

Conquering the sky: engineers from Polytechnic AES presented unique developments to Fyodor Konyukhov

On January 17, the Digital Engineering Advanced Engineering School of Peter the Great St. Petersburg Polytechnic University (AES SPbPU) was visited by the outstanding Russian traveler Fyodor Konyukhov with a team of expedition organizers. The main purpose of the visit was to get acquainted with the intermediate results of two projects that are being carried out by engineers from SPbPU. These are the design of a balloon nacelle for a flight over Russia and the design of a fairing for a motorized paraglider for a flight to the North Pole.



The famous traveler and his team were welcomed by Alexey Borovkov, Vice-Rector for Digital Transformation of SPbPU and Head of the Advanced Engineering School of SPbPU. In March this year Fyodor Konyukhov together with Ivan Menyaylo plan to make a flight of more than five thousand kilometers by balloon in harsh natural and climatic conditions, covering the distance from the Murmansk region to Chukotka.



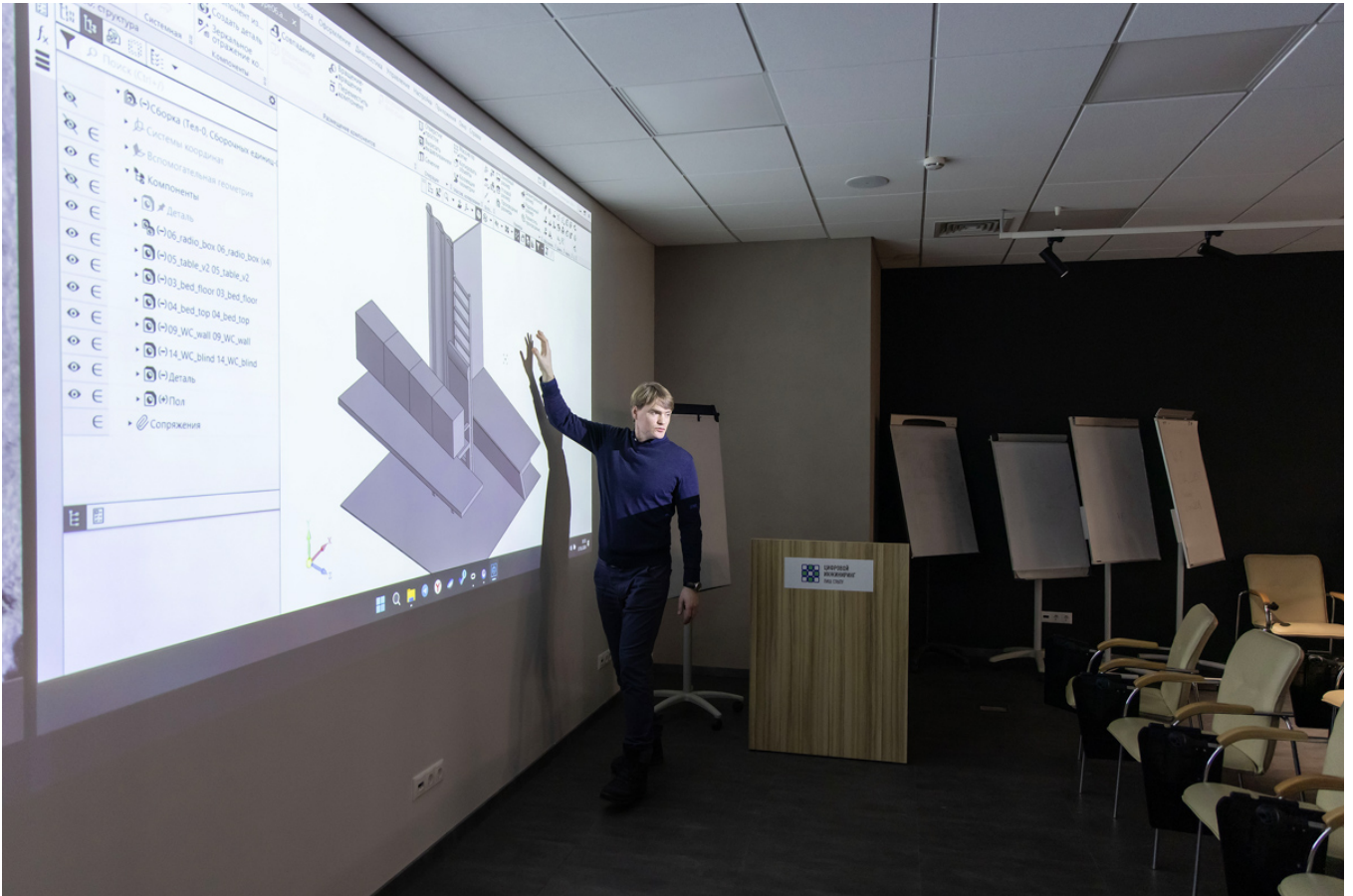
The main requirements for the balloon gondola were formulated during Fyodor Konyukhov's visit to SPbPU AES in May 2023. When designing it, it was important to use the best global practices and take into account the experience gained in other balloon expeditions. Recall that in 2016, Fyodor Konyukhov set a world record by flying a balloon around the Earth in 11 days, 4 hours and 20 minutes.

The key event of the current visit was the demonstration of an interactive VR-version of the gondola interior, which was recreated using 3D technologies by the developers of the Industrial Systems of Streaming Data Processing Laboratory at SPbPU. It was based on the model of the gondola developed by engineers and concepts of young designers. The virtual reality approach helped the traveler to see the interior from the first person, check the accessibility of the located equipment, evaluate the ergonomics of the cabin and give comments on improving the space. VR-application for the demonstration is made on the domestic 3D-engine UNIGINE.





As noted by the authors of the project, it was important to maintain a balance of safety and comfort of the participants of the future flight. Pilots will have to spend several days in sub-zero temperatures and strong winds, landing is possible both on ice and open water, so it is necessary to ensure buoyancy of the balloon basket.



During the demonstration of the interactive VR-version of the gondola, travelers and AES SPbPU engineers discussed in detail all the details: the optimal location of the sleeping place, instrument control chair, compartments for personal belongings, storage space for oxygen tanks, batteries, food and medicines, taking into account weight distribution and requirements to the position of the center of gravity.

In addition, the project of the winners of the federal contest «Young Design-2023» in the nomination «To the North!» established by the Advanced Engineering School of SPbPU was presented to Fyodor Konyukhov's team. The special nomination was created for students of specialized universities and colleges who are ready to offer their ideas for organizing the space of the balloon cabin.



Another landmark project of the SPbPU AES for another large-scale expedition is the design of a motor paraglider (powered parachute) fairing for use in Arctic conditions. This year Fyodor Konyukhov and his co-pilot Igor Potapkin are scheduled to fly to the North Pole. Rudolf Island, the northernmost point of Franz Josef Land, is chosen as the starting point, where the crew and the motorized paraglider will be delivered by the nuclear icebreaker «50 Years of Victory». After takeoff, they will have to travel more than 500 kilometers, land on an ice floe and wait for the icebreaker to arrive.

As a preparatory stage, in September 2023, the travelers made a flight

to Prielbrusie, which ended with a world record height for the crew of a paraglider-two. At the same time, the requirements for the design of a motorized paraglider for use in the Arctic zone were determined. SPbPU engineers needed to modernize the design of the aircraft to protect pilots from wind and polar cold, which occur when traveling at a speed of 50-60 km/h.



At the end of last year, the powered parachute was brought to Polytechnic University to perform 3D scanning followed by the formation of a geometric 3D model to further design the fairing to meet the specified requirements and constraints.

«First of all, the task was to achieve the comfort of the people in the parachute,» said Maxim Nikitin, a researcher at the Engineering Center (CompMechLab[®]) of SPbPU's Engineering Center (CompMechLab[®]). «An extreme flight is planned, so it is important to think over the volumes and locations of rescue equipment, as well as places for fuel tanks. The weight of the finished structure is less than 20 kg, such a result was achieved due to the use of polymer composite materials and experience accumulated in other advanced projects».



Summarizing the discussion of the project, the parties concluded a formal agreement on cooperation in terms of production of working design documentation of the paraglider fairing for the specified characteristics with further consultations and author's supervision during production. It is necessary to fully complete the modernization of the paraglider by the summer of this year.



At the end of the visit Fyodor Konyukhov gave an interview at the SPbPU's TV Studio, congratulated the university on its upcoming 125th anniversary and agreed to be a guest of the discussion club «You have the floor».



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