

Engineers create drones based on digital twins

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The TSU Supercomputer Center staff has developed a method for the automated design of drones based on mathematical modeling using the computing power of the SKIF Cyberia supercomputer. The new

approach includes the creation of a digital twin and its prototyping—the production of a functioning UAV (unmanned aerial vehicle) model. This method can be used to construct aircraft models and to optimize the performance of existing aircraft.

"The new approach solves the problem of developing the aerodynamic profile of the UAV and choosing its optimal design," says Kirill Kostyushin, project executive. "To solve engineering problems, a cloud system was created associated with the TSU supercomputer. The user uploads the required technical characteristics to the cloud system, such as maximum lift, wingspan, flight time and distance, speed, and others. Based on these parameters, calculations are made and 3-D models and a digital prototype of the aircraft are created. The best option is selected by testing UAV models in a [virtual wind tunnel](#)."

According to the developers, the use of supercomputing technologies with methods of numerical modeling and virtual prototyping can significantly reduce the development and production process. This becomes a key factor in the market competition for such developments.

TSU scientists have already released the first laboratory copy of the UAV designed to monitor the environment. It will assess the state of the environment using an onboard gas analyzer. The drone will conduct surveys of a city and a region, and work to prevent new landfills and illegal dumping of waste. In the future, such an apparatus can be used to search for fires in the forests of the Tomsk Region.

The new approach and the virtual wind tunnel can be used to improve the performance of existing aircraft. To do this, a model is loaded into the [cloud system](#), aerodynamic calculations are carried out, and problem areas are identified; then options for improving the characteristics of the product under development are proposed. This solution is embodied in a digital double (a 3-D-model) and scientists conduct virtual tests to

determine the effectiveness of the changes.

"The system can also be used to solve engineering problems in the construction of new [aircraft](#)," says Kirill Kostyushin. - "Of course, our system will not replace the design bureau specialists, but it can significantly speed up their work."

Provided by Tomsk State University

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