

(all photos: Liburdi Engineering)

# Joining forces

Having carved out a nifty niche in the engine overhaul market, Liburdi Engineering is living off its wits and passing through tough times with enviable ease.

**Tom Zaitsev** reports from the company's headquarters in Canada

In contrast to Rolls-Royce or Pratt & Whitney, Liburdi's name may not ring a bell for airlines at large. But hardly any major aeroengine maker gets by without the company's products and services today. Hence, they are also of benefit to literally all operators using single-aisle and widebody mainline aircraft powered by turbofans.

This is all the more remarkable given that Liburdi Engineering is far from being an engine repair heavyweight. In fact, it is not an engine overhaul firm at all, even though it has intrinsic links to the MRO universe. Nor is it simply a repair equipment manufacturer.

The company's owner and president Joe Liburdi

makes no bones about its distinct role. "We specialise in providing comprehensive evaluations and integrated welding and coating solutions that are not available elsewhere," he says.

His professional experience, which exceeds 40 years, and the firm's track record give credence to this bold statement. While working in a ▶

materials lab at Westinghouse, Liburdi learned the ins and outs of the technical progress in developing high temperature alloys for use in turbines, where gas fired at elevated temperatures gives better energy efficiency.

As turbine and compressor parts in modern jet engines are continually exposed to severe operating conditions, they suffer – perhaps more than other components – from thermal, corrosive and abrasive damage. As a result, these parts need to be replaced more often in order to avoid a loss of engine thrust, efficiency and eventual breakdown. But manufacturing costs can be punishingly high and, in many cases, repair is a more viable solution than replacement.

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Enter Liburdi Engineering, based in Hamilton, Ontario. Unlike conventional engine overhaul shops, it does not repair worn-out parts, although it is able to do that on a limited scale. “Rather, we develop and supply processes and technologies designed to extend their service life,” says Liburdi.



LAWS 5000 5-7 axis, fully coordinated motion welding system

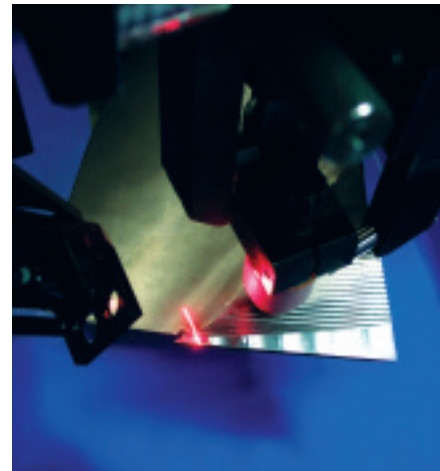
He has pursued this strategy since setting out on his own with a few employees in 1979. The company began with catering to land-based turbines used in the petrochemical industry. While dabbling in other welding applications, including orbital and nuclear, it turned to the aeroengine sector eventually. After acquiring the US firm Dimetrics in 1997, Liburdi shifted industrial turbine services to its facility in North Carolina. Aviation-related business, which is done entirely on the Canadian site, now accounts for up to half of the company's sales. Better still, it keeps growing despite what IATA has described as the worst downturn in the airline industry.

As carriers have parked aircraft and reduced utilisation, demand for MRO has slumped. Most analysts expect this situation to continue at least into the middle of 2010, while some predict slow recovery only next year. For all that, Liburdi has managed to maintain a very healthy flow of business during the current recession. According to marketing director Robert Tollett, its aerospace operation saw a 30 to 35% jump in terms of the number of orders and their value over the past year.

He says: “While many in the market were suffering significantly, our backlog was rising, our cash flow remained positive and the balance sheet was strong. We sort of proved insulated from the crippling impact of recession just because of what we offer to the industry.”

When visiting Liburdi's workshop, the variety and sophistication of equipment built there is overwhelming. On the high-precision welding side, it centres on laser, plasma and gas tungsten arc automated systems. Each comes in different architectures meeting particular customer requirements. All modifications feature real-time seam tracking and are complete with proprietary robotic controllers, structured light vision devices and power sources. These are complemented by a family of advanced coating systems based on chemical and physical vapour deposition. For good measure, there are patented powder metallurgy processes acting as a high strength alternative to welding for joining, bonding, surface build-up and protection, to name just a few applications.

Engine parts repaired using these tools and methods include all critical turbine



components from the compressor to exhaust end. Training and start-up support aside, Liburdi's products go to market packaged with comprehensive engineering services and software. They range from stress analysis of rotating blades to determine repair limits, to a detailed examination of performance and temperature distribution for the complete engine.

The result is an array of unique technologies backed by top-notch expertise and continually upgraded through feedback from a host of users. With more than 100 automated welding systems alone installed in 15 countries, the customer list contains all of the OEMs that build propulsors with thrust in excess of 18,000lb. Following audits by manufacturers, Liburdi Engineering is capable of handling components on the General Electric CF6 and GE90, the Pratt & Whitney JT9D, PW4000 and PW6000, the Rolls-Royce RB211-535 and Trent family up to Trent 1000, as well as the IAE V2500 and the CFM56.

“Collectively, these engine types power practically the entire global fleet of medium and longhaul commercial aircraft,” says Liburdi. “Almost any user could come to us with the latest components from legacy or new generation engines and get a tailor-made repair scheme developed for them in a matter of weeks or months.”

The company would receive a batch of parts from a customer, figure out factors influencing the life expectancy of parts, and see how it could be increased. The payback for customers is not having to buy them constantly. It becomes especially practical when specific part manufacturing approvals do not exist or a business case for using PMA parts and design engineered repairs, instead of the standard original material and processes, looks questionable.

Alluding to certain independent maintenance providers traditionally working with the engine ▶



The LAWS 1000 has been in service at major airlines and component repair facilities since 1990

and major users to develop better repair solutions for their own support networks as well as third parties," says Tollett. "Typically, these are carriers with large fleets and significant in-house overhaul capabilities, such as Lufthansa and Delta Air Lines, who want to be in control of their destiny. The other kind would be high-end engine shops seeking to gain an edge in the market by employing new technologies."

Senior engineer Scott Hastie, who leads one of research teams, claims that using their know-how could contribute to competitiveness on a big scale. He explains: "Our ultimate goal is to develop rejuvenation techniques for hardware that would otherwise go to scrap. Some of them essentially come down to redoing all surfaces of deformed components. As a result, they shape up as new ones but come only at a fraction of the original price."

As a rule of thumb, end-users can realise savings of up to 70% through extending the life of typical engine parts, such as blades and vanes for low- and high-pressure sections, as well as seals, nozzles, impellers and blisks.

Attesting the performance of Liburdi welding systems, Brad Milbauer, a turbine repair floor manager at Delta TechOps, writes in a follow-up letter to the company: 'Honestly, I haven't seen anything that offers more than this equipment, including software and hardware. I know that many are using a few different systems. But from what I gather, the yield is far from what we could consider an acceptable and viable alternative to that of Liburdi.'

OEMs, Tollett argues: "They start installing third-party spares in engines or producing them under PMAs on their own. Eventually they over-expand and begin competing with the OEMs, which get cheesed off and cut ties with such companies. We don't want to fall into this pattern and prefer to focus on where we are the best."

Research and development appears to be the key role carried out at Liburdi Engineering. Among its 150 staff on the aerospace side, it has 12 licensed materials experts, several people with PhDs in chemistry and physics, as well as up to 24 mechanical engineers.

"We team up with counterparts from the OEMs



For Tollett, collaboration with Pratt & Whitney, Rolls-Royce, MTU, Lufthansa Technik and others embodies a win-win philosophy. "It's not like looking to eat somebody's lunch. We are trying to expand their know-how and at the same time to grow our own technologies. You have to have a collaborative rather than antagonistic approach in this marketplace. But some guys out there lose sight of it as they get very big."

Sticking to the chosen niche and business model, Liburdi Engineering effectively stays away from recessionary pressures on the mainstream MRO industry. "Since we sit on its fringes, our business is not affected by just the number of engine shop visits," explains the owner. "What's important to us is where the investment is coming from and how business is moving around the world."

From the engine MRO perspective, there is a compelling case for players to look internally at maintenance costs and seek to cut them. It has become apparent that more people would rather revamp engine parts than buy new, which, in turn, would generate more business for Liburdi.

Although growth for MRO worldwide appears to be delayed, the recession has accentuated structural changes that had already been underway. Issues that are now top of Liburdi's list include the shift of market power to emerging markets and huge over-capacity leading to consolidation within business and supply chains.

Barring contingency, he expects a surge in capital investment in new machinery throughout eastern Europe, the Middle East and Asia. "This will beget new opportunities for technology transfer. Our equipment went initially to western Europe, but is now going eastward into lower-cost areas, like Poland," says Liburdi, who is quick to note that the region's labour rate is not a deciding factor. "In this business, it's technical competence that far outweighs savings from lower labour costs."

The company has already gained an exceptionally strong foothold in Singapore, where it accounts for the bulk of advanced welding capacity at GE's Airfoil Technologies International and local outlets of Pratt & Whitney and Rolls-Royce. A similar hub of its activity is set to emerge in Israel through further cooperation with Blades Technology.

The Israeli manufacturer is striving to become a one-stop shop and prime supplier of engine components to the OEMs, using in-house forging, machining and finishing processes. "We've had

The company's headquarters in Hamilton, Canada

**“ China is a booming and almost explosive market. You need to be more careful in picking your path and partners correctly there. For us it’s certainly a current concern calling for a particularly judicious approach ”**

Robert Tollett



Robert Tollett, marketing director,  
Liburdi Engineering

an active hand in its drive on the welding side for over 10 years,” says Liburdi. “As it is gearing up output and product range, we’re expanding our repertoire accordingly.”

Along with the need for scale and ample room for consolidation in the MRO sector, the company envisions and intends to benefit from the emergence of centres of excellence that are dedicated to engine repair services both within established airlines and in new locations – for instance, Tollett anticipates a whole cluster to appear in the Gulf states over the next few years.

“There is a keen desire, a lot of cash and an infrastructure that is already in place. The challenge

for them is to have skill sets to maintain organic growth in the high-tech area. We definitely want to collaborate with [Middle Eastern investment conglomerate] Mubadala, which is steering this development. It could be a combination of things up to a joint venture.”

To be sure, Liburdi Engineering is definitely keeping a close eye on the Chinese market. At this point, dealings are limited to a Chengdu-based MRO provider for civil aviation, but exploratory talks are being held with a range of prospective customers. Tollett has a word of caution though: “China is a booming and almost explosive market. You need to be more careful in

picking your path and partners correctly there. For us it’s certainly a current concern calling for a particularly judicious approach.”

All in all, the firm is determined to stay on track with its chosen strategy and keep welding global aviation together as seamlessly as possible. ■



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