Cut to the Bone
Aeronautics research funding decline makes it harder to take technologies to the next level

GRAHAM WARWICK/WASHINGTON

As technologies mature toward more expensive demonstrations, and budget pressures tighten, NASA is restructuring its aeronautics program in a bid to sustain the momentum behind research into environmentally efficient aircraft.

Faced with a cut in its fiscal 2013 aeronautics budget, the agency is to reduce its hypersonics research, but maintain spending on technologies for subsonic and supersonic fixed- and rotary-wing aircraft.

NASA is requesting $561.5 million for aeronautics research in 2013, down from $568.4 million in appropriations in 2012. "The budget is very tight. We got $18 million less," says Jaewon Shin, associate administrator for aeronautics. Funding is projected to remain at the lower 2013 level for the next several years. Hypersonics research will bear the brunt of the shortfall, but core capabilities will be maintained, he says.

Research to improve safety, reduce environmental impact and develop new airframe and aircraft technologies has been preserved. "We are able to fund all of our major activities into 2013," Shin says. But work on technologies to reduce fuel consumption, emissions and noise is moving toward more costly integrated systems demonstrations, forcing NASA to find money within its budget or drop some areas of research.

NASA is rejiggering its aeronautics programs to accommodate the budget-driven changes. Merging supersonic and hypersonic research will result in a new High-Speed program, with continued work on low-boom supersonic aircraft as its main focus. The Subsonic Fixed-Wing and Subsonic Rotary-Wing programs will be renamed Fixed Wing and Rotary Wing, but their research portfolios will remain essentially unchanged.

Work on cross-cutting technologies such as computational fluid dynamics design tools, as well as materials and structures, will be moved from Fundamental Aeronautics to a new Aeronautical Sciences program. Ideally, this will give NASA the flexibility to fund technology demonstrations within its existing budget, says Tony Strazisar, senior technical adviser for aeronautics research.

The biggest impact is on hypersonics, where NASA conducts research in two areas. Work on technologies for planetary entry, descent and landing will be transferred intact to NASA's Space Technology program: "Nothing will be lost," says Shin. Work on air-breathing hypersonic technologies for access to space will be cut back and merged into the supersonic research program.

"We're not canceling everything," he says, but investment in turbine-based combined-cycle propulsion and structurally integrated thermal-protection systems will be reduced.

The U.S. Defense Advanced Research Projects Agency is stepping into the breach to some extent, seeking to start the "flight experiment-intensive" Collaborative Hypersonic Research program in 2013 to demonstrate a boost-glide vehicle as a precursor to a tactical long-range strike weapon. Funding is also sought for a hypersonic technologies program to investigate aerodynamic, materials, guidance and communications technologies for long-range hypersonic cruise. Both Darpa projects are intended to support the Pentagon's conventional prompt global strike program.

Despite the cut, NASA's 2013 aeronautics budget request will be applied to ongoing research supporting the FAA's NextGen national airspace system (NAS) modernization and expanding its capabilities via new air-traffic management and air vehicle technologies. The request fully funds integrated systems-level research on reducing aircraft noise and emissions under the Environmentally Responsible Aviation (ERA) program; integrating unmanned aircraft into the NAS; and validation and verification of complex systems.

But Shin says there is no flexibility in the 2013 budget to begin work on a flying testbed for an advanced-configuration transport aircraft, conceptual designs for which have been produced by Boeing, Lockheed Martin and Northrop Grumman under the ERA program. "If we continue at this level, we will not have the flexibility [to build a testbed]," says Shin. But talks with industry and other government agencies on forming a public-private partnership to fund a civil/military demonstrator will continue, he says, "to see if the community can support a flying testbed."
X-Factor

U.S Eurocopter flight demo aimed at proving hybrid helicopter is ‘not a small toy’

GUY NORRIS/LOS ANGELES

The distinctive sight and sound of Eurocopter’s X3 hybrid helicopter turned heads at last year’s Paris air show, and now the manufacturer plans to make an impact on prospective civil and military users with the demonstrator in the U.S.

Eurocopter’s planned midyear X3 exhibition comes amid a flurry of activity among competing unconventional rotorcraft developments as Sikorsky advances its S-97 Raider high-speed semi-compound design and AgustaWestland accelerates certification plans for the re-branded AW609 tiltrotor.

All are aimed at bringing higher speed and more efficient operations to the rotorcraft market, which Eurocopter believes still needs plenty of convincing about the merits of these unusual configurations. “It’s not a small toy, it’s a real helicopter,” says President and CEO Lutz Bertling.

The demonstration is being organized mainly because “the major operators are here in the U.S. in the emergency medical and offshore oil and gas markets, and we need to convince them that it’s a high-productivity concept. We need to convince them of its simplicity,” he adds. “Of course we’d also like to show the U.S. Army that they should take it into account for the JMR,” Bertling says, referring to the Joint Multi-Role technology demonstration program.

Although no further awards are anticipated for the JMR, which is aimed at a medium-utility replacement for the Sikorsky UH-60 Black Hawk in the 2025-30 period, Bertling believes the demonstrator may spark potential interest for this and other roles. The JMR is already a tightly contested program with AVX Aircraft, Bell Boeing, Boeing and Sikorsky conducting trade studies aimed at producing two competing rotorcraft demonstrators in 2017.

Based on a modified EC155, the X3 is configured with a five-blade main rotor and two tractor propellers on short-span fixed wings. Power is provided by twin Rolls-Royce/Turbomeca RTM322 turboshift engines driving the main rotor and propellers through a modified transmission system. “Normally there’s one outlet of the main gearbox and one tail rotor; and the increase in complexity (with the X3) is that there is one more outlet for the gearbox and one more propeller,” says Bertling.

Flight tests of the aircraft, which reached a top speed of 222 kt. in May 2011, are about to resume following a detailed inspection period. Although Eurocopter would like to see the X3 flown to higher speeds than the 250 kt. achieved by Sikorsky’s semi-compound design, “to be honest, speed is not the most important thing,” says Bertling. The key objective is to “gain experience with the concept.”

With a wing designed to offload the rotor and provide up to 80% of the total lift, the hybrid concept is aimed at flying both faster and 50% higher than current helicopters. According to Bertling, this brings it into the operating realm of the tiltrotor without the additional cost, with a target price around 20% higher than comparable helicopters. As well as versions for long-distant search-and-rescue, coast guard and other missions, Bertling envisions a potential 19-seat commuter. “I strongly believe you could go to 40 to 50 passengers, but then we’re talking about the 2030s,” he says, adding that all production versions “will be significantly different from the demonstrator.”

In parallel with the X3, Eurocopter is also developing the conventionally configured, next-generation X4 aimed at the AS365 Dauphin/EC155 replacement market in the medium-twin category. An initial version will enter service in 2017, powered by a Pratt & Whitney Canada (PWC) engine, with a more advanced variant following in 2020 offered with the choice of Turbomeca’s upcoming TM800.

“As with the EC155, we will offer two engines,” says Bertling. “We prefer not to combine helicopter development and engine development. If you try to combine two things it’s a moving target. So the first version of X4 initially will fly with a PWC engine, though clearly Turbomeca will be on board.”