



NEW DIMENSIONS

The manufacturer of aerospace components always strives for surpassing its limits. This ambition combined with the country's spirited mentality leads to new innovations in the aerospace industry.

Ready for take off

Brazil – the land of *joie de vivre* and breathtaking nature. It's *samba*, *caipirinha*, endless beaches as well as the rain forest of the Amazon Basin which shape our perception. Rio de Janeiro is the symbol of absolute beauty and spectacular sights, of which the country has innumerable. Furthermore, Brazil is also land of high technology and sophisticated machining of high tech components.

São José dos Campos, a city with 700,000 inhabitants, which is located in the tropical highland of the state São Paulo, is one of the most important technology centres of Brazil and therefore does not fit our imagination. The city is home to subsidiaries of several international groups as well as numerous training and research centres, especially the ones focusing on aeronautics. Embraer, the leading manufacturer of commercial jets up to 150 seats is also the main exporter of high value-added goods in Brazil. Nowadays, the company is going through a strategical partnership process of creating two joint ventures with the aerospace giant Boeing. The company specialises in regional airliners and exactly fulfils the needs of many airlines with its intelligent developments. Therefore, Embraer's regional jets ride the wave of success worldwide. The company's portfolio furthermore comprises executive aviation and military transport aircrafts. The technology of WFL plays a major role in each and every of the thousands of daily take-offs and landings. This is because the landing gears of Embraer's smart jets are manufactured by

ELEB Equipamentos Ltda, in short ELEB, who turned to five MILLTURNS from WFL for the production of its complex landing gear components for aircrafts. It specialises in the manufacture and development of landing gears on production space totalling 24,000 m². Hydraulic actuators, electrical and mechanical valves, actuators and so-called pylons are also produced by the firm. Employing more than 600 workers, the company has developed into one of the key suppliers in the aerospace industry and its all-embracing range of services – from customised developments of landing gears through to reliable service – has garnered the company a strong reputation in the sector. ELEB Equipamentos Ltda. is best compared to a small country, with its well-planned structures and precise working methods, along with sophisticated improvement processes and visible strategies. It is this innovative mindset that enables the company to launch an average of two pivotal innovations onto the market every ten years or so. "We focused on innovation, quality and service right from the start and we have embodied these



THE TEAM

(left to right): Reinaldo Ponte Júnior (ELEB), Chris Jagersberger (WFL), Ivan Prando (WFL), Luís Marinho (ELEB), Paulo da Silva (ELEB), Gustavo Nogueira Emmã (ELEB), Josef Fellner (WFL), Gustavo Tureta (ELEB) around Luís Marinho, Managing Director of ELEB are guiding the company into an innovative, digital future.



THE FIRST MILLTURN is in continuous operation at the company's production plant. It is mainly used to manufacture cylinders, parts for the main housing and sliding housing.

values ever since," explains Luís Marinho, Managing Director of ELEB.

The master of complexity and structural challenges

The ELEB team has taken on a wide range of challenges over the past 35 years. In the 1990s, the subsidiary of Empresa Brasileira de Aeronáutica S.A., produced landing gear and hydraulic assemblies for the EMB-314 series and the ERJ-145 and won its first tender for the S-92 Sikorsky. "The next steps just fell into place. Starting with the production of landing gear plus assemblies for the E-Jet series and the development and production of a complete shipset for the Entry & Light Executive series in the 2000s," reports Reinaldo Ponte Júnior, Senior Manager in Production Technology. The company has been carrying out ongoing work on new series since 2010. This led to the development and production of parts for the KC-390 series and for the Embraer E2.

The market in which ELEB operates not only requires highest quality and reliability, but also a high degree of flexibility. Pro-

duction of very small batch sizes is a matter of course here as, once production is complete, the products undergo numerous tests. This means that very short set-up times are essential when manufacturing landing gears to ensure that valuable time is not wasted. So when ELEB started to look for its first complete machining centre in 2005, set-up times, machining quality and progressive technology were the deal breakers. Since then, these requirements have grown year-on-year and only a few providers were in a position to fully fulfil them. Different materials, such as easy cuttable aluminium, but also high-strength or hardened steel as well as stainless materials, like titanium, have to be machined efficiently. Deep hole drilling as well as deep internal machining with long, dampened boring bars is carried out. The manufacturing of typical components requires a very high cutting volume and highest precision. This, in turn, calls for contradictory requirements for the machine concept such as extreme stability, high dynamics and short auxiliary process times.

Today's main focus is on daily monitoring

of the Overall Equipment Effectiveness (OEE). This indicator is a general measure of a machine's added value for a company. The OEE is defined by three factors: the availability, the performance and the quality. Checking the OEE on a daily basis gives a clear, transparent indication of the amount of added value that WFL machines provide. The average value for WFL machines at ELEB is far over the global benchmark. "This index was one of the most important factors in favour of making an investment in five complete machining centres from WFL," reveals Paulo da Silva, Process Analyst at ELEB.

Maximising new technical potential

Before the company purchased a MILLTURN, the machining steps were very complex. In the past, parts were moved with great frequency, meaning that the risk of damage was very high compared with the situation today. The different clamping methods were a risk in terms of quality and set-up times were extremely long. After the first M120 MILLTURN was introduced in 2005, it soon

became clear that these factors had all been significantly reduced or even eliminated. Henceforth, finishing after hardening could be carried out inhouse. This enabled ELEB to broaden their horizons and develop ever bigger landing gears. The company invested in two M65 MILLTURNs in the two following years, to be able to apply the successful technology to a broader spectrum of parts. Parts for smaller aircrafts are still produced on the two M65 MILLTURNs, while the M120 MILLTURN is used to manufacture cylinders, parts for the main housing and sliding housing, for example. Based on the increased capacity utilization and ongoing innovative spirit, the company invested in another M120 MILLTURN in 2007. "The huge advantage when machining on the MILLTURNs is that you don't need to use different angular heads. The various options for mechanical processing and unrestricted access to the work piece mean it is possible to use the best tools and perfect their machining," explains Reinaldo Ponte Júnior in regard to the technical capabilities of the complete machining centre.

With the E2 series, aircraft manufacturer Embraer entered into a new top-class segment and ELEB into a new cutting-edge phase of landing gear production. "Since they were introduced into the company, these machines have delivered maximum performance and enable us to lower set-up times while increasing the quality of the parts through exact precision," reports Luís Marinho. In 2017, ELEB decided to invest in another WFL machine. The M150Y MILLTURN has a turning diameter from 1750mm and is equipped with a slide for heaviest internal machining. This opens up almost unlimited possibilities when it comes to the manufacture of landing gears. To create sufficient space for the new machine, a new production facility was established in Taubaté. This is set to be the birthplace of future innovations.

Service quality is the perfect companion

According to ELEB, the implementation and commissioning of each and every MILLTURN was flawless. The technical availability of the MILLTURNs has been close to 100 per cent since 2014. At that time, WFL decided to open a branch office in Brazil with local service engineers and

a spare part warehouse. "There were very few difficulties, just a few minor teething problems. And usually these could be resolved very quickly by WFL Teleservice. If we need spare parts, the service team is available at all times. We have seen an enormous improvement here since 2014 – back then we were also the first service customer in Brazil" reports Paulo da Silva. The flexibility of the machines especially justifies the investment. When working with new parts or carrying out trials on the complete machining centre, it impresses with very quick, precise and universal machining.

Entering the future with eyes wide open

The main reason for the company's success, is the ongoing development in all business sectors. Its innovative acting is encouraged by internal conferences on the topic of Industry 4.0. Every two years, ELEB and Embraer promote the program INNOVA. The program encourages the company culture and supports spontaneous and stimulated innovation processes. The goal is to invest time and money in resourceful proposals related to new products, businesses and technologies. After gathering ideas for im-

provements and new potential, these are compared, evaluated and adapted to suit the company by an internal circle of experts. Once the new measures have been carefully introduced, numerous improvements can be measured using the Kaizen model. The term Kaizen comes from Japanese. The first part Kai = change, while Zen = for the better. It concerns the ongoing improvement of activities, processes, methods or products by all employees in a company. In 2018, 2371 ideas were brought to the table and, following evaluation using Kaizen, 1500 of these led to improvements.

Even the degree of innovation of the machines in production was measured. All by collecting and evaluating data. These are used to improve internal processes in conjunction with WFL engineers. "It is essential that we always have an eye on the latest technologies available on the market," explains Luís Marinho of the company's plans for imminent digitalisation. "Topics such as artificial intelligence, the Internet of Things and data-based analysis are not alien concepts but familiar words to us. We have a team which exclusively deals with tying up the loose ends. So, it is important for us to work with machines that will support us as we enter the digital future.



FOCAL POINT: AEROSPACE
Demo version of landing gear manufactured on the M120 MILLTURN