEN-RESISTANT

WITHSTANDS

>2 MILLION BENDS PER 15-MM RADIUS

4.3 Scientific Activity

Implementing the Rostec's Program for Scientific and Technology Development

PREPARING AND APPROVING FORECAST 2030

The science, engineering and technology development forecast through 2030 and beyond has been prepared under the scientific and methodological guidance of Rostec Research and Technology Council.

The Forecast 2030 includes:

- Analytics of trends and laws of the global scientific, engineering and technology development;
- Comparative assessment of the current and forecast research, engineering and technologic level of development on the national and global scale;
- Identifying research and engineering findings which would allow strengthening competitive advantages of high-tech products and closing gaps in areas which are critical for the national security of the Russian Federation;
- Proposals concerning priorities in the R&D and innovative products, both for the purpose of creating advanced weapon systems, military and special vehicles, and to expand areas of commercial application of high-tech products;
- Business programming and goal-oriented planning of the Corporation, holding companies (integrated structures) and entities based on a single system of research, engineering and technology baseline data.

ASSESSMENT OF THE CURRENT RESEARCH, ENGINEERING AND TECHNOLOGIC LEVEL OF DEVELOPMENT OF ROSTEC ENTITIES, AND OF THE FORECAST 2030

As part of the forecast study, the level of technological development of Rostec holding companies (integrated structures) and directly operated entities was assessed. Comparative evaluation (correlation) of the current and forecast research, engineering and technology level of the entities was made, as compared to Russian and foreign analogues. Both product and process technologies were assessed.

KEY LANDMARKS OF 2019 HELD UNDER THE PROGRAM FOR RESEARCH AND TECHNOLOGY DEVELOPMENT 2020

The list of priority areas of science, technology and engineering increased by 361 items, of which 178 items are research and development projects for creation of novel industrial products, including civil-purpose ones.

A list of Rostec's 883 core innovative products for 2021–2025 and through 2030 has been prepared. 399 items are novel products, including civil-purpose ones.

A list of Rostec's 882 basic and core processes for 2021–2025 and through 2030 has been prepared. 342 items relate to the novel product designing, including civil-purpose products.

Implementing the Rostec's Program for Innovation Development (PID)

UPDATING THE PIDS OF ROSTEC HOLDING COMPANIES (INTEGRATED STRUCTURES) AND DIRECTLY CONTROLLED ENTITIES

In pursuance of the resolution adopted by the Government Committee for Economy Upgrade and Innovative Development of the Russian Federation dated October 22, 2018, PIDs of Rostec holding companies (integrated structures) and directly controlled entities (HC/DCE) to 2025 were prepared. They were linked with their development strategies, and with priority areas of research and technology development of the Russian Federation.

Special focus has been made on the planning of HC/DCE participation in the implementation of national projects, in pursuance of Executive Order of the Russian President dated May 7, 2018 No.204, and of the agreement with the Russian Government made on July 10, 2019, providing for work on four priority high-tech areas:

- Blockchain technology;
- Quantum sensors;
- Internet of Things;
- 5G-Mobile Networks — a wireless communication technology deployed jointly with the Rostelecom PJSC.

KEY GOALS OF PID MEASURES IN 2019

PID measures were aimed at the following goals:

- Enhancing the innovation development management;
- Mastering new competences, upgrading staff's qualification;
- Search and applied studies to proactively create technology concepts, in particular under national programs; creation of innovative products; elaboration and implementation of advanced industrial technologies;
- Production system retooling for creation of competitive high-tech products;
- Deployment of new technologies to improve energy efficiency and environmental safety of production facilities;
- Building up a state-of-the-art innovative business infrastructure on the level of the Corporation, holding companies (integrated structures) and entities;
- Commercialization of advanced technologies and intellectual property rights;
- Engaging universities, research institutions, small and medium business companies in the implementation of innovative projects;
- Interacting with Russian development institutions.

R&D IMPLEMENTATION AND COSTS

In 2019, Rostec entities delivered 350 R&D works (of them, 180 for federal needs) and 75 retooling projects; created 250 innovative products and processes; obtained 865 patents; registered 570 know-how; sold 530 and acquired from third parties 210 intellectual property rights.

Completed 25 basic and critical industrial technologies; launched 20 new industrial technologies. Rostec entities host 10 advanced foreign production technologies.

A considerable portion of the R&D was delivered under federal programs.

Total R&D cost amounted to RUB 169 billion (including RUB 118 billion out of the federal budget).

Under Rostec orders, universities delivered R&D to RUB 2.8 billion, research institutions — to RUB 12.0 billion.

Under Rostec entities' orders, small and medium innovative companies delivered R&D to RUB 2.4 billion.

ROSTEC'S REVENUE FROM SALE OF INNOVATIVE PRODUCTS

In 2019, the revenue from sale of innovative products achieved RUB 705 billion (in 2018 — RUB 573 billion), including revenue from sale of civil-purpose innovative products — RUB 145 billion, and from export — RUB 270 billion (in 2018 — RUB 214 billion).

RESEARCH PROJECTS

Pursuant to Federal law dated July 29, 2017 No. 216-FZ, and to Decree of the Russian Government dated 28 March, 2019 No. 332, the Innovative Research and Technology Center (IRTC) MSU "Vorobyovy Gory" was established, and the Management Company of the MSU "Vorobyovy Gory" was registered.

For the purpose of integrating the project parties and industrial enterprises, increasing the level of readiness of technologies and scientific developments, it is proposed to organize the Research, Development and Education Center of Intelligent Economy, Engineering and Innovations of Rostec (Rostec RDEC).

The Rostec RDEC will:

- identify, describe and commercialize unique technological competences of the RDEC MSU "Vorobyovy Gory" participants, in order to create and develop competitive products and processes;
- build global technologic excellence and competitiveness centers based on the unique technological competences of the RDEC MSU "Vorobyovy Gory" participants;
- develop the research and engineering school in forward-looking basic and critical areas;
- diversify the activity of the RDEC MSU "Vorobyovy Gory" participants, in order to increase the output of innovative civil-purpose products based on the unique technological competences of the RDEC MSU "Vorobyovy Gory" participants;
- ensure wide cooperation based on the Center's partner network comprising developers, investors, education and research institutions, innovation companies, infrastructure entities, and other parties to innovative processes;
- provide high-end professionals for innovative economy branches in the area of new-generation technologies and products;
- build and expand the system of global marketing of innovative products, services and competences, in particular by organizing exhibition, consumer conferences, developing dealership networks and other tools;
- meet the demand for competences in the digital economy, build the innovative ecosystem for Russia's scientific and technologic development.

4.4 Research & Technology Council and Innovations

Innovation Management System

In order to improve management efficiency in the research, technology and innovation development, the following is used by Rostec:

- A system of research and technology forecasting in business areas of Rostec entities;
- Control of elaboration, approval and implementation of Rostec research, technology and innovation development programs;
- Methods of scientific and technical expert evaluation of programs and projects;
- Management tools for unique technologic competences, problems and tasks, requests for third-party innovations;
- PID performance monitoring of holding companies (integrated structures) and directly controlled entities;
- Regular meetings with the management of enterprises of holding companies (integrated structures) regarding research, technology and innovation development;
- Trainings and workshops on issues related to the organization of innovation activities, in particular, at Rostec's basic chairs with the Plekhanov RUE and the PFUR.

Research & technology councils (councils of chief design engineers) are responsible for the main task of enhancing the efforts of collective expert consultancy bodies in charge of expert evaluation, analysis, and elaboration of recommendations on key decisions in the research, technology and innovation development of Rostec holding companies (integrated structures) and directly controlled entities.

Updating Corporate PID Management Guidelines and Regulations

In 2019, the corporate PID management guidelines and regulations were updated.

The Procedure of preparation (updating, adjustment), approval and fulfillment of Rostec's innovative programs requires since 2019 that medium-term PID implementation plans of holding companies (integrated structures) and directly controlled entities be prepared and approved before end of the year preceding the first year of the plan.

The medium-term PID implementation plans are the main sources of information required to elaborate investment programs of holding companies (integrated structures) and directly controlled entities in respect of building forward-looking research and technology stock, creating new competitive products, developing and implementing advanced products and processes, expanding the innovative infrastructure, enhancing the innovation development management system, organizing efficient cooperation with the innovative community.

Cooperation with Educational Institutions

Over 400 basic chairs of leading Russian universities teach professionals for the Corporation and its entities. In 2019, 4 000 of Rostec staff members completed academic conversion training and qualification upgrade courses, including about 3 000 staff members responsible for the technology and innovation development. 163 staff members studied at basic chairs with Plekhanov RUE and PFUR, 830 staff members — at Bauman MSTU, RTU MIREA and RDU MAI.

With Rostec's support, 15 prospective students were sent for the first time to employer-sponsored bachelor degree education at leading universities of Moscow, including: 4 — at Lomonosov MSU, 5 — Bauman MSTU, 2 — Plekhanov RUE, 1 — Financial University under the Government of the Russian Federation, 3 — Pirogov Medical University.

Of 15 graduates of the united magistracy of MGIMO under the Ministry of Foreign Affairs of Russia "Management of military-technical cooperation and high technologies", seven Masters graduated with an honors degree. All of them have been hired by the Rosoboronexport JSC.

Rostec became for the first time a partner of the master's degree program, Economy and Finance of High-Tech Companies, at the Financial University under the Government of the Russian Federation. After a competitive examination, 10 bachelors (graduates from the Financial University, Bauman MSTU, and Plekhanov RUE) were admitted.

"Rostec classes" have been established at two regular schools (825 and 1 100 places) using the "physico-technicallyceum" system, with the participation of the Fund for development of physico-technical schools and of the National Intelligence Development Fund. Individual educational routes will be created for students of the "Rostec classes", eventually with the involvement of Rostec staff members possessing the specific competences in science, education, business.

At Artek ICC, Ocean RCC, and Sirius EC, theme-specific sessions were organized for 200 students of 8th–11th grades with strong performance in engineering and technical projects and contests in natural sciences. Educational programs of the sessions included current issues of aircraft engineering.

For 1 500 students of grades 8–11, a STI contest was held in the Drones discipline. 50 students from all over Russia took part in the final track "UAV control systems designing" (prepared by the MAI and the UAC).

RT-Chemcomposite JSC takes part in a project held by the Ministry of Education and Science of Russia for creation and development of a school tech cluster in Obninsk.

Under the umbrella of the Russian Helicopters, a two-years educational project for senior pupils, the "Engineering Class", is being implemented, and a specialized "Technical Class" ground has been organized, providing initial competences in such professions as turner, miller, construction metal worker.

Entities forming part of the Nacimbio JSC took part in the ProjeCTOry All-Russian Forum and in the career-orientation testing of 9th–11th graders.

With the UEC's assistance, the following were organized: regional multi-discipline skills contest Zvezda, mathematical contest KickStart, Robo-Battles contest, workshops in milling and turning works on CNC machines (beginner and advanced level), career-orienting championship in physics "Build your career with the UEC", and the Silkway project, whose mission is to build the talented schoolchild — successful student — young professional — mature expert — wise tutor chain.

The KAMAZ PJSC takes part in career-orientation projects: Technical Profession Lab at Children's Development Center — preschool No. 98, Young Engineer at Children's Development Center — preschool No. 104 Belekech, Let's Work Together at Children's Arts House No. 1, My Professional Vector at NGPU, KAMAZTour at Tupolev KAI.

Priorities of Rostec's Research and Technology Activities

Priorities of Rostec's research and technology activities and the scope of forecast research and technology deliverables have been defined.

The following have been prepared:

- Lists of priority vectors of science, technology and engineering development, innovative products, basic and critical industrial technologies in the areas of Rostec business for 2021–2025 and through 2030;
- List of Rostec core innovative products for 2021–2025 and through 2030;
- List of Rostec core basic and critical industrial processes for 2021–2025 and through 2030.

4.5 Interview with Rostec Managing Director for Research and Technology, Chairman of the Research and Technology Council, Y. N. Koptev

— WHAT IS THE ROLE AND THE PLACE ALLOCATED TO THE RESEARCH AND TECHNOLOGY DEVELOPMENT AT ROSTEC?

— Rostec exists for as long as eleven years. The Corporation was established in an environment where the country was going through hard times. The situation of the industry was particularly difficult. Actually, a whole set of fundamental measures had to be taken, in order to implement economic and financial stabilization plans, while maintaining and further developing the research and technology capability of Russian enterprises. We can say that Rostec has become a benchmark and significant element in the country's life.

Today, Rostec's revenue is about RUB 1.7 trillion, which is almost 1.5% of the country's gross domestic product. The high rate of Rostec development has been incorporated in the Corporation's ten-year strategy through 2025, prepared as far back as in 2014. Rostec is confidently increasing the output of civil-purpose products — today, their share exceeds 30%. Keep in mind that the country's leadership and President Vladimir Putin had set the goal of achieving the 30% level by 2025, while by 2030, the share of civil-purpose products in the defense industry's output shall reach 50%. Thus, Rostec has already put the plan figures in place.

Rostec unites over 14 holding companies, and virtually each of them is either an industry or a quasi-industry. More than half of them are the country's monopolists, covering the full cycle of processes in specific technology development areas, for example, the entire scope of works in the aircraft equipment, precision weapons, ammunition, etc. In this context, it is absolutely clear that disregarding issues of scientific and technological development, especially keeping in mind the global environment, and those grievous omissions and losses which occurred in the past periods, would actually mean devoting the Corporation and the country in general to stagnation, and leaving the world scene in a range of sectors.

Therefore, the creation of the required research and technical basis becomes to a significant degree the paramount vector of Rostec's business. For this purpose, a system has been established, which is supported by a wide range of programs. Inside the Corporation, this is our 15-year vision — the Research & Technology Forecast which exists today through 2035, the 5-year Program of Research & Technology Development, and the Program of Innovation Development (PID), which has already been drafted for the next five years. In the past five years, Rostec spent above RUB 1 trillion for major retooling, R&D projects of large-scale output of new products, primarily military-purpose ones. At the same time, there exists a wide range of dual-purpose technologies. For example, the United Engine Corporation (UEC) develops the aircraft engine sector. There are great achievements: they have designed the PD-14, a world-class engine which is now oriented toward our new civil aircraft MS-21. The same company is responsible for the creation of a huge range of civil-purpose products, including oil and gas piping equipment, small power generators, etc. Currently, the UEC is deeply engaged in the creation of high-duty gas turbines — the industry was lost in our country, while some of the products had not been manufactured even in the Soviet Union — such as the 110 MW turbines made by the UEC-Saturn. In addition, taking account of losses incurred after the breach of relations with Ukraine initiated by them, a whole sub-industry was organized, supplying gas-turbine power units both to our Navy, and to the civil shipbuilding.

I could keep talking of these interesting results evidencing Rostec's crucial role in the national development, in particular in ensuring the contry's defense capacity. Actually, Rostec assumes over 30% of tasks formulated in the State Defense Order (SDO). Today, our military budget is below USD 50 billion. To compare: this year's American budget reaches almost USD 750 billion. The President has already pointed at the fact that among countries focusing on the advancement of their armies, we are the eighth. But, considering the particular specifics of our country and the need to ensure its defense capacity, even with this limited financing, we are able to preclude any attempted trespass of our sovereignty at the earliest stage. The current situation, in particular in Syria, shows that the Russian Army has all necessary weapons and can properly defend the national interests. Of course, all this results from quite significant investment in the advancement of science and technology.

On the average, we spend RUB 100 to 120 billion of federal budget and own funds of entities to meet various commitments in respect of creating basic critical technologies and research stock. The stock we inherited from the Soviet Union is virtually exhausted. Thus, for future national technologic security purposes, in the short term, we should focus on forming forward-looking research and technology stock both in the military sector, and in the designing of highly competitive civil-purpose products. The Research and Technology Council deems this area to be a crucial one, and is going to prioritize the creation of a forward-looking research and technology stock, namely by providing all required competences and resources. We hope we will succeed.

— IN 2019, THE ROSTEC RESEARCH & TECHNOLOGY COUNCIL CELEBRATED ITS 10TH ANNIVERSARY. WHAT WAS DONE DURING THESE YEARS, AND WHAT PROGRAMS ARE BEING BROUGHT TO LIFE TODAY?

— Across all these years, the Research & Technology Council has been deeply involved, within its competences, in the establishment and development of the Corporation. As managing director for research and technology, together with the Research & Technology Council as a division of Rostec, I am responsible for the management of research, technology and innovation development, in particular, for the organization of elaboration and for the control of implementation of Rostec's long-term Program for Research and Technology Development, including prioritization of specific areas of Rostec development in the science, engineering and technology, and of core innovation-driven products.

The main work consists in assessing the research and technical component of a project, its relevance and global importance, to what extent it promotes us to the leading positions in a specific area. These are actually the key functions and areas of activity of Rostec Research & Technology Council. Today, we face new and new challenges. They are disclosed in the new Rostec's Program for Innovative Development through 2025 (PID 2025).

For example, we are going to play a significant role in the matters of scientific and technical support of Rostec and its holding companies' activities in the implementation of national projects, in particular, in pursuance of road maps for the development of key technology sectors, as defined in the agreement signed between the Russian Government and the Rostec State Corporation in 2019 on four priority high-tech sectors: Blockchain Technology, Quantum Sensors, New Generations of Narrow-Band Wireless Communication for the Internet of Things, 5G Wireless Communication Technology.

Rostec has assumed the responsibility for bringing into life a whole range of high-tech sectors, and some interesting know-how are already available. Such as quantum sensors — a very powerful tool of cyber security. The Avtomatika Concern is the cyber security monopolist. Historically, the enterprise has always dealt in cryptographic equipment design. Implementation of quantum sensors and quantum methods of computer design allows creating microscopic sensors with very high information capacity. For example, the CNIITOCHMASH is the main battle-suit designer. This special kit of tools securing the soldier's life and functioning includes about eight subsystems: communication, protection, weapon, feed system, information system, etc. So the tiny information-bearing quantum sensors can be used as a component of the fabric the battle-suit is made of. The sensors are programmed so that they enable the bearer both to understand his state, and to transmit the information to a higher level.

Besides the day-to-day proceedings of the Research & Technology Council related to the programs in progress, we have introduced an independent assessment system last year. On a commercial basis, following a tender, we have selected a qualified assessor to have the PID concept and implementation evaluated. I would like to note that today, the evaluation rating exceeds 80%.

— IN 2019, ROSTEC RESEARCH AND TECHNOLOGY CONCIL HAS FORMED A SPECIAL INNOVATION DEVELOPMENT SECTION. WHAT NEW CHALLENGES ARE CONSIDERED BY IT?

— We expect the Innovation Development section to become an efficient communication platform where issues and objectives of Rostec's innovation-driven development will be discussed, involving all stakeholders, such as federal executive authorities, Russian development institutions, defense industry entities, research and educational institutions, universities and colleges, small innovative companies, and other agents of the external innovation community.

Today, innovation-related issues are particularly important, keeping in mind the fact that a new armament program, a new defense industry development program, a new research and technology development program have been initiated; national projects have been launched as well, with Rostec and its entities being in any way involved in five of them. By the way, according to the last year's study conducted by the Higher School of Economics, 58% of Rostec entities engage in innovations.

— LAST YEAR ALONE, ROSTEC ENTITIES COMPLETED 510 RESEARCH AND DEVELOPMENT (R&D) PROJECTS, CREATED OVER 250 INNOVATIVE PRODUCTS AND PROCESSES, WITH THE LIST OF ROSTEC CORE INNOVATIVE PRODUCTS THROUGH 2030 COMPRISING ALMOST 900 ITEMS. WHAT PROMISING PROJECTS AND PRODUCTS COULD YOU HIGHLIGHT?

— The Corporation prioritizes innovation projects taking account of the federal priorities in the research and technology development. If we speak of specific projects, for example in helicopter engineering, most promising innovation-driven products are state-of-the-art helicopter models currently being developed, such as Mi-38, Ka-62, VRT-500, unmanned VRT-300, and helicopters designed and upgraded pursuant to the new GPV (State Armament Plan) 2027.

In all, Rostec will have completed 3,597 R&D projects, pursuant to our innovation development plans through 2025, while the number of new processes and products planned for implementation is 2,422. In the next five years, special focus will be given to the elaboration of basic and critical industrial processes under State programs, especially those introduced by the Military-Industrial Committee of Russia.

— WHAT TECHNOLOGY AREAS ARE THE MOST PROMISING IN TERMS OF DEVELOPMENT?

— Development and impact of various processes in a range of areas upon improvement of the country's defense capacity have been assessed. The first place here is held by the robotics and artificial intelligence. The second sector are biomedical sciences, followed by advanced materials, food and water technologies. By the way, today's forecast says that soon, due to the global warming, over 2 billion people on the Earth will be short of sweet water. Actually, we have giant resources of sweet water. Space technologies and quantum computing are also prioritized in terms of development, like also drone technologies covered by a whole range of R&D at Rostec, such as the Korsar UAV, which has already been put into service. Today, Rostec is to a significant degree the monopolist in the area of fitting unmanned systems with all onboard devices, such as machine vision, mathematical support, armament systems. There is virtually no project in this area where Rostec entities would not be involved. Moreover, the KAMAZ PJSC today also engages in unmanned technologies in the automobile construction. The unmanned car market is expected to grow up to USD 42 billion by 2025, and up to USD 77 billion by 2035. Therefore, this area should certainly become one of our key priorities.

— SOME OF ROSTEC'S SOLUTIONS ARE USED IN MAJOR INTERNATIONAL RESEARCHES — FROM MATERIALS FOR THE EXOMARS SPACE PROJECT, TO STRUCTURES FOR THE LARGE HADRON COLLIDER. HOW CLOSE IS THE COOPERATION BETWEEN THE CORPORATION AND FOREIGN COLLEAGUES IN THE RESEARCH AND TECHNOLOGY SECTOR?

— As close as appropriate and possible. As an example, I would mention the design project of a novel electronic-ray CT scanner with dual source of emission, which involves, among others, the AcceleRAD Technologies (USA), DeeTee (Finland), EnerZ (Korea). Investment under this project exceeds RUB 7 billion.

— IN WHAT AREAS ARE OUR SOLUTIONS ADVANCED ENOUGH, AND WHERE THE FOREIGN EXPERIENCE SHOULD BE SOUGHT?

— Despite the hard times our country has gone through, today, Russian technologies are world-class technologies in a whole range of areas. For instance, the Shvabe JSC not only manufactures competitive optics, but also participates in design projects of megascience systems — the world's biggest telescopes. This holding company of the Corporation is the pioneer in civil-purpose production, especially of medical goods, such as neonatal equipment, a range of surgical instruments, even a robot surgeon similar to da Vinci system is being designed.

It is known that as to the optoelectronics, laser technology, and novel materials technology, Russia is almost on a par with the USA, but is clearly behind them in the microelectronics, computer and information technologies, biotechnologies, environmental security. Nevertheless, the domestic electronics still possesses a considerable number of mission-capable technologies whose competitive advantage is other than their low cost. These examples confirm the fact that high-performance technologies with good potential can be found virtually in any industry. However, like other areas of human activity, working in this market segment requires professional in-depth approach.

On the average, we spend RUB 100 to 120 billion of federal budget and own funds of entities to meet various commitments in respect of creating basic and critical technologies and a research stock.

— CAN INNOVATIONS BE BORROWED FROM FOREIGN TECHNOLOGIES?

— Most likely, yes. We should set tasks to borrow advanced foreign technologies. And we do set them. For instance, the PID-2025 provides for localization by our entities of over 170 foreign world-class production processes.

At the same time, we understand perfectly well that in the current situation, it is quite difficult to count on the acquisition of any serious technology. Here is a good example. We have built a competitive aircraft, the MS-21, using most advanced engine and structural solutions. About over 40% of the vehicle's weight are composite materials, with the center section and the wing, some panels, tail plane using the carbon fiber-reinforced plastic. But, in our country, it happened that since the late 1980-es, when we had a very strong chemical industry, we failed to follow the development of the carbon fiber technology. That is, we stayed actually at the level of the achievements which were specific for the mid 1980-es.

To make a competitive product, we should have all necessary materials available. At that time, ten years ago, when we started designing the MS-21, there was no such material in Russia. Many managers believed that there was no need to develop own technologies if we can buy it easily at any time. Yes, it allowed us to create a product without spending much time, all the more with the participation of such "sharks" of the industry as Boeing, Airbus, Embraer, Bombardier, which guaranteed a simplified process of international certification. With this approach, we first built the Superjet, with about 80% of foreign stuff. And what happens: when we are oriented toward material supplies from abroad — from Japan, Germany — we are given an official notice stating that consumables required for such units will no more be supplied. It is a good thing that Rosatom realized in due time that such materials are necessary for the development of their centrifuge production etc., supported the remaining assets, which were centrally held by a private oil company in Saratov. They have virtually bought them up and are now creating a super-capacity production facility in Yelabuga rated for about 3 000 t of the product. Today, we have come to certain solutions in this field in cooperation with China as well.

The situation is similar concerning the use of special electronic element base. We began to make space vehicles using the element base provided by our dear foreign colleagues. As far back as two months ago, a French supplier of progressive-wave vacuum lamps to one of Roskosmos entities notified them of cessation of supplies. In these conditions, a Rostec entity in Saratov organized promptly the manufacturing of such devices. These are only some of the examples showing how the modern global practice of technologies overflow and joint venturing can be blocked through some constraints dictated by political ambitions of our "best friends".

One of the major fails in the nineties was that we lost the understanding and the sense of danger in respect of such things, I mean, we did not hedge the risk of change in the political situation. In the Soviet Union, especially when military equipment was concerned, products were designed so that to be fully oriented toward the use of our domestic resources. Maybe not the best approach in terms of international

cooperation, globalization, etc., but it provided us with a powerful technological infrastructure to defend our independency, our sovereignty and our interests regardless of the attitude of any political leader — what we face today. Therefore, the combination of these factors: the urge to shorten the way to acquiring new technologies, and the need to secure the independence of the country — should be counted up every time very thoroughly.

— IT IS IMPOSSIBLE TO CREATE ANY INNOVATIVE PRODUCT WITHOUT UPGRADING THE EXISTING FACILITIES. IN WHAT AREAS ARE ROSTEC ENTERPRISES BEING RETOOLED?

— Development of production systems incorporating industrial technologies is a prerequisite for the fulfillment of our plans for creation of globally competitive high-tech products. Virtually all product lines of our holding companies are being retooled. The number of industrial technologies developed, and their expansion rate matched in general the tasks under the "Defense Industry Development" federal program and under the SDO. In aggregate, 293 basic and 213 critical industrial technologies are planned for implementation during 2019–2025.

Retooling of Rostec entities implies primarily the implementation of advanced production technologies, such as computer-aided design and modeling, additive technologies, novel materials and structures, robotics. In particular, special focus is given to the digitization of management and production business processes, which is considered by the Corporation as one of key components of digital transformation of enterprises. For instance, the UEC is going to generate "digital twins" of processes and products. In particular, a Technet NTI-UEC road map has been signed with the NTI Center of New Production Technologies, for the implementation of digital twins generation projects. According to the documents, projects are planned for the designing of smart digital twins of such advanced engines as TV7-117ST, PD-35, NK-12PMP, etc.

As to additive manufacturing, today, this is not just a lab experiment, but a serious industrial area. Material production costs decrease by 50%, waste by 10%, product weight can be cut down to 64%. At UEC-Saturn in Rybinsk, a special Center of Additive Technologies has been established.

In this area, we have very strong relationship with the academic community. In particular, with Evgeniy Nikolaevich Kablov, academician, who heads the All-Russian Institute of Aviation Materials (RIAM). The institute works closely with the industry and, unlike many other academic institutions, possesses very strong production and engineering facilities.

— HOW IS THE RELATIONSHIP WITH THE RUSSIAN ACADEMY OF SCIENCES BUILT?

— The assessment used to be as follows: about 60% of academic institutions and organizations were to an extent engaged in the defense industry's orders. The level of fundamental or exploratory research was very high, and it created the basis for specific research, development and all the more experimental design projects. Today, we have lost the basis to a great extent.

It should be noted that, when planning exploratory work and groundwork, Rostec holding companies are going to make

We need a research and technology groundwork, as everything which was done before mid 1980es is today virtually "eaten up". Therefore, the issue of building relationship with our colleagues from the Academy is crucial.

large-scale use of the findings obtained by the RAS under the Fundamental Research Program 2013–2020. Over the implementation period of the program, the RAS has generated a unique database of fundamental research findings in Russia. In particular, following consideration of a progress report of the Fundamental Research Program, submitted to the Government in 2018, Rostec entities expressed interest in 136 works.

We need a research and technology groundwork, as everything which was done before mid 1980es is today virtually "eaten up". Therefore, the issue of building relationship with our colleagues from the Academy is crucial.

— AS IT IS KNOWN, UNIVERSITIES ARE ENGAGED AS R&D CONTRACTORS. IN 2019, UNIVERSITIES DELIVERED R&D PROJECTS UNDER ROSTEC ENTITIES' ORDERS OF A TOTAL AMOUNT IN EXCESS OF RUB 2 BILLION. COULD YOU REMEMBER ANY INTERESTING EXAMPLES OF THIS COOPERATION?

— Indeed, our entities are quite eager to engage domestic universities in the implementation of their innovative projects for the purpose of creating new products and processes.

As an example, I would mention some research projects fulfilled by universities for the Russian Helicopters JSC. These include: elaboration and implementation of an action program for additive technologies development at M. L. Mil' MHP, experimental research in MAI's aerodynamic tube of civil-purpose Mi helicopter models with attachments, elaboration of the linear blade vortex theory of X-type antitorque rotor, and so on.

For instance, the UEC has ways and approaches to the enhancement of turbine elements studied at P. A. Solovyev RSATU. The Nacimbio JSC engages universities as well, in such R&D projects as rotavirus vaccine development based on plant viruses, development of antibodies for anthrax treatment, etc.

Further on, Rostec entities are going to engage universities in their research and development projects. R&D costs of projects fulfilled by universities upon Rostec entities' orders are growing, and can achieve RUB 2,719 million as soon as by 2025; while R&D costs on projects fulfilled by research institutions upon Rostec entities' orders will approximate RUB 14,410 million. For 2019, this figure is at the level of RUB 11,723 million.

— IT IS OFTEN SAID THAT AN OBSTACLE ON THE WAY TO BUILDING AN INNOVATION-DRIVEN ECONOMY IS THE SHORTAGE OF QUALIFIED STAFF. HOW DOES ROSTEC GROW A NEW GENERATION OF PROFESSIONALS FOR OWN PURPOSES?

— Of course, our capabilities are affected by the shortage. This has been a problem for the entire Russian defense industry so far.

Rostec has established a multi-level system of continuous learning which includes actions for personnel retention, development of basic chairs at universities and dedicated laboratories as part of educational institutions. Our entities maintain about 400 basic chairs at domestic universities, where specialists for Rostec enterprises are taught in more than 500 educational programs. We are restoring the system of mid-tier personnel training — so called vocational schools, which used to exist under industrial enterprises.

Rostec deals quite closely with the matters of secondary education. State-of-the-art methods and solutions are regularly implemented at the Rostec Network Academy as well. Yearly, the Academy admits 2 or 3 flows, comprising 150 to 200 persons each. The proven practice of extended education of Rostec companies' innovation personnel at Rostec's basic chairs at Plekhanov RUE and PFUR will also continue. 1,140 employees of Rostec entities completed the Innovation Development Management of Companies Partially Owned by the State course of the MBA module in 2013–2018.

Interview with Deputy CEO of Rostec N. A. Volobuev

We understand that any technology breakthrough depends on simultaneous creation and development of the fundamental scientific school, design engineering school, and industrial school.

— ROSTEC KEEPS STRONGLY PROMOTING ITS HIGH-TECH PRODUCTS INTO FOREIGN MARKETS. ONE OF MOST SUCCESSFUL EXAMPLES ARE THE PROCEEDINGS OF THE RUSSIA-SINGAPORE BUSINESS COUNCIL (RSBC) CHAIRED BY YOU. ARE FOREIGN PARTNERS INTERESTED IN RUSSIAN PRODUCTS?

— Certainly, foreign partners are interested in Russian products, both in military and civil-purpose ones. The RSBC assists particularly in the promotion of civil-purpose technologies and products. In 2019, using the Council's infrastructure — the international electronic B2B platform RSTrade and the Center for International Promotion of Russian High-Tech Companies and Presentation of Investment Projects in Singapore — a number of major projects was and is now being implemented. These include supplies of various power plant equipment, medical equipment, composite materials, aircraft equipment, electronic instruments and equipment, polymer goods; and seemingly less high-tech products, such as alloys with specified parameters, construction materials, pyrotechnics, etc. Not only Rostec entities, but also their partners from Russia, members of the Eurasian Economic Union, and so called far-abroad countries are involved in the supplies. Last year, hydrocarbon export grew considerably, as noted by everyone. Export of civil-purpose non-resource products to member countries of the Association of South East Asian Nations increased significantly as well — our Council contributed to this to a certain degree.

If we speak of the RSTrade platform operated by the executive structure of our Council, it is exactly one of the projects which shows the capabilities of Russian technologies and of the Russian export. As of now, over 82 thousand companies from 25 Asian, European and American countries are registered on the platform. The platform runs in four languages: Russian, English, Indonesian and Chinese. Last year, it was integrated with CamelOne, a Singaporean service platform and incorporated such important services as multimodal transport organization, thus expanding its international business.

— WHAT ARE THE AREAS WHERE RUSSIAN SOLUTIONS ARE HIGH-TECH ENOUGH? WHAT ARE THE AREAS WHERE WE CAN BE COMPETITIVE IN THE WORLD MARKET?

— A number of Russian companies were included in short lists of major customers in South-East Asia for the supply of microwave equipment. Now, in this area, Russian companies — primarily, Rostec entities — are not only competitive, but certainly among leaders. Another example are Russian developers of the VR content. IT solutions, especially in cybersecurity, voice technologies, etc. — here we hold leading positions as well. Take our Oktava PJSC (Tula) — it is one of the best examples of competitive audio products, such as microphones. At Hollywood events, microphones supplied by Oktava are used.

There are excellent examples in the medical equipment industry: these are Shvabe JSC, Ruselectronics JSC, and other entities. Moreover, they form consortiums with partners from various countries. Participation in such consortiums enables them to market end-to-end solutions (rather than single supplies of individual products), followed by multiple supplies, after-sales service, etc.

— AT THE CENTER FOR INTERNATIONAL PROMOTION OF RUSSIAN HIGH-TECH COMPANIES IN SINGAPORE, THERE IS A SHOWROOM HOSTING A PERMANENT EXHIBITION OF RUSSIAN INNOVATIVE PRODUCTS. ACTUALLY, THIS IS A PARADE OF TECHNOLOGIES AND INNOVATIONS AVAILABLE AT ROSTEC HOLDING COMPANIES. WHAT INTERESTING SHOWPIECES COULD YOU MENTION?

— The Center for Promotion of Russian High-Tech products in Singapore was established end 2017. At that time, it occupied two small rooms, and now its area is 800 m^2. Today, this is not just a showroom, but also includes laboratories, and above all an engineering center.

In 2019, we held an exhibition of our radioelectronic industry. The exposition was met with great interest, and our holding companies have already signed a number of contracts with some companies from Singapore and other countries of the region. Of particular interest are our aircraft equipment, traffic security systems, medical equipment. In Singapore, we also held an exhibition of medical equipment produced by our holding companies — Ruselectronics JSC and Shvabe JSC. For instance, Shvabe JSC manufactures state-of-the-art incubators for newborns, which are used by medical institutions not only in Russia, but also abroad. In particular, virtually all of the 15 perinatal centers built under Rostec's guidance are fitted with Shvabe medical equipment. I would note that before, we used to buy these incubators mostly in the West: in Japan, the USA, Switzerland. The neonatal equipment by Shvabe has already won respect and confidence among medical staff. We showed the equipment in Singapore, and by now, we already have a certain arrangement in respect of the sale of such equipment into the region.

705

BILLION rubles

ROSTEC'S REVENUE FROM SALE OF INNOVATIVE PRODUCTS IN 2019

Our exhibition in Singapore goes on, we plan increasing the area. Now, we are creating the Center for Development of Radioelectronics, to be headed by a top manager of Rostec's radioelectronic cluster. We hope that by engaging professionals we will farther promote our interests and, all the more, we will get new contracts.

— THE HIGH-TECH INDUSTRY IS OFTEN SAID TO BE IN STRONG NEED FOR QUALIFIED PERSONNEL. WHAT EFFORTS ARE MADE BY ROSTEC TO BRING UP THE NEW GENERATION OF PROFESSIONALS?

— Rostec's mission is to increase the scientific and technology heritage and to achieve the scale of development of leading global competitors. Rostec's current strategic demand is invention and industrial optimization. Yet, we understand that any technological breakthrough depends on simultaneous creation and development of the fundamental scientific school, design engineering school, and industrial school.

Keeping this in mind, we are improving key HR management processes along the following vectors:

- Identify competences of the future and forecast forward-looking professions, based on the technologies we have already mastered or are going to master. Technologies are the tool enabling broader interpretation of the set of specific knowledge, skills, competences, even today demanded of graduates by Rostec design engineering departments and entities;
- Re-launch cooperation with basic (reference) universities, catching up their graduates' level. Based on Rostec design engineering departments and entities' requests, we form a graduate's profile, to avoid the need to retrain them. This leads to a transformation of education programs and to the application of a dual approach to education: students become employed already during their studies, and their undergraduate practical training under the guidance of a tutor is a part of the plant/ department's shared responsibility for the end product.

Rostec as one of the country's biggest employers strongly cooperates with educational institutions. Major universities and institutes host hundreds of basic chairs. We maintain chairs at Plekhanov RUE, PFUR, we closely cooperate with Bauman MSTU; recently, we agreed upon opening of a chair at the Financial University under the Government of the Russian Federation. Of course, this is very helpful in terms of training and retraining of our future professional employees. In addition, our Corporate Network Academy operated operating for two years. We plan to tie the Academy's proceedings with the chairs' activity, to act as a single whole in the area of teaching professionals able to work properly in high-tech industries.

In this area, we deeply study the foreign experience as well. For instance, we visited some Singaporean universities: the National University of Singapore and Nanyang Technological University. They have a well-developed institute of professional training — the so-called technical colleges, which graduate virtually ready-made engineers in a period of 1 to 3 years, capable of operating advanced CNC machines. Today, the RSBC takes part in the establishment of a Center of Professional Education in Moscow, which will graduate such professionals.

We develop the system of students' internship at foreign universities, in particular in France and China. Moreover, we have agreed with the above-mentioned Singaporean universities to have our professionals taught in master's degree. These are talented young employees of our holding companies who, after completing their studies in Singapore, will continue working at our enterprises. Of course, we, in turn, invite Singaporean specialists to study at our basic chairs. Meanwhile, we improve the level of knowledge of instructors at Russian universities.

We develop proficiency upgrading road maps, personalized advancement plans, taking into account the rate of development of new competences.

We support the WorldSkills initiative and increase its pragmatic orientation.

We upgrade the workers' qualification level to international standards at professional training centers graduating highly-qualified, multi-purpose specialists capable of operating sophisticated high-duty equipment.

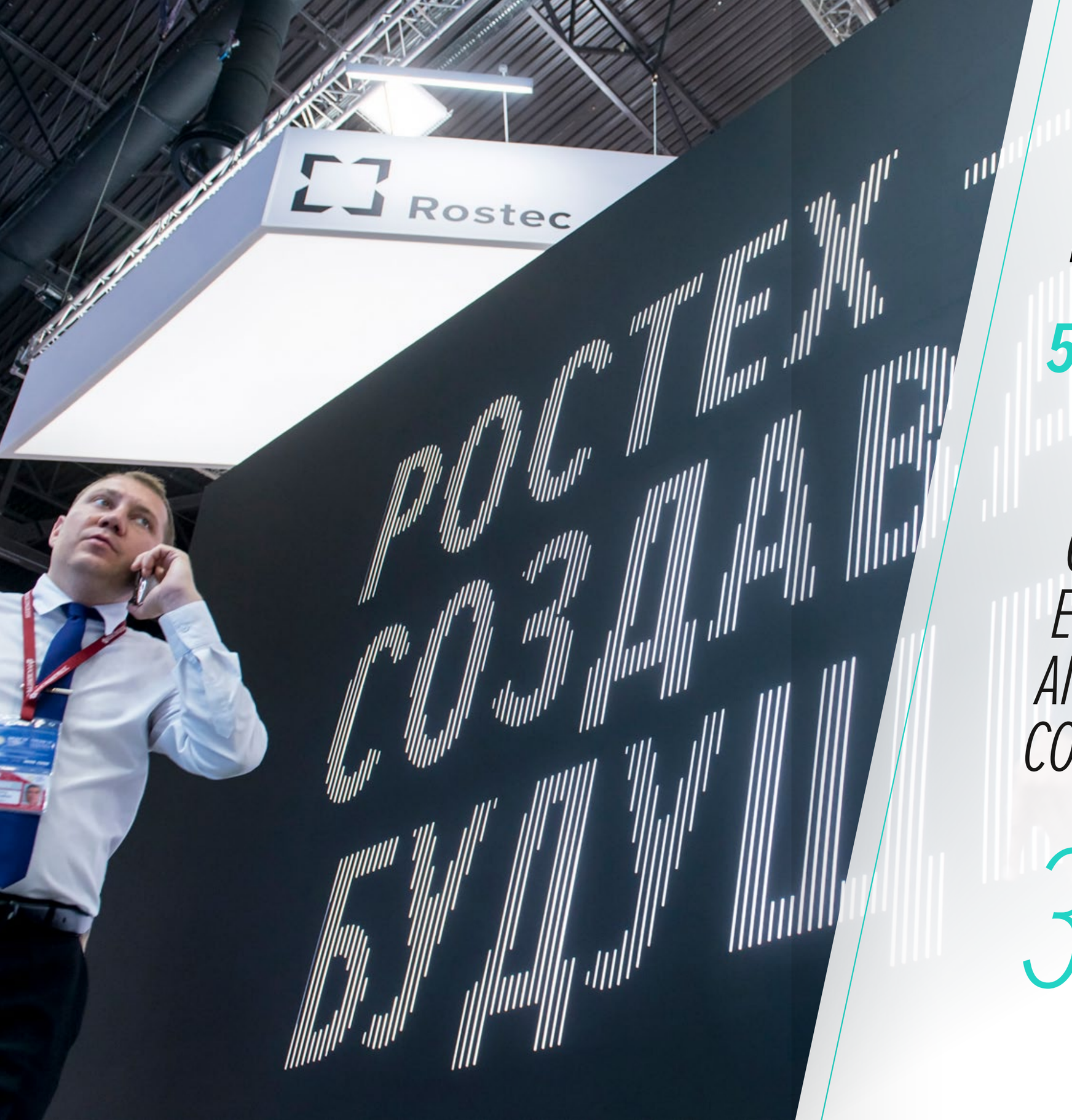
We are deeply involved in the formation of a federal talent pool.

We develop mechanisms of pupils' early career guidance. Yearly, we successfully organize contests, competitions, open days, project sessions in such camps as Artek, Ocean, Sirius, science festivals, tours to production facilities for thousands of schoolchildren.

Rostec is also deploying a pilot project: Rostec classes at two regular schools for 825 and 1,100 places based on the "physico-technical lyceum" principle, with the participation of the Physico-Technical Schools Development Fund and the National Intellectual Development Fund. The Corporation will elaborate personalized education road maps for students of the Rostec classes, in particular with the engagement of Rostec employees having special competences in the science, education, business. The joint memorandum provides for the supply of training aids and fitting out the school infrastructure, employer-sponsored education of school graduates at basic (reference) universities, and their further employment with Rostec or its entities.

These activities provide for Rostec's sustainable HR development. We are on the go, and we are sure that we move in the right direction. Finally, this will give a positive effect, and not only for Rostec and its entities. I think we will succeed in spreading our experience over a whole range of Russian structures.

Rostec strongly cooperates with educational institutions. Major universities host hundreds of basic chairs. This is very helpful in terms of training and retraining of our future professional employees.



5. OVERVIEW OF OPERATIONAL ACTIVITIES OF ROSTEC ENTITIES AND HOLDING COMPANIES

31.1%

SHARE OF CIVIL-PURPOSE PRODUCTS IN ROSTEC'S REVENUE IN 2019

Rostec

AVIATION CLUSTER

1771.6

BILLION rubles

ROSTEC'S CONSOLIDATED REVENUE IN 2019

TABLE OF CONTENTS

United Aircraft Corporation

THE UNITED AIRCRAFT CORPORATION (UAC) UNITES KEY AVIATION ENTERPRISES OF THE RUSSIAN FEDERATION, WHICH MANUFACTURE SUCH WORLDWIDE-RENOWNED AIRCRAFT BRANDS AS SU, MIG, IL, TU, YAK, BE, AND THE NEW SUPERJET 100 AND MS-21; AS WELL AS PROVIDE THE FULL CYCLE OF WORKS — FROM DESIGNING TO AFTER-SALE SERVICE

THE UAC, TOGETHER WITH AFFILIATES OPERATED BY IT, DESIGN AND MANUFACTURE 100% OF RUSSIAN-MADE MILITARY AIRCRAFT AND CIVIL AERIAL VEHICLES WITH A CAPACITY EXCEEDING 50 PASSENGERS

Structure and Product Range

The UAC includes over 30 enterprises: design engineering offices, aircraft building and repair plants, which design, manufacture, test and support the operation, warranty and after-sales service of aircraft equipment of various purpose.

Board of Directors

CEO
Yuri Borisovich Slyusar'

CHAIRMAN OF THE BOARD
Anatoiy Eduardovich Serdyukov

Industrial Director of Rostec Aviation Cluster
Anatoly Eduardovich Serdyukov

CEO of UAC
Yuri Borisovich Slyusar'

Deputy Minister of Industry and Trade of the Russian Federation
Oleg Evgenievich Bocharov

Deputy Chairman of the State Corporation for Development VEB.RF
Artyom Sergeevich Dovlatov

Deputy CEO of Rostec
Igor Nikolaevich Zavyalov

Vice-Rector for Research of the Russian Foreign Trade Academy under the Ministry of Economic Development of Russia, since January 27, 2020 — Deputy Minister of Finance of the Russian Federation
Pavel Anatolievich Kadochnikov

Managing Director for Research and Technology, Chairman of Rostec Research & Technology Council
Yuri Nikolaevich Koptev

CEO of Rosoboronexport
Alexander Alexandrovich Mikheev

Director for Legal Support of Rostec
Pavel Mikhailovich Osin

CEO of the Finansovye Aktivy Management Company
Evgeniy Valerievich Yurchenko

Deputy Minister of Transport of the Russian Federation
Alexander Alexeevich Yurchik

Key Achievements and Events

- *The demo model of the Russian heavy reconnaissance-attack long-endurance unmanned aerial vehicle S-70, Okhotnik type, made its first flight.*
- *New-generation light transport aircraft Il-112V made its first flight.*
- *Serial production of advanced 5-G Russian multi-purpose battle plane Su-57 launched.*
- *Detail design of a medium military transport aircraft prepared and defended.*
- *Serial production of the mid-range narrow-bodied passenger aircraft MS-21 launched with wide use of composites.*

Vectors of Development

- *Serialization of MS-21, Il-114, Su-57, upgraded Yak-130, Tu-160, Il-76, Il-112.*
- *Elaboration and implementation of a single import phase-out strategy to reduce the cost of the MS-21 and SSJ-100 family.*
- *Deployment of debt financing tools in respect of forward deliveries under the state defense order and trade-in of aviation materiel of the Russian Ministry of Defense, including its buyout subject to its book value, its upgrade and resale under the military and technical cooperation program.*
- *Elaboration of the matter of creating a national aircraft service company to provide full cycle of maintenance.*
- *Research work with the view of extending the line of unmanned aerial vehicles, convertible plane designing, and creating next-generation combat systems.*

RUSSIAN HELICOPTERS

Russian Helicopters JSC

THE RUSSIAN HELICOPTERS HOLDING COMPANY IS ONE OF THE WORLD LEADERS IN THE HELICOPTER INDUSTRY, ABLE TO DESIGN, MANUFACTURE, TEST AND MAINTAIN STATE-OF-THE-ART CIVIL AND MILITARY HELICOPTERS

THE RUSSIAN HELICOPTERS JSC OCCUPIES 89% OF THE RUSSIAN AND 9% OF THE GLOBAL HELICOPTERS MARKET. OVER 8,000 RUSSIAN-MADE HELICOPTERS ARE OPERATED IN MORE THAN 100 COUNTRIES WORLDWIDE

Structure and Product Range

The NHC Mil' & Kamov JSC, Kazan Helicopter Plant JSC, Rostvertol PJSC, U-UAZ JSC, Reductor-PM JSC, Arsenyevskaya aircraft company Progress PJSC, VR-Tekhnologii LLC, VSK JSC, and a number of other enterprises forming part of the holding company engage in the designing, manufacturing, and after-sale servicing of world-renowned Russian brand helicopters.

Board of Directors

CEO
Andrey Ivanovich Boginskiy

CHAIRMAN OF THE BOARD
Vladimir Vladimirovich Artyakov

First Deputy CEO of Rostec
Vladimir Vladimirovich Artyakov

CEO of Russian Helicopters JSC
Andrey Ivanovich Boginskiy

Director for Legal Support of Rostec
Pavel Mikhailovich Osin

Deputy CEO of Rostec
Dmitry Yurievich Lelikov

CEO of Rosoboronexport
Alexander Alexandrovich Mikheev

Director of the Institute of State and Law at the Russian Academy of Sciences
Alexander Nikolaevich Savenkov

Industrial Director of Rostec Aviation Cluster
Anatoly Eduardovich Serdyukov

Chairman of the Board of RT-Invest JSC
Sergey Viktorovich Skvortsov

Managing Director for Science and Technologies, Chairman of the Research and Technology Council of Rostec
Yuri Nikolaevich Koptev

President of the Republic of Tatarstan
Rustam Nurgalievich Minnikhanov

Director of the JSC "Management Company of the Russian Direct Investment Fund"
Alexander Leonidovich Chistyakov

Key Achievements and Events

- The M. L. Mil' and N. I. Kamov National Helicopter Engineering Center has been established at the consolidated M. L. Mil' MHP JSC and Kamov JSC.
- Major upgrade of the holding company affiliates has been completed, including 40 retooling and capital construction projects totaling RUB 40 billion.
- Fiber-optic sensors have been designed and incorporated into in-flight stall record system on helicopter rotor blades and swashplate condition control.
- The demo unmanned helicopter-type aviation system VRT-300 has been tested.
- At the MAKS-2019 aerospace show, the All-Russian premiere of the medium multi-purpose helicopter Ka-62, the first serial Mi-38 with upgraded cabin, and the light multi-purpose Aurus-styled Ansat helicopter took place.
- International premiere of the multi-purpose helicopter Mi-38 took place at Dubai Airshow 2019.
- Long-term contracts have been signed with the Russian Ministry of Defense for the supply of strike helicopters Mi-28NM and military-transport Mi-8AMTSh-VN.

Vectors of Development

- To organize production of Ansat helicopters at Kazan Helicopter Plant, and to supply them to China.
- To serialize the multi-purpose Ka-62 helicopter at the Progress AAC.
- To implement the international project for supply of 200 units of Ka-226T helicopters to India, with gradual localization of the manufacturing content.
- To create a specialization center for treatment of lining panels made from aluminum alloys at the Rostvertol PJSC.
- To provide integrated logistics support in after-sale service processes.
- To create a control and automation technology for helicopter designing and preproduction processes at the Russian Helicopters enterprises.

United Engine Corporation

United Engine Corporation

THE UNITED ENGINE CORPORATION (UEC JSC) LINKS UP THE KEY COMPETENCES IN THE DESIGNING, MANUFACTURING AND AFTER-SALE SERVICING OF CIVIL AND MILITARY AVIATION, ROCKET ENGINES, AND MARINE GAS-TURBINE ENGINES

IN 2019, THE POWER OF SIBERIA GAS PIPELINE WAS LAUNCHED. MANY COMPRESSOR STATIONS OF THE GAS PIPELINE ARE EQUIPPED WITH GAS PUMPING UNITS AND GAS-TURBINE UNITS SUPPLIED BY THE UEC

Structure and Product Range

The UEC JSC incorporates 12 enterprises, including full-cycle plants and a design engineering office, which design and manufacture engines for the military and civil aviation, helicopter engines, and engines used in land-based equipment.

Board of Directors

CEO
Alexander Viktorovich Artyukhov

CHAIRMAN OF THE BOARD
Vladimir Vladimirovich Artyakov

First Deputy CEO of Rostec
Vladimir Vladimirovich Artyakov

CEO of UEC JSC
Alexander Viktorovich Artyukhov

Deputy CEO of Rostec
Dmitry Yurievich Lelikov

Industrial Director of Rostec Aviation Cluster
Anatoly Eduardovich Serdyukov

Director for Legal Support of Rostec
Pavel Mikhailovich Osin

Director for Economy and Finance of Rostec
Oksana Gennadievna Lobanova

Deputy Minister of Industry and Trade of the Russian Federation
Oleg Evgenievich Bocharov

Key Achievements and Events

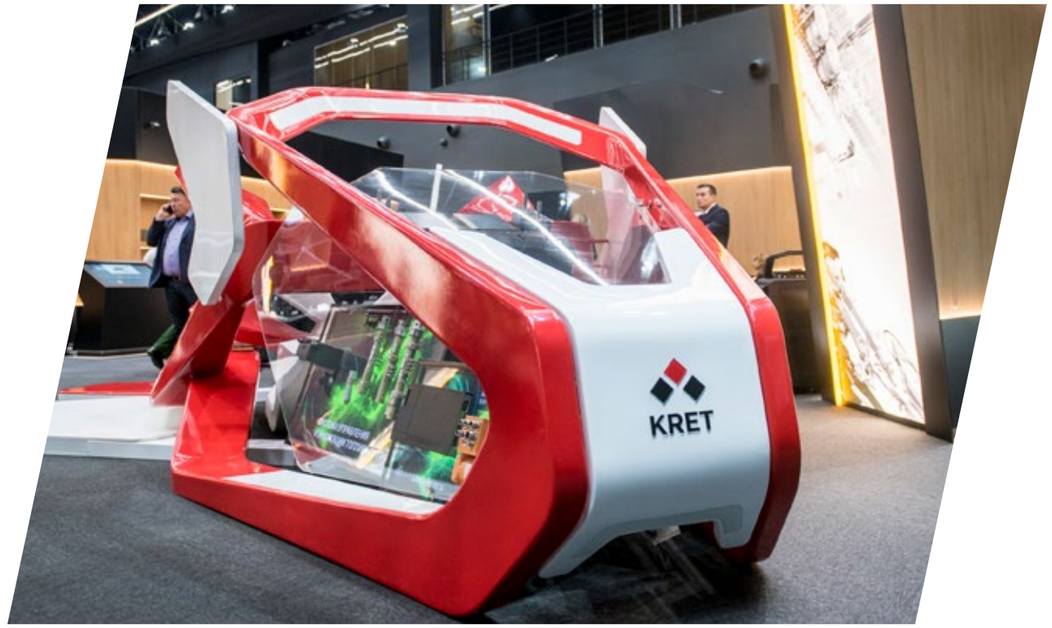
- *Work is in progress for creation of a new state-of-the-art turbofan engine PD-8 for SSJ and Be-200 aircraft, and of turboshaft engines VK-650V and VK-1600V to be used at Ka-226, Ansat and Ka-62 helicopters.*
- *The country's largest innovative production of gas-turbine engine blades launched.*
- *Performance of the TV7-117V improved; first flight of the Il-112V aircraft, equipped with the TV7-117ST engine, completed.*
- *Project cooperation of enterprises established for creation of a propulsion power plant (PPP) PD-8, terms of reference for the designing of PPP components issued.*

Vectors of Development

- *Serialization and supplies of PD-14 engines for MS-21 aircraft.*
- *Serialization and supplies of TV7-117ST engines for Il-114 aircraft, and in the long term — for light aircraft and unmanned aerial vehicles.*
- *Creation of a 24-26 t thrust engine under the PD-35 program.*
- *Production of helicopter engines, GTD-500 and GTD-1500, which will guarantee Rostec's stable position in the rotary-wing vehicle market.*
- *Designing and manufacturing a low-emission combustion chamber for industrial gas-turbine engines.*
- *Elaboration and implementation of a corporate modular program for digital designers, creation of mirror engineering centers.*

Radio-Electronic Technologies Concern JSC

THE RADIO-ELECTRONIC TECHNOLOGIES CONCERN (KRET JSC) IS ONE OF THE GLOBAL LEADERS, RUSSIA'S MAJOR DEVELOPER AND MANUFACTURER OF MILITARY- AND CIVIL-PURPOSE RADIO-ELECTRONIC PRODUCTS



IN 2019, SERIAL PRODUCTION OF THE NEW-GENERATION AIRBORNE RADIOELECTRONIC WARFARE HAS BEEN LAUNCHED

Structure and Product Range

KRET JSC incorporates over 60 enterprises engaged in the design and manufacturing of on-board radio-electronic equipment systems; radio-electronic warfare and reconnaissance devices; systems and devices for state recognition; medical equipment and hardware.

Key Achievements and Events

- *BINS-2015, a state-of-the-art inertial navigation system has been developed.*
- *A set of equipment testing and correction works has been completed for certification purposes to international aircraft navigation and operation requirements.*
- *Design documentation and software have been developed for components and systems of the advanced complex of small aircraft avionics, flight tests were completed.*
- *Certification documentation has been drafted for the Russian-made real-time system, pursuant to ARINC 653 requirements for use on aircraft.*
- *Helicopter and aircraft onboard defense system against guided missiles has been developed.*

Vectors of Development

- *To create an avionics complex, an integrated control system, a fuel system, control system elements of general aircraft equipment and lighting facilities consisting of Russian-made components.*
- *To maintain the policy of maximum equipment harmonization on all types of civil-purpose aerial vehicles manufactured now or in the future.*
- *To increase the capabilities of the radio-electronic warfare facilities being developed, due to wide use of state-of-the-art technologies, including solid state electronics and radiophotonics.*
- *Further increase of the non-military product share by entering new product segments and expanding the presence in existing markets (medical equipment, measuring instruments, meters, etc.).*

TECHNODINAMIKA
A Rostec Company

Technodinamika JSC

THE TECHNODINAMIKA JSC IS SPECIALIZED IN THE DEVELOPMENT AND SERIAL MANUFACTURING, TRIALS AND AFTER-SALE SERVICE OF AVIATION SYSTEMS AND ASSEMBLIES FOR AIRCRAFT INDUSTRY ENTERPRISES AND AIRLINES

IN 2019, CONSOLIDATION OF RUSSIAN LEADERS OF THE PARACHUTE BUILDING INDUSTRY HAS BEEN COMPLETED. TECHNODINAMIKA ENTERPRISES ACCOUNT FOR 97% OF THE DOMESTIC MARKET OF PARACHUTE SYSTEMS

Structure and Product Range

Technodinamika JSC incorporates 37 plants and research institutes, which design and manufacture seven of 17 key aviation systems, thus holding 23% of the Russian unit-building market.

Board of Directors

CEO
Igor Georgievich Nasenkov

CHAIRMAN OF THE BOARD
Anatoly Eduardovich Serdyukov

Industrial Director of Rostec Aviation Cluster
Anatoly Eduardovich Serdyukov

CEO of Technodinamika JSC
Igor Georgievich Nasenkov

Executive Director of Rostec
Oleg Nikolaevich Evtushenko

President of Dinamika SC JSC
Viktor Evgenievich Grigoriev

CEO of Dinamika SC JSC
Mikhail Davidovich Chernyi

First Deputy CEO of Technodinamika JSC
Yuri Mikhailovich Polskiy

First Deputy CEO of Dinamika SC JSC
Kirill Vladimirovich Dybko

Key Achievements and Events

- *First flight of the military transport aircraft Il-112V supported.*
- *Winner of 13 tenders of the Irkut Corporation PJSC for the designing of systems and assemblies of the advanced civil-purpose aircraft MS-21.*
- *Research and development works have been launched for creation of a crash-resistant fuel system and anemergency ditching system of the Ka-226T helicopter to be supplied to India.*
- *Jointly with the Roschemzaschita, the first research model of the ozone converter for passenger aircraft has been manufactured; the solution can break the monopoly of American manufacturers of the equipment.*
- *Tecnodinamika JSC joined the holding company of the Polyot Parachute Plant in Ivanovo — a unique full-cycle parachute equipment manufacturer.*
- *Divers of the underwater research team of Alexey Leonov Russian Geographical Society set a world record of ice diving time with the use of breathers supplied by the Respirator RPE JSC.*

Vectors of Development

- *To develop, supply and provide after-sale service of systems and assemblies for the advanced civil-purpose aircraft MS-21 and aircraft family SSJ-NEW.*
- *To develop new landing systems: Federation, Horizontal-4000, Tara.*
- *To resume the production of explosion-proof earthquake resistant AIM engines for oil & gas, energy generation and nuclear industry.*
- *To participate in an experiment for equipping underground parking lots in Moscow with new-type mechanical parking complexes.*

Rostec

CONVENTIONAL ARMS, AMMUNITION AND SPECIAL CHEMISTRY ***CLUSTER***

50 *BILLION USD*

ANNUAL ORDERS ON HAND OF ROSOBORONEXPORT JSC

TABLE OF CONTENTS

HIGH-PRECISION WEAPONS

High Precision Systems NPO JSC

HIGH PRECISION SYSTEMS NPO JSC IS THE DEVELOPER AND MANUFACTURER OF ADVANCED WEAPONS, MILITARY AND SPECIAL EQUIPMENT, INCLUDING TACTICAL BALLISTIC MISSILE SYSTEMS, SHORT-RANGE GUN-MISSILE INTEGRATED WEAPON SYSTEMS, GUIDED ANTITANK MISSILES AND ASSAULT WEAPON SYSTEMS

HIGH PRECISION SYSTEMS NPO JSC IS THE MONOPOLIST IN THE ENGINEERING AND PRODUCTION OF TACTICAL BALLISTIC MISSILE SYSTEMS IN RUSSIA, HOLDING ABOUT 50% OF THE WORLD MARKET OF MAN-PORTABLE AIR-DEFENSE SYSTEMS

Structure and Product Range

The holding company includes 13 enterprises engaging in the development, production, upgrade, repair and sale of weapon, military and special vehicles.

Board of Directors

CEO
Alexander Vladimirovich Denisov

CHAIRMAN OF THE BOARD
Vladimir Vladimirovich Artyakov

First Deputy CEO of Rostec
Vladimir Vladimirovich Artyakov

CEO of High Precision Systems NPO JSC
Alexander Vladimirovich Denisov

Chief Accountant of Rostec
Natalia Vladimirovna Borisova

Executive Director of Rostec
Oleg Nikolaevich Evtushenko

Head of Section for Legal Support of International and Investment Activities of Rostec Legal Support Department
Andrey Alexandrovich Smotritskiy

Adviser to CEO of Rostec
Alexander Alexeevich Kotenkov

Rector of the Financial University under the Government of the Russian Federation
Mikhail Abdurakhmanovich Eskindarov

Key Achievements and Events

— Weapons, military and special vehicles have been designed and supplied under the State Defense Order.

— The "Lidar for Unmanned Cars" initiative implemented by A. E. Nudelman KBtochmash design office was among the five winners of the Vector program held by the Corporate Network Academy.

— Employees of KEMZ JSC, members of Rostec team, won two silver and one bronze medal at the VI National Championship of end-to-end worker professions WorldSkills Hi-Tech 2019.

Vectors of Development

— To bring to life a set of measures ensuring timely and efficient designing, upgrade and serial supplies of advanced weapons, military and special vehicles both under State contracts and under the military and technical cooperation program.

— To create and market state-of-the-art road building, agricultural and utility vehicles.

— To participate in the proceedings of the National Association for Technology Transfer in the section "Diversification and transfer of defense industry technologies".

SCIENTIFIC INDUSTRIAL CONCERN TECHMASH

JSC Research and Industrial Concern Techmash

JSC RESEARCH AND INDUSTRIAL CONCERN "MACHINE ENGINEERING TECHNOLOGIES" (JSC RIC TECHMASH) IS ONE OF KEY DESIGNERS AND MANUFACTURERS OF VARIOUS-PURPOSE MISSILES AND AMMUNITION FOR THE RUSSIAN ARMED FORCES

THE VOLUME OF AMMUNITION DELIVERED BY THE TECHMASH AFFILIATES IN 2019 FOR GENERAL-PURPOSE FORCES OF THE RUSSIAN ARMY EXCEEDED THE AGGREGATE VOLUME DELIVERED BY ALL OTHER SUPPLIERS

Structure and Product Range

The Concern's control circuit encompasses 35 enterprises, united into five divisions, which design and manufacture rocket projectiles and multiple launch rocket systems, as well as a whole range of ammunition, including submunition and engineer ammunition.

Board of Directors

CEO
Vladimir Nikolaevich Lepin

CHAIRMAN OF THE BOARD
Vladimir Vladimirovich Artyakov

First Deputy CEO of Rostec
Vladimir Vladimirovich Artyakov

CEO of RIC Techmash JSC
Vladimir Nikolaevich Lepin

Managing Director for Science and Technologies, Chairman of the Research and Technology Council of Rostec
Yuri Nikolaevich Koptev

Independent Director
Alexander Veniaminovich Kulikov

Director for Economy and Finance of Rostec
Oksana Gennadievna Lobanova

Director for Implementation of State Programs of Rostec
Ivan Alexandrovich Skrylnik

Head of Section for Legal Support of International and Investment Activities of Rostec Legal Support Department
Andrey Alexandrovich Smotritskiy

Key Achievements and Events

— Proceeds from sale of civil-purpose products achieved RUB 9.4 billion. In particular, supplies of drill-pipes grew by 12%, and of agricultural machinery — by 26%, as compared to 2018.

Vectors of Development

— To create new advanced destruction and non-lethal weapons.

— To establish cooperation with Korean companies SHINSHINSA and Nanodta Lab Co concerning the use of nanodiamonds.

SPECCHEMISTRY JSC

SPECCHEMISTRY JSC IS THE LEADER IN THE DESIGNING AND MANUFACTURING OF SPECIAL COMPONENTS FOR MISSILES AND AMMUNITION USED BY STRIKE GROUPS OF GROUND FORCES, AEROSPACE FORCES, THE NAVY, STRATEGIC MISSILE SYSTEMS, AND AIRBORNE FORCES' ARMAMENT

IN 2019, SPEECCHEMISTRY'S AFFILIATES PRODUCED OVER 80% OF SPECIAL COMPONENTS FOR MISSILES AND AMMUNITION, INCLUDING PYROTECHNICAL ITEMS, INITIATING DEVICES, EXPLOSIVES, SOLID PROPELLANTS AND GUNPOWDER OF VARIOUS FORMULATONS

Structure and Product Range

SPECCHEMISTRY JSC consolidates 11 manufacturers of gunpowder and solid propellants, polymer products, a wide range of pyrotechnical items, explosives and initiating devices, two information analysis centers, and a distributor company.

Board of Directors

CEO
Yuri Viktorovich Zozulya

CHAIRMAN OF THE BOARD
Vladimir Vladimirovich Artyakov

First Deputy CEO of Rostec
Vladimir Vladimirovich Artyakov

CEO of Specchemistry JSC
Yuri Viktorovich Zozulya

Director of the Conventional Arms, Ammunition and Special Chemistry Department of the Ministry of Industry and Trade of the Russian Federation
Dmitry Valerievich Kapranov

First Deputy Chairman of the Section for Defense Issues under the Ministry of Defense (IACAR) at the Presidium of the Russian Academy of Sciences (External Director)
Alexander Veniaminovich Kulikov

Director for Economy and Finance of Rostec
Oksana Gennadievna Lobanova

Director for Implementation of State Programs of Rostec
Ivan Alexandrovich Skrylnik

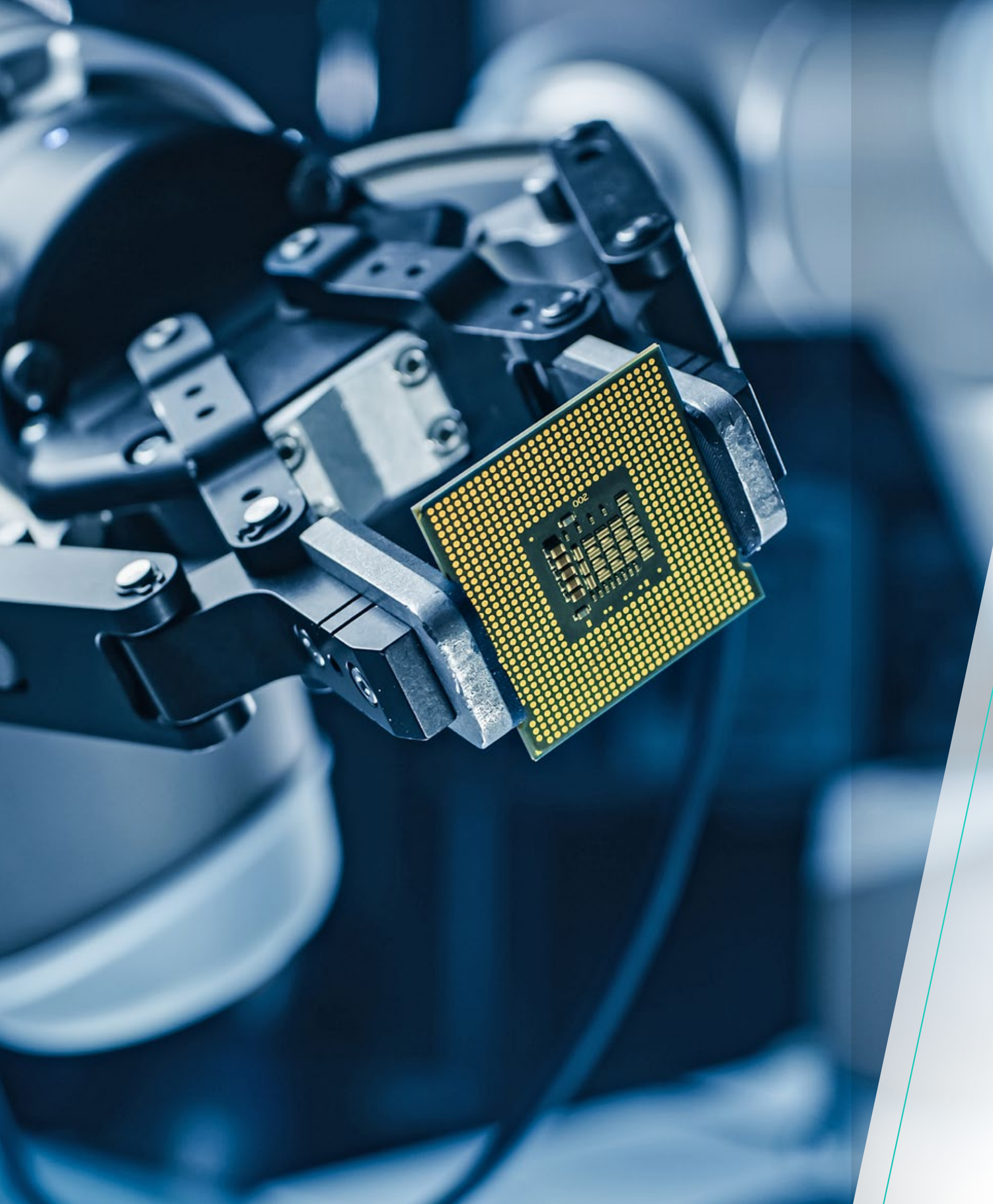
Head of Section for Legal Support of International and Investment Activities of Rostec Legal Support Department
Andrey Alexandrovich Smotritskiy

Key Achievements and Events

- *A project pipeline consisting of 30 innovative projects has been formed. Its deployment will allow the SPECCHEMISTRY JSC to strengthen its current market positions and will provide new market outlets.*
- *A pyrotechnical firework and signal elements manufacturing technology based on ballistite powders has been elaborated and deployed.*
- *A blast protection system for strongboxes, ATM and other closed objects has been created, based on the use of pyrotechnical inert gas source units and a detection system.*
- *Requirements to explosives and explosive mixtures have been elaborated for items subject to considerable kinetic heating, including layout solutions of cast and pressed explosive alloys.*

Vectors of Development

- *To create Russia's first facility to produce micronized silica gels and stable silicasols, with annual output of 6,000 and 3,000 t, respectively, using the German technology of CWK Bad Koestriz.*
- *To produce high-efficient protector and plant stimulator (pesticide) to improve the yield of agricultural crops by an average of 20–35%.*
- *To expand the production of components for drilling and blasting works, by increasing the output of initiating explosives and by producing industrial explosives at the facilities of a private partner competent in drilling and blasting works.*
- *To develop advanced pyrotechnical items using safe technologies.*
- *To produce new forms of anti-tuberculosis drugs.*
- *To produce sealing elements for the oil and gas industry.*
- *To produce industrial parts using state-of-the-art hydraulic stamping method.*
- *To manufacture paints and lacquers with unique properties.*



Rostec

RADIO-ELECTRONIC ***CLUSTER***

179,2

BILLION rubles

ROSTEC'S CONSOLIDATED NET PROFIT IN 2019

TABLE OF CONTENTS

ROSEL

Ruselectronics JSC

RUSELECTRONICS JSC MANUFACTURES OVER 50% OF ELECTRONIC COMPLEXES IN RUSSIA AND 8% OF ALL RADIOELECTRONIC PRODUCTS IN RUSSIA, PROVIDING 10% OF WORKPLACES IN THE BRANCH

RUSELECTRONICS JSC HOLDS 70% OF THE DOMESTIC MARKET OF MICROWAVE PRODUCTS AND IS THE LEADER IN THE DESIGNING OF AIRCRAFT SCOUTING SYSTEMS AND HIGH-TECH SMART CONTROL AND COMMUNICATION SYSTEMS

Structure and Product Range

Ruselectronics JSC incorporates over 150 enterprises and research institutions specializing in the designing and manufacturing of radio-electronic components, communication technologies, facilities and systems, computer and telecommunications equipment.

Board of Directors

CEO
Alexander Anatolievich Borisov

CHAIRMAN OF THE BOARD
Sergey Stepanovich Sakhnenko

Industrial Director of Rostec Radio-Electronic Cluster
Sergey Stepanovich Sakhnenko

CEO of Ruselectronics JSC
Alexander Anatolievich Borisov

Director for Legal Support of Rostec
Pavel Mikhailovich Osin

Executive Director of Rostec
Oleg Nikolaevich Evtushenko

Director for Economy and Finance of Rostec
Oksana Gennadievna Lobanova

Managing Director for Science and Technologies, Chairman of the Research and Technology Council of Rostec
Yuri Nikolaevich Koptev

Head of M&A Section of Rostec Investment and Investment Project Department
Vasiliy Anatolievich Akimov

Key Achievements and Events

- Trials of a civil UAV countering complex, Attack-DBS, completed successfully in Krasnodar airport.
- An automated control system of power supply mains deployed at facilities in Kemerovo region, Trans-Baikal and Krasnoyarsk Territories.
- Presentation of Groza, the first civil-purpose digital small-size tropospheric communication station with high-speed modem, conducted.
- Ground-based satellite communication stations hosted at the Russian `Bellingshausen' station in Antarctic to increase GLONASS accuracy.
- Computing complex of the information and telecommunication center of ERA, the military innovation technopolis, created.
- Serial production of chip resistors with rated output of 100 million items per year launched.

Vectors of Development

- To prepare a development road map of such high technologies as “New generations of the microelectronics and creation of electronic component base” and “Internet of Things”.
- To develop Russian technologic 5G solutions jointly with the Sistema JSFC and Rostelecom PJSC.
- To launch production of smart electricity meters of rated annual output up to 1 million items, in the Istok special economic zone.
- To create (jointly with the Rosseti PJSC) a center of competence for information security and information protection of critical infrastructure facilities.
- To prepare reconstruction projects of nine posts on the State Border of the Russian Federation.

Shvabe
Founded in 1837

Shvabe JSC

SHVABE JSC PROVIDES THE FULL CYCLE OF PROCESSES UNDERLYING THE CREATION OF CUTTING-EDGE ELECTRO-OPTICAL AND LASER EQUIPMENT: FROM BASIC ANDEXPLORATORY RESEARCH TO SERIAL PRODUCTION FOR THE BENEFIT OF RUSSIA'S DEFENSE AND MOST CIVIL INDUSTRIES

SHVABE'S EXPORT UNDER THE MILITARY AND TECHNICAL COOPERATION PROGRAM EXCEEDED THE PLAN BY OVER 18.7% IN 2019

Structure and Product Range

The holding company encompasses over 40 entities of the country's optoelectronic industry which design, produce and supply optoelectronic and laser systems, special- and dual-purpose complexes, as well as civil-purpose items.

Key focuses in terms of special and dual-purpose systems promotion are: creation of thermal-imaging, laser-thermal-imaging and other systems operated in a wide spectral range — from ultraviolet to THz, creation of conceptually new materials, and of the home-made electronic components base and photonics devices, including solid state detector and photo receivers based on them.

Board of Directors

CEO
Alexey Pavlovich Patrikeev

CHAIRMAN OF THE BOARD
Ilya Iosifovich Klebanov

Chairman of the Board of Directors of Shvabe JSC
Ilya Iosifovich Klebanov

CEO of Shvabe JSC
Alexey Pavlovich Patrikeev

Head of Rostec Strategic Research Section
Maxim Vitalyevich Grushkin

Director for Economy and Finance of Rostec
Oksana Gennadievna Lobanova

Industrial Director of Rostec Radio-Electronic Cluster
Sergey Stepanovich Sakhnenko

Head of Section for Legal Support of International and Investment Operations of Rostec Legal Support Department
Andrey Alexandrovich Smotritskiy

Managing Director for Science and Technologies, Chairman of the Research and Technology Council of Rostec
Yuri Nikolaevich Koptev

Key Achievements and Events

- *137 civil-purpose R&D projects completed, 33 devices serialized.*
- *Non-military products share achieved 39.6%.*
- *16 operating room modules, 24 mammographs, 13 X-ray machines, 47 ultrasound systems, 5,000 lung ventilators, 300 defibrillators supplied under the Federal Health Program.*
- *360 new transport and pedestrian traffic lights, 160 traffic light pedestals, 98 outdoor lighting and contact network pedestals, and 15 video surveillance cameras installed to maintain operation of the Smart Transport System of Moscow.*
- *Lighting equipment supplied to Nizhniy Tagil, which allows cutting electricity and lighting operation costs down by 40%, reducing the crime and vandalism rate by 1.5 to 3 times, and by 30 to 40% the number of road traffic accidents.*

Vectors of Development

- *To construct the Heliogeophysical Center of the RAS. To create unique scientific tools under the Federal Program "Science and Technology Development 2013–2020".*
- *To create a modular center for PET-CT examinations, production of radiopharmaceuticals to diagnose oncologic diseases.*
- *To create a full-cycle facility to produce primary pharmaceutical package for injectables.*
- *To supply mobile medical units to Russia's regions during 2020–2021.*
- *To elaborate and to implement serial production of HiFU devices to diagnose and treat neoplasms in mammas and other organs located close to the skin surface.*

Avtomatika Concern JSC

AVTOMATIKA CONCERN JSC IS THE MAJOR DEVELOPER OF CRYPTOGRAPHIC COMMUNICATION HARDWARE AND SYSTEMS, SECURED INFORMATION AND TELECOMMUNICATION SYSTEMS, AND SPECIAL-PURPOSE AUTOMATED CONTROL SYSTEMS

IN 2019, THE SHARE OF CIVIL-PURPOSE PRODUCTS IN THE AVTOMATIKA CONCERN'S TOTAL REVENUE EXCEEDED 60%

Structure and Product Range

The Avtomatika Concern includes 20 enterprises producing over 2,000 articles. Besides being supplied to the domestic market, the products are exported to six countries.

Board of Directors

CEO
Vladimir Alexeevich Kabanov

CHAIRMAN OF THE BOARD
Alexander Vladimirovich Starovoytov

President of FGANU CITIS
Alexander Vladimirovich Starovoytov

CEO of Avtomatika Concern JSC
Vladimir Alexeevich Kabanov

Industrial Director of Rostec Radio-Electronic Cluster
Sergey Stepanovich Sakhnenko

Director for Special Commissions of Rostec
Nikolay Valentinovich Andrianov

Director for Economy and Finance of Rostec
Oksana Gennadievna Lobanova

Director for Organizational Development of Rostec
Anna Nikolaevna Sharipova

Head of Section for Legal Support of International and Investment Operations of Rostec Legal Support Department
Andrey Alexandrovich Smotritskiy

Key Achievements and Events

- *A 1,100 km long underwater fiber-optical telecommunication line (FOTL) designed and constructed to ensure communication between Russian regions bypassing the land territory of third countries.*
- *An information & telecommunication system is created and expanding to link up defense industry enterprises to exchange classified information.*
- *Research and production company established (RPC Kriptonit JSC), to engage in cryptography, quantum computations, machine learning, big data stores, and securing blockchain-based solutions.*
- *Cifromed LLC established for implementation of digital technologies and platform-based solutions generating a single digital circuit of healthcare.*
- *Labeling equipment assembly facility established at Kalugapribor JSC.*
- *Revenue increased by almost one third (up to RUB 49.7 billion) and net profit by two thirds (up to RUB 2 billion).*

Vectors of Development

The innovative activity to focus on traditional sectors:

- *information security,*
- *cyber security,*

and on advanced end-to-end technologies:

- *quantum technologies "Quantum sensors";*
- *wireless communication technologies;*
- *industrial Internet of Things;*
- *big data/blockchain.*

Rostec

HOLDING ***COMPANIES*** *BEYOND CLUSTERS*

10.1%

ROSTEC'S CONSOLIDATED NET INCOME IN 2019

Uralvagonzavod Concern JSC

URALVAGONZAVOD CONCERN JSC IS ONE OF THE WORLD LEADERS IN THE PRODUCTION OF ARMORED VEHICLES AND GUNNERY, RUSSIA'S ONLY DEVELOPER AND MANUFACTURER OF ARMORED FIGHTING VEHICLES AND ARMAMENT, RUSSIA'S LARGEST MANUFACTURER OF RAILWAY VEHICLES

IN 2019, URALVAGONZAVOD'S SHARE IN RUSSIAN SUPPLIES OF FREIGHT CARS AMOUNTED TO 23%. EXPORT OF NEW HEAVY FIRE-THROWING SYSTEMS AND TANK SUPPORT COMBAT VEHICLES INCREASED, T-72 TANKS UPGRADED

Structure and Product Range

The Uralvagonzavod Concern JSC includes over 40 production, design engineering facilities, and research institutes engaging in the designing, manufacturing, and sale of armored vehicles, freight rolling stock, light rail vehicles, road building and off-road machinery.

Board of Directors

CEO
Alexander Valerievich Potapov

CHAIRMAN OF THE BOARD
Vladimir Vladimirovich Artyakov

First Deputy CEO of Rostec
Vladimir Vladimirovich Artyakov

CEO of Uralvagonzavod Concern JSC
Alexander Valerievich Potapov

Director for Implementation of State Programs of Rostec
Ivan Alexandrovich Skrylnik

Director for Legal Support of Rostec
Pavel Mikhailovich Osin

Director for Economy and Finance of Rostec
Oksana Gennadievna Lobanova

Deputy CEO of Rostec
Dmitry Yurievich Lelikov

Managing Director for Science and Technologies, Chairman of the Research and Technology Council of Rostec
Yuri Nikolaevich Koptev

Key Achievements and Events

- *17.8 thousand railcars of various purpose produced. Process sulfuric acid tank car, eight-wheel dump car, timber transport flat car designed and certified.*
- *New types of state-of-the-art innovative low-floor tram cars: 71–415 (single-section), 71–418 (multi-section) designed and certified. Production of proprietary tram bogies established. Certificate of conformity obtained in respect of the 71–411 tram car for 1,000 mm track, with low floor in the medium part. Serial production of single-section, fully low-floor tram car (model 71–415) launched.*
- *Contract amount under the military & technical cooperation program grew 2.4 times.*

Vectors of Development

- *To bring the holding company entities' share in the domestic market of rail cars up to 31% by 2025, to reduce the production cost by 20%.*
- *To increase annual revenue from sales of urban electric transport up to RUB 14 billion by 2025. For this purpose, the light rail urban transport line is supplemented with in-house production of electric transmission elements and tram car unit and assembly control systems.*
- *To achieve a 12% share in the Russian tractor market. Development and broader implementation of electric and hydromechanical transmission, joystick control.*
- *To launch production of equipment for collection, sorting and processing of solid household waste. To bring revenue from sale of such equipment up to RUB 12 billion by 2025.*

National Immunobiological COMPANY

Nacimbio JSC

THE NATIONAL IMMUNOBIOLOGICAL COMPANY (NACIMBIO JSC) IS A HOLDING COMPANY CREATED FOR THE PURPOSE OF ENSURING THE NATIONAL SOVEREIGNTY IN THE PRODUCTION AND SUPPLY OF IMMUNOBIOLOGICAL MEDICATIONS

IN 2019, THE HOLDING COMPANY SUPPLIED VACCINES FOR SCHEDULED IMMUNIZATION, REGISTERED AND TIMELY SUPPLIED 5.4 MILLION DOSES OF ULTRIX QUADRI, AN INFLUENZA PREVENTION SPLIT VACCINE

Structure and Product Range

The Nacimbio JSC incorporates such enterprises as RPA Microgen JSC, FORT LLC, Sintez JSC, which engage in medication development and production.

In 2019, Nacimbio as the sole provider supplied vaccines included in the National Schedule of Preventive Vaccines (order of the Russian Government dated April 23, 2018 No. 744-r), plasmatic blood preparations (order of the Russian Government dated March 28, 2018 No. 520-r) and medications for treatment of HIV infection and tuberculosis, and somatic medications, vaccines and medical equipment for the Federal Penitentiary Service of Russia (orders of the Russian Government dated December 29, 2018 No. 3001-r and No. 3002-r).

Board of Directors

CEO
Andrey Yurievich Zagorskiy

CHAIRMAN OF THE BOARD
Alexander Yurievich Nazarov

Deputy CEO of Rostec
Alexander Yurievich Nazarov

CEO of Nacimbio JSC
Andrey Yurievich Zagorskiy

HR Director of Rostec
Yulia Dmitrievna Tsvetkova

Director for Organizational Development of Rostec
Anna Nikolaevna Sharipova

Director for Legal Support of Rostec
Pavel Mikhailovich Osin

Head of financial policy and consolidated management reporting section of Rostec economy and finance department
Maria Vladimirovna Chernysheva

First Deputy Minister of Health of the Russian Federation
Tatyana Vladimirovna Yakovleva

Key Achievements and Events

- *Ultrix Quadri, the first domestic last-gen inactivated split tetravaccine for influenza prevention, was marketed.*
- *Vactrivir, the first domestic combined vaccine for prevention of measles, rubella and parotitis, was registered.*
- *The first domestic pentavaccine for prevention of pertussis, diphtheria, tetanus, hepatitis B and haemophilus influenza was registered.*
- *Additional prompt supplies of measles prevention vaccine completed as part of cleanup immunization due to adverse epidemic situation.*
- *Agreement signed with MSD, an international company, concerning phase-by-phase production localization of preventive vaccines against rotavirus infection, chicken pox, and human papilloma virus.*

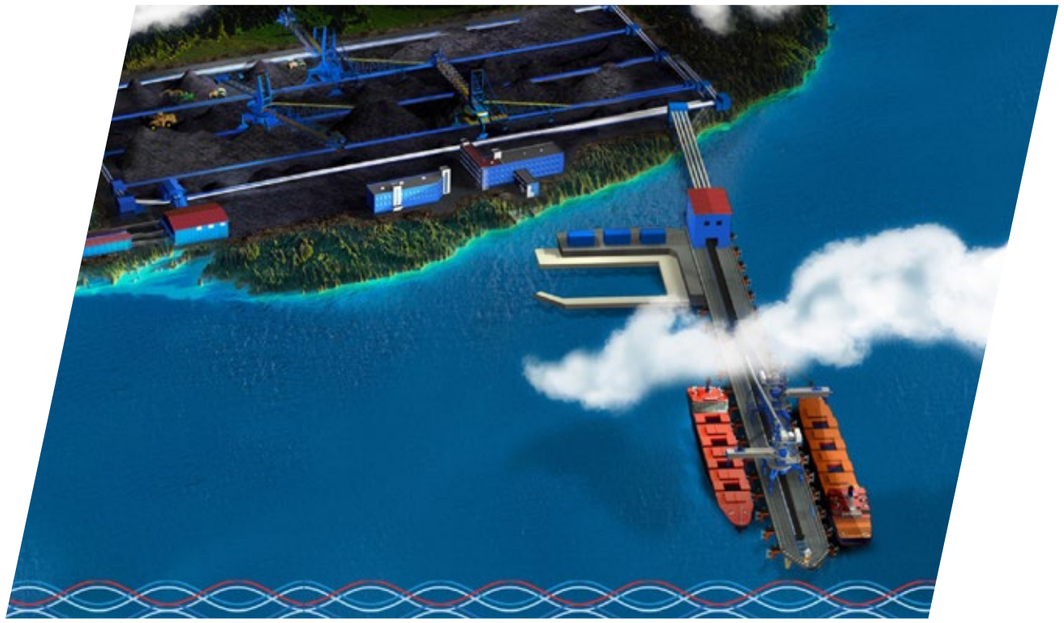
Vectors of Development

- *To upgrade production assets in full compliance with the GMP.*
- *To develop and market new immune-biological medications.*
- *Transfer of production processes and phase-by-phase localization within Russia of advanced vaccines, as per the National Schedule of Preventive Vaccination.*
- *To expand an up-to-date portfolio of top-needed medications: bacteriophages, botulotoxins, allergens.*

Business Development
Rostec

RT-Business Development LLC

RT-BUSINESS DEVELOPMENT LLC IS IMPLEMENTING ROSTEC'S STRATEGY FOR INCREASE OF CAPITALIZATION OF THE CORPORATION'S HIGH-TECH, RESOURCE, AND ASSOCIATED INFRASTRUCTURE PROJECTS



RT-BUSINESS DEVELOPMENT'S NET PROFIT MARGIN IN 2019 AMOUNTED TO 70%

Structure and Product Range

The holding company manages about 19 portfolio and direct investment projects in the field of natural resources, industrial technologies, and infrastructure.

Board of Directors

CEO
Alexander Nikolaevich Nazarov

CHAIRMAN OF THE BOARD
Dmitry Yurievich Lelikov

Deputy CEO of Rostec
Dmitry Yurievich Lelikov

CEO of RT-Business Development LLC
Alexander Nikolaevich Nazarov

Executive Director of Rostec
Oleg Nikolaevich Evtushenko

CEO of ERA LLC
Ekaterina Viktorovna Lapshina

Director for Economy and Finance of Rostec
Oksana Gennadievna Lobanova

Key Achievements and Events

- *RT-Business Development LLC has invested RUB 1.5 billion.*
- *Income generated from partial divestment amounted to RUB 4.2 billion.*
- *Net investment profit generated by RT-Business Development LLC in 2019 from investment projects, without transit dividends, revaluations and exchange rate differences, amounted to RUB 2.5 billion.*

Vectors of Development

RT-Business Development LLC's key mission is to provide assistance to Rostec in the accomplishment of strategic goals, and to increase the monetization of opportunities via Russia's investment projects abroad.

Strategic goals by 2025:

- *total revenue: RUB 125.6 billion;*
- *net profit from projects accomplished during 2020–2025 — RUB 434 billion;*
- *implementation of seven core projects: Sukhoi Log, Industry 4.0, Gurbey, Port Vera, Ogodja, Natural Resources, Medicine IT.*

RT-Chemcomposite
Rostec

RT-Chemcomposite JSC

RT-CHEMCOMPOSITE JSC IS THE CENTER OF COMPETENCE FOR CHEMICAL TECHNOLOGIES AND COMPOSITE MATERIALS

RT-CHEMCOMPOSITE JSC LINKS UP CORE DEVELOPERS OF HIGH-TECH COMPOSITE AND SPECIAL MATERIALS, STRUCTURAL OPTICS, SYNTHETIC FIBERS, AND A WIDE RANGE OF LIGHT CHEMISTRY PRODUCTS

Structure and Product Range

RT-Chemcomposite JSC includes enterprises specialized in scientific research, design and manufacturing of polymer composite material (PCM) products for the aviation and space branches, structural optics for civil machine engineering , high-tech polymers and synthetic fibers.

Board of Directors

CEO
Kirill Yulyevich Shubsky

CHAIRMAN OF THE BOARD
Alexander Yurievich Nazarov

Deputy CEO of Rostec
Alexander Yurievich Nazarov

CEO of RT-Chemcomposite JSC
Kirill Yulyevich Shubsky

Head of Rostec Strategic Research Section
Maxim Vitalyevich Grushkin

Director of Rostec Treasury
Ilina Valerievna Migal

Managing Director for Science and Technologies, Chairman of the Research and Technology Council of Rostec
Yuri Nikolaevich Koptev

Deputy CEO of Alliance Group LLC
Gennady Alexandrovich Vasiliev

Director of Roszheldodrsnab – RZD affiliate
Kirill Borisovich Voronin

Key Achievements and Events

- *Hexagonal boron nitride production launched, for use in aircraft and rocket engines.*
- *Production of import-phaseout polymer materials launched, such as: autoextinguishing structural foam sheets, vehicle floor coating, glue films for multiple-layer glass, transparent granulated PMMA for instrument making.*
- *Structural fiberglasses with improved radio-physical and operating properties created.*
- *Technology developed and implemented, of preceramic polymers — poly(oligo)silazanes, modified with boron and refractory metals (Ti, Zr, Hf, Y, Ta), for ceramic-matrix composites used in the production of rocket and space equipment.*

Vectors of Development

- *To bring to life civil-purpose investment projects for creation of new production facilities to manufacture polymer composite materials, organic-silicon monomers, high-tech polymers, ceramics, synthetic fibers for all branches of economy.*
- *To extend cooperation with foreign partners in civil sectors, such as chemical, composite and fiber technologies, coke and by-product process engineering.*
- *To commercialize the available research potential at own industrial sites, to ensure maximum load of industrial capacities.*
- *To develop cooperation with fuel and energy entities and with the railway sector.*

SIBER JSC

SIBER JSC IS ONE OF LEADING PROVIDERS OF SERVICES TO ENSURE TECHNICAL AND PHYSICAL SECURITY AND SAFETY OF FACILITIES. MAINTAINS VIABILITY AND DEVELOPMENT OF ROSTEC'S SINGLE SECURITY SYSTEM

THROUGH 24 AFFILIATES OF RT-SECURITY JSC, THE HOLDING COMPANY MAINTAINS SECURITY AND SAFETY AT OVER 400 ROSTEC FACILITIES

Structure and Product Range

The holding company encompasses RT-Security JSC, RT-Fire Safety JSC, R&D Center for Security Equipment, and a network of private security companies — RTO-Guard PSC.

Board of Directors

CEO
Vladimir Petrovich Kapysh

CHAIRMAN OF THE BOARD
Nikolay Anatolievich Volobuev

Deputy CEO of Rostec
Nikolay Anatolievich Volobuev

CEO of Siber JSC
Vladimir Petrovich Kapysh

Lead of legal support projects of the corporate governance and asset management section of Rostec Department for Legal Support and Corporate Governance
Konstantin Mikhailovich Kuryshkin

Assistant to CEO – Director for operating support of Rostec CEO
Ilya Anatolievich Myasnikov

Lead of MTC projects of Rostec Department for International Cooperation and Regional Policy
Viktor Nikolaevich Fedorchenko

Chief Security Officer of Rostec
Kazbek Vladimirovich Khodov

HR Director of Rostec
Yulia Dmitrievna Tsvetkova

Key Achievements and Events

- *SIBER's consolidated revenue exceeded last year's figure by 12.8%.*
- *Detected 23 540 facts of breaches of procedures in force at guarded facilities, unlawful entry, carrying-in of forbidden substances, attempted minor misappropriation and theft, including 62 attempts of penetration by unauthorized persons.*
- *Detected 204 attempts of unlawful carrying tangible assets out of guarded territories by enterprise employees, including five attempts of major misappropriation of tangible assets.*
- *RDC Security Equipment appointed to be the center of competence for Rostec security hardware.*

Vectors of Development

- *An Integrated Situation Center will be created, in order to increase the controllability and security of Rostec affiliates, based on the existing Operation Duty Office of the holding company.*
- *Setup of a Shooting Training Center to drill security professionals, including with the use of duty and combat small arms.*
- *Creation of an infrastructure ensuring the security of Rostec affiliates outside of Russia.*

Rostec

5.2

OVERVIEW OF OPERATIONS OF DIRECTLY CONTROLLED ENTITIES IN 2019

54.4 K RUB/month

AVERAGE WAGE AT ROSTEC IN 2019

Strategic Entities under Direct Control

ROSOBORONEXPORT
Russian Defence Export

Rosoboronexport JSC

ROSOBORONEXPORT JSC IS RUSSIA'S ONLY STATE INTERMEDIARY APPROVED FOR THE EXPORT AND IMPORT OF THE ENTIRE RANGE OF MILITARY AND DUAL-USE PRODUCTS, TECHNOLOGIES AND SERVICES

ROSOBORONEXPORT'S ORDER PORTFOLIO REMAINED AT A RECORD LEVEL AND EXCEEDED USD 50 BILLION

Structure and Product Range

The official status of the exclusive special State exporter allows the Rosoboronexport to offer comprehensive solutions to their foreign customers in respect of creating national defense systems for ground, air and sea boundaries, providing an optimum cost-performance ratio. The solutions may include both supply of products and provision of services in the military sector, and establishing licensed production in the customer's country, creation of military and technical infrastructure, joint ventures for machinery manufacturing and maintenance, joint research and development projects.

CEO
Alexander Alexandrovich Mikheev

Key Achievements and Events

— Scope of exported military-purpose products extended. Advanced radio-electronic warfare systems against small-size drones, several types of radiolocation stations and targetry for training of air defense crew, tactical-purpose coastal missile system Rubezh-ME, 300-mm multiple rocket launch system Tornado-S, Kalashnikov assault rifle series 200, remote mine clearing machine MBR Listva, special armored scout vehicle SBRM, upgraded 20 382 project-based corvette, multi-purpose helicopter Ka-32A11M have been marketed internationally.

— Six employees of Rosoboronexport JSC were awarded the National Prize "Golden Idea" 2019 in four nominations.

— Advertising catalogues for new product range promoted by the Rosoboronexport JSC have been created, including: "Civil and Duty Small Arms", "Armament of Law-Enforcement Agencies", "Safeguards of VIPs and critical facilities", "Forensic Outfit".

Vectors of Development

— To expand the geography, extend the product range, and increase the export volumes of Russian-made products of military and dual purpose, as well as special vehicles.

— To set up a Competence Center for technology transfer and intellectual property management.

— To offer foreign customers comprehensive solutions for the creation of national defense systems for land, air and sea boundaries, providing an optimum combination of performance and cost, by implementing mutually beneficial offset programs.

НОВИКОМБАНК

JSCB NOVIKOMBANK JSC

JSCB NOVIKOMBAN JSC IS A STATE-OF-THE-ART FINANCIAL INSTITUTION SPECIALIZING IN THE LENDING TO LEADING ENTERPRISES OF HIGH-TECH INDUSTRIES

FINANCING OF HIGH-TECH COMPANIES INCREASED BY 30.6%, PRIMARILY DUE TO THE FINANCING OF PROGRAMS UNDER NATIONAL PROJECTS

Structure and Product Range

The JSCB Novikombank JSC is among Russia's top 25 financial institutions. Represents the business model of a classic all-purpose corporate bank providing its customers with timely financing, subject to their current needs. The network of branches covers 18 federal subjects. Novikombank maintains branches and offices in Saint Petersburg, Kazan, Tula, Nizhniy Novgorod, Togliatti, Samara, and other Russian cities.

CHAIRPERSON OF THE MANAGEMENT BOARD
Elena Alexandrovna Georgieva

Key Achievements and Events

- NOVIKOMBANK's assets exceeded RUB 472 billion, thus grew by 15%.
- Loan portfolio grew by 27.1% and achieved RUB 352 billion.
- Net profit grew 7 times — up to RUB 10 billion.
- Net interest income grew by 65.2% — up to RUB 17.5 billion.
- Return on equity (ROE) amounted to 22%, against a market average of 15.6%.
- Number of projects for Rostec entities diversification involving the NOVIKOMBANK grew from 35 to 87. Financing provided for this purpose achieved RUB 210 billion.
- Portfolio of mortgage and cash loans grew by 85%. Total amount of mortgage loans granted exceeded RUB 1.1 billion.
- Issue of Rostec and affiliate employee's social and payment cards grew by 131%. As at year-end 2019, social and payment cards were held by more than 230 thousand people.
- Regional coverage was expanded by opening offices in Ural and Siberia.
- The Expert-RA rating agency upgraded the credit rating to ruA level, "Stable" forecast.
- Moody's rating agency upgraded long-term deposit rating to Ba3 level, "Stable" forecast.
- The AKRA agency confirmed the credit rating at A (RU) level, "Stable" forecast.

Vectors of Development

- To increase financing of science-driven and high-technology industries, in order to comply with governmental objectives as to upgrade of the Russian economy, in particular by diversifying the product range and by increasing the non-military product share in the defense industry's output.
- To participate in the deployment of measures of State support provided to priority industries and economy segments; client navigation, primarily Rostec affiliates, under State support schemes intended to develop the industrial production.
- To expand the presence in regions where Rostec affiliates are located, such as Siberia and the Far East.
- To enhance the competitive product line, subject to particular customers' needs.

RT-Energy LLC

RT-Energy LLC is the competence center for energy supply, saving and efficiency.

CEO
Dmitry Igorevich Gottlieb

KEY ACHIEVEMENTS AND EVENTS

- Revenue from Energy Supply operations amounted to: +134% (RT-Energo LLC), +10% (RT-Energo group of companies).
- Major electrical consumer portfolio maintained and increased.
- An energy efficiency improvement project implemented in the construction of a block-modular gas boiler house (28 MW rated heating capacity) and an external gas pipeline for KumAPP JSC (member of Russian Helicopters JSC).
- Energy surveys conducted at Rostec facilities, energy saving and optimization programs prepared, with a cost benefit exceeding RUB 200 million per year.

VECTORS OF DEVELOPMENT

- To implement energy supply projects.
- To deploy the automated resource management system (electrical and heat energy, gas, water and effluents).
- To put in place energy saving and efficiency improvement initiatives, including capital-intensive ones.
- To conduct energy surveys and prepare energy saving and efficiency improvement programs, to analyze financing options of energy saving and efficiency improvement projects.
- To cooperate with the Russian Ministry of Energy and other federal authorities for the purpose of developing and enhancing the regulatory and legal framework of the energy industry.

RT-Capital LLC

RT-Capital LLC is a system integrator for distressed and non-core assets, ensuring comprehensive protection of Rostec's rights and legitimate interests in case of bankruptcy or toxic debt enforcement.

CEO
Kirill Valeryevich Fyodorov

KEY ACHIEVEMENTS AND EVENTS

- Total value of funds and assets enforced/collected from handling distressed receivables grew by 60%, up to RUB 3.2 billion.
- Enforced and restructured distressed receivables transferred by Rostec amounted to RUB 5.6 billion.
- Revenue from sale of non-core assets totaled to RUB 8.4billion.
- Asset portfolio achieved RUB 120 billion.
- RT-Capital's management circuit encompassed over 150 distressed and non-core companies.
- As part of enforcement of AvtoVAZAgregat's distressed receivables, shareholding in BelZAN (Russia's leading manufacturer of fittings, coil springs and normals used by KAMAZ and AVTOVAZ) was consolidated. Debts of BelZAN group companies were restructured to a total of RUB 800 million, which allowed avoiding bankruptcy of the major employer.
- Service agreement has been signed for support of bankruptcy proceedings and legal servicing of distressed developers for the benefit of Dom. RF.

VECTORS OF DEVELOPMENT

- To achieve benchmarks and to accomplish objectives set by the Corporation and approved in the RT-Capital's development strategy through 2025.

- RT-Capital to develop as an end-to-end center of crisis management, transformation, asset value creation, and mobilization of the Corporation's investment resource.
- To strengthen cooperation with Moscow Government on renovation, technology park development.
- In cooperation with Plekhanov RUE, to create and form an expert center of crisis management and distressed assets restructuring.

RT-Inform LLC

RT-Inform is responsible for procurement to Rostec holding companies and affiliates of IT, information security, software acquisition, implementation, support, and provision of IT-related services.

CEO
Aziz Tofikovich Bedirov

KEY ACHIEVEMENTS AND EVENTS

- Revenue increased by more than 46%.
- Net profit increased by more than 70%.
- Category-based procurement approach fully enacted.
- The common corporate technical standard for IT assets updated.

VECTORS OF DEVELOPMENT

- To expand the automated finance & procurement system to Rostec affiliates.
- To create a corporate office to manage Rostec affiliates' digital transformation.
- To prepare a concept for deployment of a common corporate ERP system at Rostec.
- To implement the IT strategy to create a single data processing center and to organize the IT infrastructure of the Rostec-City complex.

RT-Finance JSC

RT Finance provides a wide range of financial and consulting services to Rostec affiliates.

CEO
Anna Petrovna Orlenko

KEY ACHIEVEMENTS AND EVENTS

- Rostec's consolidated financial statements 2018 under IFRS prepared and supported.
- A competence center for preparation of financial statements under IFRS was set up.
- The range of financial instruments in which RT-Finance, as Rostec's pool leader, will be able to invest, has been expanded.
- Funding provided for assignment of receivables (factoring), which allowed Rostec affiliates to finance their working capital, replace loans without increasing the debt burden, manage contractual grace periods.

VECTORS OF DEVELOPMENT

- To increase intra-group financing operations with Rostec affiliates, in particular by expanding the list of contractors from among Rostec affiliates.
- To develop the competence center for evaluation of affiliates' financial position and financial risk level.
- To develop IT systems for the automation of business processes related to intra-group financing operations, and systems for preparation of financial statements under IFRS.
- To organize the initial bond offering to finance Rostec's projects related to the production and sale of civil-purpose products.

Directly Controlled Entities

Roschemzaschita Corporation JSC

Roschemzaschita Corporation JSC is the leader in the development and production of radiation, chemical and biological protective gear, reconnaissance, and life support systems of special, dual and civil purpose.

CEO
Marat Mukhazhirovich Chabdarov

KEY ACHIEVEMENTS AND EVENTS

- Pilot production of unique chemical products and materials to absorb ammonia, sulfur oxides, and organic matters used in the protective suit fabrication, has been launched.
- A smoke protection hood DZK-15 has been designed on the basis of an innovative regenerative product, for the MS-21 aircraft crew.
- The ShS-30E self-rescuer obtained international certificate required for supplies to Asian countries.
- Export of self-rescuers to European and CIS countries has been established.
- Research and development works have been undertaken regarding creation and enhancement of life support systems for space vehicle and advanced station crews (Electron-VM, SPDU, and other systems).

VECTORS OF DEVELOPMENT

- To set up a high-duty facility to manufacture protective machinery components using direct production technologies.
- To create a comprehensive information system to manage the multi-stage wide-range production.
- To produce smoke hoods DZK-15 and a range of thermochemical oxygen generators to be used in civil aircraft.
- To implement the ChP-I-I product for medical purposes.

Kalashnikov Concern JSC

The Kalashnikov Concern JSC manufactures and supplies fire arms, remote weapon stations, track vehicles, ships and speedboats, drones, special clothes and gear to over 30 countries worldwide.

CEO
Dmitry Valerievich Tarasov

KEY ACHIEVEMENTS AND EVENTS

On September 19, 2019, attended by the President of the Russian Federation, the opening ceremony of Kalashnikov Academy in Izhevsk took place. Its students are taught in IT, robotics, industrial design. In addition, Kalashnikov Academy features a neuro- and a mechatronics laboratory.

VECTORS OF DEVELOPMENT

- To use competences of RPA Molniya to design reusable aerospace vehicles.
- To scale up the production of Kometa 120M, a foil-borne passenger vessel.
- To implement the project of creating a photo- and video-fixation system operator for the road network of the Russian Federation.

- To design the Nanuk complex system intended for operation in arctic conditions, and incorporating special drones, high-latitude gear, life support and relocation systems.

CNIITOCHMASH (Central Research Institute for Precision Machine Engineering) JSC

The CNIITOCHMASH JSC is the research and development center of small arms, ammunition, simulators, battle gear, other weapons, protective gear against precision weapons.

CEO
Albert Vladimirovich Bakov

KEY ACHIEVEMENTS AND EVENTS

- The Center, a high-duty software and hardware complex (capacity of 50 trillion operations per second), intended for physico-mathematical modeling of small-arms systems lifecycle, has been put into operation.
- 1 730 certification trials for 700 pieces of weapon, 230 batches of bullets, and 800 pieces of armor protection gear have been completed.

VECTORS OF DEVELOPMENT

- To use computer-aided simulation methods with the use of the high-duty software and hardware complex Center to design advanced weapons, military and special machinery.
- To design and serialize nondestructive testing aids for special alloys, ceramics, composites, based on the laser ultrasound and allowing to determine the physical and mechanical properties of the materials in finished products of military, dual, and civil purpose.
- To set up an experimental research center and to design within a short timeframe prototypes of small arms systems, using world-class breakthrough technologies.

RT-SocStroy LLC

RT-SocStroy LLC is the general designer and general contractor for the construction, fitting-out and putting into operation of healthcare facilities.

CEO
Alexander Samuilovich Kolotov

KEY ACHIEVEMENTS AND EVENTS

- The design of a birthing center in Magadan completed and delivered to the customer.
- Construction of an antituberculosis dispensary in Khabarovsk started.
- The design of a general hospital in Nazran for 450 beds prepared for technical and price audit, for the facility to be included in the Federal Targeted Investment Program.

VECTORS OF DEVELOPMENT

- RT-SocStroy to participate as the sole provider (contractor) of construction works of an emergency hospital in Sevastopol and a Children's regional clinical hospital in Tver.
- To act as a technical customer, general designer and supplier of medical equipment for the construction of an addiction rehab clinic for the Valuevo clinical sanatorium.

Oktava PJSC

Oktava PJSC is the manufacturer of a wide range of acoustic devices: microphone equipment, telephone and microphone insets and headsets.

INTERIM CEO
Vladimir Mikhailovich Saukh

KEY ACHIEVEMENTS AND EVENTS

- Revenue grew by 40% up to RUB 233 million.
- Export geography broadened by 55%.
- Biometric microphones marketed.
- An advanced musical solution was presented: vocal microphone MK-119.
- Serial production of professional recording microphones MK-115, MK-117, MKL-112 launched.

VECTORS OF DEVELOPMENT

- To set up production of hearing aids.
- To strengthen the positions in the broadcasting, concerting.
- To replace up to 50% of equipment, gauges, and product quality evaluators.
- To serialize the production of headsets for radio stations.
- To market a dynamic vocal microphone and a home studio system.

RT-Logistics JSC

RT-Logistics JSC is the competence center in logistics, providing the whole range of transport, logistics and customs services for the purpose of increasing efficiency of logistics support provided to Rostec entities.

CEO
Artyom Anatolievich Fedosov

KEY ACHIEVEMENTS AND EVENTS

- Consolidated revenue achieved RUB 2.3 billion, which exceeds the 2018' figure by 24%.
- Net profit grew to RUB 83.2 million.
- Vehicle fleet increased from 39 to 88 units.
- 16,251 customer requests, including customs operator services, accomplished in 2019.
- RT-Logistic's representatives work in Vladimir, Saint-Petersburg, Yekaterinburg, Naberezhnye Chelny.

VECTORS OF DEVELOPMENT

- To enhance and increase the basic infrastructure of the holding company's logistics assets.
- To expand the geography of presence in Russian regions.
- To service customs operations in connection with mailings sent by individuals in case of cross-border trade.

Kaliningrad Amber Factory JSC

Kaliningrad Amber Factory JSC is the worldwide largest commercial producer of amber.

CEO
Mikhail Ivanovich Zatsepin

KEY ACHIEVEMENTS AND EVENTS

- 457.5 tons of amber produced in 2019, including 18 unique ingots weighing above 1 kg each.
- Record was set in raw amber production: 8 tons in a 12-hour shift, against the average of 4 to 4.5 tons.
- Output of the walking excavator ESh 11/70 achieved an absolute record of 1.9 million m^3 total rock, against the plan of 1.5 million m^3. The 230 thousand m^3 per month figure was the excavator's alltime best during the factory's history.
- Russia's first-ever auction of unique amber with inclusions was held by Yantarny Yuvelirprom JSC — an affiliate of Kaliningrad Amber Factory.
- The Karier substation (110 kW) was upgraded, lighting installed along the road from Yantarny drive way to the quarry administration, and major repairs undertaken of electrical lines at warehouses and in other premises. Total length of pipes replaced within the factory achieved 2.2 km.

RT-Project Technologies JSC

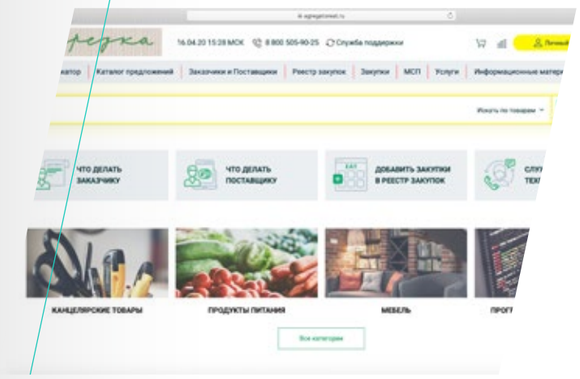
RT-Project Technologies JSC is a competence center for IT development and deployment in governmental procurement, including pricing control systems.

CEO
Sergey Nikolaevich Yarosh

KEY ACHIEVEMENTS AND EVENTS

- The Integrated Procurement Information System (IPIS) has been further developed for the benefit of the Russian Treasury. The amount of contracts and agreements placed yearly in the IPIS totals to about RUB 27.9 trillion; 300 million transactions are processed daily; the system encompasses over 2.7 million active users, is integrated with more than 200 external systems, and contains about 960 TB of procurement data.
- The Integrated Trade Aggregator "Beryozka" is maintained for small-size procurement purposes. By means of the aggregator, 51,990 deals were consummated totaling RUB 11,929,856,471. In addition, 272,821 deals totaling RUB 9.355 billion were recorded in the procurement register.

TABLE OF CONTENTS



- Measures taken to increase the non-core assets value to a total of RUB 4,335 million.
- In 2019, RT-Project Technologies' revenue grew by 10%, while the net profit increased more than 6 times and exceeded RUB 1 billion.

VECTORS OF DEVELOPMENT

- To create a price comparison system for goods (works, services) of same kind, to provide ongoing access to the data to employees of core agencies of the Federal Antimonopoly Service of the Russian Federation and to other concerned agencies.
- To implement digitization and digital import phaseout projects with private partners, in order to improve the efficiency of procurement operations of Government customers, to sell non-liquid stocks, to attract foreign tourists to Russia, to organize the unmanned vehicle traffic.

Neftegazavtomatika JSC

Neftegazavtomatika JSC is the competence center in oil and gas technologies.

CEO
Konstantin Vladislavovich Stanislavchik

KEY ACHIEVEMENTS AND EVENTS

- Revenue from implementation of innovative civil-purpose products grew 1.6 times, up to RUB 426 million.
- World's first automated aircraft filling control designed, with continuous aviation fuel metering in units of mass and real-time data transmission.
- A 25% level of hardware localization achieved, import dependence reduced in the production of high-tech equipment for directed drilling of oil and gas wells.
- An automated toxic emission eco-monitoring system deployed.

VECTORS OF DEVELOPMENT

- Serial deployment of aviation fuel metering systems.
- To serialize the automated toxic emission eco-monitoring systems.
- To increase the level of hardware localization up to 38% in the production of high-tech equipment and software for directed drilling of oil and gas wells.

5.3 Delivery by Rostec Affiliates on the State Defense Order and National Programs in 2019

One of Rostec's key statutory functions is the organization of delivery on the State Defense Order, Federal Target Programs and programs for military and technical cooperation between the Russian Federation and foreign states.

State Defense Order

In 2019, Rostec State Corporation and its affiliates operated in connection with the State Defense Order (SDO) pursuant to the following regulatory acts:

- Federal Law No. 275-FZ dated December 29, 2012 "On the State Defense Order";
- Federal Law No. 60-FZ dated December 13, 1994 "On the supply of products for federal needs";
- Federal Law No. 44-FZ dated April 5, 2013 "On the contract system in the procurement of goods, works, services for federal and municipal needs";
- Decree of the Russian Government No. 1255 dated December 26, 2013 "On the Rules of elaboration of the State Defense Order and its key parameters";
- Decree of the Russian Government No. 1275 dated December 26, 2013 "On exemplary provisions of government contracts under the State Defense Order";
- Decree of the Russian Government No. 504 dated June 2, 2014 "On defining the notion of a major breach of provisions of a government contract under the State Defense Order".

The scope of Rostec affiliates' activities covers the designing, manufacturing, upgrade, after-sale service, repair and disposal of arms, military and special equipment (AMSE).

Rostec affiliates hold key positions for a wide range of final models of the AMSE, and of component parts for Aerospace Forces, Ground Forces, Airborne Forces, and coastal defense troops of the Navy.

In 2019, over 360 Rostec affiliates delivered on the SDO.

The most important items of AMSE supplied by Rostec affiliates to the governmental customers include:

- aircraft Su-34, Su-35s, Il-76MD-90A, Be-200, Yak-130;
- helicopters Mi-8 (AMT, AMTSh, MTV-1, MTV-5-1 modifications), Mi-28 (N, NM, UB modifications), Mi-35M, Mi-38T, Ka-52, Ka-226T;
- Pantsir-S1 air defense missile-gun systems;
- tactical ballistic missile system Iskander-M;
- multiple-launch rocket systems Tornado-G;
- radio-electronic warfare systems Bylina, Vitebsk, Khibiny and Palantin;
- facilities of the integrated tactical control and command system Sozvezdie;
- self-propelled artillery weapons Coalitia-SV and Msta-SM;
- infantry combat vehicles BMP-3;
- airdrop combat vehicles BMD-4M;
- armored recovery and repair vehicles BREM-L and BREM-1M;
- ammunition, air bombs of various gauges;
- Ratnik battle suits;
- army vehicles, including protected ones of the Taifun-K family.

Share of industrial clusters in the delivery on SDO 2019:

- aviation cluster — 48.3%;
- conventional arms, ammunition and special chemistry cluster — 30%;
- radioelectronic cluster — 19.8%;
- other entities — 1.9%.

Tasks under the SDO 2019 have been fulfilled by Rostec entities to 99.5%.

In order to ensure delivery on SDO projects in 2019, the Corporation cooperated with federal executive authorities, governmental customers, as well as third-party integrated structures — general SDO contractors, including: Almaz-Antey VKO Concern JSC, Tactical Missiles Corporation JSC, Corporation MIT JSC, United Shipbuilding Corporation JSC.

Real-time interaction with the duty shift of the National Defense Agency of the Russian Federation took place as well.

National Programs

In 2019, over 120 Rostec affiliates participated in the implementation of a range of projects as part of key State and Federal Target Programs for the development of the defense sector, including:

- Development of the Defense Industry;
- Development of the Aviation Industry;
- Development of Electronic and Radio-Electronic Industry.

In all, Rostec affiliates delivered on more than 400 re-equipment, capital construction, research and development projects.

The above activities include over 80 investment projects which were subsidized by the Russian Federation in form of an asset contribution to the Corporation, including 26 projects of production facilities' upgrade, which have been completed and commissioned.

Holding companies of the aviation cluster (United Engine Corporation JSC, Russian Helicopters JSC, Radioelectronic Technologies Concern JSC and Technodinamika JSC) have completed renovation and retooling projects of key production facilities and specific sections, renewal of machinery stock and deployment of Russian-made high-tech equipment, to ensure the manufacturing of:

- helicopters and their components;
- gas-turbine and turbojet engines for advanced aerial vehicles;
- frame-borne vehicles;
- state-of-the-art avionics.

Holding companies of the conventional arms, ammunition and special chemistry cluster: High Precision Systems JSC, and Techmash JSC have completed investment projects for renovation and retooling of facilities producing:

- rocketry components;
- small arms;
- state-of-the-art ammunition for artillery systems.

Integrated structures of the radio-electronic cluster, including Ruselectronics JSC, Shvabe JSC, Avtomatika Concern JSC, have completed renovation ad retooling of core facilities, among which:

- renovation and retooling of facilities producing optoelectronic instruments for space- and aircraft, and for fighting machines based on unified cross-branch tracked vehicle platform;
- facilities upgrade for the purpose of designing and manufacturing communication and control complexes as part of automated ground-based and airborne control systems.

In 2020 and beyond, the upgrading of key production facilities of Rostec enterprises belonging to the defense sector will continue.

5.4 International Activities

Military & Technical Cooperation

In 2019, Rostec entities — weapon manufacturers and exporters — kept on adapting to the new environment involving anti-Russian sanctions, unprecedented pressure upon traditional buyers of Russian equipment, and intensified competition in the weapons market.

Over the year, a wide range of state-of-the-art military hardware has been marketed, with proven tactical, technical and operating performance in combat conditions.

Shares of industrial clusters in the volume of supplies are as follows:

- aviation cluster — 64%;
- conventional arms, ammunition and special chemistry cluster — 32%;
- radioelectronic cluster — 4%.

In all, over 100 Rostec entities were involved in the manufacturing and supplies of military-purpose products for export, in particular, as part of production, research and technical cooperation with CIS countries. They delivered on 1,400 contracts (commission agreements).

Supplies were fulfilled by entities both jointly with the Rosoboronexport JSC being the State intermediary, and as independent subjects of military and technical cooperation.

Interaction with the State intermediary Rosoboronexport JSC was deployed in the following areas:

- marketing assistance via Rostec representative offices in foreign states;
- control and coordination of compliance by Rostec entities with their contractual obligations toward the State intermediary, in respect of production and supply of military-purpose products for export;
- settling matters of internal pricing for military-purpose products to be supplied to foreign customers;
- providing surety to guarantee performance under bank loans;
- assisting in the organization of top-level negotiations with foreign customers;
- joint participation in the proceedings on enhancement of the regulatory and legal framework on matters of the military and technical cooperation;
- joint participation in intergovernmental commissions on matters of the military and technical cooperation.

Efforts made by Rostec in cooperation with concerned federal authorities and organizations ensured confident preservation of Russia's high positions in the global arms market in 2019.

Key International Projects 2019'

During the reporting period, Rostec provided active assistance to entities of the Corporation in the international marketing of civil and dual-use products. The potential of the Corporate

representatives in respective foreign countries was maximally used, which is an efficient tool for fulfillment of Rostec commitments as to export promotion of high-tech products.

Currently, the Corporation maintains 55 representative offices abroad. De facto, 51 of them are operating: offices in Laos, Yemen, Libya and Ukraine have been suspended. A whole range of Rostec representative offices are region-wide, which expands considerably the geography of the Corporation's international business.

Best practices of assistance to promotion of high-tech products by Rostec foreign offices are described below.

CHINA

One of key premieres at the MAKS-2019 aerospace show was the full-scale mockup of CR929, an advanced Russian-Chinese wide-bodied long-range aircraft, which will be first supplied to customers in 2025-2027.

In October 2012, the Board of Directors of CRAIC, a joint venture of the UAC and the Chinese COMAC Corporation for the CR929 program, approved the setup of an engineering center in Russia. Its branch will open in Shanghai, were final assembly of the aircraft will take place.

In 2019, the Russian Helicopters JSC has signed contracts for supply to China of the following Russian-made helicopters:

- 68 units of Mi-171 (including upgraded Mi-171E);
- 18 units of Mi-171Sh (military & transport);
- 14 units of Mi-171, with VK-2500 engine;
- 21 units of Ansat.

On June 6, 2019, at the Saint Petersburg international economic forum (SPIEF-2019), the KAMAZ PJSC and the Chinese Weichai Power Co., Ltd signed an agreement setting up a joint venture at Tutaev engine plant, for the production of industrial diesel and gas engines, with volume above 17 l and power between 520 and 2,500 kW.

The engines are suitable for shipbuilding, electric power generators, and heavy-duty special vehicles. The key region where they will be marketed are countries of the CIS and of the Eurasian Customs Union. Serial production of the engines is planned for the mid 2020.

In May-June 2019, the Center of Oil and Gas Technologies (Neftegazavtomatika JSC) completed pilot testing of a logging-while-drilling (LWD) device at oil fields in East Siberia. The device was designed jointly with CETC (Chinese Electronic Technologies Corporation). Following the pilot test, an agreement was signed at the SPIEF-2019 between the Neftegazavtomatika JSC and the 22nd CETC Research Institute, in respect of joint production of the equipment for oil service companies, contemplating the involvement of Rostec's production capacities.

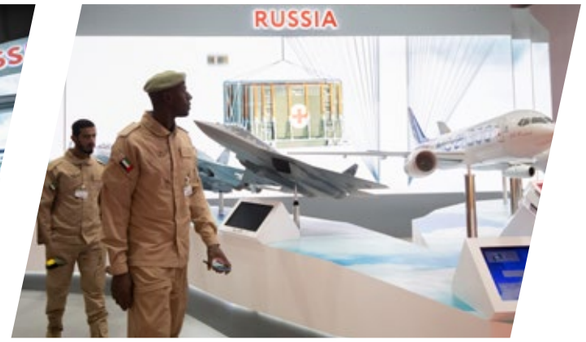
SINGAPORE

Since January 2019, a project of the Engineering and Innovations Center of Rostec's radio-electronic cluster (Ruselectronics JSC, Shvabe JSC, and Avtomatika Concern JSC) is being implemented at the facilities of the Center for International Promotion of Russian High-Tech Companies and Investment Projects Presentation.

In September 2019, with the Center's assistance, Shvabe JSC and the Taisiya Corporation Ltd (Singapore) signed a long-term partnership memorandum for the development of sales of Shvabe's arterial tension correctors in Asian countries. The memorandum was supported by a contract with a planned volume of supplies of up to 750 thousand units. The first lot of 10 thousand arterial tension correctors ABP-051 will be supplied to Bangladesh.

In September 2019, at the 10th session of the top-level Russia-Singapore Intergovernmental Commission, a cooperation agreement was signed between Rostec and the Institute of Technical Education (ITE), Singapore, providing for setup of a Center of professional education and HR certification for innovative industries in Moscow. The document defines the key principles of cooperation, academic profile, and project implementation plan. Pursuant to the agreement, Singaporean experts will be involved in the first stage of the project — till July 2022.

In December 2019, as part of a business session of Moscow Government "Smart City Technologies: Advanced Smart Solutions for End-to-End Projects" in Singapore, the RT-Techpriemka JSC presented a project named "Center of supplies quality as a comprehensive solution for building efficient relationship between Asian corporate customers and Russian suppliers". Previously, in September 2019, the RT-Techpriemka JSC signed the respective agreement with the Russia-Singapore Business Council.



REPUBLIC OF KOREA

Under the effective memorandum of cooperation between Rostec and the administration of Gyeonggi province, on October 31, 2019, the opening of the Russian-Korean Center for Technologic Cooperation took place in Ansan technology park. The Center is accommodated in the ERICA Industrial Research Complex of Hanyang Polytechnic University.

Residents of the Center are Rostec representative office in the Republic of Korea, the Russian-Korean business council, and the Korean financial group HANA. The Center exhibits products and solutions of Ruselectronics JSC and Shvabe JSC. The Center's business objective is to assist the joint designing and promotion of advanced civil-purpose products, and to master state-of-the-art designing and production technologies.

ITALY

In July 2019, an agreement was signed between the Italian concern Stone and the Scantronic Systems LLC (member of Ruselectronics JSC) for the supply of inspection complexes under infrastructure projects of the Italian General Directorate of Customs in Genova and Trieste ports for an amount of EUR 76 million.

INDONESIA

In December 2019, negotiations between Rostec delegation and PT. REGIO AVIACI INDUSTRI (Indonesia) took place in Djakarta. The parties expressed their intention to jointly create environment to set up production of the Il-114-300 and its modifications in Indonesia. The respective agreement is supposed to be signed during Vladimir Putin's visit to Indonesia in 2020.

MALAYSIA

In 2019, after a seven-year break, steps were taken to resume the Russian-Malaysian cooperation, in particular, to promote Russian high-tech products, including those of military purpose, in the Malaysian market. For this purpose, the first session of the Joint Russian-Malaysian Commission for economic, research and cultural cooperation took place in Moscow in October 2019.

AFRICA

At the Russia — Africa economic forum, an agreement was signed between Giportsvetmet JSC (member of the RT-Business Development holding company) and the African Export & Import Bank (Afreximbank), the V Holding Group, and the Russian Export Center (REC JSC), providing for creation of a multinational platform for the implementation of mining projects.

INDIA

At the Aero India 2019, the Russian Helicopters JSC signed a number of memorandums of understanding with Indian companies, providing for the setup of production of assemblies and components of Ka-226T helicopter.

SERBIA

Rostec and the Government of the Republic of Serbia signed a memorandum of cooperation at the International Aerospace Show MAKS-2019. The parties have agreed to jointly develop innovative projects based on advanced technologies, and to promote high-tech products.

AZERBAIJAN

In December 2019, construction of a service center for repair and maintenance of Russian-made Mi-8 helicopters was launched in the Republic of Azerbaijan.

KAZAKHSTAN

The Russian Helicopters JSC signed an agreement with the Kazakhstan Engineering Comapny and Aircraft Repair Plant No. 405, for the supply of 17 knock-down kits for the assembly of Mi-8/171 helicopters in the Republic of Kazakhstan.

In December 2019, an investment agreement was signed for the setup of a KamAZ components production facility in the Republic of Kazakhstan. The document provides for the Republic of Kazakhstan to assume obligations as to finance the component manufacturing, to grant tax preferences, to exempt from payment of customs duties, and to reimburse a portion of costs to the investors.

KIRGIZIA

In 2019, the infrastructure of the first phase of the "Safe City" project in Kyrgyz Republic was put into operation by Vega Concern, member of Ruselectronics JSC. In Bishkek, software and hardware complexes have been deployed, providing automatic photo- and video-evidencing of road traffic offenses, and a smart video surveillance system.

UZBEKISTAN

Pursuant to an agreement between Uzavtosanoat JSC and KAMAZ PJSC providing for setup of a production facility in the Republic of Uzbekistan, a new two-shift production line was organized in November 2019, where KAMAZ trucks are assembled, with rated capacity of up to 3,000 units per year.

In Dzhizak region, the M. F. Stelmakh Polyus RDI JSC (member of Shvabe JSC) implements a project for serial production of automated water treatment systems under the program of drinking water supply to rural population.

The importance of Rostec affiliates operating in foreign states is increasing, as the President of the Russian Federation has adopted decisions on increasing the efficiency of relationship abroad between Russia's trade missions and Russian companies, for the purpose of accomplishing strategic objectives as to upgrade of the Russian economy, with a focus on attracting advanced technologies and investment, energy efficiency, increasing the high-tech products' share in the export.

Participation in International Exhibitions

EXHIBITION	DATE AND VENUE
1. **ShieldAfrica-2019** INTERNATIONAL SECURITY AND DEFENSE EXHIBITION	**January 21–24** ABIDJAN, COTE-D'IVOIRE
2. **Safety Technologies — 2019** INTERNATIONAL FORUM	**February 12–14** MOSCOW, IEC CROCUS EXPO
3. **AERO INDIA — 2019** INTERNATIONAL AEROSPACE EXHIBITION	**February 14–18** BANGALOR, INDIA
4. **IDEX-2019** INTERNATIONAL DEFENSE EXHIBITION	**February 17–21** ABU DHABI, UAE
5. **Mobile World Congress — 2019**	**February 25–28** BARCELONA, SPAIN
6. **CIEX-2019** INTERNATIONAL EXHIBITION	**March 7–10** TIANJIN, PRC
7. **IWA-2019** INTERNATIONAL SPORTING AND HUNTING WEAPONS EXHIBITION	**March 8–11** NUREMBERG, GERMANY
8. **Lima-2019** INTERNATIONAL AEROSPACE AND NAVAL EXHIBITION	**March 26–30** LANGKAWI, MALAYSIA
9. **Asia Health — 2019** INTERNATIONAL FAIR OF HEALTHCARE PRODUCTS AND SERVICES	**March 27–29** SINGAPORE

EXHIBITION	DATE AND VENUE
10. **LAAD-2019** INTERNATIONAL LATIN AMERICAN EXHIBITION OF AIRCRAFT AND DEFENSE SYSTEMS	**April 2–5** RIO DE JANEIRO, BRAZIL
11. **The Arctic — territory of dialogue** INTERNATIONAL ARCTIC FORUM	**April 9–10** SAINT PETERSBURG
12. **ExpoElectronica-2019** INTERNATIONAL ELECTRONIC INDUSTRY EXHIBITION	**April 15–17** MOSCOW, IEC CROCUS EXPO
13. **NEFTEGAZ-2019** INTERNATIONAL EXHIBITION OF EQUIPMENT AND TECHNOLOGIES FOR OIL AND GAS SECTOR	**April 15–18** MOSCOW, CEC EXPOCENTER
14. **MIOGE / Oil & Gas** INTERNATIONAL OIL AND GAS INDUSTRY EXHIBITION	**April 23–26** MOSCOW, IEC CROCUS EXPO
15. **FAMEX-2019** INTERNATIONAL AEROSPACE EXHIBITION	**April 24–27** SANTA LUCIA, MEXICO
16. **IDEF-2019** INTERNATIONAL DEFENSE EXHIBITION	**April 30 — May 3** ISTANBUL, TURKEY
17. **MILEX-2019** INTERNATIONAL WEAPON AND MILITARY EQUIPMENT EXHIBITION	**May 15–18** MINSK, BELARUS
18. **SITDEF Peru — 2019** INTERNATIONAL FAIR OF DEFENSE TECHNOLOGIES	**May 16–19** LIMA, PERU
19. **CIPR-2019** DIGITAL INDUSTRY OF INDUSTRIAL RUSSIA, IV CONFERENCE	**May 22–24** INNOPOLIS, REPUBLIC OF TATARSTAN
20. **HeliRussia-2019** INTERNATIONAL HELICOPTER INDUSTRY EXHIBITION	**May 23–25** MOSCOW, IEC CROCUS EXPO
21. **SPIEF-2019** SAINT PETERSBURG INTERNATIONAL ECONOMIC FORUM	**June 6–8** SAINT PETERSBURG, RUSSIA
22. **Russian-Chinese EXPO — 2019** INTERNATIONAL BUSINESS FAIR	**June 16–19** HARBIN, CHINA
23. **Paris Air Show — 2019** INTERNATIONAL AEROSPACE SHOW	**June 17–21** PARIS, FRANCE
24. **Communic Asia — 2019** INTERNATIONAL COMMUNICATIONS TECHNOLOGY AND IT EXHIBITION & CONFERENCE	**June 18–20** SINGAPORE
25. **Amberforum-2019** INTERNATIONAL AMBER INDUSTRY FORUM	**June 20–23** SVETLOGORSK
26. **Army-2019** INTERNATIONAL MILITARY-TECHNICAL FORUM	**June 25–30** KUBINKA, MOSCOW REGION, CEC PATRIOT
27. **INS-2019** INTERNATIONAL NAVY SHOW	**June 26–30** SAINT PETERSBURG
28. **INNOPROM-2019** INTERNATIONAL INDUSTRIAL EXHIBITION	**July 8–11** YEKATERINBURG
29. **MAKS-2019** INTERNATIONAL AEROSPACE SHOW	**August 27 — September 1** ZHUKOVSKY
30. **BIOTECHMED-2019** EXHIBITION OF MEDICAL TECHNOLOGIES	**September 4–6** VLADIVOSTOK
31. **Eastern Economic Forum — 2019**	**September 4–6** VLADIVOSTOK
32. **Import Phaseout-2019**	**September 10–12** MOSCOW, IEC CROCUS EXPO
33. **DSE-2019** INTERNATIONAL DEFENSE EXHIBITION	**October 2–4** HANOI, VIETNAM
34. **Arms & Hunting — 2019** INTERNATIONAL ARMS EXHIBITION	**October 10–13** MOSCOW, GOSTINYI DVOR
35. **Business mission timed to the ITAP exhibition**	**October 22–24** SINGAPORE
36. **Interpolitech-2019** POLICE & MILITARY HARDWARE EXHIBITION	**October 22–25** MOSCOW, VDNKH
37. **RUSSIA — AFRICA — 2019** ECONOMIC FORUM	**October 23–24** SOCHI
38. **BIDEC-2019** INTERNATIONAL DEFENSE EXHIBITION & CONFERENCE	**October 28–30** MANAMA, BAHRAIN
39. **Dubai Airshow — 2019** INTERNATIONAL AEROSPACE EXHIBITION	**November 17–21** DUBAI, UAE
40. **DEFENSE AND SECURITY — 2019** INTERNATIONAL ASIAN DEFENSE AND SECURITY EXHIBITION	**November 18–21** BANGKOK, THAILAND
41. **Milipol Paris — 2019** INTERNATIONAL EXHIBITION OF SAFETY FACILITIES AND SYSTEMS	**November 19–22** PARIS, FRANCE
42. **Gulf Defense & Aerospace — 2019** INTERNATIONAL ARMS AND MILITARY HARDWARE EXHIBITION AND CONFERENCE	**December 10–12** AL-KUWAIT, KUWAIT

In 2019, Rostec organized 42 expositions at international congress and exhibition events for entities from various industry sectors, including 22 events abroad and 20 events in Russia. Over 150 Russian companies took part in Rostec expositions, where over 3,000 exhibits were shown.

As compared to 2018, it can be noted that generally, leased areas at international congress and exhibition events tend to increase; the number and the geography of the said exhibitions attended by the Russian business community in the reporting year have expanded.

5.5 Corporate Finance, Budgeting and Accounting

Operations of Rostec funds

As at the beginning of the year, the scope of money pooled in the Corporation's target funds reached 52 billion rubles. According to decisions made by the Corporation in preceding years, RUB 33 billion has been put aside to finance key investment projects of Rostec entities and to provide anti-crisis support to new assets transferred to Rostec during 2017-2018,

A portion of the Corporation's profits received in 2018 was allocated for additional capitalization of target funds, in an amount of 20.5 billion rubles.

In 2019, new tasks were set to the Corporation; pursuant to them, Rostec has authorized the financing of top-priority investment projects, namely development of the civil production, allocation of funds to the United Aircraft Corporation for the implementation of the investment phase of the MS-21 project, for stabilization of its entities' operations.

In general, during 2019, money was allocated out of target funds for the implementation of new investment projects, anti-crisis management and financial rehabilitation of entities, as well as social programs financing, exceeding 30.2 billion rubles.

Digitization of Key Business Processes

In 2019, the Rostec automated control system for finance and procurement operations (AS FPO) has been put into operation.

The AS FPO is the common corporate digital platform encompassing Rostec and its entities, thus forming a single information space at all management levels: entities — holding companies — the Corporation.

The system is based on a domestic software.

The AS FPO consists of three transactional subsystems for centralized management of cash flows, liquidity, and cash pooling, procurement, contracting by Rostec and its entities.

Also, the system features a fully automated corporate budgeting, starting with budgeting of individual entities, consolidated budgeting of holding companies, and consolidated budgeting of the entire Corporation.

The system also generates the management reports for executives of any management level. A managerial data monitoring and analysis system, "Manager's Board", has been designed and tested.

As of today, over 17 thousand users from 669 Rostec entities are connected to the AS FPO system.

On August 10, 2019, a project was launched for conversion of legally relevant workflow with Rostec's third party contractors into electronic form, in order to maintain prompt feedback in respect of delivery/receipt of basic source documents.

As part of the tax monitoring, digitization has been launched in respect of control procedures and archived source documents pertaining to the financial and tax accounting. Remote access to the fully structured electronic archive of source documents for the year 2019 has been provided to the tax authority.

Enhancement of the Corporate Finance Planning and Budgeting

In order to improve the finance planning process, the "Management Reporting and Budgeting" module of the AS FPO has been put into full-scale operation.

Automation of the budgeting in the AS FPO allowed cutting down the labor costs for the generation of entities' budget forms, avoiding double data input into the system, accelerating the feedback from approving authorities, and conducting prompt and accurate reconciliation of intra-group operations when generating holding companies' consolidated budgets and the general consolidated budget of all Rostec entities.

Thus, the budgeting automation improved the budget preparation quality.

In order to reduce the management report misrepresentation risk, an initiative has been launched in 2019, for harmonization of financial and managerial accounting methods (including the plan), with international financial reporting standards (IFRS) (1st stage of harmonization). Common corporate accounting policy principles have been drafted, approved, and enacted at all Rostec entities, which will allow preparing financial and managerial accounts for the year 2020 according to federal accounting standards, materially harmonized with the IFRS.

Tax Monitoring

Rostec has become the first non-profit entity to obtain consent from Inter-Regional Inspectorate of the Federal Tax Service for major taxpayers No. 4 for the conduct of tax monitoring.

The tax monitoring ensured the utmost transparence of financial and business operations, optimal structure of interaction processes with the tax agency, allowed optimizing the internal control system.

As part of the tax monitoring, access was provided to Rostec's information base containing accounting and tax documentation.

Compliance by the Corporation with the fiscal legislation was controlled online. In particular, the following was checked:

- timely and full recognition of business operations;
- correct assessment and payment of taxes, levies, insurance premiums;
- reporting and accounting data.

Following the tax monitoring, IIFTS No. 4 decided to conduct the same procedure in 2020.

5.6 Treasury's Activities

Cash Flow Management

In 2019, the Single Corporate Treasury (SCT) kept on increasing the efficiency of Rostec and its affiliates' cash flow management by centralized management of Rostec affiliates' cash flows, including those of intra-group financing, external debt financing, receivables management, leasing operations, operations with idle funds.

Treasury Operations Fulfillment Procedure

In 2019, measures were taken to increase the efficiency of business processes governed by current SCT regulations, including:

- managing Rostec affiliates' receivables and payables for the purpose of systemizing and enhancing the procedure;
- managing the liquidity by deploying a tool enabling generation and follow-up of payment schedule, by means of Rostec and its affiliates' automated system of financial and procurement operations (AS FPO). Further development of this tool will improve the accuracy of Rostec and its affiliates' cash flow planning in the short and medium term;
- managing the intra-group financing of Rostec affiliates, involving the Corporation's pool leader;
- elaborating measures to mitigate the settlement risk under export contracts.

Automation of the Treasury's Business Processes

In order to increase the efficiency of treasury business processes, further efforts were made in 2019 to develop the AS FPO, namely its "Financial Flows and Liquidity Management" module, which will allow ongoing monitoring and efficiency analysis of application of financial resources of Rostec, its holding companies (integrated structures) and affiliates; and end-to-end control, from procurement to real-time payment.

As at year-end 2019, the AS FPO is constantly used by Rostec affiliates whose aggregate revenue amounts to 61% of the Group's consolidated revenue.

In the reporting period, a project has been launched for creation of an information & analytics platform — the "Manager's Board" AS based on the AS FPO. Implementation of the "Manager's Board" AS, namely of its "Treasury" functional module, will improve the quality and the prompt provision of data in respect of key performance indicators of Rostec affiliates to the management of Rostec, holding companies (integrated structures), affiliates of holding companies (integrated structures), and directly controlled entities, as required to support any corporate actions, and will optimize the paperwork.

Interaction with Governmental Authorities and Agencies

Rostec is taking measures to improve the Russian legislation governing the State Defense Order.

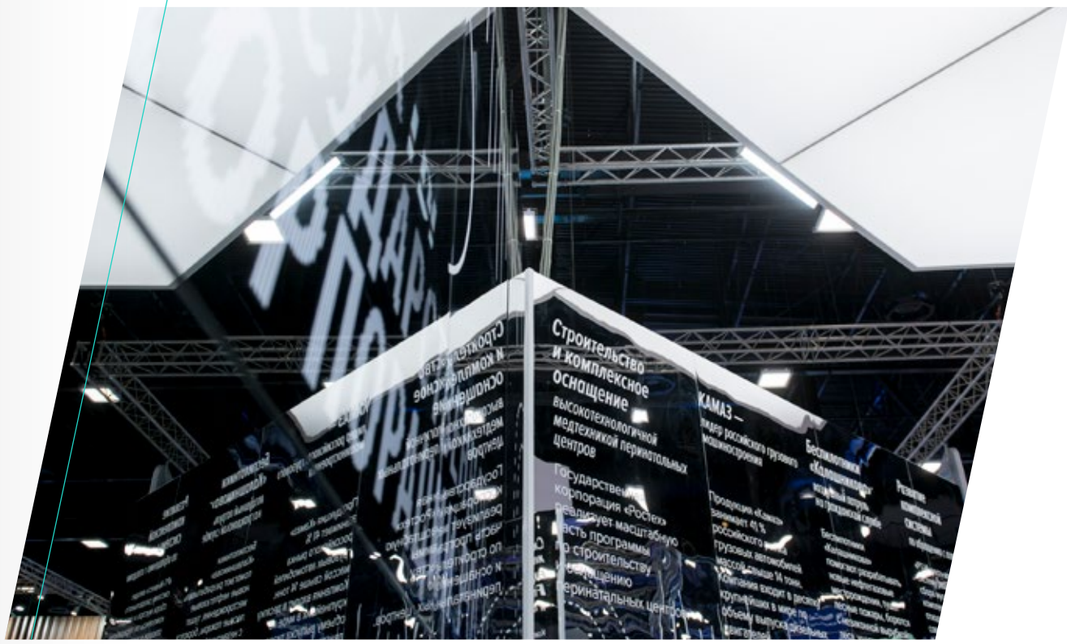
Regular interaction with executive authorities and other competent agencies allows optimizing the settlement procedure, including advancing of general contractors under the SDO, minimizing the balances held on each Corporate entity's account, optimizing external financing sources and schemes, in order to mitigate the risk of funding shortage and to ensure unconditional fulfillment of the State Defense Order.

Systemic work with executive authorities and agencies is underway, regarding implementation of State support measures for the benefit of strategic entities of the defense industry.

Interaction with Banks

In 2019, the SCT continued the systemic work with banks based on single approaches and principles of interaction with credit institutions, subject to the considerable expansion of the Corporation.

A special focus is made on matters of interaction with banks authorized to provide support to State Defense Order contracts.



Interaction with Money Market Players. Credit Ratings

Rostec is implementing a large-scale long-term project to raise external financing, by floating exchange-traded debentures through the specialized entity, RT-Finance JSC.

In 2018, for the first time, leading Russian rating agencies accredited by the Central Bank of Russia, the RAEX (Expert RA) and ACRA, assigned the highest credit ratings to Rostec at the AAA level, with stable forecast.

The ratings were reconfirmed in 2019.

Interaction with the Federal Treasury

In 2019, Rostec Treasury continued the efficient cooperation with the Federal Treasury agencies as to the authorized application of Rostec's targeted funds by the Treasury. Efforts of the Federal Treasury have been supported, as to the use of single client accounts of non-parties to the budgeting, with continuous control and monitoring by the SCT of timely State programs financing by means of centrally administering the federal budget funds in the AS SCT.

Financial Risk Management System

A financial risk management system (FRS) is deployed at the Rostec State Corporation and its affiliates.

The Rostec and its affiliates' FRS is part of SCT and of the common Risk Management System.

FRS has a set of tools available to manage the following financial risks:

- credit risks related to loans and suretyships granted;
- credit and market risks related to the placement of idle funds and payments;
- credit risks related to possible default on obligations by the Corporation's and its entities' suppliers of products and services. An institute of guarantor banks whose guarantees are used as a security for the contractual obligations of suppliers has been deployed at the Corporation and its entities;
- currency risks — the currency position of the Corporation's entities is calculated and assessed.

For the purpose of the FRS development and enhancement, the creation of an automated system for assessment of credit risks pertaining to Rostec's contractors and entities has been launched in 2019. The system is supposed to be integrated with the AS FPO, and its tools will be used in the management of Rostec entities' receivables and payables.

5.7 Rostec's Procurement Operations

Key Performance Indicators

In 2019, Rostec entities signed over 100 thousand contracts totaling RUB 1.9 trillion.

Tender-based procurement provided average saving of 86.6%, with total savings exceeding RUB 22 billion.

Procurement Digitization

Procurement digitization allows the customer to reduce costs and man-hours, to accelerate and harmonize decision-making processes of various entities (subject to their specific context), to cut down staff training costs.

In 2019, the "Procurement Control" (PC) module of the automated system of financial and procurement operations (AS FPO) has been put into operation. It allows improving the transparence of the procurement procedure and to manage it at all stages — from the identification of needs and budgeting, to acceptance and payment of works.

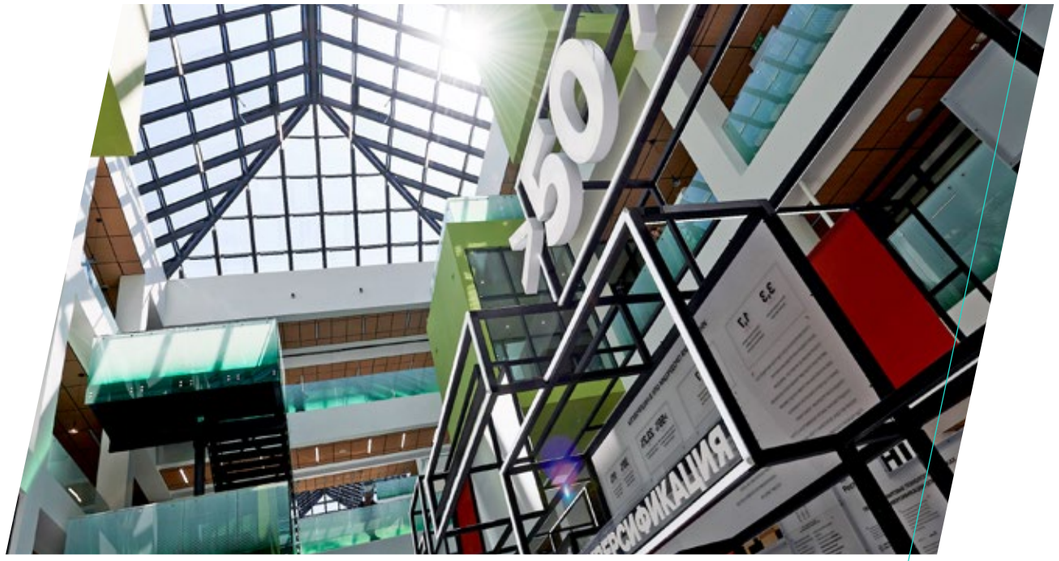
Key Achievements

In 2019, the United Aircraft Corporation (UAC PJSC) and 82 entities controlled by it started applying the provisions of the Common Procurement Regulation (CPR) enacted at Rostec.

Efforts made by the procurement department (PD) allowed transforming the UAC's procurement system without prejudice to the aircraft engineers' production and research activities.

A category-based management approach has been elaborated and implemented, orienting the procurement procedure toward improving the end user's satisfaction, cutting down the costs, man-hours, and procedure time limits. The category-based approach allows reducing costs not only by optimizing internal processes, but also by benefiting from the market environment.

Rostec was among leaders in a rating of major customers' loyalty toward small and medium businesses, prepared by the ANO ASI jointly with the All-Russian Public Opinion Research Center and the MSP Corporation.



For the second year in a row, Rostec procurement director Tatiana Gololobova is among best procurement directors, as rated by RAEX.

Internal and External Interaction

In 2019, the IV strategic session on procurement was held under the guidance of Rostec CEO S. V. Chemezov, at which over 270 representatives of Rostec entities have collectively determined the strategic vector of the procurement system development — the category-based management.

PD representatives participate in meetings held by the Federation Council and by the Ministry of Economic Development, in round tables organized by the Federal Antimonopoly Service and the Ministry of Finance. In 2019, PD representatives participated in a specialized panel session of the Saint Petersburg International Economic Forum.

RT-Komplektimpex and Procurement Efficiency

To efficiently perform the procurement tasks, an infrastructure entity has been established within Rostec — the RT-Komplektimpex LLC.

RT-Komplektimpex responsibilities include organization and support of procurement procedures, staff training, procurement due diligence, preparation of business analytics, as well as knowledge management in respect of best procurement practices and pricing models in various markets.

In 2019, tender-based procurement organized by the RT-Komplektimpex for Rostec and its entities provided cash savings of RUB 3.3 billion. 89,300 procurement documents were subject to a due diligence (+14% as against the last year). The number of procurement procedures held for Rostec entities grew by 20% as compared to the preceding year, and achieved 575. 2,346 employees of Rostec entities were trained in 10 specific programs.

Key vectors of RT-Komplektimpex development currently include: preparation of category-based strategies, procurement outsourcing, procurement due diligence.

5.8 Brand and Communication

In 2019, Rostec's communication agenda focused on partnership development, buildup of efficient production systems, and creation of high-tech civil-purpose products under national projects.

Communication with the target audience on various sites, including social media, was aimed at increasing the brand awareness and strengthening the perception of Rostec as the flagship of the Russian industry, possessing broad expertise in various segments — from microelectronics and pharmaceutics, to aircraft and car building.

The positive trend was successfully maintained even in the environment of an information war set off against the Corporation, record-breaking in terms of duration and number of negative "dumps".

Key Figures

The number of publications referring to the Corporation in Russian and foreign media grew by 3.2% as against 2018, and reached 544 thousand.

At the same time, the media index grew by 81.6%, which is an evidence of a qualitative change in the Corporation's media presence. The dynamics is to a great degree boosted by the cooperation with leading mass media and prompt response to negative news triggers.

Most publications (about 80%) relate to the Corporation's key civil-purpose businesses and topics, including expansion of the aviation cluster through accession of the UAC, development of the "technologies of the future", participation in specialized forums and conferences (SPIEF, MAKS, Army, INNOPROM, CIPR, BIOTECHMED, etc.).

Rostec is also highlighted in the media space as an active contractor under national projects aimed at the State's advancement.

The elaboration of key thematic streams and the quality of info agenda integration with strategic and ongoing business objectives underlay the specialized KPI system implemented in 2019 at Rostec entities.

Corporate Website and Social Media

During 2019, almost 2.4 thousand units (including texts, documents, photographs, infographic materials, videos) were published on the corporate website. 6.3 thousand posts were published in social media.

Total number of visits to the website was 8.1 million, which is by 39% more than the last year's figure. The number of unique visitors over the same period achieved 7.2 million which is by 54% more than in 2018. Aggregate audience of official social media accounts amounted to almost 840 thousand subscribers (+7%).

YEAR	NUMBER OF PUBLICATIONS	MEDIA INDEX
2012	1 205	27 454.64
2013	148 586	524 060.45
2014	229 193	926 347.25
2015	278 011	1 462 691.93
2016	312 618	2 029 384.67
2017	475 235	6 131 120.59
2018	527 643	6 359 189.30
2019	544 045	11 550 927.90

"No doubt, the country should claim leadership in high technologies... The Rostec State Corporation does a lot for the development of such technologies — providing both specific solutions, and general concepts. Key companies have entered into eight agreements with the Government for the development of high technologies in specific areas, four of them are with the Rostec State Corporation. These include blockchain, Internet of Things, quantum sensors, and 5-G wireless communication. In these sectors, we will go, or rather run, ahead. This is in line with our strategy through 2025, which implies transition from "hard" to "smart". Development of these areas underlies our future growth".

Sergey Viktorovich Chemezov
(a fragment of interview given to the RBC)

Rostec website is a registered mass media and daily publishes news, analytics and overviews.

PARAMETER	2018	2019	%
TOTAL VISITS	5 831 815	8 119 138	+39.22
NUMBER OF UNIQUE VISITORS	4 703 074	7 249 449	+54.14
VIEWING DEPTH	2.52	2.76	+9.23
VISIT TIME	0:02:45	0:02:55	+5.67
BOUNCE RATE	6.1	8.4	–37.55

Leading Speakers of the Corporation

In 2019, the number of publications referring to Rostec's leading speakers grew by 18% and exceeded 75.2 thousand.

Top-3 cited persons were: Rostec CEO S. V. Chemezov, who was mentioned in 28 thousand publications, Rostec Executive Director O. N. Evtushenko, and Director for International Cooperation and Regional Policy V. N. Kladov.

SPEAKER	NUMBER OF PUBLICATIONS	MEDIA INDEX
SERGEY CHEMEZOV	28 217	1 760 755.89
VIKTOR KLADOV	5 737	89 797.20
OLEG EVTUSHENKO	5 391	550 273.62
ALEXANDER MIKHEEV	9 099	503 911.53
SERGEY ABRAMOV	3 922	420 051.00
ANDREY BOGINSKY	6 714	394 898.72
ANATOLY SERDYUKOV	2 164	208 475.25
YURI SLYUSAR	3 318	113 488.32
SERGEY KOGOGIN	2 507	77 201.00
VLADIMIR KABANOV	1 392	69 417.44
VLADIMIR DMITRIEV	1 837	63 772.01
VLADIMIR LEPIN	1 776	60 752.64
ALBERT BAKOV	1 264	50 895.63
IGOR NASENKOV	1 118	40 270.81
LEONID BELYKH	805	37 629.00

81.6 %

ROSTEC'S MEDIA INDEX GROWTH IN 2019

S. V. Chemezov gave an interview to the RBC, where he expressed his opinion on the current political situation, Rostec's involvement in the implementation of the Digital Economy national project, and other key focus areas.

Moreover, he spoke of production diversification at Rostec facilities in a TV show "Deistvuyushie litsa s Nailei Asker-zade" on Russia-1 TV channel.

S. V. Chemezov's interview to the Turkish agency Anadolu gained considerable resonance.

Top management's statements were one of the main sources of public information about Rostec, and played a key role in the buildup of its image.

Presence in Foreign Media

As before, China remains the number one country providing the widest coverage to the Corporation's activities. This is due to the big number of Russian-Chinese projects, and to Rostec's active participation in exhibitions held in the PRC, first of all, the China AirShow — 2019.

At the same time, the Corporation shifted the emphasis and focused on the communication work in promising regions, which determined the media's interest of such countries as Turkey, India, Vietnam.

In particular, Turkish media gave extensive coverage to the topic of supplies of guided missile systems S-400, and other lines of cooperation with Russia. Indian journalists highlighted the supplies of air defense systems, and the implementation of joint projects under the Make in India national program, including the construction of a factory to manufacture Kalashnikov assault rifles.

The USA have shown traditionally high interest in Rostec's business. Publications in American media covered Russian projects in Venezuela and advanced armament solutions offered by Rostec entities. In additon, American and European periodicals kept watch on partner projects of Russia and Turkey.

"Like the armaments or the high technologies, the medical industry is of strategic importance: it affects directly the nation's health. Total import dependence in the healthcare is dangerous. If tomorrow some supplies of equipment or medications are shut off — how will we be treated? With this in mind, the industry is doing everything to produce competitive world-class equipment... Rostec entities design new medical equipment, manufacture medications and vaccines, deliver IT systems for healthcare facilities, build specialized clinics and provide their comprehensive fit-out".

Oleg Nikolaevich Evtushenko
(a fragment of interview given to Izvestiya)

Rostec

6.

CORPORATE **GOVERNANCE**

3,000

K RUB/person

YIELD PER EMPLOYEE IN 2019

TABLE OF CONTENTS

6.1 Development of the Corporate Governance System

Formation and Development of the Corporate Governance System

Rostec management system is built pursuant to the Development Strategy and Asset Management Concept, applying basic typical corporate governance models to holding companies (integrated structures) and directly controlled entities. The approach to the corporate governance of holding companies is differentiated and built pursuant to each cluster's development strategy.

The Corporation establishes holding companies on the basis of joint stock companies where it has a shareholding interest, ensures their development and undertakes asset restructuring. The corporate governance system applied increases the holding companies' investment attractiveness.

In 2019, the Governance System Concept has been drafted, approved by Rostec Management Board, and validated. The system defines the parties, general corporate governance principles, key management tools, principles and norms of relations between the governance system agents.

Adoption of the Concept will speed up the managerial decision-making, mitigate key risks, synchronize powers, delimitate areas of responsibility, and structure the assets based on a synergetic effect.

Regulatory Framework of Rostec Corporate Governance System

In 2019, in order to increase performance of directors of head entities of holding companies (integrated structures), remuneration regulations and decision preparing and making procedures were updated, the institute of an external member of the BoD has been introduced.

Amendments were proposed to the list of entities approved by Decree of the Russian Government No. 718 dated July 14, 2012, as amended by Executive Order of the President of the Russian Federation No. 379 dated August 15, 2019.

The competence of Rostec Supervisory Board has been modified in respect of decision-making on key matters related to the business of Rostec entities included in the list of entities approved by Decree of the Russian Government No. 718 dated July 14, 2012.

6.2 KPIs and Labor Remuneration System

The performance control system enacted at Rostec is designed so to ensure implementation of the Rostec Development Strategy 2025. The system of key performance indicators (KPIs) implies the dependence of remuneration on performance.

Two types of remuneration for employees of the Corporation and its affiliates are provided:

1) short-term (yearly) remuneration for achieving KPIs for the head office administrative staff and CEOs of Rostec affiliates;

2) long-term remuneration for key executives of the head office and Rostec affiliates. The long-term incentive scheme is rated to a 8-year period.

The KPI structure established for the short-term remuneration includes three groups of indicators:

1) global corporate financial and economic indicators tied with Rostec Strategy and Business Program; as well as indicators related to the performance under the state defense order and national programs;

2) functional or project-related indicators evidencing the implementation of projects or measures to mitigate key risks;

3) qualitative evaluation of an employee's performance by their superior or an authorized body (for CEOs).

The short-term remuneration system also implies KPI cascading down to lower management levels.

A prerequisite for payment of the short-term remuneration to the management of Rostec and its affiliates is the fulfillment of tasks of the state defense order, national programs, import phaseout programs, and military-technical cooperation contracts.

The long-term remuneration is subject to the achievement of KPIs reflecting the capital appreciation of Rostec and its affiliates. The fulfillment of tasks of the state defense order, national programs, import phaseout programs, and military-technical cooperation contracts is a prerequisite for this remuneration to be paid.

In addition, global corporate KPIs established for the short-term remuneration should be achieved to at least 85%.

6.3 Internal Audit and Risk Management

Proceedings of the Internal Audit Department

The Internal Audit Department reports directly to the CEO of Rostec.

The key mission of the department is to conduct internal audits based on a fair risk-oriented approach, in order to maintain and increase the value of Rostec and its affiliates.

At the Corporation and its affiliates, the internal audit is centralized.

The proceedings of internal audit departments of Rostec affiliates are governed by standard internal audit regulations of Rostec affiliates.

The Internal Audit Department includes two sections:

- for audit, inspections and procedures of the Corporation affiliates;
- for internal audit of the Corporation.

The section for audit, inspections and procedures of the Corporation affiliates is responsible for:

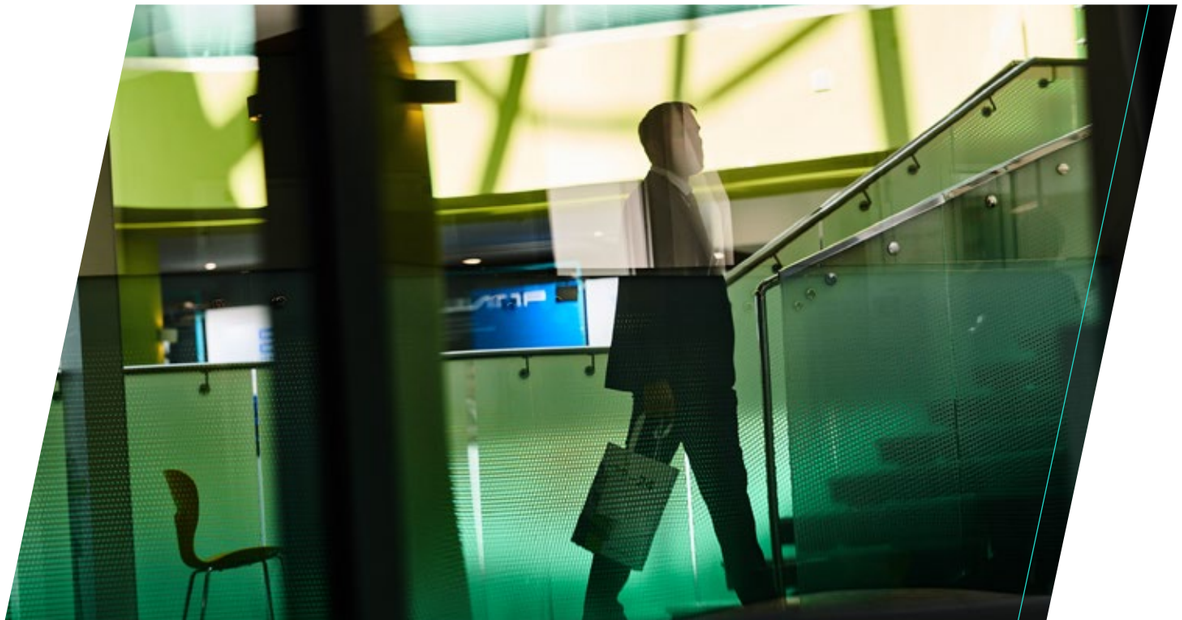
- providing recommendations following audits and inspections of financial and business operations of Rostec entities;
- developing and controlling the implementation of appropriate procedures.

During 2018, the audit, inspections and procedures section has completed 68 revisions, 13 due diligence and 7 targeted audits of financial and economic operations of the Corporate entities. Recommendations provided following these measures allowed timely detecting breaches and taking steps to mitigate Rostec's financial and reputational risks.

The internal audit department is responsible for:

- building the internal audit system;
- providing guarantees and advice to the users of internal audit services; assessing the efficiency of Rostec's internal control, risk management and corporate governance system;
- assisting the Corporation's employees in the development and compliance monitoring of procedures and efforts aimed at improving the system;
- supporting the anti-fraud, theft and corruption hotline.

During 2018, five internal audits were conducted in respect of the Corporation's critical-risk business processes; five consultations were provided upon requests of the Corporation business units. Following the consultations, corrective action plans were approved and have been implemented, in order to minimize the residual risk level in the processes and improve the efficiency of Rostec's internal control and corporate governance systems.



In 2019, internal audit departments have been put in place at strategic entities under direct control. Unified principles of labor remuneration and financial incentives for internal audit staff of head entities of holding companies (integrated structures) have been implemented.

In 2019, the automated audit and inspection system has been put into full-scale operation at head entities of holding companies, as part of internal audit digitization. Its functions include:

- automation of standard auditing and reporting procedures;
- ongoing remote compliance control;
- reduction of paperwork, providing access to concerned parties to reports upon their results and according to corrective action plans, automatic plan progress monitoring.

Risk Management

Timely identification of risks is one of the priorities set by Rostec and its entities' management bodies.

The Rostec Management Board has approved the Risk Management and Internal Control System. The document defines the preferable (tolerable) risk level and key risk indicators.

The risk management system ensures:

- guarantees of achieving the Corporation's goals defined in the Development Strategy;
- efficient and productive use of resources;
- accuracy of the accounting (financial) statements and management reports;
- compliance with applicable legislative and regulatory acts governing the Rostec and its entities' core businesses.

The risk management and internal control system include the following components:

- Control environment — a set of standards, processes and procedures defining the internal control requirements.
- Risk assessment — identification and analysis of threats and obstacles preventing the Corporation from achieving its goals.
- Control procedures — elaboration of an action program helping to minimize the risks preventing the Corporation from achieving its goals.
- Information and communication — generation, acquisition and transmission of appropriate and timely information required for management decisions and internal control purposes.
- Monitoring procedures — participation of Rostec executives in the implementation of risk management measures, and assessment of the internal control system's efficiency.

The risk management and internal control system is integrated into planning and management processes, and consists of several stages:

- identification of risks related to Rostec and to head entities of holding companies (integrated structures), based on the risk owner's expert appraisal.
- risk assessment based on key risk indicators, including generation of a list of key risks.
- elaboration of risk management measures, appointment of responsible executives, setting deadlines, subject to the priority of key risk management measures.

6.4 Risk Management Interaction

Rostec risk management and internal control system ensures:

- guarantees of achieving the Corporation's goals defined in the Development Strategy;
- efficient use of resources;
- accuracy of the accounting (financial) statements and management reports;
- compliance with the applicable legislative and regulatory acts.

The system includes the following stages:

- identification of risks pertaining to Rostec and to parent entities of holding companies (integrated structures);
- risk assessment based on key risk indicators; generation of a list of key risks;
- elaboration of risk management measures, appointment of responsible executives, setting deadlines.

Rostec

7.

INVESTMENT **DEVELOPMENT**

1.45

TRILLION rubles

TOTAL BUDGET OF PROJECTS APPROVED BY ROSTEC IN 2019

TABLE OF CONTENTS

7.1 Rostec's Role in the Implementation of National Projects

Rostec Participation in the Implementation of National Projects

The implementation of national projects is closely coupled with the diversification of the defense industry and the serialization of high-tech civil-purpose products.

In 2019, Rostec entities took part in the deployment of the following national projects:

- "Healthcare". Delivery on 34 contracts for designing, support, upgrade, and development of the Integrated State Health Information System subsystems, supply of high-tech medical equipment to several regions of the Russian Federation.
- "Education". Implementation of the "Advanced School" federal project in 12 pilot regions of Russia (Altay and Perm Territories, Kaliningrad, Kaluga, Kemerovo, Nizhniy Novgorod, Novgorod, Novosibirsk, Sakhalin, Tyumen, Chelyabinsk regions, Yamal-Nenets Autonomous District).
- "Safe and high-grade roads". Supply of 10 Tenzo-M complexes for intra- and inter-municipal roads in Tula region; supply to several regions of Russia of over 360 advanced traffic control and enforcement systems "Prizma" and "Forsazh".
- "Digital Economy". Services were provided for connection of socially important facilities in Irkutsk region to the data communications network.
- "Environment". An agreement was signed as part of the "Energy from waste" investment project, for the organization of debt financing on the syndicated lending basis, totaling to RUB 130 billion, for the construction of five solid household waste recycling plants in Moscow region and in Tatarstan.

Ecosystemic and End-to-End Products of the Corporation

At the facilities of M. F. Stelmakh RDI Polyus JSC (member of Shvabe JSC), the production of Tenzo-M modules has been launched, which are intended to identify overweight trucks, to count and classify vehicles, to control their compliance with weight and dimension limits, and allow searching vehicles moving on public roads.

The Shvabe holding company has a range of high-tech solutions available to implement the federal project named "Development of Primary Care", such as mobile medical complexes (MMC), modular medical centers, modular nuclear medicine centers. The MMC are proposed to be mounted on KamAZ frame, keeping in mind that they will be used in any road and weather conditions.

An automated electricity metering system has been designed for the Interregional Distribution Grid Company (IDGC) Center and for the IDGC Center and Volga region; the system will control the presence of users connected to the grid, and to detect their disconnection, thus responding promptly to any occasional failure.

Power optimizers, access control systems, CCTV systems, UPS, switchgear are manufactured for use in schools.

Digital Economy Project

In 2019, Rostec was appointed to be the competence center* for the implementation of the "Digital Technologies" federal project under the "Digital Economy of the Russian Federation" national program, and the lead contractor under a number of actions.

Five agreements were signed with the Russian Government, under which, the Company shall draft, approve, and implement road map action plans for the development of high-tech sectors, such as:

- quantum sensors;
- blockchain systems;
- Internet of Things;
- fifth-generation (5G) mobile networks.

As part of its commitments, the Corporation has prepared some proposals as to development of priority sectors, such as end-to-end digital technologies, researches and solutions, as well as a fast-track scheme of project financing by institutes, in the context of "end-to-end" digital technologies; road maps for the development of specific high-tech areas have been approved.

In 2019, the Government Commission for Digital Development of the Russian Federation approved two road maps prepared by the Corporation, namely for the development of wireless communication systems, and blockchain technologies, with the aggregate budget investment of RUB 63.1 billion.

Jointly with the Rostelecom PJSC, the Architecture Board for the development of the 5-G technology has been established.

Jointly with the RZD PJSC and the Rosatom State Corporation, a research & technology board for the development of quantum technologies has been established.

A strategy of digital transformation and project management in respect of digital transformation of industrial enterprises has been prepared and submitted to the Ministry of Industry and Trade of the Russian Federation.

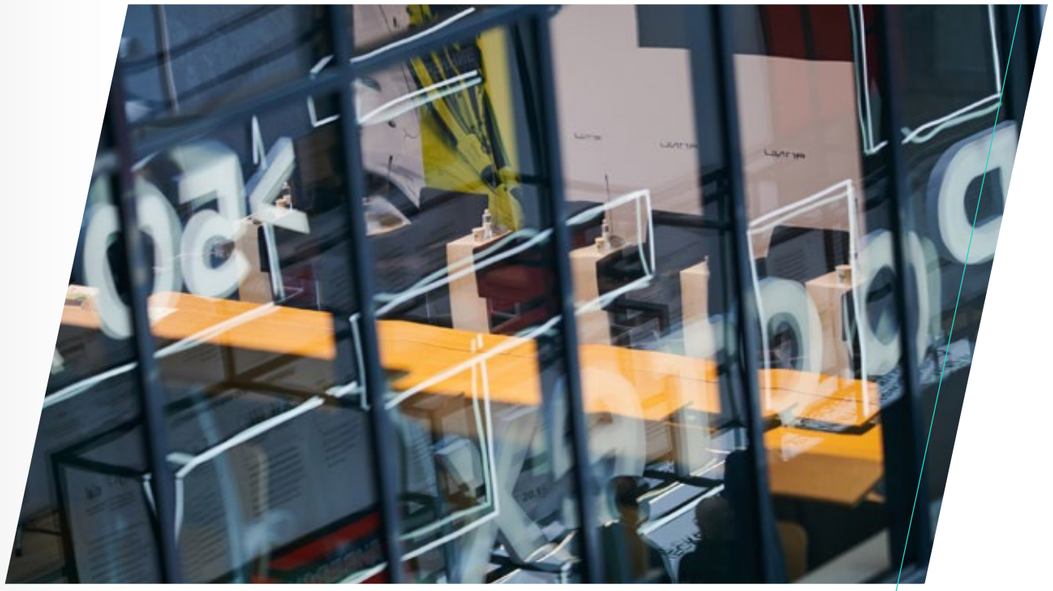
A digital maturity assessment procedure has been established and will be tested at industrial enterprises over the first half of 2020.

Jointly with the Industrial Development Fund, an initiative has been deployed, for the creation of a company's digital passport based on the SIIS (State Industry Information System) platform. Proposals have been drafted on a new SIIS service product line.

Proposals have been prepared and presented as to the enhancement of project eligibility criteria for the purpose of obtaining a subsidy under Decree of the Government of the Russian Federation No. 529 dated April 30, 2019.

In order to fulfill tasks related to the digital transformation of the economy of the Russian Federation, the Rostec management board has instituted an office of director for digital transformation. A digital transformation strategy concept has been prepared, providing for Rostec to be involved in the digital transformation of branches of the Russian economy in terms of the platform philosophy.

* As defined by Decree of the Government of the Russian Federation No. 234 dated March 2, 2019 "On the control system of implementation of the "Digital Economy of the Russian Federation" national program".



7.2 Investment Activities

Investments and Initiatives

In 2019, following examination of investment programs submitted by holding companies and directly controlled entities, over 800 projects with a total budget exceeding RUB 1.45 trillion were approved.

The amount was supposed to be broken down as follows: RUB 200 billion to be invested in 2019, and over RUB 180 billion — in 2020.

A number of projects totaling RUB 32.5 billion are financed out of Rostec's fund of innovation and investment development. Among them is the project of creation of a mid-range passenger aircraft MS-21, with the supposed allocation of RUB 8.3 billion.

Powers were delegated to Rostec entities in respect of ongoing investment management. The limit of investment programs was increased, allowing holding companies and directly controlled entities to make decisions on their own.

To simplify the respective decision-making procedure, the "Investment Management" subsystem of Rostec's automated system of financial and procurement operations is used.

In 2019, a range of investment support initiatives were implemented, including:

- RT-Venture Investments JSC invested about RUB 150 million in the manufacture of innovative optoelectronic products.
- To boost innovative projects and teams inside the Corporation toward creation of new products, a corporate business accelerator has been put in place. Over 4,000 projects submitted their applications for participation in the first round. Six winner projects were elected, which will receive mentor support and funding totaling RUB 92.4 million.

Forums and Conferences

CIPR-2019

Rostec became the strategic partner of the IV Digital Industry of Industrial Russia (CIPR) international conference, held on May 22–24, 2019 in Innopolis, Republic of Tatarstan.

5,312 participants from 1,343 Russian and foreign companies discussed the role of end-to-end digital technologies and their prospects in Russia.

One of the key events was the meeting of the Supervisory Board of the Digital Economy ANPO, chaired by Andrey Belousov, Aide to the President of the Russian Federation (since January 21, 2020 — first deputy Chairman of the Government of the Russian Federation).

On the first day of the conference, the ceremony took place, attended by President of the Republic of Tatarstan Rustam Minnikhanov, and Rostec CEO Sergey Chemezov, of foundation stone laying of an aircraft assembly plant and an experimental aviation aerodrome. The construction will start in 2020, the facility will be put into operation in 2022.

Over 30 agreements were signed at the conference; some of them were signed with Rostec companies.

BARS Group JSC and the Analytical Center of the Russian Ministry of Agriculture signed an agreement for ongoing information exchange in respect of digital development of the agriculture, setup and promotion of State information resources concerning the situation and the development of the agro-industrial sector.

Shvabe JSC, CardioQuark LLC, and the Sechenov First State Medical University of Moscow of the Russian Ministry of Health signed a memorandum of cooperation in respect of cardiovascular diseases control and improvement of accessibility and quality of the telemedicine.

BIOTECHMED-2019

On September 16-17, the IV Annual international forum BIOTECHMED took place in Gelendzhik. This year, it was dedicated to the implementation of the "Healthcare" national project.

The flagship site where matters such as development of pharmaceutic industry, biotechnologies and healthcare were discussed, was attended by over 1,600 experts from 500 Russian and foreign companies specialized in biotechnologies.

Over 30 agreements were signed by forum participants, including with Rostec companies:

- Memorandum of exclusive distribution of the ABP electric stimulator between Shvabe JSC and Taisiya Corporation Limited;
- Memorandum of cooperation on matters of endoprosthesis production localization in Russia between Shvabe JSC and Limacorporate.

MAKS-2019

Exhibition, fuelling, transport and logistics businesses in the civil sector of Ramenskoe aerodrome are conducted by the TEC Russia JSC and its affiliates.

From August 27 to September 1, 2019, the infrastructure of the exhibition facility hosted the International Aerospace Show MAKS-2019.

Over the first three days, the exhibition was attended by 143.5 thousands of professionals. Total number of visitors exceeded 578 thousand 810 persons.

The special focus of MAKS-2019 was the visit of Russian President Vladimir Putin and Turkish President Recep Tayyip Erdogan.

Traditionally, MAKS became the venue where contracts and agreements were signed for the supply of aerial vehicles, in addition to documents laying the foundation of future cooperation. Cooperation agreements with Russia's major aircraft manufacturers were signed by the NOVIKOMBANK JSCB — the general financial partner of the show. The agreements are estimated at a rate of RUB 248 billion.

256 meetings took place, with a business capacity exceeding RUB 8 billion, as reported by exhibitors. In all, over 3,000 business meetings of special formats were held at the air show. Aggregate business capacity of MAKS-2019 is estimated at RUB 400 billion, and the effect from negotiations held under the military & technical development can, as assessed by the Rosoboronexport JSC, be counted in billions of dollars.

8.

SUSTAINABLE **DEVELOPMENT**

18.5

K rubles

ROSTEC'S SOCIAL EXPENDITURE PER EMPLOYEE

8.1 Staffing Policy

Building a Single Centralized HR Function

In 2019, the Corporation has decided to build a single centralized HR function, with simultaneous optimization of HR processes, keeping in mind best commercial practices (such as digitization, shared service centers, people analytics, “coffee corner”, career lifts, etc.); the HR management department has been put in place.

Taking account of Rostec’s approved strategic initiatives, the HR management department has defined the key medium-term development vectors:

- to set up a technological engineering school at the Corporate Network Academy (achieving technological leadership);
- to establish a branch vacancy portal (“Job Market”) (developing the HR capacity);
- to automate HR processes (increasing operating performance);
- to assist Rostec executives and affiliates in making staff-related decisions via an assessment system, to build a labor pool;
- to provide a comprehensive employee’s benefit plan, social & payment card (increasing Rostec and its entities’ competitiveness in the labor market);
- to mitigate social strain risks by excluding ungrounded income differentiation and untimely wage payment;
- to establish a transparent rotation system and career lifts to reduce employee turnover (efficient use of Rostec’s resources);
- to enact single standards and policy for key business processes of HR management (increasing the operating performance);
- to provide in-depth ongoing HR analytics and reporting to support managerial decisions;
- to identify and to analyze trends defining the development vectors of Rostec’s human capital (professions of the future, competence management, human activity automation).

A strategic effect from the implementation of the key initiatives will be the building of an efficient HR vertical at holding companies (integrated structures) and directly controlled entities, improving the manageability, business process harmonization keeping in mind the digitization, centralization, outsourcing trends.

Operating Results of the Corporate Network Academy

The Corporate Network Academy (Rostec Academy) is the expertise center for human capital development.

Over 60 educational programs and 10 consulting products are intended for managers of various levels, engineers, and young professionals.

In 2019, over 1,700 attendees studied at the Academy on a full-time basis.

3,320 employees of Rostec entities completed an online study under the Vector program.

Ideas of civil-purpose products were suggested by 1,770 participants, 15 projects completed pre-acceleration, of them, six were selected into the business accelerator. Rostec employees who received the status of technology leaders took part in a series of supplementary workshops and webinars.

A special focus is made on the development of civil-purpose production within the KURS program: participants not only study, but also build a dialogue and strengthen their inter-relations, while being able to conceive their individual advancement route. 410 people completed the KURS program over 2 years. 21% of graduates were promoted to a higher position.

Youth Educational Initiatives (WorldSkills)

Rostec and its affiliates’ key objectives in connection with their participation in the WorldSkills initiative include:

1) boosting the prestige of being employed at Rostec industrial facilities, advancing workers and engineers, in particular, in order to achieve the operating performance pursuant to Rostec’s Corporate Strategy.

2) increasing the pragmatic orientation of WorldSkills initiative — its integration into current and long-run objectives faced by Rostec entities and employees;

3) improving the efficiency of cooperation with sites controlled by Rostec: monitoring the existing ones, involving potential sites and equipment, creating favorable professional environment for the purpose of getting prepared to the championship, and holding internal championships;

4) creating an integrated systemic approach to the WorldSkills initiative.

For 2 years, the Rostec Academy has prepared the Rostec team for the participation in competitions of various levels under the WorldSkills system.

Championships using the WorldSkills methodology were held at holding companies: Ruselectronics JSC, UEC JSC, Russian Helicopters JSC, RPA Splav JSC, Uralvagonzavod Concern JSC, RPC Techmash JSC, Avtomatika Concern JSC.

In 2019, the team comprising eight employees of the Russian Helicopters JSC won a gold medal in a contest under the “Lifecycle Management” competence at the WorldSkills international championship in Kazan.

Nikolay Pilyushenko, 2nd grade machine engineer of Moscow V. V. Chernyshev Machine-Building Enterprise (member of the UEC JSC) won the silver in the “Aircraft Equipment Maintenance” category.

At the Sixth National Championship of End-to-End Worker Professions held under the WorldSkills methodology, the Hi-Tech 2019, Rostec team won 39 medals, including 15 gold, 11 silver and 10 bronze medals. Rostec employees obtained another three awards in the Eurasian tour competitions of WorldSkills Hi-Tech.

Improving the Labor Remuneration and Incentive System

Rostec employees’ wage consists of a fixed part and markups (extras) of compensatory or incentivizing nature, as well as a variable short-term (at year-end) and long-term remuneration (established for specific Rostec executives included in the long-term incentive program).

The wage structure is determined by the category of the position held by the employee, subject to their qualification, complexity, scope, quality, and conditions of their work.

The amount of the variable remuneration depends on the fulfillment of key performance indicators and of bonus reduction rules, pursuant to the Corporation’s in-house regulations.

In 2019, the incentivization of Rostec executives has been strengthened, to boost them to achieving strategic goals. The number of bonus reduction requirements has been cut down.

8.2 Social Responsibility

SOCIAL PROGRAMS

Total social expenditure:

2018 — 9.0 billion RUB;

2019 — 11.0 billion RUB.

Social expenditure per employee:

2018 — 17.9 K RUB;

2019 — 18.5 K RUB.

ROSTEC HOUSING PROGRAM

The Housing Program has been put in place since 2015 and is aimed at attracting and retaining employees possessing qualifications and competences needed by the Corporation and its entities; as well as recent graduates from specialized higher and secondary schools.

The Rostec Housing Program offers refund/subsidy of interest or of the initial installment under mortgage loan agreements, or of the rent and utility bills for any real property rented by employees.

The program incldes the optimization of interest rates for employees, by providing more attractive terms compared to standard bank offers.

The program incorporates a support scheme for employees intending to buy a housing property in Rostec City.

Total financing in 2019: 1.1 billion RUB.

HEALTH RESORT SERVICES

Health resort services are provided to Corporate employees to support and improve their health, prevent occupational diseases, create proper conditions for rest and, as a consequence, increase the motivation, performance and, in general, working capability of the Corporation employees.

Since 2017, the services are provided jointly with the Zelenaya Roscha resort.

Total financing:

2018 — 764 million rubles;

2019 — 911 million rubles (+ 19% against 2018).

NON-STATE PENSION SCHEMES

In 2018, the reorganization procedure continued in respect of non-State pension funds within the Corporation, based on the NSPF Rostec JSC. It is planned to create a single consolidated non-State pension fund with the aggregate value of managed assets of RUB12 billion.

The implementation of the corporate pension program by the NSPF Rostec JSC is in line with the Federal pension-related initiatives.

In terms of long-term implementation of the corporate pension program, NSPF Rostec's benchmark is the build-up of a pension scheme which would allow each employee to receive a pension (state plus corporate parts) making 40% of the employee's lost earnings.

Total financing:

2019 — 901 million rubles.

OPTIONAL HEALTH INSURANCE (OHI)

Rostec gives particular attention to the involvement of its enterprises countrywide into OHI programs, in order to maintain employees' health and prevent occupational diseases. These programs have been implemented by the Corporation together with the Insurance Broker RT-Insurance LLC.

In 2019, amendments have been prepared to the current OHI system, which will extend the range and the number of accredited healthcare institutions, improve the quality and accessibility of medical services provided.

Total financing:

2018 — 1.65 billion rubles;

2019 — 1.81 billion rubles (+9% to 2018).

SOCIAL RESPONSIBILITY

The Rostec State Corporation makes special focus on the solution of social issues and development of the social infrastructure for its employees' benefit.

Key elements of Rostec's social policy include:

- guaranteed social support to all categories of employees, development of Rostec entities' social infrastructure;
- social policy standardization for all Rostec holding companies (integrated structures) and affiliates;
- focusing on the contracting/retention of high-end professionals possessing competences and qualifications required to implement the approved Strategy;
- personalized approach, adapting social policy elements to individual requests and life projects of Rostec employees;
- setup and development of a staff health management system, including diagnosis, treatment, rehabilitation, fitness & recreation, preventive measures. Implementation of the health management system will have a beneficial effect on performance, increase the employees' involvement and motivation, attract qualified personnel, strengthen Rostec's role as a socially responsible employer.

In order to monitor key elements of the social policy, Rostec has put in place an automated system of corporate social programs planning and recording (AS CSP), ensuring ongoing control of the implementation of corporate social programs, increasing the efficiency of social expenditure management, ensuring the targeted application of corporate social programs.

In 2019, social programs existing at holding companies (integrated structures) and entities which accessed Rostec during 2019 were monitored, their compliance with industry agreements and trade union contracts was analyzed, relations with trade union organizations and the All-Russian public organization “Russian Engineering Union” were maintained.

MIR-BASED SOCIAL AND PAYMENT CARD

The social and payment card, being an all-purpose payment instrument, allows implementing social programs for the benefit of employees and their family members.

As at year-end 2019, the JSCB NOVIKOMBANK JSC has contracted 122 thousand new customers — holders of the social and payment card.

High-end products and services, including free of charge ones, provided by the JSCB NOVIKOMBANK JSC to holders of the social and payment card, have become available to employees of Rostec entities.

SUPPORTING SOCIALLY IMPORTANT EVENTS

Rostec and Sports

In 2019, pursuant to Rostec’s physical culture and sports policy, 28 fitness & sports clubs were set up. The flagship fitness & sports club was opened in Tula at the RPA SPLAV JSC. This comprehensive approach was appreciated by the Russian Ministry of Health and included in the federal project — library of corporate programs for employees’ health promotion.

The Corporation and its affiliates play an important role in the support of sports clubs, teams, federations of a number of sports, and in the conduct of contests of various scale, including international ones.

ALL-RUSSIAN PHYSICAL TRAINING AND SPORTS SOCIETY (ARPTSS) “TRUDOVYE REZERVY”

With Rostec’s assistance, the ARPTSS “Trudovye Rezervy” held 22 federal and regional events in 2019, including four title-bearing events: winter, summer, Moscow and global corporate games. Following four contest stages, the 2019 best corporate team was named at the final game in Sochi. The absolute winner was CNIIAG team; SIBER team was the second; and the RPC KBM team held the third place.

During the year, the ARPTSS “Trudovye Rezervy” held a range of sports tournaments, including: football championships — spring and autumn laps in Moscow and Tula, volleyball and basketball; in summer — beach football and volleyball; a tennis league was launched; a swimming contest took place.

In all, 2 thousand sets of medals in 30 sports were played during 2019. Over 12 thousand people from five federal districts took part in the contests. Over 200 sporting facilities hosted the events.

In 2019, the ARPTSS “Trudovye Rezervy” set up a new hockey league linking up over 100 amateur teams.

The traditional children’s hockey tournament, Ragulin Cup, took place for the twelfth time, as well as the international Ozerov Tennis Cup, supported by the International Tennis Federation.

As at year-end 2019, corporate games held by the ARPTSS “Trudovye Rezervy” received the BISPO award and were named “The sports event of the year”.

It should be noted that the ARPTSS “Trudovye Rezervy” reached an international scale and joined the European and the World Federation of Corporate Sports (WFCS/EFCS). Due to this, Russia will for the first time be present at the World Corporate Games, yearly attended by over 7 thousand athletes representing over 400 companies.

ROSTEC DRONE FESTIVAL

The second international Rostec Drone Festival took place on August 24-25, 2019 in Gorky Central Recreation and Leisure Park, on the Big Field, with the support of Rostec.

The event was organized by the Trudovye Rezervy ARPTSS jointly with the Drone Sports Global.

The festival’s mission is to develop and promote this most innovative aero-modeling sport, which was not recognized as an official sports discipline in Russia until 2017.

For the second year running, pilots from all over the world met in Moscow and fought for the victory and a prize fund of 2,500,000 rubles. Sixteen of 32 participants came from foreign countries, such as Spain, Germany, Latvia, Belarus, Poland, Austria, Israel, Sweden, South Korea, France.

This year, the sportsmen had to clear a unique indoor two-level track with suspended structures and a tunnel for viewers where everyone could come and see the race from its very epicenter.

The festival took two days: on the first day, qualification contest took place, on the second day — the final race. A large-scale entertainment program was organized for viewers. A simulator site and a training track were in place at the festival, where anyone could be trained in drone handling. For children, there was a cryo show and master classes in robot control. This year’s musical program was picked up specially for modern music lovers: GRUSHA MUSIC DJs, Russia’s beatbox champion LekS, hip-hopper Santee, Black Star artists: Ars-N, Pabl. A and JMar (NOAH Music label) cheered the audience with their new hits.

As part of the Rostec Drone Festival, a photo contest “The art of drones” and a video contest “Fly and shoot” took place, in order to elect the best photo and video shot from an unmanned aerial vehicle. The contest was attended by 153 authors with 282 works from 49 towns and three countries.

During the two days, almost 600 thousand people from all over the world saw an online translation of the breathtaking drone racing; over 250 thousand people visited the Gorky Park.

For the second year running, the international Rostec Drone Festival has proven its status of one of the most amazing drone racing festival, following which, the leads of the Drone Champions League suggested conducting one of their five laps for the first time in Russia.

STRIKING TEN

In 2019, the Striking Ten tournament took place for the third time. Initially, this mass sports event was timed to Rostec’s 10th anniversary celebrated in 2017; it was met by Rostec employees and entities with great interest, and has become an annual experience. Every year, the number of entities participating in the tournament grows; now, along with Rostec entities, partner companies such as Transmashholding JSC, Aeroflot PJSC, and Uralkali PJSC have become its permanent participants.

In 2019, over 17 thousand people took part in 50 qualifying tournaments of the Striking Ten held in 29 cities of Rostec presence, which became an absolute record. The format of the event is being improved and expanded from year to year. Thus, the 2019’ novelty was the “Series of strikes” category — total force of a series of punches made by a participant in 30 seconds.

In regional qualifying battles, the participants of the tournament were tutored and supported by Olympic champion Alexander Povetkin, MMA champion Jeffry Monson, world and European boxing and Thai boxing champion Grigoriy Drozd, kickboxing champion Batu Khasikov, Russian boxing champion Evgeniy Romanov, European WBA champion Eduard Troyanovskiy.

Over 300 employees of industrial enterprises fought in the grand final held in Moscow end November 2019, for a prize fund exceeding RUB 3 million, and places on the victory podium in five weight classes (ladies with boxing experience — in four weight classes).

Technodinamika JSC, Transmashholding JSC, Rumyantsev MPO JSC (member of the Technodinamika JSC holding company) and Ulyanovsk Instrument Design Bureau JSC (member of the KRET holding company) were distinguished in special nominations — active involvement and mass coverage.

The grand final of the boxing tournament and of the punch force championship were visited by special guests — famous sportsmen: absolute world champion in light-heavy weight Roy Jones Jr., professional boxing champion in the super middleweight according to seven boxing associations Natalia Ragozina, MMA fighters Yulia Berezikova and Nikita Krylov, gymnast and four-time Olympic champion Alexey Nemov, two-time Olympic champion, two-time European champion, six-time USSR champion Boris Lagutin.

KAMAZ MASTER

Russia's only works team, successfully presenting the country in the world motor sport, is a many-time prize winner and sixteen-time winner of the Dakar supermarathon, and holds by right the leading place in the world rating of motor teams.

Today, the KAMAZ Master team, being the only one among the `big league' of international rallies which conceives, designs, assembles its own race trucks, and competes using the same, includes five World Cup holders, 16 international masters of sport, 12 Russian honored masters of sport, 16 masters of sport.

KAMAZ Master is an eight-time winner of the international Silk Way rally, the all-time leader of Russian rally raid championships. In 2019, the team has for the 16th time become the champion of Dakar, a top-complexity rally marathon.

ROSTEC DEMINSKY SKI MARATHON

The XII Traditional International Rostec Deminsky ski marathon, held on March 2-3 in Rybinsk district of Yaroslavl region, was attended by 2,900 sportsmen and 9,000 guests.

For the first time in its history, the marathon has become the world's third in terms of the number of finishers among similar free style race contests.

ARSENAL FOOTBALL CLUB

The Arsenal football club held for the first time the sixth place in the Premier League tournament table, and progressed to the semifinals of the Russian Cup.

The Tula team played confidently against the grand masters of the Russian football, and managed to break into the second qualifying lap of the Europa League.

RUSSIAN ICE HOCKEY FEDERATION

In 2019, the youth and national teams won bronze medals of World championships.

One of 2019' most amazing hockey events were matches of the European hockey tournament — First Channel's Cup and Russian Classics — held at the Gazprom Arena football stadium in Saint Petersburg. The competitions were seen by over 100 thousand guests.

ALL-RUSSIAN UNARMED SELF-DEFENSE FEDERATION. "UNARMED SELF-DEFENSE TO SCHOOLS" PROJECT

The "Unarmed Self-Defense to Schools" project links up over 1,500 educational institutions from 76 federal subjects. 115 thousand schoolchildren are taught this popular combat sport in 322 sport clubs, including 117 rural clubs.

In 2019, 10 sports halls were equipped under the "Unarmed Self-Defense to Schools" project with Rostec's support in Sverdlovsk, Orel, Tomsk, Novosibirsk, Volgograd regions, Perm and Khabarovsk Territories, Chechen Republic, Yamal-Nenets autonomous district, and Khanty-Mansi Autonomous District — Yugra.

SPECIAL RUSSIAN OLYMPIAD

In 2019, the Special Russian Olympiad celebrates its 20th anniversary. With Rostec's support, all-Russian contests in a range of sports are held for mentally impaired people; teams are selected and sent to European and international contests.

As of today, the special Olympic movement involves 120 thousand athletes. About 15 All-Russian contests are held for them yearly.

RUSSIAN BICYCLING FEDERATION

In 2019, two reference contests of the Russian Bicycling Federation's (RBF) schedule took place with Rostec's support: the international stage cycling race "Five Rings of Moscow" (May 1–5, Moscow), and the Russian highway bicycling championship (June 26-30, Belgorod).

The Moscow cycling race involved 140 sportsmen from five countries and has been broadcasted for the first time on RBF's YouTube channel.

It was the first time that the Russian highway bicycling championship took five days, instead of two. The contest has become a real feast for Belgorod dwellers. On the final day, young bicyclers could also take part in rides.

BAUMAN TECHNICAL UNIVERSITY VOLLEYBALL TEAM

Thanks to Rostec's support, Bauman Technical University master team successfully presents the many-thousands army of the student community, holding high positions in Russian championships.

In 2019, the team had 21 matches in the Russian Top League A men's volleyball championship, the Russian Cup, etc. The games were visited by more than 9 thousand viewers.

Socio-Cultural Projects

SPASSKAYA TOWER XII FESTIVAL OF MILITARY BANDS

Spasskaya Tower, the XII International Festival of Military Bands, held from 23 August to 1 September, was attended by 30 bands from 12 countries, and by two international groups: the Celtic bagpipe and drum orchestra, and the Celtic dance team.

Russian and foreign participants of the festival performed as well at other sites across Moscow: at five railway stations and in seven parks.

The "Military orchestras in parks" special project hosted 16 free-of-charge concerts.

The solemn procession of the festival participants at VDNKh could be seen by over 40 thousands dwellers and guests of the capital.

The Kids' Spasskaya Tower special project developed further over 2019; it included a yearly Festival of kids' and youth wind bands, as well as an Inter-regional parade of kids' honor guards. During the festival days, everyone could visit thematic tents and the kids' ground, where exhibitions, master classes, contests, relays and games were deployed.

ROSTEC INTERNATIONAL FIREWORKS FESTIVAL

On 17-18 August, the yearly International Fireworks Festival was held in Brateevo Cascade Park. The Festival was dedicated to the theater, and was visited by about 700 thousand people, while online broadcast of the performances was viewed more than 2.2 million times.

Teams from Russia, Portugal, France, Italy, Pakistan, Spain, Canada, Argentina took part in the festival. The Russians were the first in the pyrotechnical contest, and won the Assol golden figurine — the new symbol of the festival.

Another amazing event was a pyrotechnical show on 30 m high towers using horizontal fireworks. The 5 m high Dragon installation (the event's talisman) was photographed by thousands of viewers.

TOLSTOY INTERNATIONAL THEATRE FESTIVAL

Over 10 thousand people visited the Tolstoy International Theatre Festival held in Leo Tolstoy's Estate Museum "Yasnaya Polyana" on July 4-7.

Productions created specially for the festival, using interactive elements and landscapes of Yasnaya Polyana as scenery, were shown to the public.

The Childhood sound drama, a War and Peace-based adventure game, and the Garret project of the Contemporary Art Museum PERMM presenting Leo Tolstoy as a usual dweller of Yasnaya Polyana made the festival be interesting not only to grown-ups, but also to children.

IN THE FAMILY CIRCLE NATIONAL PROGRAM

The 15th anniversary of the National Program "In the family circle" was celebrated by the International festival of children's and family films "In the family circle" and the "Ice Moscow" V New-Year's Festival.

30 films from 23 countries were shown during the festival. Viewers could communicate with stars such as Christina Asmus, Alexander Robak, Anna Ardova, Pavel Trubiner, Ekaterina Shpitsa, Elena Lyadova, Vladimir Vdovichenkov, Sergey Shakurov, Andrey Chadov, Olesya Zheleznyak.

The opening ceremony was attended by the Spleen band, Yulia Savicheva and Maxim Leonidov.

Over 1 million people visited the V New-Year's Festival "Ice Moscow" held from December 28, 2019 to January 12, 2020. It was dedicated to great Russian highlights — the outstanding symbols and images of Russian breakthroughs and victories dating from various epochs.

To build the magic Ice Moscow country, over 3.5 thousand tons of natural ice was brought from lakes of Sverdlovsk and Arkhangelsk regions, and handled by 170 sculptors from all over Russia.

URAL INDUSTRIAL MODERN ART BIENNALE

About 115 thousand people attended the events of the jubilee 5th Ural Biennale held from September 12 to December 1, and dedicated to the "Immortality" theme.

76 artists and artistic groups from 25 countries over the world presented their vision of the digital and social immortality, cultural memory and its connection with the science and technologies.

The public program included a symposium named "How, who and why dream of immortality?", and a forum named "Industriality and culture: Why we do not believe in creative economy".

One of the biennale's core project sites has for the first time become a going production facility: the exhibition took two floors of the optics production building of Yalamov Ural Optical and Mechanical Plant — leader of the optics industry, member of Shvabe JSC.

The biennale's strategic project — the art residence program — took place in 10 cities of Ural and Siberia.

For the second time, the Corporation became the biennale's strategic partner, and gained the Kommersant — Initiatives award conferred to companies and major businesses for best cultural, environmental, and charitable projects.

XIV INTERNATIONAL ACADEMIC MUSIC FESTIVAL "STARS ON BAIKAL"

"Stars on Baikal", the annual international academic music festival in Irkutsk, hosted 18 concerts visited by about 9.5 thousand viewers.

The festival's lead, the Russian national youth symphonic orchestra, consisting of 100 young performers from 20 Russian regions, gave a free-of-charge concert for students and gifted children.

Denis Matsuev's charitable solo concert became also a highlight. With his performance, the artist decided to help the flood victims in Irkutsk region.

Proceeds from the Note Do charity auction will be applied to purchase musical instruments and pay travels to contests for young talents from needy families in Angara region.

Scientific and Educational Projects

PROJECTORY ALL-RUSSIAN PROFESSIONAL NAVIGATION FORUM

Over 500 talented schoolchildren and 120 teachers from 80 regions of the country attended the PROJECTORY All-Russian forum held in Yaroslavl on November 23–26.

This year, the forum participants, together with tutors, solved practical cases faced by Rostec entities operating in areas such as healthcare, electric vehicles, power industry, and engine building.

Participants of the healthcare project session could observe, in online mode, a laser vision correction operation done at a clinic in Yaroslavl using the Olympus — an ophthalmologic station designed by Rybinsk instrument-making plant, member of the Rostec corporation.

In a session dedicated to the transport equipment, schoolchildren tried on the role of novel environment-friendly vehicle engineers. Supported by Rostec designers and experts, they created a concept of an electric jet ski snow mobile, based on the prototype of Café Racer, a town electric motor cycle designed by Kalashnikov Concern JSC.

Participants of the Industrial Revolution section dealt with the issue of recycling old aircraft engines, and elaborated a project of a town helicopter taxi system.

Following the forum, the Corporation awarded three excelling schoolchildren with sponsored certificates of education at leading technical universities of the country.

NAUKA 0+ ALL-RUSSIAN SCIENCE FESTIVAL

The annual All-Russian Science Festival NAUKA 0+ held on 11–13 October gathered about 950 thousand participants. Core events took place in Moscow.

Events were organized by leading universities, research institutes and centers, technology facilities, museums and schools of Moscow. Researchers and science promoters from China, the USA, Norway and EU countries took part in the festival.

This year's focus was the 150th anniversary of the discovery of the Periodic table of chemical elements by Dmitry Mendeleev. An installation of the famous Mendeleev table on the Palace of the Pioneers front on Vorobyevy Gory was dedicated to the event. The composition was 67 m long and almost 9 m high, and became Russia's biggest Mendeleev table.

Helping Flood Victims in Angara Region

After the immense flood in Irkutsk region had fallen down in July 2019, one of the natural disaster's most hazardous consequences was the epidemic situation in the flooded regions.

As hundreds of farm livestock died as a result of the flood, an intestinal infection and hemorrhagic fever outbreak could have begun in the region.

In order to prevent possible spreading of infectious disease outbreaks, the Nacimbio holding company supplied 12 thousand doses of bacteriophages, being a safe alternative to antibiotics. The medicines were delivered to the region as soon as on June 30, five days after the beginning of the first flood wave.

The RT-NEO IRKUTSK LLC, member of Rostec, sent 150 units of special vehicles, including bulldozers, excavators, loaders and dump trucks to manage flood losses in Tulun, the town most affected by the high water. The trucks helped clear heaps, demolish ruined buildings, and erect dams to protect dwelling houses. In all, theRT-NEO IRKUTSK LLC cleared over 200 thousand cubic meters of debris of houses, buildings and structures, removed hundreds of thousands cubic meters of rubbish.

To help dwellers of Irkutsk region affected by the flood, the Rostec State Corporation has launched construction of a housing community.

On December 26, 2019, a permit was obtained for commissioning of the first run, consisting of 32 duplexes on Cheremkhovo driveway (i. e. 64 flats in all).

The construction is financed out of voluntary donations of Rostec employees and entities. The target financing amount is up to 1 billion rubles.

Works have been accomplished at a rated price of RUB 45,097 per 1 m^2, as defined pursuant to Order of the Ministry of Construction, Housing and Utilities of the Russian Federation No. 816/pr dated December 17, 2018.

Each house features two flats of 48.18 and 61.36 m^2 (two-room), 72.99 and 91.98 m^2 (three-room), which is in line with Irkutsk region's social norm.

The wall has a three-layer structure: a 400 mm thick gas-concrete block on inside, followed by a 100 mm thick Penoplex heat insulator, and a 100 mm thick sand-concrete facing block outside. The total wall thickness of 600 mm ensures compliance with all air-to-air heat transmission requirements. In addition, the seismic activity of the region was taken into account. Roof is made of metal tile, laid over timber rafters and lathing.

Every house is fitted with an individual combined heating boiler (coal or wood, and a tubular electric heater).

Each house is properly finished, including wallpapering and linoleum floor covering. Wet areas are coated with ceramic tiles. In all premises, except the boiler room, stretched ceilings with lights are installed. Every house is equipped with an electric stove and a bake oven.

The POZIS JSC (member of Rostec) delivered state-of-the-art household appliances of their make free of charge to new settlers.

The housing community possesses all necessary utility infrastructure: central water supply and wastewater disposal, electricity and lighting. The community's on-site roads will be seasonally asphalted.

Construction of Udarnaya TPP in Krasnodar Territory

On-site preliminary works have been completed, including: top soil stripping; construction of a camp for 850 people, office buildings, warehouses; building site infrastructure. Works are underway, such as pit excavation, construction of foundations and superstructures, STP, GTP, 220 kV open switchyard, HVAC, fire water pump house, utilities arrangement.

On April 5, 2018, following a tender procedure, 266 power purchase contracts have been signed. Duration of the contracts is 15 years, starting from April 1, 2021. Buyers undertook to buy power under the contracts at a monthly rate of RUB 1.6 million per MW.

8.3 Anti-Corruption Practices

Anti-Corruption Framework

In 2019, anti-corruption practices were conducted in compliance with federal laws, Executive Orders of the President of the Russian Federation, Decrees of the Government of the Russian Federation, regulatory acts of the Russian Ministry of Labor, as well as in-house acts, including Rostec's Anti-Corruption Plan for 2018-2020 (the Plan), developed and approved by the Corporate Order dated 17 August 2018 No. 96.

Developing the Internal Regulatory Framework

Guidelines have been prepared for the identification and assessment of corruption risks pertaining to procurement operations of Rostec entities. Guidelines on completion of statements in respect of income, expense, property and property-related liabilities have been updated and supplemented.

Lists of offices have been updated, of which the filling or being appointed to:

- entails any prohibition under art. 349.1 part four clauses 1–4 and 7–11 of the Russian Labor Code;
- requires that employees provide information in respect of their income, expense, property and property-related liabilities;
- entails publication of details of income, expense, property and property-related liabilities on Rostec's official website.

45 documentary materials were subject to a due diligence in 2019. Corruptogenic factors were found in 19 documents (11 in 2018), necessary amendments were made.

Anti-Corruption Control and Corruption Risk Management

In line with the requirements of the anti-corruption law in respect of prevention and settlement of conflicts of interests, the following measures were taken:

- conflict of interests is monitored on a systemic basis;
- a Standard form of a conflict of interests statement was approved and forwarded to Rostec entities;
- employees are advised as to submission of a conflict of interests statement, and of the settlement procedure;
- advisory support provided to over 15 Rostec entities in respect of drafting respective regulations;
- materials were analyzed in respect of 52 job applicants; recommendations were provided in respect of 23 applicants concerning possible conflict of interests in case of fulfilling official duties;
- 20 notices were prepared and sent to employers of former public officials upon signing a labor contract with them.

The results of the efforts made to prevent and settle any conflict of interest during the year2019 were reported to the Government of the Russian Federation.

From January 1 to April 30, 2019 Rostec employees prepared and submitted income statements. In all, 893 statements were accepted from 372 employees (345 in 2018).

All due dates of statement submission were met. Data in respect of 42 employees and their family members were published on Rostec's website. Over 900 income statements submitted during 2018–2019 were subjected to comparative analysis (over 800 in 2018).

Following the analysis, 17 employees were audited (11 in 2018). In respect of nine of them, audit materials were submitted to the Committee for Compliance with the code of conduct and settlement of conflicts of interests.

In 2019, six meetings were prepared and held by the Committee, where audit data and reasoned opinions were considered in respect of 15 employees who had or might have had a conflict of interests, or who had submitted incomplete or inaccurate information on their income or property. Following consideration, the Committee recommended to CEO that disciplinary actions be taken in respect of three employees. In respect of six employees, it was strictly noted that such breaches are unacceptable; in respect of six employees, specific measures were taken to settle their conflict of interests.

In order to harmonize the system of corruption prevention measures at the Corporation and its entities, anti-corrupt practices were monitored at 18 holding companies and over 50 directly controlled entities. The results of the monitoring were considered at an annual meeting with deputy CEOs of the entities for safety matters during Q1 2019.

In the reporting period, 19 meetings of holding companies audit committees were held on anti-corruption matters. Following the meetings, opinions were given, listing the deficiencies identified and containing recommendations as to their correction.

Rostec's corruption risk matrix has been updated, a list of corruption-sensitive functions has been prepared, guidelines as to corruption risk identification and assessment were established. Rostec entities were assisted in their efforts to minimize corruption risks, by subjecting them to a monitoring procedure.

Further measures were taken to improve Rostec employees' anti-corruption qualification. 48 employees holding corruption-sensitive offices, with a period of employment with Rostec below 3 years, were trained. Qualification was upgraded of five employees responsible for anti-corruption practices, and of over 20 employees of Rostec entities holding corruption-sensitive offices. The results of the training process conducted at the Corporation and its entities were reported to the Government of the Russian Federation.

Operation and support were provided to the hotline for prevention of theft, fraud and corruption. In the reporting period, 109 reports received via the hotline were checked. 11 reports were confirmed, 12 — partially confirmed. Respective response measures were taken following the checks.

Control of compliance with anti-corruption laws in the procurement was ensured.

92 revisions and inspections of Rostec entities' financial and business operations were conducted. Various matters were considered as part of the work, in particular those related to the economic feasibility in highly corruption-sensitive areas.

Over 2019, over 1,200 contracts and supplementary agreements (over 900 in 2018) were audited; of them, 75 were rejected and sent back for finalization. Nine contracts were rejected as the signatory for the Corporation might have had a conflict of interests, eight — due to improper calculation and application of the initial ceiling price, eight — due to absence of an anti-corruption clause in the contract.

Provisions were added to the Single Procurement Regulation governing the proceedings of Unfair Suppliers Register of the Corporation, where persons are listed who wrongfully avoided signing a contract, or committed a material breach of contractual obligations.

Compliance with the gift reporting procedure by employees in connection with their official capacity or official duties was analyzed. Actually, the practice of giving and accepting gifts in business trips, official and business meetings has been terminated. On the eve of holidays, information letters are sent to employees regarding non-acceptance of gifts.

In the reporting period, over20 meetings of the Management Board were held, chaired by Rostec CEO, where anti-corruption matters were discussed, including elimination or minimization of corruption risks in the course of business of the Corporation and its entities.

Data concerning income and property of certain categories of Corporate employees, proceedings of meetings and decisions of the Committee, anti-corruption guidelines and reference materials are published on Rostec's official website and regularly updated.

In 2019, over 350 anti-corruption materials were published in mass media and in the Internet. 15 anti-corruption statements of Rostec and its entities' officials for Russia-wide mass media were prepared.

Jointly with governmental and local authorities, support is regularly provided in the preparation of publications, creation of anti-corruption programs and films.

Interaction with the State Authorities and Non-Governmental Organizations

In line with the Cooperation Agreement with the Russian Ministry of Internal Affairs, informational support was provided to the investigatory agencies in the investigation of over 115 corruption-related criminal cases (2018: over 100). Based on materials provided by the Corporation and its entities to law enforcement authorities, 69 criminal proceedings were instituted upon corruptive elements of crimes. In 2019, damage repaired under supported criminal cases exceeded RUB 2 billion (2018: over RUB 970 million).

Efforts made jointly with security departments of Rostec entities prevented damage in excess of RUB 17 billion (last year — RUB 3.4 billion).

27 anti-corruption materials were submitted to the Presidential Administration, Prosecutor-General's Office, Government and Ministry of Labor of the Russian Federation (2018: 18).

Half-yearly progress reports of the Corporation's anti-corruption action plan 2018-2020 and quarterly anti-corruption reports were regularly submitted to the Russian Ministry of Labor.

Pursuant to the requirements of the Plan, Rostec representatives took part in:

- workshop/meeting "Efficient pricing and control of justified cash expenditure in case of product supplies under the SDO. Settling the conflict of interests between the state customer and the contractor" (at the site of RDI Oboronprom);
- VIII Eurasian Anti-Corruption Forum "Law against Corruption: Mission and New Trends", held by the Institute of Legislation and Comparative Law under the Government of the Russian Federation;
- round table on anti-corruption practices in procurement, held at the Higher School of Economics;
- all-Russian conference "State defense order and diversification" initiated by Russian non-government organizations;
- round table "Building anti-corruption business principles in Russia" (organized by the Chamber of Commerce and Industry of the Russian Federation).

8.4 HSE Activities

Health and safety matters are among Rostec's paramount priorities.

In 2019, the Corporation kept on working out a comprehensive integrated safety, health and environment management system (hereinafter, the HSE).

As part of operation and development of the HSE management system, in order to improve sustainable safety culture, Rostec entities were subjected to HSE audits during 2019; the following regulations have been prepared and enacted:

1. Rostec Environmental Safety Strategy and Policy, defining Rostec's mission in respect of the environment: namely, efficient management of the impact of Rostec entities' production operations upon the environment, in order to preserve the latter for the benefit of nowadays and future generations.

The Corporation's strategic vectors in respect of the environment include:

- excluding excess emissions and retaining pollutant discharge by Rostec entities from facilities adversely affecting the environment;
- reducing the volume of industrial waste burial, increasing the share of recycled resources;
- increasing the level of environmental culture among employees of Rostec entities;
- environmental rehabilitation of minor rivers, ponds; bringing the quality of surface water bodies covered by the Rostec entities' area of influence up to the norms defined according to the water body's category.

2. "Building an environment safety service at Rostec entities, qualification requirements applicable to executives and specialists of the service" corporate standard.
3. Standard regulation on the health safety management system at Rostec entities.
4. Standard regulation on the industrial environmental control at Rostec entities.
5. Standard regulation on the labor safety management system at Rostec entities.

The above documents make up the HSE management system by defining responsibilities, distributing authorities among executives of all levels, according to the business frame of Rostec entities; defining methods of implementation of statutory requirements of the Russian law, subject to each entity's specific business.

A project has been launched, encompassing elaboration and implementation of the AS FPO system named "Safety, health, environment and transport safety management at Rostec entities" (the AS CSM). The project's key mission is the automation of continuous HSE monitoring and management at Rostec entities.

The AS CSM is based on a risk-oriented approach to the HSE management, integrated with budgeting and investing processes, for the purpose of providing up-to-date and accurate analytics to adopt efficient management decisions at all levels (end-to-end harmonization).

As part of sustainable safety culture promotion, in April 2019, Rostec held the second strategic session in Sochi at the site of the All-Russian HSE Week for employees of Rostec entities, where key matters were discussed concerning the improvement of labor conditions, health and safety of employees, with Russian supervisory agencies — recognized HSE experts both on the Russian and international scale. In order to increase the staff and management's involvement in the HSE hazard identification and risk assessment process, a team building session/training was held, named "Health and Safety Risk Management Practice", attended by over 150 employees of Rostec entities.

One of the HSE Week's key events was the handing of a certificate of Rostec's accession to the Zero Injury international initiative (Vision Zero).

Seven Vision Zero golden rules matching Rostec's HSE strategic objectives are:

1. To be a leader — to show commitment to the principles.
2. To identify threats — to control risks.
3. To set goals — to elaborate programs.
4. To create a health & safety system — to achieve a high level of organization.
5. To ensure health and safety at workplace when operating machines and equipment.
6. To upgrade qualification — to develop professional skills.
7. To invest in HR — to motivate by involvement.

8.5 Quality Assurance

Elaborating, Implementing and Monitoring Rostec's Quality Objectives

The RT-Techpriemka JSC, being the competence center of the quality management system, provides methodological support in the elaboration of quality objectives and their monitoring.

In 2019, the achievement by Rostec entities of objectives set in 2018 was monitored, key performance indicators in terms of product quality were measured.

Following the assessment, amendments were made to bonus cards of heads of parent entities of Rostec holding companies (integrated structures); bonus cards for the senior management of entities responsible for product quality assurance were prepared.

In order to enhance processes significantly affecting the product quality, quality objectives of the Corporation and the holding companies (integrated structures) for a 3-year period (through 2022) are being prepared.

Standardization Efforts

Currently, the following Corporate quality management standards prepared by the RT-Techpriemka JSC have been approved and are being implemented:

- CS RT QMS 23.006: Rostec's quality policy and objectives. Adopting, cascading, monitoring, updating.
- CS RT QMS 23.007: Auditing Rostec entities' suppliers.
- CS RT QMS 23.008: QMS performance measurement procedure.
- CS RT QMS 23.009: Special requirements as to the application of Russian standard GOST R ISO 9001-2015 at Rostec entities.
- CS RT QMS 23.010: Quality data analysis in respect of components and materials supplied.

Auditing Compliance by Rostec Entities with Quality Management Requirements

Quality compliance audits were conducted in strict conformity with the approved road map.

Following the audits, a list of key non-conformities is prepared and mailed to Rostec entities to estimate whether they exist or not, and to take preventive measures to avoid them.

23 scheduled checks were held in 2019, which exceeds the 2018' figure more than twice.

Following the audits, three times as many non-conformities were detected in 2019, as compared to 2018, which entailed triplication of the number of corrective actions.

Developing and Implementing Quality Management Systems at Rostec Entities

A meeting of the Quality Coordination Council was held. All decisions made by the Council were implemented in a timely manner.

Documented Quality Management System regulations were put in place.

Training programs were elaborated and workshops were held for employees of Rostec entities, concerning the implementation of Rostec's quality management procedures, regulations and standards.

Measures were taken by the RT-Techpriemka JSC upon requests of final military hardware manufacturers.

9. DISCLAIMER

Some statements contained in this annual report of the Rostec State Corporation are based on forecasted future events. Such statements contain terms referring to the future nature of an event, including (but not limited to) the words “considers”, “estimates”, “expects”, “assumes”, “plans”, “could”, “intends”, “will”, “must”, their equivalent negative forms, word combinations with similar meaning, as well as discussions of strategies, plans, goals, tasks, future events or intentions of the Corporation.

Statements of a forecasting nature may include (without limitation) the following information:

- estimate of the Corporation’s future operational and financial results, as well as forecast of factors affecting the current value of future cash flows;
- the Corporation’s plans for constructing and upgrading of industrial facilities, as well as planned capital investments;
- the Corporation’s product demand behavior and plans for developing new products, as well as pricing plans;
- plans for improving the corporate governance practice at the Corporation;
- the Corporation’s future industry position and forecasts of the development of market segments in which the Corporation operates;
- possible regulatory changes and assessment of the effect of various regulations on the Corporation’s business;
- other plans and forecasts of the Corporation regarding future events.

The above statements that contain forecasts related to future events are subject to the effects of risk and uncertainty factors, as well as other factors which may result in the deviation of forecasts from actual results. The Rostec State Corporation therefore does not recommend that it be unreasonably relied on any information contained in this annual report with respect to future events. The Corporation assumes no obligation to publicly revise these forecasts, neither in an attempt to reflect the events or circumstances taking place after the publication of this annual report, nor aiming to refer to an unexpected event, except as required by law.

TABLE OF CONTENTS

Rostec


Rostec