

# NEW ROTORCRAFT

2010

## Certification and delivery deadlines slip to the right for new helicopters

by Thierry Dubois and Mark Huber

Both product support and research and development have taken hits in the helicopter industry as cash flow and current sales shrink, while future orders are clouded by important changes and growing uncertainty in key customer sectors.

In helicopter EMS (HEMS), stricter patient transport protocols in some markets have significantly reduced flight operations, and new FAA Part 135 rules governing HEMS will include equipment mandates that are expected to drive up costs, perhaps resulting in additional operator and program consolidations.

Offshore operators have seen oil prices nearly halved from record highs of \$145.29 per barrel on July 3, 2008, while natural gas prices have plunged even more precipitously. Collapsing property and other tax revenues have strained governmental budgets, particularly at the state and municipal levels, and the overall economy has crimped air-tour and charter operators.

Certification programs for new helicopters continue to move to the right as tighter revenues stretch development timetables. The degrees of delay vary considerably and some, such as those for the Bell/Agusta 609 tiltrotor, are not completely related to the macro economy. Bell achieved certification for its 429 last year and has begun amping up deliveries. Certification of more new models, including the Sikorsky S-76D and S-434 and the Robinson R66, is likely this year, but that milestone originally was expected last year or even earlier.

The good news is that these new helicopters offer buyers significant improvements in operating economics as well as upgraded avionics, engines and rotor blades. Meanwhile, OEMs are attempting to hold the line on prices at least partially while boosting margins, through aggressive global outsourcing of major components, and in some cases whole airframes, for new and legacy aircraft from manufacturing partners in China, Eastern Europe, India, Mexico and Turkey. Here are the latest new helicopter program developments.

### Singles

#### Eurocopter Bluecopter

Eurocopter is planning to fly an EC120 light single powered by a diesel engine, instead of the usual 504-shp Turbomeca Arrius 2F, next year. The Bluecopter name refers to Eurocopter's desire to improve the environmental performance of its helicopters.

While the EC120 will be a demonstrator, with an expected 40-percent cut in fuel consumption, it is likely that future Eurocopter light rotorcraft will use this technology. The engines will provide significant advancements in noise and emissions. The main challenge is weight, but Formula 1 technology could provide the materials to make the engine lighter. Eurocopter has rechristened the diesel a "high-compression engine." The airframer has yet to choose the engine supplier, but Turbomeca is a likely contender.



Eurocopter Bluecopter

#### Mi-34S2 Sapsan

Russian Helicopters is working on a turbine version of the Mi-34 light single, the Mi-34S2 Sapsan, to be powered by a Turbomeca Arrius 2F. The company plans to apply for European and U.S. certification.

The Sapsan (Russian for peregrine falcon) can seat five, including the pilot, and is expected to have a 143-knot max speed, 120-knot cruise speed and 460-nm range.



Mi-34S2 Sapsan

Service ceiling should be 19,600 feet; hover ceilings, in and out of ground effect, will be 12,800 feet and 14,300 feet, respectively. MtoW is slated to be 3,200 pounds.

First delivery is pegged for next year's fourth quarter, but the company will begin production only if it receives enough orders. It plans to manufacture five Sapsans next year, with a ramp up to 40 per year in 2016.

The \$1 million aircraft is aimed at markets such as Russia, CIS countries, Asia, Africa and Latin America. It will enter European Union and U.S. markets beginning in 2016.

#### Robinson R66

In 2007 Robinson announced its first turbine helicopter, the Rolls-Royce RR300-powered R66. Three aircraft are currently in flight test and Robinson now anticipates certification in this year's first half. The company plans to finalize dealer agreements, deposit policies and a price for the



Robinson R66

R66, believed to be near \$1 million, early this year and achieve full-rate production next year. Company founder Frank Robinson thinks that R66 production could eventually reach 150 to 200 annually.

The R66 is bigger than the piston-powered R44 on which it is loosely based. Its luggage bay is large enough for golf clubs. There is one extra seat in back, the pilot seats are wider and legroom is capacious, and the overall cabin is eight inches wider than that of the R44. Empty weight is 1,270 pounds and the useful load comes in at 1,300 pounds, 300 pounds more than an

R44. However, due to the RR300's 23-gph fuel burn, the R66 carries 75 gallons of fuel, while the R44, which burns 15 gph, carries 47 gallons.

Initially, all major R66 components, including the engine, will have a TBO of 2,000 hours, although that is likely to be extended over time to perhaps 2,200 hours. The RR300 weighs about one-third of the Lycoming IO-540 that powers the R44 and produces 225 shp (continuous). Forward speed on the R66 increases slightly to 117 knots and the service ceiling increases to 14,000 feet.

The R66 will have hydro-pneumatic engine controls as opposed to Fadic, and the traditional "six-pack" steam gauges instead of an integrated glass cockpit display. The R66's main rotor chord is slightly wider than the R44's, but the diameter is the same. Its fuel system meets new and more stringent crashworthiness standards. The R66 features the same T-bar cyclic as that in the R44 and is designed for easy pilot transition from the R44.

#### RotorWay Eagle 300T

Kit helicopter company RotorWay launched a new to-be-certified design aimed primarily at the training market in July 2009, but the company's plan to have a non-conforming prototype ready to fly by early this year appears to have been delayed. RotorWay now hopes to have a helicopter airborne by the middle of this year and certification by the end of next year so customer deliveries can begin in 2012. It should be noted, however, that RotorWay has never before produced an FAA-certified aircraft, suggesting that this timetable might be optimistic. CEO Grant Norwitz said the new helicopter will be priced "less than an R66." The company is currently taking \$5,000 deposits on the helicopter.

The Eagle will be powered by a Rolls-Royce RR300B1 turbine that is similar—but not identical—to the engine used on the



RotorWay Eagle 300T



R66. Preliminary specifications for the 2,050-pound two-seater include a 1,100-pound useful load, 500-pound external load, 110-knot maximum cruise speed and 13,000-foot ceiling. The Eagle will carry 80 gallons of fuel, for two hours endurance with a 30-minute reserve.

### Sikorsky S-434

The first S-434 flew in December 2008. Sikorsky received an initial order for nine 434s from the Saudi Arabian Ministry of Interior and had delivered two of those helicopters by the end of last year. FAA certification for the 434 is expected later this year.

The 434 is a derivative of the Sikorsky-Schweizer 333 and incorporates several system components developed with Northrop Grumman for the Navy's MQ-8B Fire Scout vertical takeoff and landing tactical unmanned aerial vehicle. The chief difference between the 333 and the 434 is the latter's four-blade main rotor, which reduces noise, improves lift and increases mtow and useful load when combined with a more powerful Rolls-Royce 250-C20W engine (320 shp for takeoff). The useful load of the 434 increases by 655 pounds, to 1,855, compared with that of the 333. The 434 also has a larger, 84-gallon fuel tank. This makes the 434 a stronger-performing hot-and-high and utility helicopter suitable for a variety of missions, including training, patrol and sling-load operations. Price is expected to approach \$1 million. Sikorsky will continue to produce the 333.



SIKORSKY AIRCRAFT



SIKORSKY AIRCRAFT

aircraft is thought to be more than 200 pounds lighter than the standard Grand, but AgustaWestland would not confirm this.

### HAL Dhruv

The Dhruv advanced light helicopter (ALH) by India's state-owned aeronautical and defence company Hindustan Aeronautics (HAL) is a multi-role, multi-mission new-generation helicopter in the 5.5-ton weight class. It is powered by two 990-shp Turbomeca TM333-2B2 turboshafts that have sufficient margins to provide single-engine performance and Category A takeoff and landing capability.

The Dhruv is two-thirds composite by weight for resistance to corrosion, longer life, ease of repair and crashworthiness.

The helicopter is designed to meet the requirements of both civil and military operators. Company sources told AIN that HAL is able to offer any variant of Dhruv for civil use, and it builds these commercial helicopters to order. HAL has so far delivered 90 utility versions of the ALH to defense forces and civilian agencies. Prices vary according to modifications.

The current production rate of the Dhruv is between 20 and 24 per year. The company intends to obtain EASA certification for the Dhruv. It is also working on a new version that will have a glass cockpit and more powerful engines.

### Eurocopter EC175

Eurocopter's EC175 medium twin made its first flight on Dec. 4, 2009. It is targeted at the offshore oil and gas market, which accounts for most of the 114 helicopters currently on order. EASA certification is pegged for the second half of next year, with first delivery planned for

the second half of 2012. The lag between certification and delivery stems from the high number of options (40 to 45)—each of which needs to be certified—on this first aircraft, according to Eurocopter.

The cruise speed is understood to be approximately 140 knots. The radius of action offshore at ISA+20, with 16 passengers, will be 270 nm. Maximum range, with "very few" passengers, will be 700 nm. The EC175 is a seven-metric-ton-class (15,000-pound-class) helicopter. Two Pratt & Whitney Canada PT6C-67E turboshafts will supply 1,775 shp each.



Eurocopter EC175



Kamov Ka-226T

The EC175 is a 50-50 joint program with China's Avicopter, which calls it the Z15. Avicopter is responsible for the airframe, including flight controls. It is also developing the tail-rotor transmission and the fuel system and is responsible for some equipment integration—the landing gear and the engine. Finally, Avicopter builds the main rotor. Eurocopter's share consists of the main gearbox, the tail rotor, doors, electric systems and the avionics suite, including autopilot.

The two firms have invested a total €600 million in a "common standard vehicle." From there, they will offer two different sets of options and the helicopter will undergo two different certification processes through the EASA and the CAAC.

### Kamov Ka-226T

Russian Helicopters is flight testing a Kamov Ka-226 light twin powered by Turbomeca Arrius 2Gs. Known as the Ka-226T, it is the first coaxial-rotor helicopter to be fitted with Turbomeca turboshafts, which raise its operating ceiling to 24,600 feet. Production is expected to start next year. The manufacturer is touting the performance of the Ka-226T "in mountainous terrain and hot climates, over water, in windy conditions and in urban high-rise operations." The Ka-226T has an mtow of 8,800 pounds and a payload of 3,200 pounds. It can carry nine people, including two pilots. Maximum speed is 124 knots. With 10-minute emergency reserves, endurance is 3.3 hours and range is 283 nm.

Instead of a conventional cabin, the Ka-226 can be outfitted with different cabin modules depending on the mission—passenger transport, patrol, construction, EMS, firefighting or search-and-rescue.

### Sikorsky S-76D

The latest variant of this now 34-year-old airframe was announced in 2005 and might receive FAA certification approval later this year. The S-76D first flew on February 7 last year. Currently three aircraft are in the flight-test program and the first production airframe was assembled in December at Aero Vodochody in the Czech Republic. The airframe will be shipped to Sikorsky-Coatesville in April for final assembly. Customer deliveries are slated to begin next year, and Sikorsky claims 100 "delivery position agreements" for the \$12 million helicopter. Falcon Air Services of Abu Dhabi will be the launch customer for the S-76D.

While the S-76 airframe remains largely unchanged, the -D has significant upgrades in rotors, engines, avionics and

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## Twins

### AgustaWestland AW109S Da Vinci

AgustaWestland has begun delivering a tailored version of the AW109S Grand to Swiss air rescue organization Rega. The Da Vinci, the result of a set of specifications issued by Rega to replace its A109 K2s, is thus not offered to other customers.

The cockpit is new and includes a dual duplex four-axis digital automatic flight control system, a 3-D synthetic vision and



terrain awareness and warning system (Taws), a Euronav V digital map and a Max-Viz EVS-1000 enhanced vision system (EVS). The cockpit is equipped for single-pilot VFR operations and is compatible with night-vision goggles.

The Da Vinci helicopter delivers more power through the main transmission with one engine out and has an aerodynamically cleaner rotor system. This contributes to an increased rate of climb and more speed, both of which are important for Rega's operations in the Alps. Rega and Aerolite developed a special EMS interior.

Thanks to its fixed landing gear, the



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cabin comfort. It features new composite, flaw-tolerant main rotor blades and electric rotorcraft icing protection, dual-speed main rotor with active vibration control and quiet mode, a marginally quieter tail rotor, a health and usage monitoring system, digital four-axis autopilot and a glass cockpit that includes integrated digital maps. The -D will be powered by two Faded Pratt & Whitney Canada PW210S engines, each producing 1,050 shp.

The modular PW210S promises to simplify maintenance as it has just five major rotating components and a combination reduction and engine accessory gearbox. The new engine/composite main rotor combination will give the S-76D up to 1,000 pounds more lifting capacity in hot and high conditions and increase range by 50 miles compared with the S-76C+.

The Thales TopDeck avionics suite developed for the -D features four six- by eight-inch LCD displays that provide flight, engine, caution and warning, systems status, checklists and mission data. The two outboard screens are PFDs and the inboards are MFDs. Data and symbology are automatically transferred to the MFD in the event of a PFD failure. The displays are NVG compatible. The trackball cursor control device allows control of avionics via virtual control panels on the cockpit displays and interfaces with the FMS through the cockpit displayed map, rather than the conventional keyboard. This enables the system to dynamically build flight plans and provide easy access to other information, including Jeppesen charts that can be loaded onto the system via flash memory cards.

The -D will incorporate the same Silencer noise-dampening cabin architecture used on the -C++. Two main executive layouts will be available for five to six passengers as well as a utility configuration that can accommodate up to 12.

### Urban Aeronautics X-Hawk

Israel-based Urban Aeronautics is flying its Turbomeca Arriel 1D1-powered Mule UAV. As of mid-December, the company had performed only low hovers with safety wires, according to company CEO Rafi Yoeli. The Mule is the demonstrator for Urban Aero's concept of an aircraft featuring two shrouded main rotors in tandem configuration.



Urban Aeronautics X-Hawk

The company is eyeing a full-size, 11-passenger version—the X-Hawk. On the demonstrator, each of the two six-foot-diameter lift rotors has five blades. The two rotors are located fore and aft of the cabin. Two smaller shrouded rotors act as thrusters. The architecture, with its shrouded rotors, enables the aircraft to fly in a city without the dangers usually associated with open rotors. Its main drawback is fuel burn, much higher than that of a helicopter.

### Tiltrotor and Compound Helicopters

#### Bell/AgustaWestland BA609 Civil Tiltrotor

Now entering its 12th year of development, the Bell/Agusta BA609 program appears to be headed for divorce court. For nearly three years AgustaWestland CEO Giuseppe Orzi has made no secret that he is displeased with the glacial pace of the 609's development and it now appears that negotiations are taking place that would either give AW a majority interest in, or outright ownership of, the program. Neither AW nor Bell will formally comment on the status of these negotiations, but last year Orzi told an Italian business conference that AW's parent, Finmeccanica, had authorized him to negotiate for control of the program as a means to accelerate development and certification. Even under the most ideal outlook, airworthiness approval is unlikely until at least 2014.

The 609 first flew in 2003, and only two prototypes are flying—one at Bell in Texas and the other at AW in Cameri, Italy. Two more prototypes scheduled to join the test program for several years now have yet to materialize. However, in December an AW spokesman told AIN that both aircraft are under construction at Cameri and will join the test program in 2011 and 2012. The number-three tiltrotor will be used for ice trials and hot and cold environmental testing, while number four will be dedicated to avionics and communications validation, night flight and customer demonstrations.

However, commercial interest in the program has waned as development deadlines repeatedly slipped and the unit price

Bell/AgustaWestland BA609



Sikorsky X2 compound coaxial technology demonstrator

of the 609 has climbed from an estimated \$8 million to \$10 million in 1998 to more than \$29 million today, making it considerably more expensive than the 19-seat Sikorsky S-92A or AgustaWestland's own three-engine AW101. But AW is believed to be pursuing a large order for the 609 from the Italian government for up to 50 of the aircraft configured for coastal patrol and search-and-rescue. Officially, orders for the 609 stand at 77, but the status of many of those is tenuous at best. Two years ago some order holders told AIN that they could not justify continued interest in the 609 at a price near or above \$20 million.

Yet, the twin P&WC PT6-67A-powered 609 would seem ideally suited for a less price sensitive, government-backed over-water SAR role. The Bell/Agusta 609 has an mtow of 16,800 pounds. Preliminary data indicates the aircraft has an unrefueled range of 700 nm (boosted to 950 nm with auxiliary fuel tanks), a cruise speed of 275 knots (maximum forward speed 310 knots) and a service ceiling of 25,000 feet. In utility configuration it could carry up to 12 passengers plus crew.

Despite its tortuous development history, Pier Guargualini, CEO of AW parent Finmeccanica, sees a big future for the 609, last summer predicting demand for up to 500 aircraft during its first decade of production.

#### Sikorsky X2 Compound Coaxial Technology Demonstrator

The X2 first flew in 2008, but 2009 came and went without its achieving Sikorsky's stated goal of beating the world

helicopter speed record of 216 knots/249 mph (held since August 1986 by the Westland Lynx).

Sikorsky announced the self-financed X2 in 2005. The compound coaxial helicopter features fly-by-wire flight controls and combines components from existing Sikorsky aircraft, including the S-76, Black Hawk and CH-53, and other manufacturers' aircraft. All of the components were scrutinized for their ability to enhance the X2's mission of high forward speed and low vibration.

Power for the 6,500-pound X2 comes from a single LHTec (Light Helicopter Turbine Engine Company) T800 turboshaft rated at up to 1,680 shp. Sikorsky had previously flown the LHTec engine on the RH-66 Comanche scout and attack helicopter prototype developed for the Army. That program was canceled in 2004 after expenditures of \$6.9 billion and 20 years of development. LHTec has developed a successful civilian variant of the T800, the CTS800. (Ironically, the same modified Westland Lynx that set the current world speed record in 1986 served as a testbed for the CTS800.) The T800 drives the twin four-blade Eagle Aviation contra-rotating rigid main rotors and the Aero Composites six-blade pusher propeller, or auxiliary propulsion system, mounted at the end of the tailboom. Sikorsky claims its X2 technology is suitable for military missions such as assault, armed reconnaissance, close air support and combat search-and-rescue, and unmanned applications.

One way Sikorsky might cash in on the X2 was revealed in May last year, when it displayed a mock-up of a possible X2 military light tactical helicopter (LTH) design at the Army Aviation Association of America annual convention. The LTH mockup was widely seen as a precursor to a potential Sikorsky bid for the Army's armed scout helicopter program.

However, Sikorsky would face substantial competition for the contract from both Boeing and an EADS-Lockheed Martin partnership. Both are offering solutions featuring commercial, off-the-shelf airframes that, while slower, likely present less technical risk and lower unit costs. □

Anand and Madhura Katti contributed to this report.