Sukhoi Design
A new stage in a 75-year history

NX and Teamcenter allow the creation of digital mockups that are key to a transition to paperless operations.

From fighters to regional passenger jets
A list of modern military jets would be incomplete without the internationally known Sukhoi aircraft developed by Pavel Sukhoi, an outstanding Soviet aircraft builder, his colleagues and followers. During its 75-year history Sukhoi Design Bureau has developed nearly 100 aircraft types and their modifications, with more than 60 produced on a full-scale basis. More than 10,000 aircraft have been manufactured, with over 2,000 exported to 30 countries worldwide. Sukhoi aircraft have set more than 50 world records.

Recent developments from Sukhoi Design Bureau include the Sukhoi Su-24 all-weather front-line bomber with changing wing sweep and the Sukhoi Su-25 armored attack aircraft. One of Sukhoi Design Bureau's most famous fighters is the Sukhoi Su-27 fighter (known abroad as Flanker) and its modifications Su-30, Su-32 and Su-33. The company has also created aerobatic airplanes, and since the early 1990s has been making civil aircraft as well.

In 2003, Sukhoi Design Bureau became part of Sukhoi Company, Russia's largest aviation holding with a staff of 28,000. Sukhoi Company performs a full range of operations, from aircraft design engineering to maintenance and repair. The company is ranked first among Russian aircraft exporters and third worldwide in terms of the production of modern fighters. Sukhoi Company continues to make progress in engineering combat aircraft, its core field of activities. It is now testing the Sukhoi Su-47 Berkut aircraft with forward swept wings, which will be the basis for a new aircraft generation. The company is also applying its expertise to developing passenger airplanes such as the Sukhoi Superjet, a Russian regional jet.

Right software is key to success
Realizing that it is impossible to develop aircraft today without digital product development software, Sukhoi Design Bureau studied and tested various systems including CADDS 5, I-deas™ software, Catia and Pro/Engineer as well as the NX™ digital product development system from Siemens.
Siemens PLM Software. “The global aviation industry uses NX and Catia,” says Evgeny Savchenko, head of MCAD at Sukhoi Design Bureau. “It was up to our engineers to select the system they wanted and they chose NX, which was originally developed at McDonnell Douglas, an aerospace manufacturer.” The feature that sold the engineers on NX was the kinematics module.

The initial phase of implementation resulted in the Sukhoi Design Bureau engineers generating paper documents despite the fact that they were being trained in new CAD technology. They learned to operate the relevant functions, but the company eventually offered an authorized NX training class as well. “As we studied the system carefully, we began to understand that it was a set of new technologies rather than a set of new tools,” says Savchenko. “We realized that we needed to direct our efforts at improving collaboration,” Savchenko notes.

Moving to digital mockups
The next stage began when an enterprise computer system was set up and the number of seats doubled. At that time, Sukhoi Design Bureau also initiated pilot projects involving digital mockups of airplanes, with data management handled by the Teamcenter® engineering product and process management system from Siemens PLM Software. These activities were aimed at developing an airplane with light aircraft engines.

At that stage the basic principles for working with the digital mockup were established. These included: “top-down” assembly, distribution of responsibility and access control, standardization of the user workspace in Teamcenter, division of the drawing and the model, and the addition of requirements to the model. The most important changes were related to the implementation of NX WAVE technology for structuring controlled associative links between models.

The company established a Basic Control Structure (BCS) that contains information obtained during the preliminary development stage, such as a surface model, load-carrying scheme, production break line scheme, routing and wiring schemes and so on. Engineers obtain the information they need only from the BCS. Engineers do the digital linking of the product in their workspace and link a model free of any redundant elements to their outcome area. This is the model that will be included in the digital model of the product. This approach helps control changes during the time a design is subject to continuous modification due to often-contradictory requirements. Siemens PLM Software’s Moscow office helped implement these technologies.

“The whole company can now access the results of efforts of tens and hundreds of employees, which then become assets of the company,” says Savchenko. “This is the main function of product data management (PDM). In my opinion, PDM and CAD systems can be from different vendors, but the PDM system must be from Siemens PLM Software. We have learned that from our experience.”
That project convinced Sukhoi Design Bureau that using PDM for making digital mockups is necessary and delivers benefits. “I cannot understand how some other companies can work using only an operating system,” says Savchenko. “Monitoring numerous files, updating versions...impossible! It is important that companies understand how crucial it is to be able to manage your product data.”

The Superjet 100 was implemented by Sukhoi Civil Aircraft with support from engineers from Sukhoi Design Bureau, who at that time had had more experience with the Siemens PLM Software solutions and had been trained in their use. When work on the Superjet 100 project began, with the overall digital product stored in Teamcenter, the company realized that doing this project in another PDM system would have been impossible. Interaction between multiple PDM systems also would have been impossible. It was clear to all that the project could only be supported by a single PDM environment – Teamcenter.

It is at this point that the company focused its efforts on setting up centralized standard product libraries. The entire corporation is involved in the process, and work continues on delivering the libraries.

Digital product data includes more than geometry
One of the most significant projects during the fourth stage of the PLM implementation was the development of the digital mockup of fins for Sukhoi Su-30, along with its production launch at Irkutsk Aviation Plant. Sukhoi transferred the digital mockup as a file structure and also provided standard, paper-based engineering documentation. That was the first project in which a Russian plant received a model of an airplane that was so well developed. Plant management was very pleased with it.

“We learned from that experience that we need to provide plants with models that contain all of the information necessary for manufacturing,” Savchenko notes. At this phase Sukhoi Design Bureau undertook the development of a digital technology called ELOIZ that contains not only product geometry but also the information needed to manufacture a product such as: the materials it is made of, the technical requirements it must comply with, the standard products it comprises, where it is described (in a CAD model or drawing), documents authorizing its issue, modifications and so on. Siemens PLM Software solutions provide the basis for the creation and maintenance of this data.
Customer's primary business
Sukhoi Design Bureau is one of the best-known developers of military and civil aircraft
www.sukhoi.org

Customers location
Moscow
Russia

“Thanks to a seamless implementation of the newest MCAD and PDM technologies from Siemens PLM Software, Sukhoi remains one of the leading corporations in the aviation industry.”

E. I. Savchenko
Head of MCAD
Sukhoi Design Bureau

Future plans for linking the enterprise
“Among the major benefits, direct and indirect, that our company has gained from the implementation of Siemens PLM Software solutions, I would single out significantly higher operational quality and greater productivity with lower costs,” says Savchenko. “All of that is very important, but not crucial. What is really crucial is that we – Sukhoi Design Bureau, the plants and all of Sukhoi corporation – are implementing invaluable new technologies. That allows us to not only make digital product models but also to manufacture products using modern equipment that can process digital information.” Such equipment is now being installed at the company’s plants.

Sukhoi is now working to set up a corporate data exchange system. “In other words, we are working to create a modern company equipped with modern technologies and quite competitive in the global market,” Savchenko adds. “Many of our new goals can be achieved by means of Siemens PLM Software solutions. We are very pleased with the solutions we have already implemented, and that makes us confident about the solutions we will implement in the future.”

In the near term, Sukhoi Design Bureau plans to implement new capabilities for checking model quality and Teamcenter functionality for managing projects. Another major issue for the company is the need to establish full collaboration between plants, which will be achieved through Teamcenter multi-site collaboration capability. “We are witnessing a qualitative rather than quantitative growth in our demand for Siemens PLM Software products,” Savchenko notes. “That proves that we made the right choice.”