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## Aircraft Industries depends on milling cutters for high-volume machining from MAPAL

In the production of structural components for the aerospace industry, three criteria are all decisive: The components must be flawless, reliable and economically disintegrated. This requires tools specially developed and adapted for this purpose. The Czech manufacturer of commercial aircraft Aircraft Industries relies, among other things, on high-volume cutters from MAPAL.

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## Machining structural aircraft parts reliably and cost-effectively

The story of Aircraft Industries began in 1936. Since then, the company, based in Kunovice in the Czech Republic, has built more than 8,000 aircrafts of various types. The manufacturer is currently focusing primarily on the latest generation of its L 410 model, the L 410 NG, which entered series production last year. The standard version of the aircraft, 90% of which consists of aluminium parts, is designed for short-haul flights. The multipurpose aircraft can transport 19 passengers and is also used for transporting cargo from remote areas to major cities.

The L 410 NG represents a significant improvement on its predecessor, featuring a new wing structure that allows for higher fuel capacity and thus a longer range. It is also fitted with more powerful engines and cutting-edge avionics.

## Manufacturing parts quickly and efficiently

In preparing for the production of parts for the aeroplane, Aircraft Industries revised its approach to machining and, in 2015, installed a new horizontal machining centre for high-performance aluminium machining. "This enables us to manufacture our parts more quickly and efficiently," say Libor Krchňáček and Oldřich Zich from Aircraft Industries, explaining their decision to purchase the equipment. At the same



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time, the company was in the market for tools that satisfied its requirements with regard to machining speed, durability and surface quality.

Parts for the L 410 NG – the skin on the upper and lower surfaces of each wing, which forms the outer shape of the wing, as well as the integral subframe and fuselage sections – are machined from large blocks of aluminium. “MAPAL’s glowing references and experience in aluminium machining made it our first port of call when we were drawing up the process for machining the aircraft skin,” the responsables from the Aircraft Industries team recall. For milling machining, Aircraft Industries contacted Petr Macho, who is MAPAL’s technical consultant responsible for the Czech Republic.

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## PKD cutter achieves surface roughness from 0.4 to 0.8 $\mu\text{m}$

“We conducted some exploratory trials with a PCD-tipped high-feed milling cutter, and the customer was thrilled with the tool right from the start,” recalls Petr Macho. The four-bladed milling cutter, which is designed specifically for machining convex surfaces, has a diameter of 20 mm and features a special toroidal geometry. At a spindle speed of 23,000 rpm and a cutting speed of 1,445 m/min, it produces an average surface roughness of between 0.4 and 0.8  $\mu\text{m}$ . “We are very happy both with the surface and with the tool life of the milling cutter,” say Libor Krchňáček and Oldřich Zich.

## Feed rate up to 13 m/min: The SPM-Rough with a corrugated profile

Starting with this first tool, the partnership gradually grew broader. “Once we had made effective use of the PCD milling cutter for machining the surface of the wing skin, we tested solid carbide milling cutters for machining the integral subframes of the main wing,” recalls Libor Krchňáček. As Oldřich Zich adds, “We are absolutely delighted with the machining quality and reliability of these tools as well.” To rough machine the entire structure, including the pockets, the company uses the SPM-Rough high-performance milling cutter with a corrugated profile. It impresses with high material removal rates, excellent rigidity and perfect chip flow at high machining



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values. For example, it is capable of operating at a feed rate up to 13 m/min. “The bottom panel of the wing, which is part of the fuel tank, is made from 2000 kg of material – and after 35 hours, 73 kg is all that is left,” says Krchňáček.

Aircraft Industries uses a solid carbide milling cutter from the SPM series for finishing the structures of the main wing as well. It features polished chip flutes that ensure that chips are removed reliably. “This was another milling cutter that delivered optimal results right from the first test,” says Macho. The result is that all three tools are now being used to great effect for manufacturing various parts of the aircraft. “What matters to us is that the tools we use are reliable and provide accuracy of repetition while still being cost-effective,” stresses Zich, “and all of that is exactly what we get from the MAPAL tools.”

## From parts manufacturing to final assembly

It is little wonder, then, that the decision-makers at Aircraft Industries not only employ MAPAL tools for manufacturing parts but are also considering using them for final aircraft assembly. “The latest stage in our partnership has involved carrying out tests with combination tools for reaming and countersinking for hand drills to machine the rivet bores,” says Macho. Aircraft Industries has also tested a MAPAL reamer for reaming H8 bores in the aircraft interior. These tests, too, have been successful, which means that MAPAL tools will no longer be limited to parts manufacturing but will soon be appearing in final assembly at the Aircraft Industries factory in Kunovice.

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Captions:



From left: Libor Krchňáček and Oldřich Zich from Aircraft Industries discuss machining operations directly by the machine with Petr Macho from MAPAL.

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Aircraft Industries currently manufactures the aircraft L410 NG. \\(Image provided by Aircraft Industries)

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The inner shape of the aluminium wing is machined using tools from MAPAL.



Aircraft Industries uses different milling cutters as well as drilling and reaming tools from MAPAL.



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Aircraft Industries manufactures the aircraft parts ...



... and then assembles them in full.

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