BillyPix first test-flew the H135 in 1998 – when it was still known as the EC135 and the manufacturer as Eurocopter – so I was curious to see what improvements have been made since.

Our invite from Airbus Helicopters was to fly the latest Helionix-equipped variant at its Donauwörth factory in Germany.

One of the biggest changes for the current P3/T3-standard helicopter from earlier iterations is the increase in maximum take-off weight (MTOW), from 2,720kg (5,600lb) to the present 2,980kg.

The flight-test aircraft was fully loaded to this figure, although Airbus Helicopters went even further, putting in another 20kg of fuel to take account of time spent on the ground receiving a thorough briefing from chief experimental test pilot Alexander Neuhaus.

This ensured that when we pulled up into our first hover, we were at 2,980kg – a nice touch. No doubt operators will be encouraged to do likewise to get maximum range and endurance for their flights.

Our aircraft was a prototype to test various systems and equipment, so there were no passenger seats to try, but as with most all-rounders, there are a variety of interiors available. The standard passenger transport layout comes with five rear and two cockpit seats.

QUICK CHANGE

The H135 will be capable of carrying an underslung load of 1,400kg and internal configurations can be changed from one role to another in about 10min, the manufacturer says.

Airbus Helicopters has accumulated 300h of flight testing on the new Helionix system and achieved certification on 16 November ahead of first delivery next year.

Neuhaus ran through the limitations section in the as-yet-unpublished flight manual, which show that the maximum all-up weight of 2,980kg can be maintained to quite hot and high conditions before being restricted. The outside ground effect and inside ground effect hover weight ceilings are also high, allowing the operator great flexibility in hot climates.

The aircraft is cleared up to 20,000ft, which is impressive considering the thin air at that altitude. It can hover at up to 16,000ft in ground effect and operate in outside air temperatures from -35°C (-31°F) to ISA +39°C, up to a maximum of +50°C.

The basic payload with full fuel plus pilot is 780kg. Standard fuel tanks give a total of 560kg. Endurance with no reserves is about 3.4h, but additional fuel tanks are options.

Although the flight manual forbids all aerobatic manoeuvres, loads from -0.5g up to +2g at maximum aircraft weight have been dem-
While the aircraft cannot be flown with no hydraulics for the pilot’s controls, the two systems are fully redundant, says Neuhaus, so the loss of both is very unlikely.

The other unlikely loss of both systems is with the engines. Neuhaus says Airbus Helicopters has not required engines-out landings to be performed by its test pilots, as a double failure is considered a remote possibility.

While we did not carry out an autorotation during our flight, Neuhaus says the average rate of descent for the H135 is 2,200ft/min. This is fairly high for a helicopter of its size, but could be useful if the pilot needs to get down quickly for some reason.

The H135’s engines – either the Pratt & Whitney Canada PW206BB or the Safran Helicopter Engines Arrius 2B2+ – are the same as the earlier version, but the full-authority digital engine control (FADEC) management has
been adjusted. My test aircraft was fitted with the French-built turboshafts.

The aircraft is equipped with an ice detector, but flight in icing conditions is prohibited. Western helicopter manufacturers have not yet caught up with the Russians, who manage to operate theirs in fairly severe icing.

Airbus Helicopters has tried hard to make the H135 environment-friendly by reducing its noise signature, cutting airframe and other sources of drag so as to require less power, adding more efficient engines, dropping empty weight and other measures, such as lowering the rotor speed in certain conditions thanks to the modified FADEC.

As well as the optional traffic collision avoidance system, there is a helicopter terrain awareness and warning system (HTAWS), which alerts the pilot if the aircraft is getting too close to an obstruction. If, say, carrying out a mountain rescue close to a cliff, the HTAWS can be muted, but only for 5min.

The never-exceed speed (Vne) is the same as the earlier model: 150kt (280km/h). It is calculated automatically in flight and the pilot warned if it is exceeded. As usual, the test pilots have taken the aircraft to Vne +10%. The H135 is quite benign at 165kt, says Neuhaus, even at maximum weight. A Vne short red line is displayed on the airspeed strip.

SMART ACCEPTANCE

Airbus Helicopters has computerised many tasks. This includes the pre-flight authorisation and acceptance. I went with Neuhaus to accept the aircraft, which he did by just offering his card to a computer screen. If the aircraft has not been prepared and signed for by the technician, the system will not accept the pilot's input – a clever but simple safety feature. If on an operation with no engineer, the system can be modified for the pilot to pre-flight the aircraft and accept it.

Our density altitude for the flight was a mere 500ft with only about 3kt of wind. Visibility was good, the cloud base high. I followed Neuhaus round his pre-flight inspection. No panels are opened, oil and other essential levels are evident and it takes just a few minutes. I noted the wire strike protection at the front and the wide sliding passenger doors which close totally flush. Litters can be loaded easily through these or the two rear clamshell doors.

Neuhaus pointed out the modified fenestron shrouded tail rotor, which is high enough to allow the loading of litters, baggage and freight through the rear clamshell doors with the rotors running.

Another safety feature is that the main gearbox has a dry-run capability of at least 25min, which should give enough time to land somewhere in the unlikely event of total loss of oil. The belly and undercarriage are crash-resistant, and the fuel system is designed to survive a heavy or crash landing without spillage.

The floor is level all the way to the cockpit. The panel dividing the cabin from the rear bay can be removed quickly to provide a voluminous storage area. It has numerous tie-down rings and is stressed for 600kg/m². The Héliconix version allows the rear baggage bay to be removed to give additional floor space.
Experimental flight test engineer Jurgen Steiner accompanied us on the flight and was very helpful explaining some of the features.

I climbed easily into the right-hand seat with its five-point harness. All the seats will be crash resistant and have shoulder harnesses with an automatic locking system and headrests to help prevent whiplash injuries. The pilot’s seat and tail rotor pedals can be adjusted to allow full access to all the cockpit equipment and displays. This is important since the aircraft, like its predecessor, will be certified for single-pilot instrument flight rules (IFR) conditions. The left-hand cockpit seat can be turned 180° for use by a systems operator.

The single panel in front of the pilot contains all the information required to operate the aircraft.

The instrument panel is of the latest Airbus Helicopters design and completely computerised. It belongs to the same Helionix family as found on the H145 and H175. It can provide whatever information the pilot selects. The outstanding feature is the single 6 x 8in (15.5 x 20.5cm) panel in front of the pilot which contains all the information required to operate the aircraft: attitude, heading, speed, rate of climb/descent, route, altitude, power, terrain and collision avoidance, for example.

This makes flying it much easier than in other aircraft where the pilot has to continually scan through various instruments. The pilot can bring up whatever is required on to the screen, and there are no dials or needles.

All presentations are colour coded – green for normal; amber means caution, pilot awareness and subsequent response; white requires pilot awareness and may require pilot response; and red is for getting the pilot’s attention and immediate response.

Every limit is associated with an audio cue. This is good for a pilot who has his head out of the cockpit for, say, long-line underslung operations. There are no temperature and pressure gauges on the display. These parameters are monitored discretely and brought to the pilot’s attention only if there is an anomaly.

Both the cyclic stick and the collective lever have enough buttons on them for the pilot to be able to conduct the whole flight without removing their hands from them. The exception is when the aircraft is flown by the four-axis autopilot: it is then operated with hands and feet off all the controls.

In among the screens is the standby attitude indicator. In the event of a total loss of all the displays, this small instrument (2 x 3.5in) has enough information for the pilot to continue to fly, approach and land safely. It shows attitude, airspeed and height/altitude. It has its own battery supply, so is independent from the main systems.

All-round visibility is good. I was to take particular advantage of this when we went vertically down on to the landing spot from 200ft.

Unlike some other similar-sized helicopters I have flown, there is plenty of storage space for the various articles that we pilots like to take on board, plus the essential manuals.

The aircraft is fully equipped with all the latest aids and communications equipment. Switches and other equipment on the overhead panel are, thankfully, kept to a minimum and are easily reached from the pilot’s seat. Vital systems have backup or redundancy, thus providing a high level of safety of operations. This is especially important and relevant for single-pilot IFR flights.

POWER TO SPARE

Neuhaus went logically through the cockpit to set it up for engines start. He did it from memory using a simple flow pattern and took just a few minutes. He started both engines in quick succession by moving two switches and sitting back to observe and monitor. If in a hurry, such as for a rescue mission, the aircraft can be made ready to fly within about 2min. Once all the automatic pre-flight checks have been done, the pilot is presented with a green “all systems go” light; another nice touch.

My first hover was easy, requiring very little input from me. A glance at the power needle showed that we had plenty of power in hand at

Hovering the fully-loaded H135 in ground effect required little input from the pilot.

<table>
<thead>
<tr>
<th>H135 Specifications</th>
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<tbody>
<tr>
<td><strong>Dimensions</strong></td>
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<tr>
<td>Length</td>
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<tr>
<td>Width</td>
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<td>Height</td>
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<tr>
<td>Rotor diameter</td>
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<tr>
<td><strong>Weights</strong></td>
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<tr>
<td>Maximum take-off weight</td>
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<tr>
<td>Empty weight, standard configuration</td>
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<td>Useful load, standard configuration</td>
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<tr>
<td>Maximum cargo-sling load</td>
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<tr>
<td>Standard fuel capacity</td>
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<tr>
<td><strong>Engines</strong></td>
</tr>
<tr>
<td>Two Pratt &amp; Whitney Canada PW206B3 or Safran Helicopter Engines Arrius 2B2+</td>
</tr>
<tr>
<td><strong>Take-off power</strong></td>
</tr>
<tr>
<td>P&amp;WC: 708shp/ Safran: 660shp</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
</tr>
<tr>
<td>Never-exceed speed</td>
</tr>
<tr>
<td>Fast cruise</td>
</tr>
<tr>
<td>OEL rate of climb (65KIAS)</td>
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<tr>
<td>Hover ceiling IGE ISA +20</td>
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<tr>
<td>Hover ceiling OGE ISA +20</td>
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<tr>
<td><strong>Maximum range</strong></td>
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<td><strong>Operating ceiling</strong></td>
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Source: Airbus Helicopters
this maximum all-up weight. Likewise when we hovered out of ground effect. Handling during sideways, backwards and spot turns in both directions was similarly benign.

I invited Neuhaus to take over control and carry out these manoeuvres at high speed while following him through on the controls. He went sideways at 30kt in both directions and I noted that there was still pedal available at this speed. Rearwards at 30kt showed no tendency for the nose to suddenly drop, as in some other helicopters I have flown; this can not only be disconcerting when close to the ground, but can also be hazardous.

I did not time Neuhaus’s 360° spot turns, but they were fast. There was still some pedal availability in both directions, but more importantly in recovery to the hover, when a bootfull is required.

I glanced at the power indication during all of this and found it easy to interpret. It changed colours as power was increased. Maximum power available was easily seen. The pilot does not need to memorise any numbers: it is all done with colours and presentations. We did not get anywhere near maximums during these extreme manoeuvres at maximum weight.

We climbed up to cruise altitude and did some, for me, reasonably tight turns in both directions. I invited Neuhaus to go steeper at this high weight. At 60° in both directions, there were no signs of any aerodynamic distress.

To give pilots realistic engine-failure practice in some helicopters, you have to use full single-engine power, but this reduces the life of the engine. The modern helicopters I have test-flown now have a training mode, selectable on the H135 by pressing a single button.

Once done, the engine indications immediately went to a realistic single-engine presentation, with the only exception that they were highlighted with a T in a triangle. Our right hand engine – the “good” one – showed full power.

SAFETY FEATURES

An automatic countdown started going from yellow to red when the full-power time limit was approaching. This was accompanied by real rotor speed droop, which I restored by lowering the collective lever slightly. If it droops more than 12%, as yet another safety feature, the “failed” engine power will be restored automatically. In reality, to protect the life of the engine, no more than maximum continuous power is used. Another single click restored us to normal twin-engine configuration.

To complete our flight, Neuhaus demonstrated the many hands- and feet-off automatic pilot characteristics. The autopilot has four axes – pitch, roll, yaw and collective. The pilot can adjust any of the attitude or flight modes (pitch, roll, yaw, heading, rate of descent/climb) by use of a single button. If weather conditions are so bad that the aircraft cannot be flown safely, using this autopilot should get him/her out of trouble. Likewise, if the pilot gets into an excessively unstable condition, two clicks will cause the aircraft to revert to straight and level.

Neuhaus then demonstrated auto-hover and the ability to tweak it gently left, right, backwards or heading change. Ideal for search and rescue missions when recovering someone down below, in the sea, say. Similarly, hover height can be adjusted. This was highlighted at the end of our final automatic approach back to base.

If a malfunction or other warning pops up while the pilot has his/her head out of the cockpit, they are alerted by sound. They can then look inside the cockpit and press a button to bring up the message: a good safety feature.

Although technically the aircraft is complex, it is extremely pilot-friendly

To complete our flight, Neuhaus set up a hands- and feet-off automatic instrument approach back to the H circle at the Airbus Helicopters base. The choice of approach glide slope is up to 10° for non-precision and up to 6° for a precision glide slope such as an instrument landing system (ILS). These generous limits take full advantage of a helicopter’s capabilities. The pilot can select any parameters for acquisition of the final glide slope – direction of capture, height, speed, rate of descent and the like. The whole profile is presented on the pilot’s screen. The aircraft will automatically level off at 50ft after a precision approach such as an ILS, or 100ft for non-precision.

There are some high trees on the instrument approach to Donauwörth, so Neuhaus selected a 10° glide slope. The autopilot followed all of the parameters set up. These were seen clearly on the pilot’s screen. The aircraft flew us down, hands and feet off, to a 200ft hover over the H. Neuhaus then wound us down to 3ft and invited me to take control and land.

The shut-down, like the start-up, was logical and easy, despite the many sophisticated systems involved. Any serious limitation deviations or mechanical issues are recorded and can be downloaded.

The overall impression is that although technically the aircraft is complex, it is extremely pilot-friendly to operate, has many safety features and, in most cases, more than enough power to carry out demanding tasks, such as a high-altitude rescue.

Passengers, no doubt, will enjoy the comfort, with good outside visibility, low noise and a smooth, fast ride. Purchase price is from €4 million ($4.4 million) for the fully equipped basic aircraft to €6 million for more specialist configurations, such as law enforcement.
H135 retains lift as new chapter starts

Despite entering its third decade, Airbus Helicopters’ light-twin stalwart continues to sell strongly, with latest cockpit upgrade promising to further enhance rotorcraft’s capabilities

DOMINIC PERRY LONDON

In a period where the market for heavy rotorcraft has dried up, much of the good news for Airbus Helicopters is coming from its German factory and is being generated by the pair of twin-engined, medium-class platforms it produces there: the H135 and H145.

According to its third-quarter sales figures, between them the two aircraft accounted for 211 total net orders, registering respective figures of 42 and 47 for the nine months ended 30 September.

For the light-twin H135, which celebrated its 20th anniversary earlier this year, the feat is particularly impressive given that it is a product originally conceived in the 1970s, predating the formation of even Eurocopter.

Of course, the 2.9t maximum take-off weight helicopter has gone through multiple iterations since the first delivery to launch operator DRF Luftrettung in 1996.

The latest, the P3/T3 – the letters denote either Pratt & Whitney or Turbomeca (now Safran Helicopter Engines) powerplants – arrived in late 2014 and saw the addition of a number of enhancements to improve hot and high performance.

Replacing previous P2/T2 models, the new variant features longer main rotor blades, relocated engine inlets designed to reduce installation power losses, and uprated powerplants.

In October 2015 the manufacturer an-
The longer blades have another benefit too: because there is less rotor loading, noise emissions are cut to 8.4dB below ICAO limits, making the H135 one of the quietest in its class. “Customer feedback is that the helicopter is much less noisy,” says Humpert.

Backlog for the type stands at about 80 units, and “as the market is coming back again” the production rate is rising from 36 aircraft last year to 48 in 2016 and to 64 next year. “So this is one of the big challenges I am going through to manage the production ramp-up,” says Humpert. He is hopeful sales momentum can be maintained so that output can be held at the 2017 rate.

Since the programme started, the airframer has delivered a little over 1,220 examples of the helicopter to 350 customers in 75 countries. Half of the operational fleet is engaged in emergency medical services operations, 17% in business and commercial transport, 16% in public services (typically law enforcement), 10% in military missions, 4% in offshore operations (mostly wind farm inspections), and the remaining 3% in military training.

MAJOR IMPROVEMENTS
In that situation – with deliveries contracted until 2019 – the rotorcraft will be assembled earlier and then parked to enable the production cut-off in 2018.

“I want to finish with the current glass cockpit in 2018 to stabilise my production on one type only,” Humpert says. To encourage this migration, prices on the current glass cockpit will rise “for product policy reasons”, with 2017 the final year in which to order it.

As well as new-build helicopters, an enhancement package is available to raise in-service examples of the previous version to the P3/T3 standard.

Humpert says there are “lots of upgrade prospects”, with 145 offers out to the market. It is mainly driven by improvements to the full-authority digital engine control software, but the repositioning of the air inlet cowlings – moving them to the side rather than the front of the aircraft – is a “major driver to improve available power” through a “significant reduction” in engine installation losses.

Previously, air had to bypass lots of equipment on the way to the aft engine deck, causing pressure loss and a temperature increase of about 3°C (5.4°F), translating to a reduction in the engine power available, particularly at altitude or in hot conditions.

In addition, the rotor diameter grows to 10.4m (34ft) from 10.2m previously, combining with the other changes to significantly lift hot and high performance.

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NEW OPPORTUNITIES
Humpert is confident that the military market is an area ripe for growth. Australia, Germany and Japan are all customers for H135 trainers, with the UK added to that list earlier in the year following its selection of the type for the country’s Military Flying Training System requirement.

Twenty-nine examples, powered by Safran Arrius 2B2+ turboshafts, will be supplied under the contract, with deliveries to begin in 2017. A bigger opportunity will also present itself next year, when the US Navy begins an effort to replace its current fleet of Bell Heli-
“Twenty years makes it sound like a very old aircraft but in reality it is very young”
Guillaume Faury
Chief executive, Airbus Helicopters

Airbus Helicopters' strategy has seen the position of the H135 reinforced by the decision last year to ditch the AS355 Twin Squirrel – effectively a French-built competitor, at a similar price point to the German model but “less capable” – says Humpert.

“In the AS355 had experienced its good times; that is why we are replacing the twin-engined product policy with only the H135.

“Our strategy is to have this helicopter as a light-twin, low-cost entry model. That is why we have done significant work to reduce the costs on the H135.”

In addition to holding the list price for the past three years – “we offer more helicopter for the same money” as Humpert puts it – work has been carried out to significantly bring down the direct maintenance costs of the H135.

Direct maintenance costs have fallen by 15% These have fallen by about 15% so far and Humpert believes “there is more in the pipe” to enable a 20% reduction over 2013 costs.

In addition, life limits have been removed on main rotor blades, and gearbox time-before-overhaul rates have risen to 3,600h. They will jump again to 4,000h next year and to 5,000h in 2018-2019, assuming operational trials go according to plan.

Of course, the H135 does not have the market to itself, with the AgustaWestland AW109 and Bell 429 competing in the segment. In addition, there are signs that the Italian manufacturer is contemplating a successor to its current light twin: a notional AW209.

Significantly, Airbus Helicopters has been maturing a slew of aerodynamic and technical improvements under its Bluecopter initiative. Although it is at pains to point out these are largely “platform agnostic” and could be applied to any model in its range, they have been demonstrated on an original EC135 prototype.

Although Humpert acknowledges that technologies matured on the Bluecopter will find a place on the H135 in future, they will be applied only as part of an upgrade programme. “Once we are forced to do a step, it will be a step where we expect more than a small aerodynamic improvement,” he says.

Mitigating against further near-term changes is that “customers would like to see a stabilisation of the production line or product line”.

Speaking at the beginning of October at an event to mark the type’s 20th anniversary, Airbus Helicopters chief executive Guillaume Faury described the H135 as “a great success”, noting that it “represents very well the DNA of Airbus Helicopters”.

“Twenty years makes it sound like a very old aircraft but in reality it is very young,” he said.

Humpert is firmly behind this statement: “Twenty years is not a lot for a helicopter – past models were in production for a lot longer. It is still within the first half of its life – clearly there is a lot to come in future.”