

Hornet-2 flies “hands-off” controlled by onboard sensors

Hornet-2, Prox Dynamics' second prototype has made its maiden flights and is now demonstrating stable flight using onboard sensors. Hornet-2 is very similar to the first prototype, Hornet-1 (see link to article at the end), but with a much more sophisticated sensor package and a mathematically derived regulator for flight controls.

“Controlling the helicopter is extremely easy, and it will hover for a prolonged time, up to several minutes, with no control inputs” says Petter Muren, the company CEO and chief aerodynamicist. “Forward, rearward and turning flight is also performed effortlessly without the usual control couplings and pilot challenges found in regular helicopters” he continues.



The control loop gains and gyroscopic precession coefficients were all calculated based purely on the mathematical model of the aircraft and needed little or no corrections before stable flight was achieved. The Hornet-2 has demonstrated completely stable flight from hover and up to a speed of 7 m/s. The flight envelope will be further expanded in the weeks to come.

Being impossible to fly without the electronic stability augmentation probably makes the Hornet-2 the smallest “fly by wire” helicopter in the world. This is a major step in achieving required flight control response for flying in windy and turbulent conditions. It also forms the first important steps in the autopilot development.

Hornet-3 on the drawing board

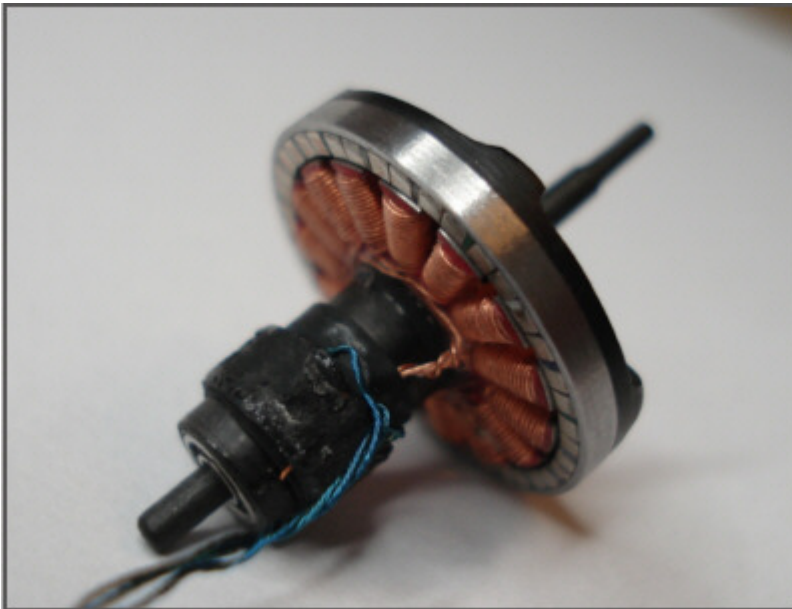
Hornet-3 will be the first prototype equipped with a full avionics package short of an integrated GPS. This includes camera, autopilot sensors, two way digital data link and capabilities for advanced onboard processing. The weight is still limited to 15 grams.

The Hornet-3 will utilize Prox Dynamics own brushless motor (see below) directly driving the main rotor, thereby removing the need for reduction gears. First flight is scheduled early in 2009.

As an integrated part of designing and building the Hornet-3 a first version of the GCS (Ground Control Station) will be developed. This will enable precise control of the helicopter as well as continues logging of all flight and sensor data.

Prox Dynamics develops brush-less motor

As stated above the Hornet-3 will use an in-house designed and built brushless motor for driving the main rotor. Hornet-1 and Hornet-2 have used commercially available motors driving the main rotor through a reduction gear. "This does not give us sufficient efficiency; it is too noisy and too complex" says Trygve Marton, the company CTO.



The new motor is similar to other brushless outrunner motors only smaller and with a higher efficiency. It is designed with a lower nominal RPM and a much higher torque than usual.

The high efficiency at low RPM is achieved through extremely tight tolerances, a high number of magnetic poles and an advanced digital motor controller. When the motor is installed in the helicopter it will have a weight of 2 grams and a size of 16 x 4 mm, including electronics and microcontroller.

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Link to article on Flight Global: www.flightglobal.com/articles/2008/07/22/225952/prototype-of-pd-100-black-hornet-uav-helicopter-makes-maiden-flight.html