

# Information Technology and Innovation

Aeroflot Group continued with its digital transformation in line with the IT Strategy adopted by PJSC Aeroflot's Board of Directors in 2018. The digital transformation covers all steps, from managerial solutions and aircraft maintenance and repair to development of services for passengers. New technology solutions promote efficiency and transparency of Aeroflot's business processes and strengthen its leadership position.



### 2019 highlights

Aeroflot received an E-Commerce Project of the Year award at the **CNews AWARDS 2019** for a number of projects aimed at better end-to-end customer experience in key online channels, i.e. the website and the mobile app.

## Key Aeroflot Group's IT technology development priorities



### Business trends

Website upgrades

Increase of mobile devices importance for passengers

Increase of mobile devices importance for staff

New technologies in the airports: automated airport



### Technology trends

NDC (direct agent distribution)

Cloud technology – resource pool management

Big Data and machine learning

Artificial intelligence

Robotic process automation



### Managerial trends

Data management

Strengthening cybersecurity

Innovation centres

Membership in the Digital Transportation and Logistics Association

Import substitution

Aeroflot won **GlobalCIO awards** for:

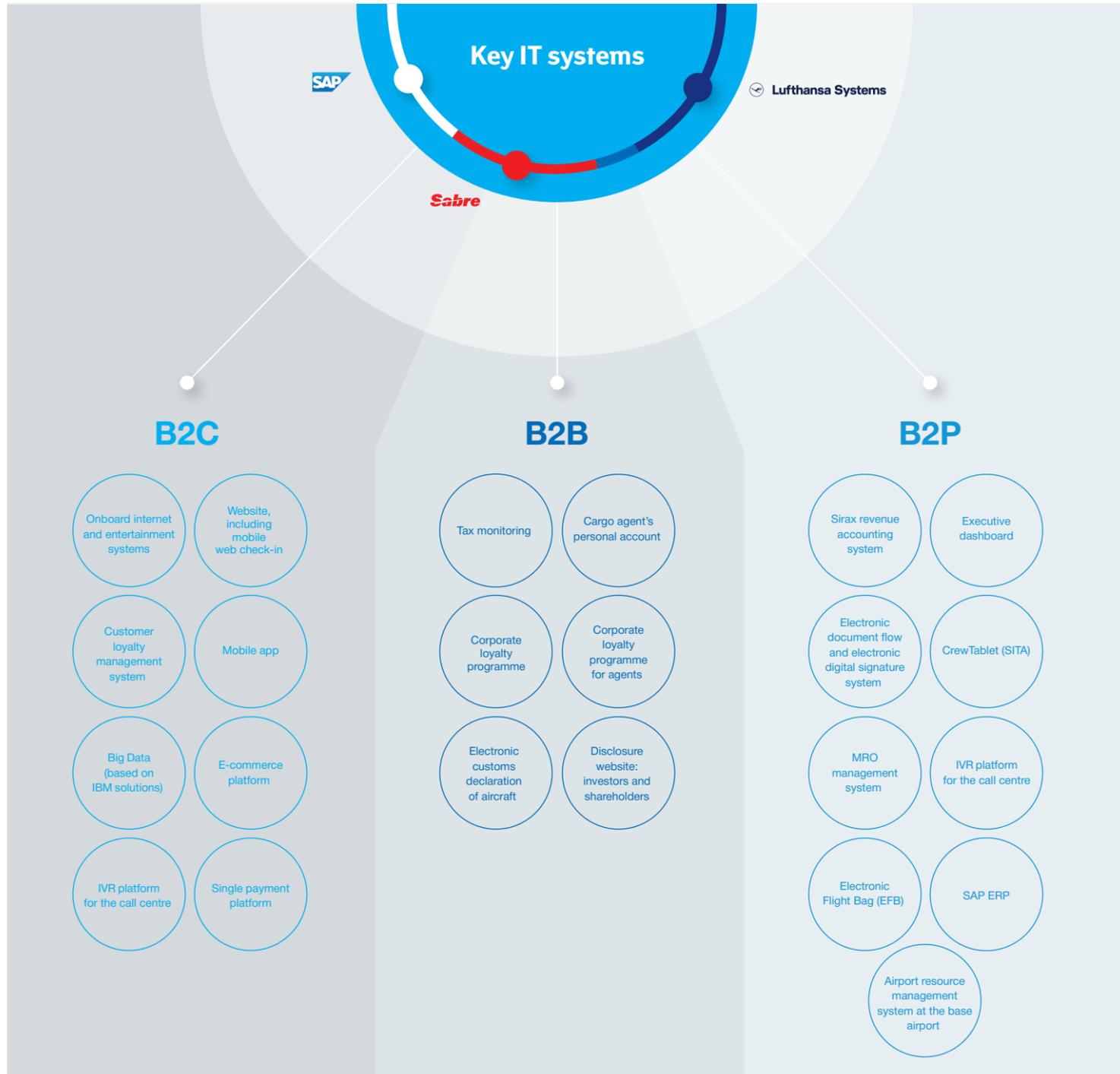
- an automated system for predicting cargo and mail capacities (to predict available cargo and mail capacity aboard Aeroflot's passenger flights, both long- and short-term, as well as to increase aircraft load volumes)
- the system to optimise creating, conducting and analysing marketing campaigns (to optimise automated targeting of marketing campaigns to customers given the variety of communications, offers or communication channels).

Aeroflot won the annual **Innovation Time 2019 award** in the IT and Digital Technology category. The prestigious award was granted to Aeroflot's Tax Monitoring Data Mart project, recognised as the organisational and managerial innovation of the year.

IT projects in 2019 were implemented in online sales, operations, aircraft maintenance and repair, cybersecurity, marketing, enterprise management and cargo transportation.

In 2019, Aeroflot joined the Digital Transportation and Logistics Association focused on driving digital transformation across the transportation industry, as well as on creating and developing a single multimodal digital transportation and logistics environment across Russia.

**Key Aeroflot's 2019 IT systems**

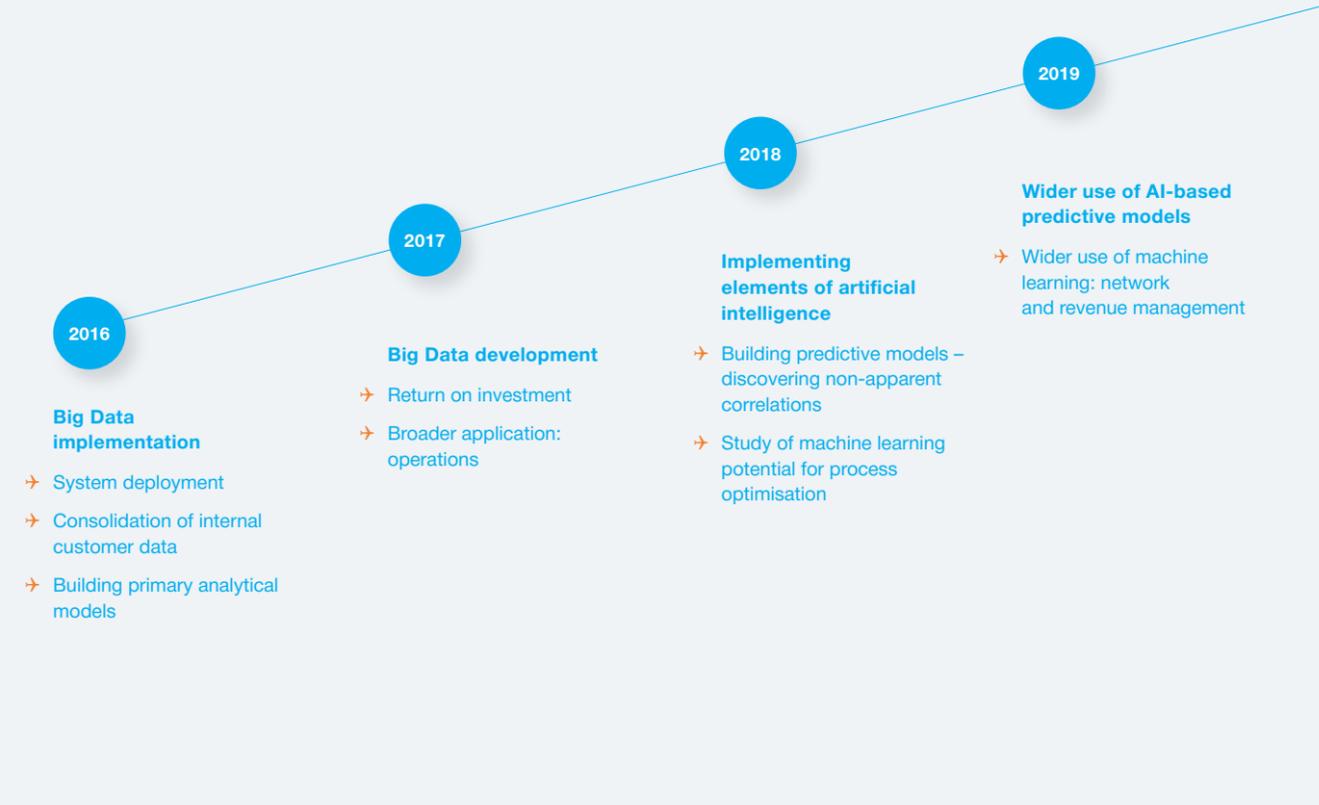


**Development areas**

**Using Big Data technology**

Aeroflot makes wide use of Big Data in its digital transformation. A smart passenger segmentation system based on Big Data has been implemented. The system can identify customer profiles by merging and analysing passenger data from different sources, including past customer interactions. The service recommends travel destinations based on a passenger's flight history and calculates Customer Lifetime Value (CLTV). Big Data is also used to analyse the customer impact of interactions through different channels.

Cargo Air, a Big Data-based automated system for predicting cargo and mail capacities aboard Aeroflot's passenger flights, was launched in 2019. Big Data analysis helped increase the accuracy of predicting available cargo and mail capacity and optimise commercial load.



## Building a shared airline retailing environment under the NDC programme

Aeroflot continued to develop its project for building an integrated airline retailing environment under the NDC standard in 2019. Technical capability to connect agents to the NDC system was implemented, an action plan with six pilot agents was developed and Tickets.ru agent was connected. Sales through the NDC channel are growing at a good pace.



Value-added services:  
la Carte menu



Air ticket refund  
and exchange



New NDC  
version 18.2



IATA NDC Level 4  
certification

In early 2020, Aeroflot received the NDC Level 4 certificate, which helps significantly improve customer service while booking is fully agent-managed. There are activities in the pipeline to obtain the highest level of certification, NDC@Scale.

## Digital transformation of operations-related systems

Aeroflot implements artificial intelligence, machine learning and IoT technology in all key operations processes. The company embraces paperless technology, with flight documentation uploaded to the onboard computer and the EFB. Data is analysed to improve flying techniques and flight safety.

Aeroflot implemented a smart connection management system in 2019, offering optimal passenger re-routing solutions to preserve flight connections after schedule disruptions.



### Crew Tablet for flight attendants

- Flight schedule
- Flight load factor
- Aircraft cabin configuration
- Passenger information, including frequent flyer status
- Special meal orders
- Working with documents



### Electronic Flight Bag for pilots

- Transition to electronic documents at every part of the flight from take-off to landing
- Makes paper-based on-board documentation redundant
- Replaces traditional heavy flight bags containing navigation documentation with modern touch-controlled electronic tablet devices

An automated ETA module to predict aircraft arrival time was implemented. Personal accounts for flight attendants were also launched in 2019, streamlining cabin crew operation.

Aeroflot implemented a project to automate online auctions to sell blocks of cargo capacity that helps more promptly respond to the cargo market environment and drive the segment's margins.

## Digital solutions for passengers

Aeroflot continued to implement digital solutions and services in 2019, offering its customers a whole new air travel experience.

Aeroflot's own check-in system and web and mobile check-in services have become available to passengers in the airports of Ulyanovsk, Aktobe, Marseille, Dublin, Palma de Mallorca, Beirut, Cairo and Saratov. Self-service check-in kiosks have been installed in the airports of Rome, Paris, Yerevan, Volgograd, Minsk, Lisbon, Stockholm and Saransk. Aeroflot's passengers can use paperless mobile boarding passes in many airports around the world.

The corporate website and mobile app continued to improve, with navigation and homepage updated and baggage-free fares made available on the website and in the app.

Website users can now redeem discount coupons when buying air tickets. To reduce average airport check-in queue time, Aeroflot implemented an option whereby customers can submit visa details when buying air tickets for certain destinations on the website.

Aeroflot continues to develop its value-added services offering. In 2019, a service to pay for excess baggage was launched and value-added service processes were redesigned.

To increase the service level of the contact centre, the text-to-speech engine used in the IVR was upgraded. Voice information is unique to each customer interaction, and a high-quality text-to-speech algorithm makes the interaction closer to a human one.

## Website and mobile app feature development and navigation improvement to drive the share of online sales



Website upgrade



Mobile app upgrade



Integration of new services as features of the website and the mobile app

- Baggage-free fares
- Preselect seats
- Travel class upgrade for miles
- Travel class upgrade for cash
- Order a transfer
- À la Carte menu option





Customer experience digitalisation

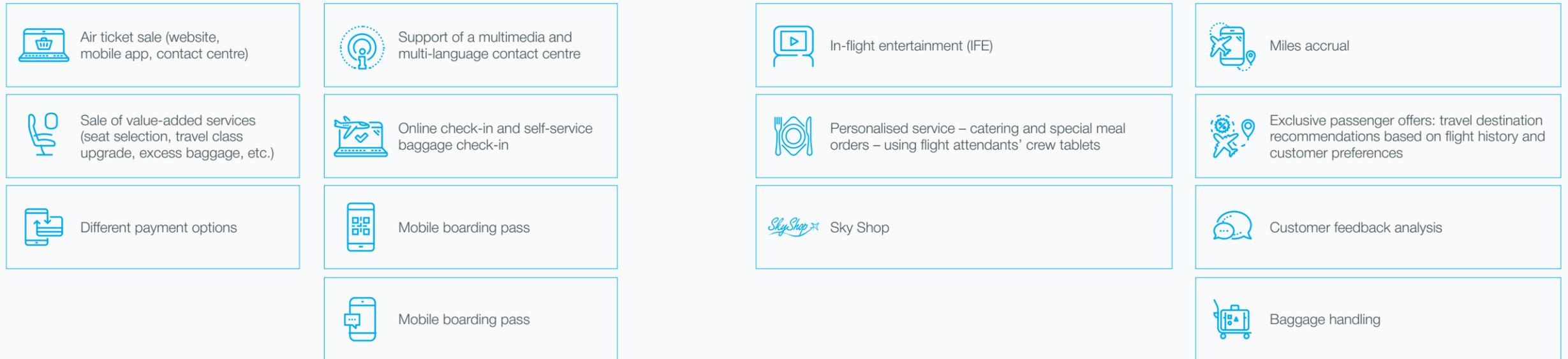
Before the journey

Prior to the flight

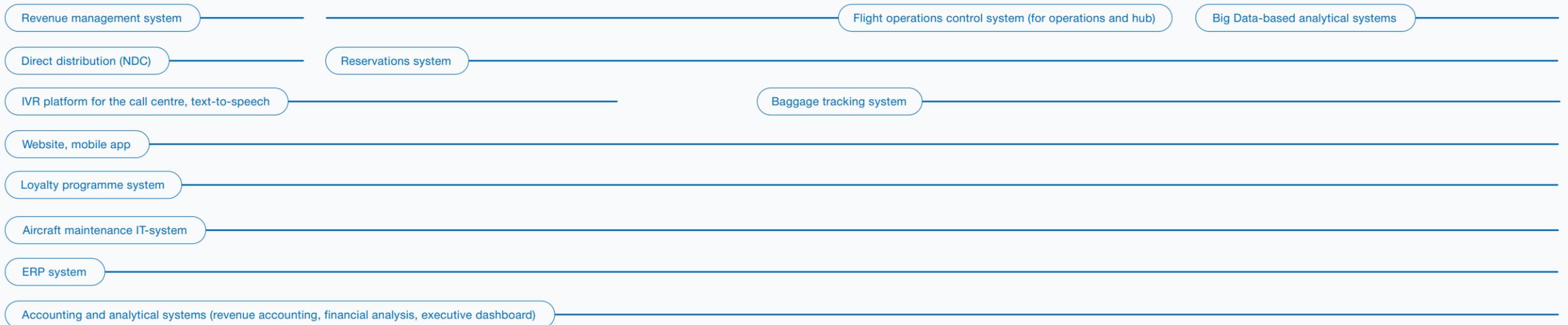
During the flight

After the journey

Customer experience digitalisation



Support technology



## Operational Review continued

### IT development in subsidiaries

01 Ensuring that subsidiary IT operations are up-to-date is a key development priority for Aeroflot Group.

02 Rossiya airline implemented an employee training administration system and a distance learning system in 2019. This helped automate employee training course and test design and administration, monitoring the learning progress and test results.

03 Implementation of an automated aviation security management system drove effectiveness of passenger and employee safety measures. The airline also deployed IT infrastructure implementing technical measures to ensure confidential information security.

04 Aurora airline implemented a new software solution in 2019, Safran Analysis Ground Station (AGS), for flight data analysis to ensure aviation security and risk management. The airline's website opened sales of value-added services, such as seat selection and payment for excess baggage. Aurora's website offers passengers a virtual cabin tour of Airbus A319 and DHC-8-400.

Pobeda airline had an upgrade of its data centre hardware and a complete overhaul of its network infrastructure in 2019.

The airline had good experience with Jeppesen Crew Pairing, Jeppesen Crew Rostering, Jeppesen Crew Bid software. The software helped reduce costs in building crew rosters, balance the flight hour and rest requirements, reduce the number of days off duty and increase average annual pilot flight hours.

### Support of innovative development

Aeroflot continuously drives innovation in all aspects of its operations to strengthen its technology leadership in the global airline business. Aeroflot Group's innovation ecosystem reinforces its competitive edge and helps optimise operations and administrative processes as well as offer its customers an unmatched service level.

The main document that sets forth the innovative development focus areas for PJSC Aeroflot and its subsidiaries, JSC Rossiya Airlines and JSC Aurora Airlines, is PJSC Aeroflot's Innovative Development Programme (IDP) approved by its Board of Directors on 25 August 2016. The IDP programme has been developed in line with the roadmaps for new economy industries and coordinated with the Ministry of Transport, the Ministry of Science and Higher Education and the Ministry of Economic Development of the Russian Federation. The IDP covers the main innovation focus areas and activities of Aeroflot Group. In 2019, the Company completed the update of the Innovative Development Programme 2025 taking into account the requirements of the state strategic planning, Aeroflot Group's updated Strategy, Aeroflot Group's Long-Term Development Programme, the Investment Programme and other strategic documents, plans and programmes of Aeroflot Group. The goals and objectives of the Programme are aligned with the targets of national projects (programmes), including Research, Education, Digital Economy of the Russian Federation, International Cooperation and Exports, Small and Medium-Sized Businesses and Support for Individual Entrepreneurs, Labour Productivity and Employment Support, as well as the Strategy for the Scientific and Technological Development of the Russian Federation until 2035 and the action plans (roadmaps) of the National Technology Initiative.

The Programme's key focus areas include:

- improving flight safety and building an integrated security and anti-terrorist system
- implementing modern technology, specifically Russian technology where appropriate, including IT security software solutions
- enhancing Aeroflot's competitive position, including such key metrics as the share of the air transportation market and customer satisfaction with the services we provide
- engaging with development institutions, support of government projects that foster new economy industries
- automating the airline's operating and administrative processes
- improving environmental performance, energy efficiency and resource conservation
- increasing labour productivity and creating highly productive jobs.

The KPIs under the Innovative Development Programme reflect the long-term vision for the Russian and international air transportation market and the goals of the Long-Term Development Programme, the Strategy and the Investment Programme. The Innovative Development Programme's KPIs include reduced product costs, flight safety levels, NPS, lower fuel costs, increased labour productivity, etc.

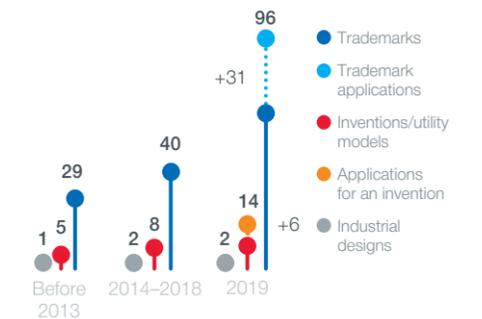
### One-stop-shop system

PJSC Aeroflot has an automated one-stop-shop system to manage proposals for innovative solutions coming from SMEs and other participants of the Company's innovation ecosystem. The system enables the SMEs to originate innovative proposals related to Aeroflot's business. The proposals are reviewed by the Committee for Innovative Development under PJSC Aeroflot's Management Board. Following the review, decision is made whether the innovation proposal can be implemented in Aeroflot Group companies. A total of 62 proposals have already been reviewed, including 14 in 2019, four of which are being further reviewed for possible implementation.

### Intellectual property assets

A stock-taking of intellectual property rights was conducted in 2019 in accordance with Russian Government Directive No. 7050p-P13 dated 30 August 2018 and a resolution of the Company's Board of Directors. A total of 1,752 PJSC Aeroflot's intellectual property assets were identified, including 238 items for which it is feasible to seek legal protection.

PJSC Aeroflot's intellectual property assets registered in Russia (cumulative total)



As at the end of 2019, PJSC Aeroflot had 128 registered intellectual property assets. Key areas were aviation security and IT solutions. For example, in 2019 the Company obtained a patent for a method of detecting of explosives and other target substances in Eurasia and the US, and validated the patent in a number of European countries.

A positive resolution was also obtained granting two patents for an automated information system for pilot training.

Trademark registration is the most effective corporate identity protection method today, and when a brand is widely recognised, it becomes a practical necessity. With that in mind, the Company obtained 22 trademark certificates and filed over 20 new applications in 2019.

## Operational Review continued

### Key innovation development projects in 2019

<p><b>02</b></p> <p><b>Construction of a new advanced hangar facility that is completely unique for Russia</b></p>	<p>Construction of Hangar 4 for aircraft maintenance and repair at Sheremetyevo airport continued in 2019. Hangar 4 is a unique patent-protected facility. It is designed to accommodate one wide-body Boeing 777 or up to three narrow-body aircraft. The hangar will improve the Company's operating performance by reducing aircraft downtime when there is a failure, and for maintenance or engine change. The project will also create new jobs as well as reduce outsourcing by expanding the range of in-house maintenance services for Aeroflot's aircraft.</p>
<p><b>03</b></p> <p><b>04</b></p> <p><b>Digital take-off and landing research.</b></p> <p><b>Development of a software solution to use SSJ100 aircraft take-off and landing data and flight documentation on Electronic Flight Bags</b></p>	<p>Expected project outcome is pilots and engineers adopting the software solution to use SSJ100 aircraft take-off and landing data and flight documentation on Electronic Flight Bags.</p>
<p><b>Research project to study the possibility of building a predictive model of aviation incidents frequency in specific flight conditions</b></p>	<p>Aeroflot uses an innovative approach exploring new flight safety management options in an environment of growing flight hours, increased cockpit crew workload and evolving flight conditions. The project studied the possibility of building a predictive model of aviation incidents frequency in specific flight conditions. Modelling was based on aircraft specifications and performance, flight crew performance, aerodrome network characteristics, flight hour projections and external factors. The result is a reliable model predicting aviation incidents frequency, built on the information from the database. The study helps identify the limitations of the existing database and formulate recommendations for further development of the Company's information systems and databases.</p>
<p><b>Digitalisation projects</b></p>	<ul style="list-style-type: none"> <li>→ Development of a software solution to prepare consolidated targets of Aeroflot Group's Innovative Development Programme and improvement of the automated monitoring system</li> <li>→ Development of an Executive Dashboard software solution at PJSC Aeroflot</li> <li>→ Continuous delivery for website updates</li> <li>→ Cargo agent's personal account</li> <li>→ Upgrade of document scanning features of the government-sponsored flights booking system</li> <li>→ Cargo Air, an automated system for predicting cargo and mail capacities</li> <li>→ E-ticket and boarding pass import into the Google Pay app</li> <li>→ Further development of the automated ETA module</li> <li>→ Occupational Safety system, and others</li> </ul>

## Aircraft Maintenance and Repair

Aeroflot Group has an efficient aircraft maintenance, repair, and overhaul (MRO) system aimed at ensuring high fleet reliability, flight safety and on-time performance.

The MRO policy of Aeroflot Group airlines provides for strict compliance with the requirements of countries of registration, maintenance programmes and aircraft lease agreements. It is focused on enhancing capacity and technical competencies, rolling out cutting-edge technological solutions and providing employee training and development opportunities while improving economic efficiency.

