# SUPERJET Nears Flight

**Russia's new regional jet poses an integration challenge involving multiple avionics suppliers from North America and Europe**

By Bernard Fitzsimons

Fast approaching a first flight currently scheduled for December, the Sukhoi Superjet 100 is barely a year away from its inaugural delivery to launch customer Aeroflot in November 2008.

The development, production and testing efforts are ramping up accordingly. Alenia Aeronautica has taken a 25 percent stake in Sukhoi Civil Aircraft Co. (SCAC) and will set up a joint venture in Italy to provide marketing and after-sales support outside Russia and the Commonwealth of Independent States. Boeing has expanded its long-standing consultancy role. Airframes are under assembly at Komsomolsk-on-Amur in the Russian Far East and undergoing tests by TsAGI, the Central Aerohydrodynamic Institute, at Moscow's Zhukovsky air base. The PowerJet joint venture of Snecma and Russia's NPO Saturn is building and testing SaM146 engines in Rybinsk.

(Top) Courtesy Sukhoi Civil Aircraft (Bottom) Courtesy Thales

**(Top) Flight deck of the new Sukhoi Superjet 100 regional jet with Thales avionics suite was inspired by the cockpit layout of the Airbus A380. (Bottom) One of the two systems integration benches used by Thales in Toulouse, France. One bench was to be moved to Moscow by the end of the year.**

France's Thales, meanwhile, is developing the new regional jet's avionics under a $120 million contract signed last year that covers the specification, design, validation and integration of the complete suite through certification, plus the first 50 shipsets of hardware. The design is the product of a long definition phase with Sukhoi that started before the contract award and continued afterward.

Program manager Lionel Rouchouse said the company has around 270 people working full time on the Superjet program in Toulouse, Bordeaux, Paris and elsewhere in France, in Moscow and in

Montreal. There are two integration benches in Toulouse, one of which is likely to be moved to Moscow before the end of the year, and an electronic bird at the SCAC headquarters in Moscow. There is also a software development joint venture in Moscow employing more than 60 SCAC staff, in addition to the 30 staff Thales has at its office in the city.

## A380 Inspired

The avionics architecture and flight deck layout are derived from those of the Airbus A380. The high processing capability of the integrated modular avionics at its core saves weight by enabling several functions to be hosted inside the same processor, Rouchouse said. The processors communicate via a dual Avionics Full Duplex Switched Ethernet that is automatically switched in case of failure. An integrated central maintenance system provides efficient failure correlation and troubleshooting.

The flight guidance, flight management and recording system includes an autoflight control system, flight guidance control panel, CMC Electronics CMA-9000 flight management system (FMS), and flight warning system, plus air data and smart probes and flight and voice recorders. Thales provides the flight deck's five-screen control display system, control panels and the integrated electronic standby instrument.

Communications, navigation and surveillance equipment includes radio navigation, radio and audio communication, data link, Honeywell Primus 880 weather radar, the T2CAS terrain and traffic collision avoidance system from the Thales, L-3 Communications joint venture ACSS, and Thales multi-mode receiver, VHF communications and radio altimeter.

In total, Rouchouse said, the avionics suite comprises 190 items of equipment and 90 part numbers. Proposed growth options include a single head-up display (HUD) and a multimode receiver with microwave landing system (MLS). Thales and Sukhoi also are evaluating whether to propose a predictive windshear weather radar. Optional features include single or dual high frequency (HF) radios, dual Goodrich electronic flight bags (EFB) and a printer, among others.

Principal suppliers include Rockwell Collins, VOR/DME navigation; Honeywell, inertial reference system (IRS) and communications management unit (CMU); Teledyne Controls, Integrated Flight Data Management Unit (IFDMU); and MPC Products Corp., Skokie, Ill., throttle.

"Thales has to manage all those subsystems because we have a system integrator responsibility," said Rouchouse. "We have to manage more than 17 partners in North America and Europe, so it's a complex program."

The involvement of staff in Montreal is a legacy of the Bombardier Dash 8/Q400 program that features Thales's first complete commercial flight deck. They are handling the legal and contractual aspects, plus purchasing from suppliers in North America.

"The same team was involved in the Dash 8 program and now in Sukhoi," Rouchouse said. "So we have a good synergy, but the avionics proposed is more complex and a new generation."

Further complications include Russian legal and customs procedures and the fact that the aircraft is manufactured eight hours' flying time from Moscow. Another complication is the Moscow software joint venture that is providing the software for the data concentrator and some automatic coding and verification on the cockpit displays. "It's a difficulty having our customer being the customer and the supplier in the same program," Rouchouse said.


CMC Electronics CMA-9000 FMS

Both the system integration benches in Toulouse and the electronic bird in Moscow use real flight deck equipment, and

### Russia's Regional Revival

The Sukhoi Superjet 100 is the first Russian airliner designed to meet Western certification standards, and is considered key to the growth of Russian aerospace.

The aircraft is being built by Sukhoi Civil Aircraft Co. (SCAC), the civil division of Russia's famed Sukhoi Co., and Italy's Alenia Aerospace, a 25-percent stakeholder in SCAC.

Designed to FAR 25, European JAR 25 and Russian AP-25 requirements for transport-category aircraft, the Superjet will be available in 75- and 95-seat versions, in both basic and long-haul configuration. It will compete against the Antonov 148 and comparable Embraer and Bombardier regional aircraft.

As of August, SCAC reported 71 firm orders for the Superjet, including 30 by Aeroflot; 15 by the Russian airline alliance AirUnion; 10 by Financial Leasing Co., of Russia; and 6 by Russian airline Dalavia. The first Western customer, announced this year at the Paris Air Show, is ItAli Airlines, based in Pescara, Italy. ItAli has ordered 10 95-seat, long-range variants.

## Thales, Sukhoi Collaboration

Thales has been active in Russia since predecessor, Sextant Avionique, became involved in the MiG-AT military trainer program in 1993. The company has worked with Sukhoi since 1994, when it decided to participate in project 711, which aimed to equip an Su-27 Flanker prototype with Sextant avionics.

Subsequent fruits of that involvement include a 1998 contract to supply the Indian Air Force Su-30MKI's cockpit display system, plus navigation and identification equipment.

Under a 2003 contract covering the Royal Malaysian Air Force Su-30MKM, Thales is responsible for providing full interoperability with western aircraft, NATO standard stand-by instruments, a wide field-of-view holographic HUD, navigation FLIR and Damocles targeting pod for full day and night operational capabilities for air-to-air and air-to-ground missions, and combined interrogator/transponder IFF.

the electronic bird has a display system with wrap-around visuals. Moving one of the benches to Moscow will enable Thales engineers to be more reactive in investigating problems detected on the bench or on the aircraft itself.

To help ensure the technology used represents the state of the art, Thales has recruited a 17-strong panel of pilots, including two of its own pilots and others from Air France, its subsidiaries Regional and CityJet, Eurowings, Air Canada, Aeroflot and Brussels Airlines.

Integrated Flight Data Management Unit supplied by Teledyne Controls

"The feedback we have is good," Rouchouse said. "It's a good design, a good aircraft."

The choice of the CMA-9000 FMS was the result of "a good trade-off between complexity and price," Rouchouse said. The CMA-9000 already is installed on some Eurocopter helicopters and the Pilatus PC-21 military trainer, as well as being used in various retrofit applications.

Stephane Villeneuve, CMC's director of sales and marketing for Europe, Asia and Australasia, said the Thales selection for the Superjet was "very satisfying and really confirms our claims that the -9000 is a very viable solution for OEMs around the world."

The FMS is easily customized. "We do software upgrades of the -9000 on a very regular basis, adding new functionality all the time," Villeneuve said. So the system is readily adaptable when customers require special capabilities. It also benefits from the experience of its predecessor, the CMA-900.

"We have a long experience in FMS and everything that comes with it, such as world-wide support, and the man-machine interface has been honed over decades," Villeneuve said. "It's not a solution that just came out with no pedigree, and I think that gives the company credibility for a customer like Thales."

CMC is developing several new functionalities for the SuperJet 100 application, Villeneuve said. They include vertical navigation with performance data, required time of arrival computations, data link, fuel computation management, interface support for digital maps, radio tuning capabilities and multi-sensor selection. Some functionalities are completely new, others adaptations of existing functions to comply with specific platform requirements. But "the box is already built on standard interfaces, so from that perspective it's not a lot of work to adapt the box to this platform," Villeneuve said.

The company maintains a single software development line in order to avoid the risk of "orphan programs," when an FMS is developed with a software load for a single customer, never evolves and remains on a side track from the main development.

Among the other suppliers, Teledyne said its IFDMU is a customized version of the flight data interface management unit selected by more than 100 Airbus operators. Designed to perform flight data acquisition, aircraft condition monitoring and data recording, it combines the functions of the flight data interface unit used for mandatory data acquisition, data management unit used to monitor engine and aircraft condition, and digital access recorder.

Replacing up to three LRUs, the IFDMU will enable operators to save weight, wiring and rack space and significantly reduce initial equipment costs.

Integration on the electronic bird had just started in early August. "But on the system bench in Toulouse we are on track, on schedule, so the integration is good for us," Rouchouse said.

In early July, SCAC personnel were installing the Snecma-supplied simulator for the Superjet's SaM146 engine in the electronic bird. Another simulator has been operational at TsAGI since last year, and SCAC First Vice President and Superjet Program Director Igor Vinogradov said the six pilots trained to fly it so far had already insisted on a reduction in the flap and slat retraction time to make it easier for crews to maneuver in complex European terminal airspace. The results of the integration were being fed back to suppliers, including Liebherr Aerospace in Lindenberg, Germany, where the fly-by-wire flight control system is being developed.

Brett Wells, Thales Aerospace Services Worldwide director of strategy and business development, said the company was in the process of formulating its total service offering for both its customers and the market. "We are working on a range of support and services, which will include our avionics-by-the-hour support. These will be based both in Russia and the rest of the world, as is our network of support services today."

"It's a very interesting program," said Rouchouse. "We have the first integration with the equipment, so it's not only a project, it's not only a design documentation.

"We have the real product now. It's an interesting phase, but we have all the flight-test program and difficulties to come, so it's not an easy journey we face with the program." avs