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Editor's NOTES



Mike Bryant

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Welcome to the Summer 2022 issue of *Airside International*, in which the first of the features relate to the perennial challenge of preventing aircraft damage. *Megan Ramsay* looks at how technology, training and agreed standards of operations might help to mitigate the danger.

This issue's other two features concern the little-discussed business of airside drainage and water recycling, and the continuing trend amongst ground service providers for electric ground power units (GPUs).

We get the latest news from two of the bigger GSE lessors – Mercury GSE and HiSERV – and catch up with GSE manufacturers based in Turkey (DENGÉ Airport Equipment) and Thailand (Bliss-Fox Panus GSE).

We meet with ADB SAFEGATE Airport Systems' global sales director digital solutions, Ilya Burkin, who explains how the company is helping airports to digitalise in order to improve both safety and efficiency in many areas of their operations, and also speak with ground service providers Havas

and GAT Airline Ground Support to get the views of changing times from the industry's handlers.

Going green is an ongoing theme of these pages, no more so than when the UK's Birmingham Airport and Farnborough Airport both detail to *Airside* their impressive sustainability strategies. And Edmonton International Airport in Canada is also doing its bit, looking to convert airside vehicles to run on combined hydrogen and diesel fuel. These are all parts of the wider efforts being made by the aviation industry to minimise harmful carbon emissions and contribute to a more sustainable future.

In the ever-changing field of technology, we chat with Lana Jansen of WePlan, which offers a software-as-a-service (SaaS) platform that enables airlines to optimise their crew manpower deployment on a continual basis, and take a look at Schiphol's decision to acquire two innovative TaxiBot semi-robotic pushbacks.

Finally, we look forward to late summer and the launch of a new European exhibition dedicated to GSE – GSE Expo Europe – to be held in Paris this September.

We hope you enjoy the issue.

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ADB SAFEGATE's Safedock A-VDGS helps prevent accidents on the apron

Preventing aircraft damage

Aircraft are vulnerable to damage caused by the vehicles that service them on the ramp coming into contact with them – an increasingly expensive (and potentially very dangerous) occurrence, as more and more aircraft are made of easily damaged composite materials. Technology is helping to reduce such incidents, while proper training and consistent standards are also essential. *Megan Ramsay reports*

Accidents and incidents involving aircraft on the ground are by no means infrequent, especially on the apron. This is a very congested area, populated by vehicles,

people and, of course, aircraft whose pilots have limited visibility from a flight deck. From hazards like foreign object debris (FOD) and GSE; to wingtip collisions owing to the non-observance of clearances; to events like a recent accident in Istanbul where an aircraft stopped short of its

parking position and the next taxiing aircraft collided with its tail – the apron is clearly a high-risk environment. David Stark, consulting director and practice leader of enterprise risk services at insurance broker and risk advisor Marsh McLennan, outlines several reasons for

aircraft damage: inconsistencies in risk management, policies or procedures; variability in maintenance and inspection of equipment and infrastructure; “non-conforming operational behaviours in the airside environment, as a result of insufficient supervision, enforcement of protocols, and high staff turnover”; and variability in the methods used to assess hazards, evaluate risk management and apply continuous improvement.

According to Stark, there are also inconsistencies in reporting cultures across airline networks and maintenance, repair and overhaul (MRO) stations. “This can lead to uncertainties and delays in incident investigation, assignment of contractual responsibilities, and insurance claim lodgement and resolution,” he points out.

Furthermore: “As modern airframes are increasingly comprised of composite materials, airworthiness can be impacted by incidents that may have previously presented less of a risk, such as a small scrape or dent caused by a ground service vehicle.”

Either way, damage to aircraft is costly not only in terms of the necessary repairs but also because of the interruption to business when turnaround is delayed as a result of an incident. Damage to aircraft is expensive, and the bill, Stark says, often comes in below insurance deductibles.



Peter Håkansson, ADB SAFEGATE's product manager, gate

There is also of course potential for the damage to go unseen and/or unreported, a potentially extremely dangerous situation.

Solutions

One approach to reduce so-called ‘ramp rash’ is to implement technological solutions that reduce the possibility of human error causing damage to aircraft.

ADB SAFEGATE is one company that provides systems of this type. Peter Håkansson, product manager, gate at ADB SAFEGATE, says: “We believe airports should automate as much as possible, removing opportunity for human error

results in safer operations.

“For example, our Safedock A-VDGS helps prevent accidents through apron scans that check for obstacles and debris; tail and wingtip clearance checks; aircraft verification to make sure the approaching aircraft is the correct type for the stand (if not, the parking procedure can be aborted); and approach monitoring to ensure aircraft enter the stand correctly, in alignment with the correct centre line.”

Other safety features include detection of unauthorised pushback, with an alert sent to air traffic control (ATC), ground operations staff, the pilot and the pushback driver.

Plus: “We can set rules to prevent pushbacks taking place on opposite stands at the same time,” Håkansson goes on. “We can create interlocking rules, too; for instance, if a passenger boarding bridge (PBB) is not in a safe position, we would not allow the aircraft to park. Another important aspect is low visibility. Pilots have a big responsibility and their view is even more restricted than usual in low visibility conditions, so it’s essential to have tools to support them in those conditions.”

ADB SAFEGATE also improves transparency, as the information the system collects is provided to airport operations, engineers, IT and management via its SafeControl Apron Management (SAM)

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solution. Data is available for all parties to view in a central system, which has the flexibility to allow staff to access data at home or on a mobile device, so that in the event of a critical incident, they are alerted and can take action.

ADB SAFEGATE’s gate solutions are present at 47 of the world’s 50 biggest airports, and: “We hold regular discussions with customers and partners to identify problems, operational challenges and accidents/incidents and then work together to solve them,” Håkansson says. Indeed: “This is a big force driving our development.”

Skills gap

An increasingly prevalent headache in aviation is the widening skills gap that results from the loss of older, more experienced staff alongside a lack of new, younger employees willing to work their way up.

Covid-19 has exacerbated the situation as many staff approaching retirement age have left employment early rather than return from furlough. Those who have returned from furlough, naturally, have perhaps not been keeping their skills sharp for some time in the interim.

Stark cautions: “As air travel resumes, accidents in the ramp area of airports across

the world may occur, as personnel have not performed their duties for some time.”

Monika Mejstrikova, director of ground operations at the International Air Transport Association (IATA), acknowledged at the 33rd IATA Ground Handling Conference (IGHC) in November 2021 that: “Many skilled employees have left the industry and are not coming back. And recruiting, training and accrediting new staff can take up to six months.”

The potential for safety on the ramp to suffer under such conditions is clear; but has it? According to Swissport head of quality and safety David Anderson, the answer is a definite ‘no’.

He explains: “We haven’t seen any direct correlation between people coming back from furlough, or new starters, and aircraft damage incident rates. Re-induction of furloughed employees is tailored to how long they have been away and what they need to revise.

“Like other handlers, the number of passenger flights we handled during Covid dropped but cargo flights increased, so in many areas our people maintained recency. Plus, from a handler’s perspective, the same basic procedures and safety considerations apply whether handling a cargo or passenger flight.”

EU regulatory developments

Since 2018, EASA (the European Union Aviation Safety Agency) has been working towards the establishment of a set of ground handling objectives designed to ensure that ground service providers follow only safe procedures in their handling on the ramp. Regulation (EU) 2018/1139 will mean that, instead of having to comply with 27 different requirements at EU aerodromes, handlers will have only one set of rules to follow.

While the pandemic has delayed progress, EASA and a group of experts representing all affected stakeholders are now working on the draft rules and it is expected that the regulation will be published in 2024. Thereafter EASA will publish an associated decision

containing Acceptable Means of Compliance and Guidance Material to support the implementation of the requirements included in the regulation.

“As far as we can tell from the current drafting phase and the feedback from the experts with whom we are working, the regulation will not provide detailed requirements on ground handling operational procedures, because these are the first and fastest ones to change and update, to include lessons learned from daily operations, new technologies, etc, and a regulation cannot keep pace with this rhythm of change,” an EASA spokesperson said.

“It will instead establish the high-level safety objectives that a provider of ground handling services must comply with in order to ensure safety of its operation.”

In late April, the EASA spokesperson said: “In the coming weeks and months EASA will have several focused consultation sessions with the EASA Advisory Bodies [composed of representatives of the EASA member states and the European Commission, among other entities] on the first draft of the Opinion. We will also organise a webinar on 30 June, open to the public (<https://www.easa.europa.eu/newsroom-and-events/events/webinar-eu-ground-handling-regulation>).

“The purpose of the webinar and the focused consultation is to provide some clarification on the draft rules, obtain the first feedback from industry and member states, to see if we are heading in the right direction to address the needs already identified in 2019, and to collect their suggestions and recommendations.” ■

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IGOM update

In February, IATA launched the IGOM Portal – what it describes as an online platform where, with the IATA Ground Operations Manual (IGOM) as the primary reference, airlines and ground service providers can exchange information, including any variations, on their ground handling requirements.

“Safe and secure on-time turnarounds are a priority for airlines and a critical deliverable for GSPs [ground service providers],” says Nick Careen, IATA senior vice president operations, safety and security. “Standardisation of procedures through the IGOM is a key enabler.

But it must be implemented to be effective. The IGOM Portal will provide the means to understand variances and manage adoption.”

He continues: “The safety gains from global standardisation have been proven as aviation has developed. Along with facilitating global adoption of IGOM, the IGOM Portal will establish a baseline to measure and manage the global adoption of IGOM, which will also lead to significant efficiency gains.

“With greater standardisation, for example, GSPs will see a reduced need for airline specific training and will more easily be able to deploy staff across multiple customers,” Careen concludes. ■



Swissport’s **David Anderson**

Anderson says the core of Swissport’s staff have remained with the company through the pandemic. The handler has also increased its staff with a high volume of new recruits – over 30,000 people globally across all business units.

“This is very positive as it demonstrates that the industry is picking up and there is no evidence to suggest that there is an adverse impact on safety,” Anderson says.

Under the specific circumstances of

a global pandemic, and in the far-from-predictable post-Covid world, Håkansson is confident that automation has a big part to play in enabling airports to keep pace with demand.

“Traffic fluctuates, and automation can solve the resource issues our industry faces: airports can cope with a rise in traffic, or also a sudden drop in traffic, without re-hiring or laying off staff,” he points out.

Increased automation has other benefits, too. “First, an automated system improves safety for staff because they are no longer required to walk around on the ramp. Second, remote marshalling allows staff to monitor operations from an office, operations room or vehicle using a mobile device. This leads to efficiency gains, because it’s possible to monitor multiple stands or gates at once. Third, working conditions are improved as staff are not exposed to safety and health issues (including noise and particulate emissions) on the ramp,” Håkansson advises.

“Automation enables staff to work more efficiently. They can focus on other tasks to further improve turnaround times or

be assigned to other roles.” Plus: “It’s safer when we are less dependent on human beings. The next step is autonomous decision making to prevent potential accidents or incidents,” he adds.

At some point, Anderson says, “We expect to see automated and non-automated vehicles working together on the apron. This may increase risk in the short term, but with planning and co-ordination that is fixable. We will then get to the point where all vehicles on the ramp are automated. We could consider designating one section of an airport as a totally automated area, and then expand from there.”

The technology is available – self-parking/self-driving cars are often cited as an example – but a great deal of investment in equipment and infrastructure will be required in order to achieve greater automation on the apron.

At an industry level, standardisation is top of the agenda when it comes to preventing aircraft damage. Should this be a case of top-down imposition of rules? Not necessarily, Anderson says. “We need to continue the drive for standardisation and simplification – and we don’t need regulation to do that; we



should be able to do it collaboratively as an industry,” he affirms.

“Turnaround should be done the same way every time; it is a repeatable process, especially when you consider that airlines are all buying their equipment from a couple of suppliers, so different procedures should not be necessary. Every time we standardise, we lower the risk,” he believes.

While recognising that industry standardisation has moved on significantly in the last ten years, Anderson feels that there is more to be done.

He observes: “When an airline has an incident, it will change its procedures, and the same is true of ground handlers. This is for a good reason and it’s done with the best of intentions – we are all trying to improve safety – but it results in non-standard procedures.”

Training staff on each airline’s particular requirements is not helping matters either; Anderson believes that IGOM (the IATA Ground Operations Manual) is the way

forward if the industry is to achieve a greater standardisation and, in turn, reduce incidents on the ramp.

At Swissport, all new GSE is fitted with enhancements such as proximity sensors as a baseline, and complies with IATA’s AHM Chapter 9 guidelines. According to Anderson: “The challenge I see coming from airlines to handlers is that you have to be certain about investment. At what point do you invest in automation and what technical solution do you adopt?”

“We have to consider our landlords’ requirements versus our aspirations in terms of automation and environmental performance. We all have to collaborate with other players to make sure we stay aligned with work other parties are doing on the airfield.

“We need a co-ordinated industry approach to allow us to maximise the benefit of technology – and this should probably be led by IATA with involvement of the airport authorities,” he adds. ■

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As well as mobile GPUs, ITW GSE also supplies pre-conditioned air units (PCAs) and power coils, such as these at Bangkok's Suvarnabhumi International Airport

Powering up for the future

The trend towards battery-powered ground power units (GPUs) continues, perhaps at a faster pace than ever before. Meanwhile, GPU suppliers are already benefiting from the ongoing recovery in the aviation industry



Poul Elvstrøm, vice-president global sales & marketing at ITW GSE

With manufacturing set-ups in both Florida in the US and in Odense, Denmark, ITW GSE offers GPUs, PCAs, cables and hoses to the aviation industry, serving both the commercial and military sectors.

It has supplied equipment to customers in more than 100 countries, and can date

its operations back nearly a century.

2019 marked an 'all-time high' for ITW GSE sales, says Poul Elvstrøm, its vice-president global sales & marketing. The company "had a really good year", and by the end of 2019 its order book was bulging. Thus, when the Covid-19 pandemic hit in 2020, devastating the global aviation industry as passenger numbers dropped through the floor, ITW GSE was well placed to survive the ordeal.

That large order backlog meant that the

impact of the downturn in the aviation sector was not felt too badly even in the worst of times, Elvstrøm recalls (and by its very nature, the business of selling GPUs and PCAs is one that involves long lead times for orders and deliveries, given that sales depend largely on major airport development programmes).

So, while flying passenger numbers dropped around the world by some 60% or so that year, the impact on ITW GSE was less keenly felt, although sales

did fall somewhat in 2020, Elvstrøm informs. Some projects continued relatively unaffected, such as the huge development programme at Qatar’s Doha International Airport as the capital gears up for this year’s football/soccer World Cup. Another big customer that year was the US Coast Guard, illustrating that new, non-commercial sector business can sometimes compensate when commercial business falls away.

ITW GSE is part of a much larger ITW business that is “very financially stable”, says Elvstrøm, and this too has helped the former over the past difficult couple of years.

During the pandemic, ITW GSE had two main priorities, Elvstrøm reports: first, putting the health and safety of its own employees at the forefront of all thinking (“People are the cornerstone of our business,” he says) and, second, concentrating its efforts around doing everything possible to support its ‘80s’: the 20% of customers who provide 80% of its business.

Over and above these two priorities was



The ITW GSE 7400 production line in Palmetto, in the US

the intention of ‘winning the recovery’: ie, being in the best possible position to meet the needs of the market once it does return to normality, and therefore grow

along with it. Hence, training, education and developing talent have remained important, while sales and marketing efforts have in no way slowed down.

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ITW GSE's sales director Lars Vestergaard and TCR asset director Arnaud Dewit celebrate the 100th eGPU to come off ITW GSE's 90 kVA production line

Quality has always been a priority for ITW GSE. Initially, both its US and Danish facilities were certified to ISO 9001 standard. However, as ITW GSE decided to apply for ISO 14001 certification too, it felt natural to streamline all quality processes and guidelines across the two facilities. Achieving that took time but, at the end of the day, it is of great benefit, says Elvstrøm.

All this helped ITW GSE to “gain additional market share” last year, when it recovered half of the business that it had lost during the first year of the pandemic. It is now almost fully recovered, says Elvstrøm, and excellently positioned to benefit from the growing confidence that is now evident in the aviation sector.

As well as the Doha project, other major airport development programmes in Bangalore in India, at the Red Sea International Airport under construction in Saudi Arabia, and at Amsterdam Airport Schiphol have also brought in plenty of work. The Middle East region in general continues to be a plentiful source of demand for new GPUs and PCAs, and this year Elvstrøm is expecting the North American market in particular to pick up strongly.

Beyond that, next year and then into 2024, he believes that the Asia-Pacific

market may bounce back with vigour, not so much China perhaps but other markets such as Indonesia, the Philippines and Taiwan. And, in particular, he is of the mind that India may well represent the biggest potential boom in airport development projects and consequent demand for GSE and infrastructure such as GPUs and PCAs.

“So, the global passenger recovery may be slow,” Elvstrøm notes, but airport projects will be driven by regional and national dynamics as much as by increased passenger numbers across the world.

Product development

The pandemic also didn't put a stop to ITW GSE's spending on research and development (R&D). In fact, says Elvstrøm, it is investing more on R&D today than ever before. Much of its new product development is driven by the ever-increasing emphasis on greater sustainability in the aviation industry, not least in demand for GSE that minimises (or eliminates) harmful emissions.

The last few years have been fundamental in the development of technologies that make battery-powered GSE financially viable, Elvstrøm considers. When previously, electric GSE

had been something of a dream, for most GSE types it is now more than realisable in terms of the maturity of the technology involved; what is holding the move from diesel to electric back, he considers, is the lack of sufficient charging infrastructure at many airports.

Thus, as well as the battery-driven GPUs that ITW GSE now offers (of which more later), the efficient use of power at airports is key, he says. Hence ITW GSE's development of 'Intelligent Power Management' (IPM) options. IPM is described as a 'complete gate power system' that allows airports to enjoy the 'smart exploitation' of installed power based on data-driven innovation. In essence, it involves an ITW GSE installed PCA monitoring and sharing power across all gate systems in order to exploit the difference between installed power and actual consumption by equipment at any given time.

According to Elvstrøm, airport operators can readily see the benefits of such a system, while ITW GSE is also talking to carriers such as United Airlines who, too, have seen the cost-saving and efficiencies that IPM represents.

ITW GSE has long emphasised the value of electric GPUs, given that diesel GPUs are one of the main contributors of harmful emissions in the business of turning around aircraft on stand. Just recently, it celebrated the 100th 90 kVA, 400Hz eGPU rolling off its Odense production line. Plus, when Elvstrøm spoke to *Airside* in the spring, he pointed out that ITW GSE had received orders for no less than 21 eGPUs in just the previous fortnight – an unprecedented number.

ITW GSE can now offer battery-powered GPUs for all types of commercial aircraft, he continues, as well as serving the military market (270V DC 400Hz battery GPUs for the F35/Joint Strike Fighter (JSF), for example).

New PCA offerings are also coming on line. ITW GSE expects to begin rolling out its new PCA 3500 later this year, a system that Elvstrøm says will be very efficient in term of power consumption while offering a high degree of reliability. It will be manufactured both in Odense and on

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ITW GSE's Florida production line.

All in all, ITW GSE is looking to the future with plenty of optimism, Elvstrøm declares. It is forecasting between 6 and 9% annual growth for the business in the next few years as it benefits from what it hopes will be a rapid recovery in the international aviation industry.

Guinault makes the most of the lull in the market

For Saint Cyr-en Val, France-based GPU and ACU supplier Guinault, the Covid-19 pandemic undoubtedly "deeply hurt the GSE business", says the company's CEO, Lionel Clermont.

On the other hand, Guinault has been using this 'quiet time' to design improvements and increase its range of products, he says, pointing to developments in the areas of:

- A 400Hz battery-powered GPU based on safe, modular LFP technology
- Air-conditioning units for aircraft that feature unique 'no-frost' technology as well as enjoying efficient power control
- A combined GPU and ACU unit fitted with Guinault's unique dual-voltage 400Hz alternator and 'no-frost' technology

Meanwhile, Guinault has embedded digital technology in its offering enabling remote monitoring capability to be improved and ensuring both highly efficient technical support and the extremely useful 'APU-OFF' reporting capacity.

Saving money and reducing emissions

Guinault's APU-OFF offering relates to the provision of APU substitution solutions that enable minimal use of expensive APUs when an aircraft is on the ground (auxiliary turbine engine-powered APUs are power-hungry and more expensive to run than the electric motors or diesel engines of ground units).

Guinault customises its commercial offer to ensure the shutdown of auxiliary power units' wherever possible, with



Guinault's EGA battery-powered GPU

options taking into account variables such as the type of aircraft, its configuration, airline operator processes, and so on.

Full APU-OFF capability remains "a key Guinault target", Clermont informs, as it has been over the past decade. New, dedicated greener and smarter technologies serve this purpose, he says.

"Specialisation and technological vertical integration is the backbone of the company," Clermont declares. "In this way the company can independently design optimal purpose-built solutions," he adds, using modern technologies relating to power electronics, alternators, electronics, industrial refrigeration and thermodynamics.

As a result, Guinault now offers an improved range of products that meet airlines' and ground handlers requirements, with cost-minimisation and environmental care as prime considerations, he notes.

Possible options include:

- Fixed infrastructure electric pre-conditioned air units
- Mobile and autonomous air-conditioning units, either electric or diesel

- Mobile and autonomous 400Hz GPUs, whether diesel or electric
- 50-60/400Hz frequency converter GPUs
- Mobile and autonomous air separation unit (ASU) air compressors
- Combined solutions involving ACU, GPUs and PCA at 400Hz

And business is getting better and better, Clermont states, though it varies from one continent to another according to the local pandemic situation. There are still issues to be resolved though: the supply chain has become a challenge for some components, and this has come alongside price inflation. Moreover, business restrictions caused by the current geopolitical situation have affected the supply chain further.

On the other hand, people are eager to travel, Clermont points out. And airlines are eager to go greener and to save further, which is exactly Guinault's mission as illustrated in its APU-OFF solution as well as its greener ACU, ASU and GPU units, be they diesel-, electric- or battery-powered, he concludes.



Bertoli: a continuous cycle of R&D

Langhirano, Italy-based Bertoli manufactures GPUs (of 40Hz with 60 to 180kVA), generators and light towers. Alberto Calugi, the company's marketing manager, says that – in the period leading up to the end of last year – he had been seeing more confidence in the future amongst Bertoli customers.

However, the initial months of this year brought new problems, notably increasing prices of raw materials and rising shipping costs. Then, from the end of February, the war in Ukraine further complicated what was already a “fragile situation” and resulted in a return to the uncertainties of the pandemic period.

Bertoli worked with potential customers on many offers in the months toward the end of 2021, although not all of them have yet reached fruition.

“We think the market will be stagnant for the next six to 12 months,” Calugi says. Indeed, “We think the full recovery of the

market will not be seen until next year, depending on the war situation and on the rebalancing of the raw materials prices.”

Looking to the future, Bertoli is introducing new technologies to its products, especially in terms of greener, low-carbon options, and is looking to introduce them to the market through specific marketing campaigns. “Many customers have asked us for fully electric GPUs,” Calugi informs.

He confirms: “We are enhancing our portfolio of products with new items, many with greener, more environmentally friendly applications, but they are still in the development phase.”

The company has also continued to make improvements to existing products. “We are in a continuous cycle of research and development,” he observes.

Overall, Calugi concludes: “We are now in a new situation, driven by the market and by social changes. We are adapting our business model and our R&D to these changes.” ■

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Bliss-Fox Panus GSE supports India's focus on electric equipment for the ramp

Bangkok, Thailand-based Bliss-Fox Panus GSE is soon to hand over a new Fox 16E electric pushback tractor to Indian airport operator GMR, one step in GMR's and the wider Indian aviation industry's efforts to minimise its harmful diesel emissions on the apron. Meanwhile, Panus is also pushing ahead with an innovative offering: upgrading its new Fox range of diesel GSE to electric battery-powered form for customers

Delivery of the battery-powered Fox 16E is scheduled for late June, subject to the current global shipping constraints, and Panus intends to make the handover to GMR management a memorable event. The unit will be delivered to and operated in Hyderabad as a replacement for a Bliss-Fox F1-150 pushback that has been in continuous operational service since delivery in 2007.

Bliss-Fox Panus GSE managing director David Burgess and Simone Livraghi, Bliss-Fox Panus GSE's senior sales and marketing manager, advise: "India has embarked on a big drive to go electric and we foresee the sale of our Fox 16E to GMR as the first of many in that market."

They continue: "The sale of the Fox 16E to GMR is a

breakthrough for both GMR and for Bliss-Fox Panus GSE – a first electrically powered pushback for GMR, reflecting its sustainability strategy to 'go green', as well as being the first sale of electric Bliss-Fox GSE to India."

Only the best

Burgess and Livraghi note that the Fox 16E was developed using only the best components available today for electric vehicles. Thus, for example, it features a Danfoss electric motor, integrated Eton hydraulic system and Microvast lithium batteries, along with Dana transmission and axles. A composite cabin, standard across the Bliss-Fox pushback range, completes the innovative design.

The tractor can pushback and tow all narrowbody and regional aircraft types, as well as any lighter bodied aircraft in



The Fox 16E electric pushback

technical towing work.

The unit offers significant benefits in terms of through-life total cost of ownership (TCO). The cost of fuel for diesel equivalents is avoided (an especially valuable saving at the moment, given the fact that oil prices have risen so dramatically this year), while maintenance costs are also significantly lower and the unit also has fewer mechanical parts that can potentially fail, so the mean time between failure (MTBF) is significantly improved.

Additionally, Burgess emphasises: “Electrically powered GSE helps our customers to achieve their sustainability goals, and is of course very quiet and smooth to operate.”

Panus GSE has deployed an after-sales team into India in order to handle increasing demand and customer expectations in this market. Indeed, Burgess and Livraghi foresee significantly rising demand to go electric in India compared to other Asian countries, and GMR's selection of an electric Fox 16E is illustrative of this gathering momentum,

which Bliss-Fox Panus GSE is keen to support both in India and elsewhere.

Hence, the company offers customers the option for Panus GSE to convert any of its Fox diesel pushback models to an electric version. Burgess explains: “The upgradeable powerpack concept is centred around having a powerpack frame that simply drops into the hull of a chassis with either a diesel engine or electrical power source.

“After the powerpack is fitted, we then connect up the electrical, hydraulic and drive systems, quite similar to the system used for military tanks and armoured personnel carriers.”

For diesel-powered pushbacks, the major components fitted to the powerpack frame are the engine, transmission, hydraulic tank/system and ancillaries. Should a customer want to convert to electric, the powerpack is lifted out of the vehicle's hull, the engine is removed and replaced by an electric motor and inverter, and the powerpack is then refitted.

There is of course also a requirement

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to upgrade the electrical system and carry out other integrations to complete the conversion, Burgess notes.

“The Bliss-Fox value proposition for this is that customers can buy a diesel-powered pushback today and consider a conversion to electric at a later date, when airport charging infrastructure catches up with ground handlers’ ‘go green’ strategies or when the diesel engine has reached the end its economic life.

“This capability is available on our entire diesel range of Fox pushback tractors: the 12-16 tonne Fox 16D, 24-28 tonne Fox 28D, 35-40 tonne Fox 40D and 45-50 tonne Fox 50D. It’s a concept that we incorporated into the design from the onset when we embarked upon designing our new pushback product range about three years ago,” Burgess informs.

Power source

The battery pack is lithium-ion. To enable longer operational cycles and increased towing capability, Bliss-Fox Panus GSE is using a more powerful battery pack in terms of kWh output than do many other manufacturers.

As alluded to above, these electric pushbacks require very little maintenance, with lithium-ion power packs requiring only yearly check-ups. Moreover, it is also possible to monitor the battery’s status and performance remotely if the customer requires.

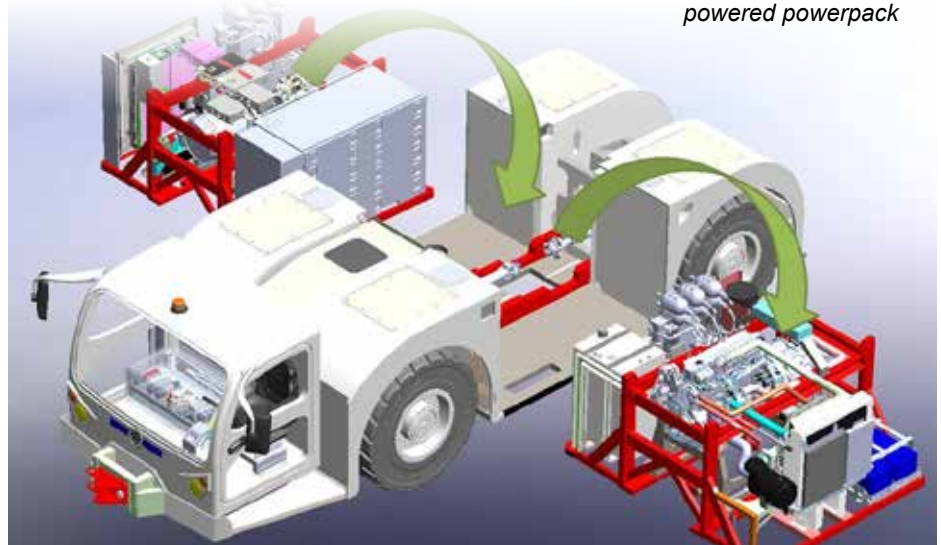
“The future is very much about electrically powered GSE and airports are a great operating environment for this technology, which can help them meet their carbon emission goals,” Livraghi advises.

“We believe all GSE manufacturers will need to develop this technology, if they haven’t already done so. The biggest challenge today is to standardise electric powerpack technology, because countries are each taking different options and creating different regulations.”

Benefiting from the aviation industry’s recovery

The Indian market is not the only one where Panus GSE is seeing demand for its products. Indeed, it is expanding its

Bliss-Fox Panus GSE can take out the diesel powerpack of a customer’s Fox conventional pushback and replace it with an electrically powered powerpack



rental fleet in Europe (and especially in the UK), while it delivered a 30-ton F1-300 pushback to Condor Technik in early spring to support the latter’s maintenance operations in Frankfurt, Germany.

Also of note, Panus is also currently supplying large quantities of GSE for the defence forces of various countries.

Looking ahead: “Many governments have now accepted that we need to live with Covid, manage it and get back to a

degree of air travel normality,” Burgess opines. “Passenger volumes are increasing, Thailand being a good example, and analysis from the International Air Transport Association (IATA) is quite upbeat, so we are anticipating an increase in demand for new GSE.

“Our production methods are lean and agile, so we are able to react to changing customer demand. Whatever our customers need, we will deliver,” he concludes. ■

Power source

Anirban Batacharrya is the business head of Vector Technorium, Panus GSE’s sales agent in India.

He agrees that this first Panus electric tug going into the Indian market definitely represents a curtain raiser to the huge market potential for such green equipment in India. Moreover: “The GMR brand in itself is a big-ticket acquisition for us and the whole industry will take note of it when the tug arrives in India.”

Batacharrya points to the Government of India’s March 2019 white paper on a National Green Aviation Policy as illustrative of the demand that exists for battery-powered GSE in the country today, demand which he believes will only grow

in the future.

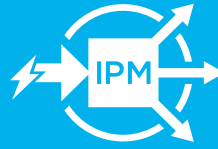
The white paper sets out a strategic framework for addressing the major environmental challenges facing the nation’s aviation industry, and points to ground handling processes and equipment as relevant issues. As a result, airlines and ground handling companies operating in India are focusing a lot of attention on electric solutions.

Another string to the Panus bow in India is provided by the leasing option that it now offers. “The GSE leasing market is a new market initiative,” notes Batacharrya. “We recognised this opportunity long ago and are working in that direction to offer leasing solutions to customers.

“This market is bound to explode soon,” he declares. ■

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ACO QMax channels set into the apron at El Dorado Airport, Bogota, Colombia

Sustainable options for airport drainage and easy access

Drainage and recycling might be one of the less discussed aspects of airport infrastructure and everyday process but it is an important part of the effort to ensure operations can run smoothly and also assist in a gateway's effort to optimise its sustainability life cycle

One of the leaders in the field of the design, development and manufacture of surface water drainage systems is ACO Group, which has offices in Europe, the US, Australia, the Middle East and the Far East. ACO has been making and selling drainage systems for over 70 years and airports represent one of the many market segments in which it is active.

Frad Eton-Ehtesham, ACO's international specifications & business development manager, says that, over the last couple of years, "Our business, just like rest of the industry, has been heavily influenced by the pandemic. Costs needed to be reduced and some airport projects that we were involved in were delayed or paused.

"At the start of the pandemic we saw an unprecedented uncertainty in the market with major projects being delayed or paused.

"Despite these challenges, we have in fact been putting more resources into

our airport offering by developing new products and engaging with new clients and projects,” he says.

Eton-Ehtesham took on the role of international specifications manager last year. In this post, he focuses on global airports and infrastructure projects. Now: “Operating from London, with the assistance of our international technical service and the help of local ACO companies, we are now able to serve designers with specific technical, logistical and commercial support in the airport infrastructure sector.”

With his strong background in environmental management, Eton-Ehtesham will help push this important element of ACO’s programme.

And some work has certainly gone ahead. In terms of major projects, in just the last two years ACO has started airport projects in India, Greece, Germany and Iceland. There are also ongoing projects in South America and other regions too.

Moreover, there has been a noticeable bounce-back in the market, Eton-Ehtesham says, which he dates pretty much to the third and fourth quarters of last year (it was apparent at *inter airport* Europe in Munich in November, for example, he says). As a result, “We have seen demand for our products for the airport sector reach record highs.

“From ACO’s perspective, our discussions

with those who were investing kept going during the pandemic. The global construction pause, brought on by the pandemic, allowed the industry to take a step back and make longer term plans. We are now seeing this in clients’ demand for ‘solutions’ instead of products. And with our complete system of products, we are in a position to offer them the right solutions.”

Sustainability

Eton-Ehtesham recalls that a feature of *inter airport* Europe 2021 was the interest of planners and operators regarding investment into applications supporting a more sustainable approach in the industry. “This is an area we are investing more into,” he says.

“We recently introduced Qmax Neo, which is a new member of our Qmax family, designed for versatile, high-capacity slot drainage systems and popular for airport projects.

“This new product differs to the existing ones in terms of material, manufacturing and transportation. Due to its low component weight and its simple assembly, a quick installation without an additional lifting device is possible.

“Importantly, the stackable nature of the product means transport space is reduced by 75%, thus greatly reducing the carbon footprint and environmental impact of the product.”

Another noteworthy new product for the company is the ACO Powerdrain. This easy-to-maintain box channel comes in various sizes, complements the Qmax for infrastructure projects and offers an alternative smaller channel for these projects.

Beside ACO’s drainage portfolio, of late it has also seen strong demand for other infrastructure-orientated products like manhole covers and special covers. With the addition of the independent Detego business that now operates and is branded as ACO Detego, ACO also now offers complex steel structures and special covers like emergency floor-exits and hydraulic ground gates. These products complement ACO’s solutions for heavy infrastructure projects like airports, Eton-Ehtesham points out.

In fact, he says, ACO offers “a complete range of products for the airport market”. Its ethos is built around offering an entire system chain, featuring Collect, Clean, Hold and now Reuse.

“The term ‘recycling’ in our world means the reuse of water. This is an important part of the ACO system chain approach of Collect, Clean, Hold and Reuse. We care for water from surfaces, such as on buildings, aprons and runways, until it is either fed back into the natural water system or treated and stored for reuse.

“With the impact of global warming, we know to expect more regular extreme



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weather conditions such as rainstorms and droughts moving forward,” he continues. “We believe we have a system chain to help clients future-proof all their infrastructure project to better withstand these extreme conditions for decades to come.”

Innovation

“Building on our global experience in this [airport] sector, we constantly innovate our offering,” Eton-Ehtesham informs. “For example, we are currently heavily investing in more digitised and integrated smart solutions for surface water management, in airport buildings as well as for outside infrastructure.

“This will expand our system chain further, allowing airport management/operators to reuse collected water for green infrastructure, cleaning or other benefits – all from a central hub.”

A growing product range with additional capability and greater environmental sustainability is drawing in new customers. ACO has offices in over 40 countries throughout six continents, and it is – says Eton-Ehtesham – very proud of its global reach and customer base around the world.

Moreover, today it is particularly expanding its footprint in Southeast Asia, as well as Central and South America.

Family owned, globally active

EJ is a market leader in the design, manufacture and distribution of access solutions for water, sewer, drainage, telecommunications and utility networks worldwide. A family-owned business founded 138 years ago, it is today a global enterprise that spans five continents.

Promoting innovation and quality and avowing a commitment to customer service, EJ’s commercial presence around the world includes 50 sales offices, manufacturing facilities and distribution hubs, as well as numerous research and development centres.

Using state-of-the-art manufacturing techniques, the Michigan, US-headquartered company supplies products in cast iron, steel (galvanised or stainless), aluminium or composite materials. It has a full catalogue of off-the-shelf products as well as modular solutions that can be assembled, but also has engineers who can

develop specific, tailor-made solutions to meet end-users’ specific needs.

For airports, it supplies infrastructure access solutions for lighting, refuelling, electrical and water networks. EJ offers a very comprehensive ductile iron range including its F900, foreign object debris (FOD) compliant hinged and assisted manhole covers and drainage gratings (see the accompanying 3D drawings on page 24).

“Our solutions are designed to ensure human safety and reliability and to generate maintenance cost savings over time,” observes EJ’s airports market director EMEA, Alberto Candil.

Plus, EJ’s team of airport experts offers continuous support to partners and customers during the specification, construction and operation phases of any project.

Comprehensive coverage

“As a leader and specialist in infrastructure access solutions, we offer a very complete range in terms of load resistance, sizes and supporting features,” Candil outlines. EJ’s F900 covers are adapted for installation on runways with heavy load resistance, but the company also offers solutions for public spaces such as parking areas, terminals and the like.

“Depending on the location and therefore on the constraints, we can offer solutions in cast iron, in steel or in aluminum and composite, from our five European production sites,” he informs.

“We produce a wide range of standard and modular solutions but our in-house projects teams are also able to design completely personalised solutions. What makes our offer special is also the wide set of options available. Our solutions offer various locking options, different shapes, sizes and safety features such as grids, lift assistance such as hinges, etc.”

Candil continues: “It’s our mission as an expert to design and manufacture products based on our customers’ needs. We have experts in airports, in design, in covers, in various materials, and we have both the industrial force and the design expertise to work on very specific solutions for very specific needs.

“Finally, and this is of the highest importance for EJ, safety is our group’s

number one concern, and this focus is reflected in our products. Third-party certified, they meet the most demanding standards. Our designs guarantee safety to those who install and maintain them, but also to those who will pass or roll over them every day.

“Finally, reliability is also a very important factor, so our solutions are produced using quality materials, and are tested and approved by third parties according to internationally recognised standards.”

Keeping busy

EJ has continued to sell its products into the airport market, despite the massive downturn in the aviation industry. Earlier this year, in February, it supplied 46 of its modular ERMATIC® access covers to Italy’s Verona Airport in support of the gateway’s new runway lighting project. EJ had been working since 2020 with the SYNERGO design company as well as the Verona Airport Authority on the project to design the right solution for the latter’s needs.

Last year saw EJ support a number of other airport projects, including:

- Ireland’s Dublin and Cork Airports, both managed by DAA (previously Dublin Airport Authority), where the project mainly involved EJ’s Hinged Hatch solution and ERMATIC® covers
- Spain’s Madrid Airport, where ERMATIC® covers, AQUERA drainage grates, and DT9S and CA05110DVL gratings were installed
- Poland’s Krakow and Radom airports, where EJ’s Hinged Hatch and LSPB covers were installed

Candil admits that the pandemic led to a lower level of investment in the aviation sector, but points out that some airports used the slowdown to actually move ahead more quickly on some work, taking advantage of low traffic volumes to undertake upgrade work in those cases where project budgets had been approved prior to the pandemic.

Moreover, “We feel that the market is now recovering slowly. And for the long term, the structural need for better and bigger airport

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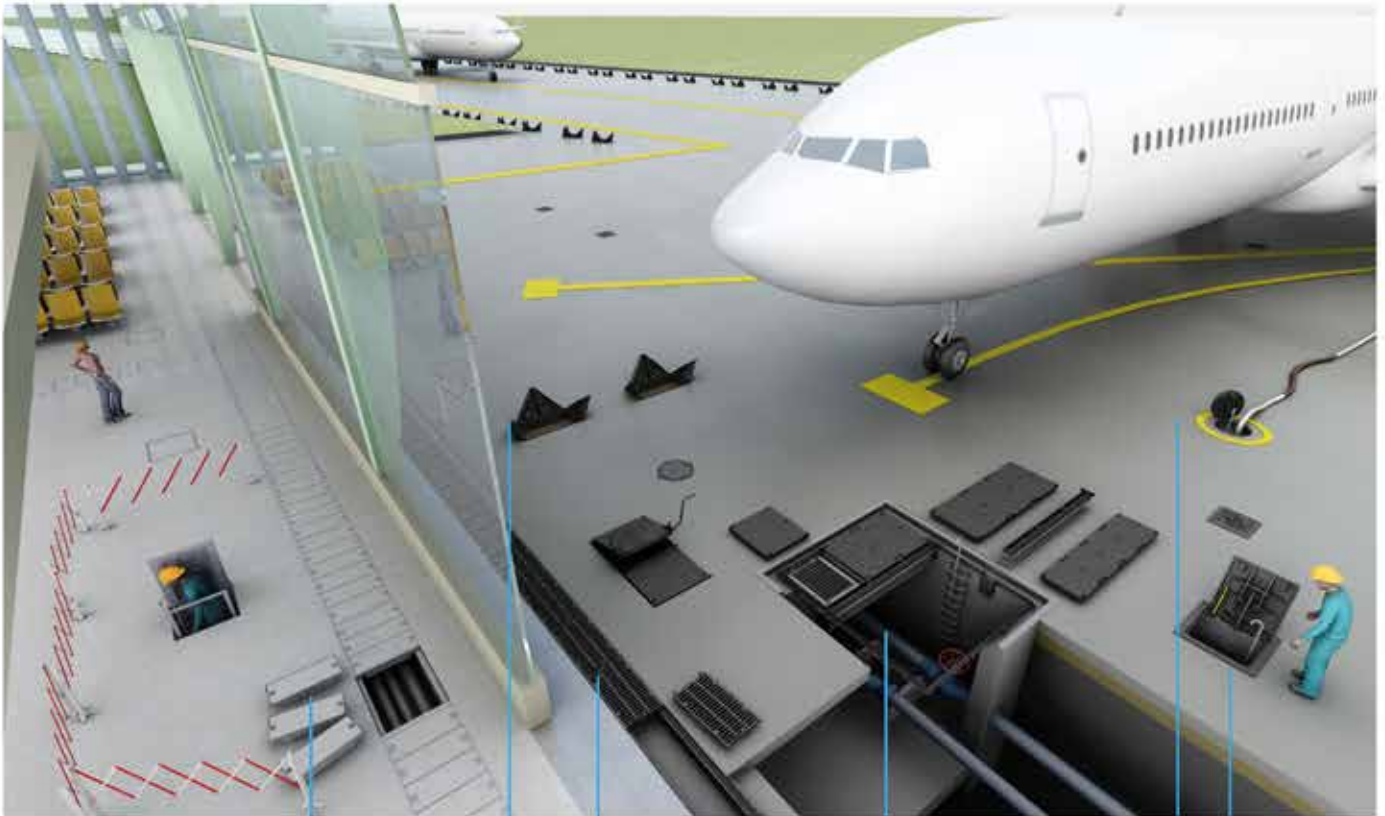
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Ductile iron multi-leaf covers and frames
Tampons triangulaires et cadres en fonte ductile



EJ offers a wide range of access covers and frames for airside environments

infrastructure remains, driving investment.”

Meanwhile, EJ itself has continued to invest in its own product lines. Products recently launched have been consistent with the need for greater network security and heightened user safety trends, says Candil.

EJ's DEFENSO® range has been designed to secure critical networks: the high-security cover is certified by the Loss Prevention Certification Board for anti-intrusion (to the LPCB's SR4 level, the highest for that category of product); it is also recommended for anti-terrorist applications.

The DEFENSO® range includes an Internet of Things (IoT) solution combining connected covers with a monitoring platform. This solution is able to detect unauthorised openings and attempts at intrusion through vibrations and temperature variation and, in such a case, offers an alert. “This is the ultimate answer for the protection of sensitive chambers and networks,” says Candil.

EJ has also developed electro-hydraulically operated steel covers for the

Berlin Metro. These are connected to the underground system's fire alert system and open automatically to allow smoke to escape in the event of a fire. These can even push aside a 10-ton car or truck that is parked on them if needed.

“Thanks to our close relations with consultants and airport authorities, we are in a position to design tomorrow's solutions together,” Candil declares. “Where possible, we can also retrofit existing products, thereby limiting costs and operational disruption for our customers.”

EJ has helped with projects at many of the busiest airports around the world, and is seeing some shift in demand patterns. Today, more than ever, “Stakeholders are demanding sustainability and transparency,” says Candil. But, “We have always worked under those principles. Besides offering safety, reliability and expertise, we are committed to conducting our activities in a sustainable way that is respectful of the environment and communities.

“That is why our production sites based

in Europe operate under ISO management systems. Our products in cast iron manufactured at our foundry in France are composed of a minimum of 92% recycled materials, and the foundry was awarded the EcoVadis Gold Medal in 2020 and 2021, an evaluation based on environmental and social responsibility.

“Those principles – of sustainability, ethics, responsible purchasing and human rights – are key nowadays to secure business and some of our customers are even requesting guarantees of our performance in those areas.”

Finally, Candil concludes, “We are also seeing a trend towards an ever greater emphasis on operator safety. Our customers want to minimise maintenance times to be more efficient and reduce costs, but they are also concerned about the safety of their own workers. Therefore, we are developing more and more products of specific designs that enable workers to lift up access covers with the least possible effort, thus reducing injuries.” ■



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GAT to introduce autonomous airside driving technology



GAT Airline Ground Support, a ground, passenger and cargo handler operating at 72 locations across the US and Canada, is teaming up with San Francisco Bay Area-based AeroVect, a developer of autonomous technology for the airport handling industry

The two businesses describe their collaboration as a “strategic long-term partnership” with the goal of deploying self-driving GSE across some of GAT’s biggest stations in the US.

A joint statement says: “This groundbreaking partnership between a national ground support provider and autonomous driving company for airport logistics is the very first of its kind in the United States.”

The first phase of the partnership will see a cargo tow tractor driven by AeroVect

Driver, self-driving technology that was developed specifically for the aviation industry, on behalf of GAT on the apron at one of its US stations (which is as yet unconfirmed). AeroVect Driver can be used across different GSE models built by different manufacturers, although at the moment the focus is on baggage and cargo tractors.

Subsequently, over the next few years, the aim is to deploy as many as 50 vehicles equipped with AeroVect at GAT stations.

The partners stress the value of autonomous driving GSE technology that facilitates “superior safety, productivity, and cost efficiency in ground handling”.

“We are enthusiastic that GAT shares

our long-term, forward-thinking mindset to deliver next-generation ground support infrastructure across America through technology,” says Raymond Wang, co-founder and CEO of AeroVect.

“This key partnership represents an important milestone in the implementation of autonomous vehicles at scale to make ground operations more reliable and predictable, with safety and on-time performance benefits that also roll up to airlines, shippers, and travellers alike,” Wang notes.

Eugenio Donati, co-founder and chief operating officer of AeroVect, adds: “As an autonomy technology company built from



the ground up specifically to serve airport logistics, we are thrilled that the team at GAT Airline Ground Support shares our unwavering focus and commitment to the global aviation industry.

“GAT shares our vision of creating an autonomous future where ground handling operations are safer, more reliable, and dramatically more productive – we look forward to jointly bringing autonomous GSE to the largest airports in America.”

Mike Hough, CEO of GAT, comments: “AeroVect’s autonomous GSE technology is not only useful and practical, but importantly a big step forward that enhances ramp safety.

“GAT Airline Ground Support has always been a first mover in the ground support industry, and we continue to invest in new frontier technologies that enable us to offer the safest, most efficient, and most reliable ground support service to our airline partners

across major airports in the United States.”

Burgeoning collaboration

Hough tells *Airside* that GAT began working with AeroVect a little more than a year ago. “I had run across a brief post of their research on LinkedIn and reached out to their two founders to discuss how we could partner on bringing the technology to the market,” he recalls.

“As they improved the accuracy of their technology, we worked with local airport authorities and others to gain approval to operate the pilot.”

The primary pilot programme involving the two partners will see an AeroVect Driver-equipped baggage tractor used to move bags from airport bagroom to aircraft and from offload to customer retrieval belts, he confirms.

“We have not yet decided on locations for the deployment,” he continues. “Much will depend on airport approvals. We



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site and undertake three-dimensional mapping of the space. That space is mapped into the unit, which is equipped with cameras and sensors that leverage all of the inputs and pair them with machine learning and artificial intelligence to enable the unit to navigate around the area and avoid any potential collisions.

“This is very similar to the technology being deployed by big box retailers on their floor scrubbers,” says Hough. “They used to have to do the work overnight with human-driven scrubbers. They now use a similar technology to operate the units at various points of the day, even while full of customers, and without a human driver. They can do this safely and without risking injury as they avoid darting children and busy shoppers.”

The partners are to spend three months testing the technology. The pilot unit will be manned by an AeroVect-trained driver at all times. He/she will have the ability to override the system in the event something does not go as planned. “During this period we will run many simulations and undertake real situation deployments to test all aspects of the system,” Hough informs.

And the benefits of autonomous driving technology? “The value to GAT will be the ability to improve quality and reduce the rushing around an airplane. Today, a typical narrowbody operation requires four team members plane-side. One of those team members peels off from the crew to deliver inbound bags while the remaining crew completes the upload process.

“With this autonomous technology, the driverless tractor will be able to do that bag delivery. Instead of waiting for all bins to download, several driverless vehicles could deliver each bin one at a time, which would dramatically decrease the time it takes to get bags to bag claim after arrival.

“Lastly, the vehicles will not be prone to human error (over-speeding, hard cornering, failure to stop at junction points, etc) and any time we can reduce time behind the wheel of vehicles, we greatly decrease the likelihood of team member injuries,” Hough concludes. ■



think the broad majority of deployments will see similar use to our testing plan at SFO [San Francisco International Airport] but also think there are potential applications for belt loaders, tractor

routes to and from cargo warehouses, and possibly even catering and fleet service high lift trucks.”

To prepare for a deployment, wherever it might be, AeroVect engineers visit the



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Havas expands its overseas footprint



In February this year, Turkish handler Havas – part of Turkey’s wider aviation service provider and airport operator, TAV Airports (which is itself part of Paris-based airport operator Groupe ADP) – confirmed that it had acquired Croatian handler MZLZ Ground Handling Services

MZLZ is the sole ground handler at Zagreb Airport, and the Croatian capital became the 31st station at which Havas provides services (of the rest, 29 are Turkish airports, while the other is Riga in Latvia).

With the acquisition, Havas began providing passenger, ramp, representation and supervision services,

flight operation, load control and communication services as well as cargo and mail handling services at Zagreb.

A consortium including TAV Airports and Groupe ADP now holds the right to operate at Zagreb Airport until 2042.

Havas general manager Mete Erna commented at the time: “We focus on constantly improving our operations through innovative solutions and providing the best service to our airline collaborations.

“Approximately 30 airlines regularly fly to Zagreb Airport, which is a significant tourist destination in the Adriatic. We will carry out all processes as the sole ground handling service provider at the airport, which also has cargo and general aviation traffic.

“We will increase the efficiency of our operations, sustain our investments in ground handling services and continue to be the preferred business partner of airlines.”

The Havas operation at Zagreb was



expected to require approximately 500 employees and a GSE inventory of some 176 motorised and 346 wheeled items of equipment.

In 2019, Zagreb Airport served 3,435,000 passengers and 45,000 flights, as well as handling approximately 13,000 tons of cargo. Due to travel restrictions introduced in response to the Covid-19 pandemic, passenger traffic at the airport in 2021 was around 41% of the traffic experienced in 2019.

Building on strength

Havas' Erna tells *Airside* about the decision to acquire MZLZ, saying: "TAV Airports as a member of Groupe ADP was already part of the consortium running Zagreb Airport. The consortium wanted to focus on its core business of airport operation and divest other activities that came under the airport umbrella.

"As the subsidiary of TAV Airports and the only ground handling company owned by any of the consortium

members, we were always a good candidate. We have also supported the development of the ground handling organisation in Zagreb through the TAV presence in the consortium. This allowed us to identify the strengths of MZLZ Ground Handling and to have a good understanding of the Croatia ground handling market, which offers good prospects."

Was the fact that Havas will be the only ground handler at Zagreb Airport

important? Apparently not. Erna observes: “Although we will be the only service provider in Zagreb for a limited period, this is not enough reason to justify such an investment. Competition will come to Zagreb in a few years time.

“We believe Zagreb has a strong enough traffic potential to sustain two ground handlers in the future. We aimed for a long-term investment in Croatia and we would not do it unless we believed in the future feasibility of MZLZ Ground Handling. We hope to grow together with the Croatian aviation sector and contribute to its development with our own know-how.”

Havas’ involvement with MZLZ is also not new. “We have been supporting MZLZ Ground Handling with our experienced management since 2014,” says Erna. “Our colleagues have taken crucial roles in the restructuring of the company after its privatisation.

“While we plan to sustain the presence

We hope to grow together with the Croatian aviation sector and contribute to its development with our own know-how

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Zagreb Airport

of our colleagues in Zagreb, we are also looking to integrate the company further into Havas, especially commercially. MZLZ Ground Handling also has a very strong and experienced team of local management and employees. We want to contribute to their development and learn from their local experience too.”

While this goes on, Havas is also looking to continue to improve efficiencies of handling at the Zagreb station. “Throughout the years we have invested in personnel development and IT infrastructure at over 30 airports, in areas including resource planning, paperless operations, online trainings and various certifications in quality, safety and environment management,” Erna points out.

“While we aim to bring those benefits to Zagreb we look forward also to gaining a stronger commercial base thanks to the similarities of the customer portfolios in Croatia and Turkey.”

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Mete Erna is Havas' general manager

Throughout the years we have invested in personnel development and IT infrastructure at over 30 airports

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Havas***

The development of Havas' footprint at Zagreb is indicative of the handler's ambition, which seemingly has not been dimmed by the Covid-19 pandemic. "We have been looking at network expansion opportunities over more than 10 years," Erna confirms. "While some of our enterprises have been successful – such as in Latvia – some others turned out to be difficult projects. The pandemic forced us to suspend our operation in Medinah, Saudi Arabia. However we also see new opportunities arising within and outside of the TAV and ADP airport network. While the uncertainties crated by the pandemic have created a difficult environment for investing, it also offers some good opportunities which might not have come to the table if not for the pandemic."

On the question of Covid-19 and its ongoing impact on the aviation industry, Erna opines: "We are confident

that travel demand will come close to pre-Covid levels by the end of 2022, as vaccination levels are higher than ever and quarantine requirements have been eased in most countries.

"This positive news lets us prepare for the busiest period since the start of the Covid pandemic. The removal of travel restrictions and less confusing travel requirements would definitely encourage passengers to travel more and would help the entire industry move to a better recovery.

"On the other hand, disruptions in labour markets and high inflation in many economies, on top of the uncertainties about traffic recovery, make recruitment a bigger challenge. We try our best to take the correct position in the market and stretch our financial capability to make Havas a very good place to work, regardless of the financial difficulties we are going through." ■

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Farnborough Airport vehicles switch from diesel to vegetable oil



UK business aviation gateway Farnborough Airport is to fuel all its on-site vehicles with hydrotreated vegetable oil (HVO), just one element in its effort to minimise harmful emissions and maximise its sustainability

Farnborough Airport, located in Hampshire in the south of England, is a full-service private airport that describes itself as ‘Europe’s leading business aviation airport’ and ‘the business aviation gateway to London’. All of its on-site currently diesel-powered cars are now

to start changing over to use HVO, which, the gateway says, creates only 10% of the emissions that diesel does.

HVO is produced entirely from sustainable renewable feedstocks, including used cooking oil, plant, food and animal waste.

The move to HVO “marks another significant step in Farnborough Airport’s

work to support the decarbonisation of the wider aviation industry”, it says.

Farnborough Airport first introduced sustainable aviation fuel (SAF) at the gateway in July 2021, enabling a reduction of emissions during flights of up to 80%, it asserts. And, over the past 10 years, the airport has reduced its controllable emissions by over 70%, its operator –

Farnborough Airport Bidco, part of Macquarie European Infrastructure Fund – informs.

Farnborough Airport CEO Simon Geere comments: “The Farnborough Airport team recognises that climate change is a clear and pressing issue and is committed to minimising its environmental impact and improving environmental performance throughout its operations.

“The introduction of HVO is another milestone in our sustainability programme and an integral part in delivering against the government’s targets for net zero carbon emissions.”

The WP Group is supplying HVO to Farnborough Airport. Because HVO is a paraffinic diesel, it can readily replace standard diesel, with no retrofitting required to a vehicle. As well as producing much lower levels of carbon dioxide, other benefits include increased storage life and reduced NOx emissions; it’s



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not susceptible to ‘diesel bug’ (the contamination of diesel by fungi, bacteria and the like); and its low freezing point.

WP Group’s commercial manager, Mark Clouter, observes: “It’s great to see Farnborough Airport switching to a renewable fuel. HVO offers an immediate way to reduce emissions, without incurring capital costs to change vehicles or equipment.

“WP is committed to our longstanding relationship with Farnborough Airport providing a secure supply of the latest products, technologies and fuel management supporting the airport’s sustainability programme.”

Sustainability

Geere tells *Airside* that the gateway’s operator regards sustainability as a critical consideration. “At Farnborough Airport, we want to ensure sustainability sits at the heart of everything we do, from our environmental performance, to having a

positive social impact on our staff and the surrounding local communities.”

He continues: “In 2018, Airports Council International Europe awarded us carbon level 3+ neutral status, making us the first business aviation airport in the world to be so accredited. We are committed to ensuring the highest standards of environmental performance via how renewables, recycling and energy efficiency can further drive down our emissions.

“Working to accelerate the use of alternative fuel technologies plays a significant part in this, as with our introduction of SAF and HVO. Over the last few years, we have worked to identify, measure and reduce emissions related to the airport’s activities, which has included establishing a dedicated Sustainability Team to achieve some pretty ambitious goals.

“For us, sustainability goes beyond simply managing our environmental

performance: it’s about building a sustainable and growing company, so it is factored into everything we do. For example, we prioritise recruiting employees from the local community. This has many benefits, not least supporting the local economy, but also reducing the carbon footprint of our staff’s commute to work. We have also recently introduced an electric car leasing programme for employees.

“Sustainability is about being an attractive employer; we want to be an employer of choice and responsibility in the region. Around 80% of our workforce lives within a 10-mile radius of Farnborough Airport and we are proud to say we made no redundancies during the pandemic.”

Speaking to *Airside* in late April, Geere confirmed that most of the airport’s remaining diesel-powered on-site vehicles would soon transition to using HVO. The HVO is supplied by WP Group



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For us, sustainability goes beyond simply managing our environmental performance: it's about building a sustainable and growing company

Simon Geere
Farnborough Airport

tankers on an as-needed basis, and kept in a 13,000-litre on-site storage tank. Currently, HVO is expected to deliver in excess of 60,000 litres of standard diesel on an annual basis.

Meanwhile, the SAF available to all aircraft that use Farnborough Airport

is produced by Neste. This SAF is made from 100% renewable and sustainable waste and residual raw materials, which includes cooking oil and animal fat waste. “We have a strong SAF blend of 38% SAF and 62% JET A1 fuel available on site and we are expecting government policy to

help strengthen the impact SAF will have in the aviation sector,” Geere says.

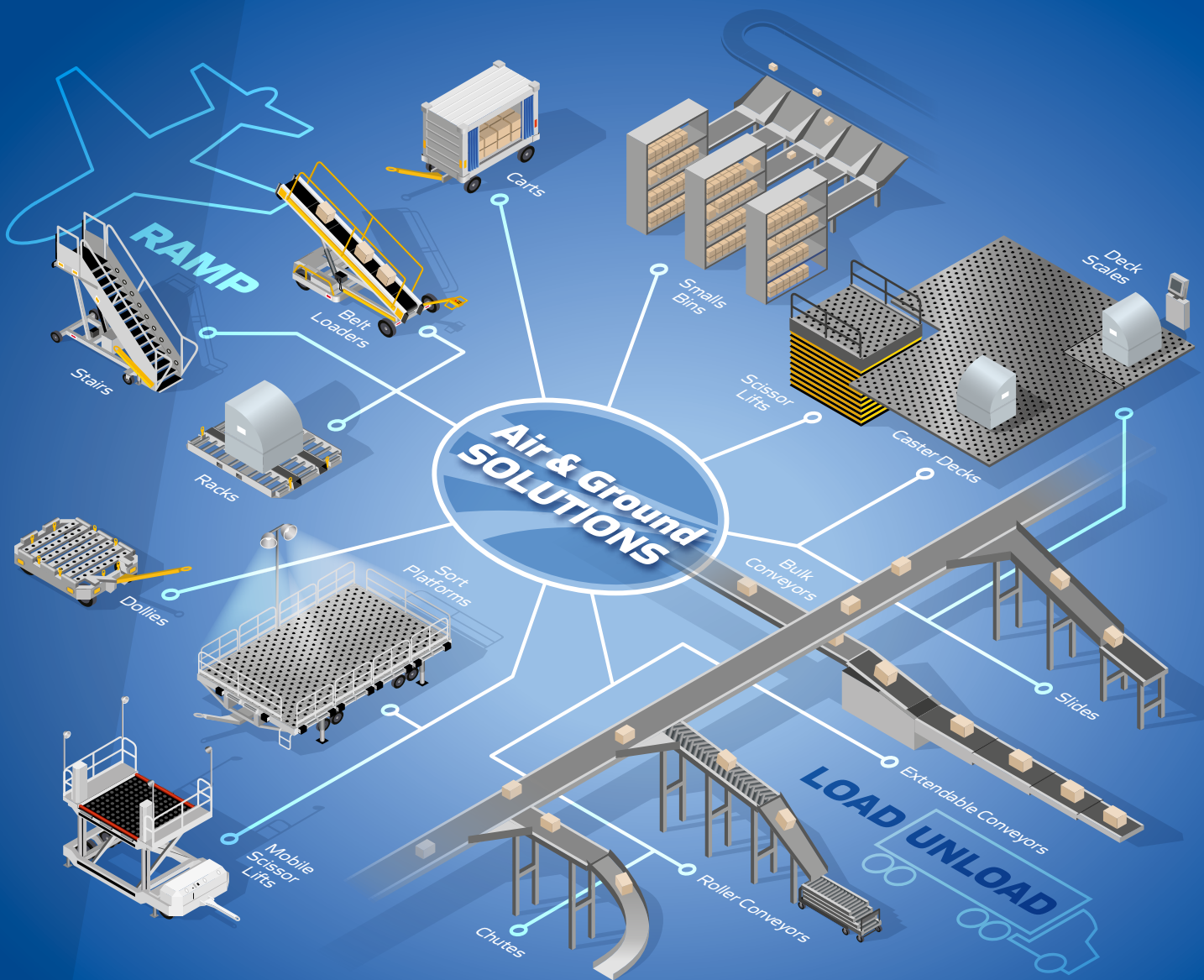
“The main challenge for SAF is its cost – it can be more than double the price of traditional Jet A1, and this means that demand for SAF is still very low, which in turn means investment in supply and production is impacted. It is, of course, circular and what we need are co-ordinated industry efforts to increase investment in this area,” he warns.

Using HVO and SAF helps the airport to minimise its harmful emissions. As alluded to above, the gateway has reduced its emissions by 70% over the last decade across Scopes one and two – the emissions it can control. The airport calculates its carbon footprint annually as part of its Airport Carbon Accreditation (ACA) scheme neutrality for Scopes one and two.

As well as changes to more environmentally friendly fuel, reductions in emissions have been achieved in several other ways, including investment in solar panels, an extensive LED light installation programme and the gradual electrification of the operational vehicle fleet at Farnborough Airport. The airport operator also purchases Renewable Energy Guarantees of Origin (REGO) backed electricity for use across the site.

There has been a focus on technological investment, too, including smart metering and efficient heating and control systems. To further improve the process, the airport has run staff competency training programmes, community engagement and business-to-business networking, all of which has helped the process of emissions reduction.

As to the future, Geere concludes: “We are also working on our own Road Map to Net Zero, which will deliver against the UK Government’s Net Zero goals. Ultimately, we will be accelerating our efforts to improve environmental performance through continuing to operate a certified environment management system (EMS) and further committing to prevent pollution, address climate change and continually improve environmental performance through technology, efficient processes, staff training and company-wide awareness.” ■



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Birmingham Airport commits to net carbon-zero operations

Birmingham Airport, the UK's seventh-largest airport serving England's second city and the surrounding region, has published a new roadmap for achieving net carbon-zero operations by 2033. Committed to minimising its environmental footprint, the gateway's wide-ranging sustainability programme promises significant changes both landside and airside, building on progress made over the last decade

Birmingham Airport's commitment to environmental sustainability is not new – in fact, it announced its ambition to move to zero-carbon operations in 2019. Now, despite the collapse in the aviation

industry caused by the Covid pandemic, Birmingham has publicised a roadmap to success by 2033.

Birmingham Airport CEO Nick Barton observes: "Our Net Zero Carbon Plan sets out how we will become net zero by 2033 through investments in energy-saving initiatives and stakeholder partnerships

over the next decade.

"Our investment to become net zero will escalate immediately with a multi-million pound outlay up to 2025, focusing on renewables and energy efficiencies. The second phase of investment will be developed to complete our net zero transition by 2033, with a focus on

emerging technologies to create a low-carbon environment.

“While we have a good track record in achieving low-carbon operations, we know that meeting our net zero target will need more impactful and immediate action. Through innovation and partnership co-operation, we can make real change to [the] climate impact [of] our combined operations,” Barton adds.

Set aside is an initial multi-million pound commitment covering the next four years to reduce those emissions that the airport controls (known as Scope 1 and 2 emissions) by 60%. This is to be achieved through a programme of investment in renewable energy generation, energy-efficient lighting and energy management technology.

Up to 40% of the electricity used at the airport will be sourced through solar power, while the airport has already moved to 100% green tariff electricity. The airport’s heating and cooling

infrastructure is also to be modified, including upgrades to building fabric and a gradual transition to low carbon alternatives.

Airside, the number of electric vehicle (EV) charging points will be increased from the 25 already in place to prepare for the expanding number of EVs that will access the airport’s ramp.

Building on progress

Tom Denton, Birmingham Airport’s head of sustainability, points out that these are just some of the changes that are to come, and that these improvements build on efforts already made over the last 10 years or so to reduce the gateway’s environmental footprint.

“Over the last decade we have been driving quite hard throughout the airport to reduce our Scope 1 and 2 emissions,” he says. Such projects as installing 50,000kW solar panels on the North Terminal roof have formed part of a concerted effort

to upgrade infrastructure in order to introduce cleaner energy or minimise energy consumption. LED lighting is also to be introduced throughout airport buildings to lower energy consumption, for instance.

The changes are by no means confined to infrastructure and landside operations. Airside, the airport operator is working with partner airlines, handlers, terminal concessions, industry associations concerned with environmental good practice such as Sustainable Aviation, and even regulatory bodies as part of efforts to fulfil its sustainability goals.

One element of that is its Pathfinder programme, which is concerned with minimising fuel burnt by aircraft entering or leaving the airspace around the airport. Birmingham has collaborated with airlines using the gateway as well as NATS, the UK’s air traffic management services provider, on optimising the air lanes in this airspace and on facilitating

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On the ground, too, Birmingham has looked to minimise fuel burn through more efficient taxi procedures. In particular, it has encouraged its carrier partners to adopt single-engine taxiing when possible, whether preparing for departure or subsequent to landing. This saves fuel and thereby lowers emissions levels, as well as entailing less noise.

Not all airlines have been 100% on board with this – there are challenges to the adoption of single-engine taxiing, such as the increased strain and wear it can put on the single engine used, especially where an uphill gradient on a taxiway might need to be navigated. But many airlines have been keen to look at this possibility, not surprising perhaps given the high costs of fuel that any airline must bear.

The fuel burn of diesel vehicles is also

a focus for Birmingham Airport and additional charging points for electric vehicles will be installed, as previously mentioned. Birmingham Airport already operates 20 electric vehicles, six of which are electric buses that work the gateway’s car parks, bringing passengers to/from their terminal. The buses use an innovative pantograph charging system which delivers power at passenger pick-up/drop-off points, meaning the vehicles don’t need to be plugged in for everyday recharging.

These are landside buses, but the airport operator is also looking at the potential for battery-powered airside bussing, and indeed at the time of writing was involved in a trial of an electric airside bus.

The potential for the use of electric GSE on the apron is also being investigated and promoted. For example, at least one ITW GSE electric ground power unit (eGPU) is going to be put through its paces in a trial at the airport in the near future. The possible



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emission savings that could be achieved through the use of electric tugs and the like is also to be explored, Denton confirms.

Key to achieving these goals will be getting the buy-in of the airport’s partners and stakeholders. And, the vast majority of them seem to be onboard. As well as the airlines, airport tenants and so on, also vital will be the role of the airport’s ground service providers. Currently, Swissport and Up & Away Aviation Services ground handle at Birmingham, although a third party is expected to join them very soon (some airlines, such as Jet2, also self-handle at Birmingham). It is they who will, for example, operate any battery-powered GSE.

“They have been very amenable to what we are trying to achieve [with regard to sustainability], even though they are stretched,” says Denton. “They are very receptive and indeed proactive in supporting what the airport is trying to achieve.”

More to do

The measures that have already been put in place – the installation of solar panels, the introduction of energy-efficient procedures and the switch to EVs – have already facilitated a 33% reduction in those emissions that the airport can directly control. But there is much more to do.

Denton believes the 2033 net carbon-zero target is an ambitious challenge, but one that the airport is committed to.

And Barton comments: “When we launched the Sustainability Strategy in late 2019, never could we have imagined the catastrophic impact the pandemic would have on all our lives. While by no means unique, the impact on aviation has been severe and we have had to diversify and prioritise investments over the last few years.

“As we now see signs of recovery, I feel confident that we will meet net zero by 2033 and deliver on our sustainability strategy commitments in the coming years.” ■



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Hydrogen offers an alternative to simple diesel at Edmonton

Hydra Energy is to offer low-carbon hydrogen as complementary fuel for diesel vehicles operating airside at Edmonton International Airport (EIA)

The collaboration between Alberta, Canada's EIA and Hydra Energy, a company that has already delivered a hydrogen-powered heavy-duty truck to a customer and also offers Hydrogen-as-a-Service (HaaS) to commercial fleet operators, has been

made official in a memorandum of understanding (MoU).

British Columbia, Canada-based Hydra sources low-carbon hydrogen from "chemical partners" to provide clean fuel to Hydra-retrofitted fleets "at diesel-equivalent (or lower) prices", thus – it says – "enabling an immediate and affordable transition to cleaner trucking".

Hydra is to convert vehicles and other specialised equipment that operates airside and in other restricted areas of the airport to run on both hydrogen and diesel. The move is expected to reduce vehicle emissions by up to 40%.

"Hydrogen continues to prove its value in reducing truck emissions since [continued on page 48...](#)

Supporting emissions-free hydrogen fuels

EIA describes itself as a “strong supporter” of the efforts being made to transition to hydrogen fuel “for Alberta, for Canada and for all of the aviation industry”.

The airport is home to the Airport City Sustainability Campus, a broad campus of businesses with a focus on fostering innovation, new technologies and sustainable operations, and this is supporting the process of converting to the emission-free sources of fuel that hydrogen represents.

“We believe in a sustainable future, a future where technology and emerging energies will help us achieve carbon neutral status in the coming years,” remarks Tom

Ruth, EIA’s president and CEO.

“Beyond that, our Airport City Sustainability Campus can help create demand for hydrogen and offer real-world testing scenarios which will encourage private investment in the Edmonton Metro Region’s hydrogen industry.”

Some of the potential developments in this area in which EIA is expecting to be involved include:

- Hydrogen-powered shuttle buses for passengers. EIA has signed an agreement with Canadian company Letenda for hydrogen-powered shuttle buses that will be integrated into the airport fleet that is used for parking and also for on-demand transit service within its Airport City

Sustainability Campus

- Industrial vehicle hydrogen fuel conversions. The types of industrial vehicles to be converted are still to be determined but types that the airport operator is considering include snow removal vehicles such as graders and brushing trucks as well as GSE vehicles including baggage tugs, fuelling vehicles and other similar machines
- Development of hydrogen fueling stations for public access
- Further exploration of the uses of hydrogen fuel in aviation

Testing and development of the relevant technologies is expected this year and beyond, depending on the scope of the work and the various partners involved. ■

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Edmonton-based logistics specialist Veteran Express Secure Logistics (VEXSL) is taking up Hydra Energy's retrofit offering to convert diesel trucks to co-combust with hydrogen

it doesn't compromise on the power and torque required for heavy payloads, works in cold temperatures, and doesn't add the weight of heavy batteries that can reduce payload and revenue," explains Hydra Energy CEO Jessica Verhagen.

"In Hydra's case specifically, our unique Hydrogen-as-a-Service model also means we can retrofit existing fleets to run on both hydrogen and diesel at no cost to fleet owners overcoming the expense hurdle when it comes to decarbonising fleets".

Looking to the future

Verhagen tells *Airside* that the exact number of EIA airside vehicles that will be converted using Hydra's proprietary hydrogen-diesel, co-combustion injection system will be assessed to determine which ones are the best fit to convert.

"Hydra is mainly looking to ensure there is appropriate space for hydrogen tanks onboard, that diesel consumption is high, and that the type of vehicle is scalable to other locations (ie, not so specialised that it only exists at EIA). For example, a runway sweeper makes a great

candidate," she suggests.

Regardless of vehicle type, however, Hydra's dual-fuel retrofit approach allows each converted vehicle to displace up to 40% of diesel with low-carbon hydrogen – with no impact on vehicle performance. In fact: "Based on over 240,000km of on-road testing with real drivers in the most challenging road conditions, truck performance has not been negatively impacted," Verhagen confirms.

"That means no reduction in power, torque, payload, or range. Indeed, drivers report an improved driver experience as well."

A hydrogen refuelling station will be built on airport grounds to fuel the converted vehicle fleet as quickly as diesel. It will include hydrogen fuel storage as well.

Conversion

Typically, Hydra truck conversions take only a couple of days and, says Verhagen, it costs fleet owners nothing. The process involves the installation of:

- Hydrogen tanks and gas handling components behind the truck cab, which is where the low-carbon

hydrogen is stored (up to 40kg of hydrogen)

- A hydrogen injection manifold in line with the air intake that blends hydrogen air before entering the engine block. This is how hydrogen is injected
- A dedicated secondary controller behind the truck dashboard that controls hydrogen flow. When the driver presses a pedal, it sends a signal to the master original equipment manufacturer (OEM) computer that the secondary Hydra controller intercepts. It then injects the required hydrogen needed to produce 40% of the required power demand directly into the air intake, eliminating the need to modify the engine block (and making the retrofit fully reversible)

The first EIA vehicle conversion is scheduled for 2023. Prior to then Hydra will be converting several semi-trailer trucks that also service the airport.

This MoU with the EIA is a first of

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its kind for Hydra, Verhagen points out – and will represent the first hydrogen-converted airside fleet in North America.

It will offer an example of the new opportunity that exists for airports everywhere to “start reducing emissions right now when it comes to a large part of their airport operations. In fact, since this announcement with the EIA, additional airports have started to reach out to Hydra to discuss potential decarbonisation of their own on-site fleets,” she announces.

According to Verhagen, EIA has recognised the opportunity not only to reduce its own fleet’s emissions but also to leverage the on-site hydrogen refuelling infrastructure that it will have to benefit other fleets in the region looking to reduce their environmental impact.

This is the case, for example, with Canadian truck operator Hercules Logistics, which is to initially operate a hydrogen-converted Class 8 fleet within EIA’s Airport City Sustainability Campus.

Another example is Veteran Express Secure Logistics (VEXSL), which has also announced that its Edmonton-based truck fleet is to be converted to use Hydra’s hydrogen-diesel, co-combustion injection system and refuelled through EIA’s upcoming hydrogen fuel infrastructure.

The plan is for an initial Hercules truck to be retrofitted to run on hydrogen and diesel very soon and if satisfactory to the client, Hydra will begin retrofitting the rest of its fleet next year.

“What’s most important is that reducing fleet emissions is possible right now through Hydra’s practical dual-fuel retrofit approach and supporting Hydrogen-as-a-Service business model,” says Verhagen. “So often when it comes to decarbonising such a challenging sector like transportation, it’s easy to focus on zero-emission solutions available down the road at a large cost to fleet operators when in fact, it’s going to take transitional, lower-emission steps to get to net zero – steps that need to start today.

“Hydra offers the only economical, viable way for fleets of all kinds – whether at an airport or on a region’s roads – to reduce their environmental impact right now without breaking the bank in the process.” ■



No single solution

Myrton Keehn, vice president of air service, business development, ESG (environmental, social and governance) and government relations at EIA, believes that there is no one solution to reducing emissions and addressing the climate crisis the industry faces.

“Hydrogen is a promising technology that will bring many benefits but it’s just one tool of many that we must employ,” he urges. “Our airport has already taken other steps with our cogeneration electricity facility that runs on natural gas and captures waste heat to warm and heat our terminal building, allowing us to use less gas and reduce our emissions.

“We’re also going ahead with Airport City Solar built by Alpin Sun on our property. It will be the largest solar farm at an airport anywhere in the world. We must use all the tools available to us and not limit our horizons.”

With regard to the potential for supporting the conversion of GSE used at EIA to hydrogen power, the airport is discussing the options for ‘going green’: “These are the conversations that we look forward to having with our various partners in ground handling,” Keehn informs.

“We can’t comment on specific conversations with individual companies. However, we certainly want our broader airport community to embrace what is possible. We know we can’t make these sustainable changes in isolation – it will take our full community working together to make meaningful progress on reducing emissions at the airport.”

And on the subject of sustainable aviation fuels, Keehn opines: “Airlines around the world are racing to invest in SAF. We believe there will be considerable demand for it, and sooner than may be expected. We have signed MoUs [memoranda of understanding] with two flag-carriers – Air Canada and KLM Royal Dutch Airlines – to work together on sustainability initiatives.” ■

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HiSERV assists AeroGround handling operations in Berlin

HiSERV, the Germany-based GSE rental specialist, has begun supporting the needs of ground services provider AeroGround Berlin at the capital's Berlin Brandenburg Airport (BER)

According to the partners, the common goal is to “further develop the service for airlines and their customers at BER with state-of-the-art ground support equipment”.

HiSERV will not only provide GSE ranging from baggage carts to de-icers on a rental basis; it will also facilitate fleet management on the apron and maintenance/repair services through its own workshop and a mobile workshop

unit that will provide a rapid response capability on the BER ramp.

Eduard Tissen, managing director of AeroGround Berlin, comments: “With HiSERV, we have found an efficient partner who reliably meets our high demands on quality, flexibility and performance.

“Together, we have developed a project over the past few months that fully meets AeroGround Berlin's needs in terms of both content and cost. Together with our colleagues from HiSERV, AeroGround Berlin carried out an in-depth analysis,

at the end of which the co-operation that has now been concluded stands and which will be a key success factor for AeroGround Berlin in the future, both operationally and economically.”

Roland Ückert, HiSERV's managing director, adds: “We are very pleased to be able to support AeroGround Berlin with our modern equipment and service to provide an outstanding service at Berlin Brandenburg Airport.

“With our support, AeroGround Berlin will be able to further improve the

handling quality at BER to be ready for the challenges of summer 2022.”

Ückert tells *Airside* that the partners had begun working towards this collaboration in summer last year in accordance with BER licence tender arrangements. “We will supply the whole range of GSE from container dollies to pushback tractors,” he says. “As our contract has a lot of in-built flexibility, it is difficult to come up with a price or exact numbers of GSE, but it will be dozens of units.”

And, thanks to HiSERV’s huge maintenance base in Berlin, “All GSE will be fully serviced,” he continues. “Our workshop handles all types of GSE for many customers at BER airport. As a special and unique service, we also have small trucks that are fully equipped with tools and spare parts which enables us to repair GSE right on the apron.”

By March, HiSERV had already started transferring GSE to AeroGround. While

Ückert will not reveal the length of the contract, he does confirm that, “We aim to support AeroGround Berlin for the whole licence period.”

It’s been a difficult market, of course, over the last couple of years, but now Ückert says that HiSERV is seeing “huge demand for GSE from our customers, as the outlook for the summer flight period is very positive”.

He adds: “At many airports, summer slots are matching and sometimes even exceeding 2019 levels. This puts a lot of strain on ground handling agents to recruit staff and have sufficient GSE available. As far as GSE is concerned, we help our customers to relieve them of the burden of having too few units of GSE.”

Ückert also points to a growing trend amongst customers for battery-powered GSE. “We can see that the demand for electric GSE is constantly on the rise and we work closely with all GSE suppliers to match this demand,” he concludes. ■

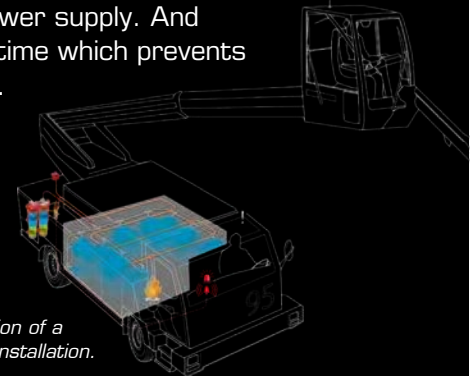


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An illustration of a Fogmaker installation.



Jason Gendron, CEO of Mercury GSE



Mercury GSE: meeting specialist needs

Jason Gendron, CEO of Mercury GSE, tells *Airside* all about the US-based full-service GSE rental and leasing specialist, and how it is currently enjoying exponential growth

Mercury GSE traces its origins back to 1948, when a number of former Flying Tigers launched a refuelling and ground handling business at Los Angeles International Airport (LAX). The Flying Tigers were US volunteers who flew in combat against the Japanese over China and Burma in the early 1940s under Claire Chennault.

Their operation at LAX grew and, in 1977, a ground support equipment division of the company was created under the leadership of Ron Spiegel, who was to become the company's president.

The division began with small contracts for leasing out individual items of GSE as well as repairing other GSE at its LAX base. It later added a larger facility away from the airport at Cerritos, California.

In 1988 the company was purchased by private equity and its GSE division was spun out privately. Thus, since the late 1980s, the prime focus of Mercury GSE has been its GSE business. Then, in late 2017, Gendron through his investment group – Cembrus Capital – acquired the company and put in a new management team. Since then, it has achieved some 600% growth in just under five years, Gendron informs. “It’s been a wild ride,” he says.

Mercury GSE sells second-hand GSE but it is perhaps better known for its full-service rental and leasing options. It refurbishes GSE and then offers the units to customers, sometimes in near zero-time (near-new) condition. Its Lease & Rent division is still based close to LAX, at Santa Fe Springs, at a 35,000 square foot state-of-the-art maintenance and storage facility, while since last year Mercury GSE has also had a maintenance facility at Dallas Fort Worth Airport (DFW).

The company now has about 40 full-time employees at its West Coast and Midwest sites, about 25 of whom are mechanics. Another 70 or so people serve as freelance, contracting workers.

Mercury GSE offers equipment including cargo loaders, pushback tractors, ground power units (GPUs), air start units (ASUs), belt loaders, dollies, stairs and baggage tugs – a full range of GSE, both motorised and non-motorised. In the latter category, it offers both diesel and electric equipment. One of its fastest-growing lines of business is to take in diesel-powered GSE and convert it to battery-powered configuration before renting or leasing the electric equipment to either the same or a different customer.

While the company is able to offer customers just about any sort of GSE, typically from the most reputable of manufacturers including JBT, TLD, Textron, LEKTRO and FAST Global Solutions, Gendron has looked to specialise in certain lines. Cargo handling has long been a primary focus of Mercury GSE, for example, and today it can probably offer more cargo loaders than any other North American supplier, Gendron believes. It currently

has more than 20 maindeck or lower deck loaders in its inventory available for sale, lease or rental.

All of Mercury GSE's sales and rentals come with full-service maintenance options and it offers much more than financing with its rental and lease deals. "We supply GSE as a service," Gendron declares.

Mercury GSE chooses to offer only high-quality motorised and non-motorised units. Environmental issues also feature highly in the company's thinking. For example, for diesel units it prefers Cummins Tier 4 compliant engines.

Changing times

The pandemic has encouraged many GSE operators to consider rental and leasing options in preference to purchases, Gendron believes, and this has further boosted that area of Mercury GSE's business.

Indeed, while Mercury GSE's leasing and rental business has historically been

used by GSE operators to "fill a gap" for short periods when they suddenly and unexpectedly find themselves in need of specific items of GSE, now non-purchase options are becoming much more mainstream, he observes.

There is no problem with demand for Mercury GSE's services – in fact, it is meeting those demands that is currently more of a challenge, because there is a shortage of GSE feedstock at the moment, with global component supply chains having been impacted of late by various issues, not least Covid and raw material/mineral shortages.

But the potential for further growth remains strong, and Gendron confirms that Mercury is currently considering the possibility of opening a facility on the US East Coast, as well as looking at potential options with regard to company acquisitions. Another possibility is expanding into new markets, most likely launching a presence in the European market. ■

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KALMAR, SWEDEN

DENGÉ celebrates 40 years of success

Istanbul, Turkey-based GSE supplier DENGÉ Airport Equipment has developed a lightweight, towable transfer platform that can be used by passengers – including passengers with reduced mobility (PRM) in wheelchairs – to board and leave regional aircraft. It is the latest development in the portfolio of a company that is celebrating 40 years in the GSE business

The transfer platform has a telescopic design and can be easily moved around by just one handler. The service height can be adjusted from 1m up to 1.5m; it features stainless steel guard rails flanking the walkway and the front end is fitted with bumper protection.

It has four hydraulically controlled stabiliser legs, ensuring that it stands firmly on the ground. Solar panel-supported lighting facilitates night operations (it comes with an onboard 220V battery).

The platform requires little maintenance, being made of hot-dip galvanised metal.

Murat Denge, managing director of DENGÉ Airport



Equipment, explains that the transfer platform was launched in March this year, with final approval for the design having been reached in January. It was specifically produced to meet a customer's demands and, in fact, that customer was involved in its design phase.

The first unit has been delivered to this customer, Murat Denge confirms.

The unit was designed for smaller (lower) aircraft like ATRs and CRJs, where the customer can combine regular passenger and PRM boarding at the same time, even if the aircraft has its own stair. Using the transfer platform, a handler can minimise ground time turnaround by having all passengers board from the platform.

The transfer platform adds to DENGÉ GSE's growing portfolio, where offering environmentally friendly GSE is one focus. Stairs are already available in an electric version, while a DENGÉ electric

ambulift version is also expected to be ready for sale later this year. Other cost-effective products that ease operational efforts are "on the way", Murat Denge informs.

This year marks the 40th anniversary of DENGÉ Airport Equipment. "Because every year of the company is valuable in a different way, we are not having a specific celebration for the 40th anniversary," says Murat Denge. However, a small in-house celebration was held in the form of a short after-work event.

Murat Denge has experienced 25 years of those 40 years, and, he says, "We are improving and expanding every year."

The biggest 'low' has been the aviation business' crisis caused by the Covid-19 pandemic, he observes, "But together with the industry we were able to overcome."

Today, DENGÉ is well positioned to benefit from the ongoing recovery in the GSE market. "As always, we try to offer the best in the quality at a very

reasonable cost," says Murat Denge. "We have never manufactured cheap products, but neither have we ever had any customer dissatisfaction.

"Our aim has been to be a well-known worldwide player [in GSE manufacturing] and, in this regard, we see ourselves as next to the industry's leaders."

What about the next 40 years? What do they hold in store? "I expect the industry will change: there will be more private air transportation, rather than public, like it is now; however, the need for GSE will still be there.

"Moreover, there will be more autonomy in terms of GSE, especially in relation to the docking processes.

"Above all, we wish for good health and a 'virus-less' 40 years. We lost my father and the company's founder in early January, who was always an important guide and influence for us; we once more realised that a healthy future is always a priority," Murat Denge concludes. ■

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*Ilya Burkin, global sales director
digital solutions at ADB SAFEGATE
Airport Systems*

ADB SAFEGATE looks to digitalised airports of the future



ADB SAFEGATE Airport Systems is helping air gateways digitalise in order to improve both safety and efficiency in many areas of their operations. The latest to benefit is Riyadh Airports Company (RAC), for whom the company helped develop a new airport management platform called OFOQ. Ilya Burkin, global sales director digital solutions at ADB SAFEGATE Airport Systems, explains all...

When did you initially start working with RAC on this project?
Riyadh Airports and ADB SAFEGATE have enjoyed more than 40 years of very productive partnership and collaboration. About five years ago,

ADB SAFEGATE started to invest in the digitalisation of airport operations, moving towards the idea of Digital Airports in a move that didn't go unnoticed.

Subsequently following a competitive tender, Riyadh Airport chose us to work on a new Airport Management Platform that is now called OFOQ.

OFOQ means 'Horizon' in Arabic,

which encapsulates RAC's ambitious plans for growth and expansion.

How did you go about developing OFOQ in partnership with RAC?

Projects like this are always a collaboration between the vendor and an airport. However, with RAC, they were requesting a truly multi-faceted approach

with a vendor who understands the operation of each different component of the airport – airfield, apron, terminal, air traffic control (ATC) – and knows how to link it all together and orchestrate total airport management.

The ADB SAFEGATE roadmap perfectly aligns with RAC’s strategy for digitalisation and automation: OFOQ is based on the principles of openness, elasticity and predictability.

What data sources support the OFOQ system?

15 different external systems are integrated with OFOQ, ranging from airlines’ and ATC data to ADB SAFEGATE docking guidance and apron management solutions.

And how are those data sources used, managed and interpreted to ensure optimal efficiency?

One of the ideas behind OFOQ is to

simplify integration and create an ecosystem that will grow, following increasing demand and the operational strategy of Riyadh Airports.

We worked very closely with the Operations Department of the airport to identify processes and decide how they could be optimised and automated, such as the automation of in-block/off-block procedures, aircraft turnaround management, communication with ground handlers and ground staff, and the management of baggage movements.

All of these aspects of airport operations are mostly ‘behind the scenes’ for passengers, but jointly they contribute to overall on-time performance (OTP) and are essential for passenger satisfaction.

Do such airport operations management systems form an important part of the ADB SAFEGATE offering today?

Innovation has been the driving force

behind ADB SAFEGATE for more than 100 years. In the 1920s, variable resistors revolutionised theatre lighting, and in 1947, we took our first steps into aviation, supplying and installing airfield ground lighting (AGL) at Brussels Airport to enable night flights.

After 75 years as a pioneer within the aviation industry, the pace of innovation is today accelerating. We see a huge growth in demand of intelligent airport management solutions and, being a provider of solutions for ‘Airfield, Apron, Tower and Terminal’ we truly believe in the concept of the ‘Digital Airport’.

The ADB SAFEGATE vision of the fully autonomous Digital Airport managed by systems is truly ambitious. It depends on integrating processes and systems from the tower, airside, apron and terminal. It is enabled by advanced technologies, including data analysis, machine learning (ML), artificial intelligence (AI) and video surveillance.

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- Improve OTP
- Reduce operational costs and create new revenue streams
- Increase predictability for more effective planning
- Stay operational in all weather conditions
- Improve the passenger experience

Does ADB SAFEGATE have unique capabilities and skills to facilitate airport digitalisation?

ADB SAFEGATE is in a unique position to help airports around the world achieve superior airport performance. We offer an unrivalled understanding of the airside environment, from tower to airfield to gate, and our industry-leading solutions have been widely adopted.

With the Digital Airport, we're adding a new dimension to airport performance. We're helping airports, airlines, ground handlers and other stakeholders gain actionable insights by analysing data across airside systems, as well as the airport systems that manage landside and airside processes and resources.

We're enabling the convergence of workflows across airports, leveraging advanced analytics to help our customers predict rather than react, become operationally resilient and achieve the triple aim of improving operational efficiency, profitability and passenger experience.

A recent example of innovation is our web-based SafeControl Apron Management System (SAM), which provides a complete view of ground traffic together with real-time updates on stand operations, equipment status and turnaround process.

It enables operators to make better decisions to mitigate disruption and enhance operational efficiency. Available from anywhere in the airport, SAM is a valued information resource to airport operations control centres.

Another example of innovation can be seen in our AS-Vision platform, which provides a single view for all flight-related information whether it is flight updates, turnaround process or KPIs [key performance indicators] and allows airports to integrate different systems for a unified stakeholder experience.

Do you think the pandemic and consequent collapse in the global aviation sector has spurred (or will spur) greater interest in systems such as these that maximise efficiency?

Absolutely, we already see it across the world. 'Digital Transformation' is a key priority for airports now. Senior leadership at airports want to track KPIs, integrate data to make better decisions, boost operational efficiency and improve the passenger experience.

Anything and everything to help recovery, generate new revenue streams and provide passengers with confidence is welcomed. With digital-driven processes 19 times more likely to be profitable than traditional methods, there is a big incentive to transform the way the airport operates. The Digital Airport makes business sense.

Maintaining a high quality of service is key to improving customer satisfaction, which in turn translates to improved non-aeronautical revenue that, for most airports, is fundamental to their financial recovery after the pandemic.

Even before the effect of Covid-19 on global aviation, billions of dollars, pounds and euros were lost each year through delays, many of which could be predicted and mitigated if an airport had the required information readily available across the stakeholder community.

ADB SAFEGATE applies the latest surveillance and automation technology to manage today's complex airport challenges. Adaptable and resilient airport management systems, with flexible business models, enable operational elasticity to help airports and airlines quickly and easily scale up or down to meet changing demand. ■

Projects like this are always a collaboration between the vendor and an airport

*Ilya Burkin
ADB SAFEGATE Airport Systems*



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All-new GSE Expo Europe set for Paris in September

This year sees the addition of a new, important industry show: GSE Expo Europe, organised by the International Airport Equipment Manufacturers' Association (IAEMA) in partnership with *Ground Handling International* (GHI), will be held at Le Bourget Exhibition Centre in Paris between 13 and 15 September

GSE Expo Europe will complement IAEMA's Las Vegas-based expo, seen here in 2018

GSE Expo Europe is to be a “dedicated community hub for GSE suppliers and users”, the organisers say: “a place where companies supplying different types of GSE can pool ideas and share innovations to help operators rise to the challenges of the post-pandemic landscape”.

The expo will be “delivered by the GSE community, focusing on the needs of the GSE community”, they add.

GSE Expo Europe is to take place in even-numbered years, while IAEMA's Las Vegas, US-based International GSE Expo – an event all those involved with GSE know well – will now take place in odd-numbered years.

Another event that those involved in the industry are familiar with is *inter airport* Europe. This also takes place in odd-numbered years, thus the scheduling of GSE Expo Europe ensures that there isn't a ‘clash’ between the two big European GSE shows.

Historically, the Vegas show had been in even-numbered years. The industry therefore enjoyed what Michael Bloomfield, board chair of IAEMA (he also founded the well-known Sage Parts), describes as an “every other year cadence” with *inter*

airport Europe. But when the Covid-19 pandemic forced a postponement of the 2020 show and Bloomfield approached *inter airport* show organiser Mack-Brooks Exhibitions to see if that show could or would be moved to avoid a schedule clash; there was little indication of any compromise, however. Indeed, there was an indication that the *inter airport* expos would be broadened out such that there would be events for three consecutive years.

Given that situation, the decision was taken to launch GSE Expo Europe in 2022 – an even-numbered year avoiding the year of *inter airport* in Munich – while the Vegas show would be held from 2023 in odd-numbered years.

Bloomfield and his colleagues at IAEMA are very aware of the danger of there being too many industry expos. Indeed, one of the prime drivers when IAEMA was established was that it would attempt to ‘consolidate’ the number of industry events and it has sought to do so since. However, there is room in the industry for this new show, IAEMA strongly believes.

Another key driver has been keeping IAEMA expos “affordable”, says Bloomfield, and this it has done with the Vegas event. Meanwhile, the Munich show had become

very expensive for IAEMA members, he opines, perhaps as a result of the very success of the show over the years.

The size of the *inter airport* Europe event had also become an issue for some IAEMA members, he continues, in that it had moved away, or “become diluted”, from being fairly exclusively GSE-oriented to incorporating a huge range of airport- and aviation-related products and systems. In that process, it had become impractical as well as expensive for many GSE suppliers, Bloomfield suggests.

Other issues that IAEMA members had pointed to as being less than ideal for them when exhibiting in Munich was the inclement weather that could often be experienced at that time of year (October), as well as the costs of hotels and the like (and their distance from the venue outside Munich).

The decision was taken for IAEMA members not to attend *inter airport* Europe 2021 in favour of their own expo in Paris this year.

Time for a change

Even without the pandemic and the issues that threw up, “I think everybody would have come to the realisation that it was time for a change,” Bloomfield says of IAEMA and its members’ thinking on the European

expo position.

The next challenge for IAEMA was to find the right location in Europe for its new show. IAEMA and its partners considered many options before the decision was taken to opt for Paris and Le Bourget.

Paris is a fantastic city for visitors, Bloomfield points out, while the weather in the French capital in September is usually great. Meanwhile, Le Bourget – which hosts the huge Paris Air Show every other year – has no shortage of indoor exhibition space and vast areas of outdoor areas for exhibition stands, ideal for showing off large pieces of GSE as well as equipment demonstration areas.

Costs for exhibitors at the show will be kept “affordable”, Bloomfield says, with IAEMA members getting a “significant discount” on stand costs.

GSE Expo Europe will be modelled on its successful Vegas counterpart, he continues. Similar to the US event, there will be a demo area for GSE, while the whole event will be devoted entirely to GSE rather than the wider aviation and airport business.

Unlike Vegas, there will be a seminar/conference element to GSE Expo Europe, with neutral industry experts offering their thoughts on subjects of contemporary relevance to GSE suppliers and users.

A key focus of the show as a whole, and the conference element of it in particular, will be product innovations and emerging and maturing technologies that improve safety, or that relate to autonomous GSE operations and hybrid/electrical vehicles. Indeed, the event will be a “dedicated forum for driving stakeholder collaboration and best practice sharing between equipment suppliers and frontline airport users”, its organisers say.

By as early as mid-March, 80% of exhibitor stand space for the event had already been booked. By the end of April, more than 100 stands had been taken up and 13,166m² of space booked, about 91% of the floor plan. However, there is room to expand the space that IAEMA has reserved, so there is no danger of reaching capacity. And, as regards visitor numbers, Bloomfield is confident that the attraction offered by the attendance of IAEMA’s premium GSE suppliers alone will

bring in large numbers of GSE operators.

On that note, Bloomfield confirms that as of the end of April, IAEMA had 88 GSE manufacturer members. But that number was growing fast and he hopes that the membership might reach as high as 150 by the end of this year.

Whether or not this ambition comes to fruition, IAEMA’s membership roll includes the biggest of the industry’s GSE suppliers as well as many smaller manufacturers, thereby covering the “full spectrum” of size, and a “great cross-section” of the GSE business.

A new era

“I am hoping that this will be the start of a new era,” Bloomfield says. “Hopefully, we are now solidly post-pandemic and by September we will be moving into whatever is the ‘new normal’.

“GSE Expo Europe will really focus on product innovation and we are looking forward to seeing a lot of technological advances around greener, more autonomous equipment and other technologies that will lead us into the future,” he concludes. ■



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WePlan facilitates efficient airline workforce planning

Lana Jansen
co-founder of
WePlan



Frankfurt, Germany-based WePlan offers a software-as-a-service (SaaS) platform that enables airlines to optimise their crew manpower deployment on a continual basis

WePlan was formed in 2019 by Lana Jansen and Franziska Burmester. They had been acting as IT consultants in the aviation sector, working to offer clients efficiency strategies in manpower management.

Both were of the opinion that there was a “critical gap” – Jansen tells *Airside* – in the tools available for airlines to efficiently plan their crew resourcing, and they set about doing something about it.

At that time, most airlines were relying on Excel for informing their manpower strategies but, Jansen says, while powerful Excel simply does not facilitate the data analysis that is required for informed future planning. They should know – they were using Excel all the time in their work, and well knew its limitations. The two women also thoroughly understood the needs of their client carriers’ workforce planning teams.

Hence, through the help of a couple of software developers they knew, Jansen and Burmester set out to create the WePlan platform; three years later, the

platform consists of 15 different modules that can be used by airlines’ planning teams – and potentially those of handlers, of which more later – to create cost-optimal plans for crew resourcing.

The need for effective forecasting, testing of scenarios and achieving maximum efficiencies has become more important than ever for operators in an aviation industry that has been ravaged by the impact of the pandemic, which has not only hit their own staff but of course led to a dramatic collapse in flying passenger numbers.

Today, it’s critical, Jansen notes, for airlines to understand their data and to be able to use that data to achieve efficiencies.

Moreover, Covid has added new complexities to the task of any airline manpower planner. Historic data is not as representative of likely future operating conditions – so the fact that WePlan also employs the most recent operational data helps here. But, more importantly, flight schedules can be changing on virtually a daily basis, as carriers seek to meet rapidly changing passenger requirement patterns.

Flexibility and adaptability have become more important than ever

and WePlan’s sophisticated roster cost estimation tool helps airlines minimise the costs associated with resource allocation, while its scenario planning analytics and forecasting help them to look forward to what might be required for the future.

Indeed, says Jansen, while scenario-based planning used to be a ‘nice-to-have feature’ of the platform, in the current operating environment for airlines it is now a ‘must-have’.

Varied customer base

The WePlan platform was built for airlines, and indeed its customers today are carriers such as TUI, Eurowings (a Lufthansa subsidiary) and AeroLogic.

TUI has deployed WePlan right across the group’s geographically based airlines, as well as at the group corporate level. In being so used, it becomes a very powerful tool for the company, whose airlines operating as TUI fly, TUI Airways (operating out of the UK), TUI fly Belgium, TUI fly Netherlands and TUI fly Nordic can each use a version of the system adapted to their own particular operating conditions.

For example, holidays are typically

taken at different times of the year in these different nations/regions, which will significantly impact manpower management and planning and which is reflected in the various systems used by the different airlines.

Meanwhile, the fact that the platform is being used by AeroLogic, a freighter operator joint venture of DHL and Lufthansa Cargo based near Leipzig, illustrates that WePlan is as useful for cargo carriers as it is for passenger airlines. Moreover, AeroLogic's constantly changing flight schedules really put the system to the test and thereby highlight its effectiveness and value, Jansen suggests.

Jansen and her co-founder are in talks with a number of other carriers about signing up to WePlan, and, in fact, some are currently undertaking proof of concept analysis of the platform.

The WePlan capability is also being extended beyond the airline environment. The resource planning of a carrier's

handling partners and even maintenance, repair and overhaul (MRO) teams can also be critical elements in how an airline plans its manpower allocation. These factors are now reflected in the platform: relevant data on handlers and MRO partners (which might be third-party service providers or might be separate divisions within an airline group) can also be fed into the platform and the information interrogated and analysed.

Improvements are being made to the various modules on an ongoing basis. An upgraded platform is made available, free of charge, to clients typically at least every couple of months.

Planning as a Service

As well as WePlan's 15 different modules that are available on an SaaS basis, the company also offers Planning as a Service, which enables clients to outsource elements of their manpower planning as a full service option.

The WePlan team then feeds results into the system such that the client can access them anytime and anywhere.

Plus, a consultancy service is also available for clients as a separate service. This might be a particularly welcome option for those carriers that dispensed with some of their planning staff during the worst of the Covid pandemic.

Someone at WePlan is always available to help out should they be needed, a vital consideration given the fast-moving nature of the aviation business today and the rapid manpower management decisions that need to be taken on a continual basis by carriers in this – still much-affected by Covid – industry.

Plus, whether a customer is signed up for the consultancy option or not, the WePlan team goes out of its way to maintain regular communication. "We may be small, but we deliver high quality, are flexible and remain close to our clients," Jansen insists. ■

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Schiphol to invest in two TaxiBots



Royal Schiphol Group, operator of Amsterdam Airport Schiphol (amongst others), has confirmed that it will buy two TaxiBots to support its efforts to achieve sustainable taxiing at the Dutch gateway

TaxiBots are semi-robotic, pilot-controlled tow tractors that are designed to make taxiing operations cheaper and more environmentally friendly by enabling aircraft to keep their engines largely switched off during the taxiing process. The two units are expected to be delivered to the Netherlands' biggest and busiest air gateway in mid-2022.

Schiphol will be Europe's first airport to use the innovative systems, which are the product of Israel's IAI and GSE manufacturer TLD (part of Smart Airport Systems). A small number of TaxiBots are

already in use at two Indian airports.

A previous trial at Schiphol demonstrated that sustainable taxiing led to a reduction in fuel consumption of approximately 50% during the taxiing process, saving money on fuel and lowering carbon dioxide, nitrogen and ultrafine particle emissions.

Royal Schiphol Group has said that it wants to operate "the most sustainable airports possible", and is targeting having an emission-free ground operation at its Dutch airports by 2030.

The investment in the TaxiBots forms part of its wider plan to minimise harmful emissions. According to Dick Benschop, CEO of Royal Schiphol Group: "2022 is

a crucial year for sustainability in the aviation sector.

"We are accelerating measures to reduce emissions and improve local air quality. That's important for the climate, our employees and local residents. We're Europeans first and one of the few airports worldwide working on implementing sustainable taxiing on a large scale. Schiphol is a frontrunner, which makes me proud."

Schiphol has worked with Air Traffic Control the Netherlands (LVNL), KLM, Transavia, Corendon Dutch Airlines and ground handling companies dnata and KLM Ground Services on a plan that is designed to see sustainable taxiing

become standard procedure at the airport.

The first step will be the deployment of the two TaxiBots for follow-up trials at Schiphol, in which carrier TUI and ground services providers Viggo and Swissport will also be involved. These trials will transition into standard procedure at the airport, with certain types of aircraft taxiing sustainably to and from Schiphol's Polderbaan runway.

Modifications to infrastructure at Schiphol are already being made to enable sustainable taxiing to and from the Polderbaan. These changes are to be finished before the follow-up TaxiBot pilot gets underway.

Modifications will include the addition of markings on the asphalt that ensure aircraft stop in the right place when they disconnect from the towing vehicle. Roads also need to be widened to enable TaxiBots to drive to and from the Polderbaan before and after taxiing has taken place without disrupting other (taxiing) traffic.

Building on past results

Carolijn Schoofs, head of innovation at Royal Schiphol Group, recalls the previous TaxiBot trials at Amsterdam: "Schiphol and its partners carried out a sustainable taxiing trial in spring 2020. During this trial, aircraft were taken to and from the runway by a TaxiBot, which enabled aircraft to keep their engines off for most of the taxiing process.

"Given the distance involved, fuel savings can reach up to 65% percent when aircraft taxi to the Polderbaan, Schiphol's runway with the longest taxi time."

But these later tests and the ensuing widespread roll-out of sustainable taxiing will require what Schoofs describes as "radical modifications to infrastructure, processes and technology" at Schiphol.

"Many of these modifications are new to the aviation sector, and Schiphol is the first airport in the world that wants to introduce sustainable taxiing on a large scale," she says. The roadmap described above aims to make sustainable taxiing standard procedure at Schiphol by 2030 at the latest.

The forthcoming trials will occur over a period of three to four months and



are expected to start before the end of summer this year. The goal is to perform multiple runs during different types of weather conditions and changing intensities of traffic, Schoofs explains. These missions will include operations for all available aircraft types and apply to both the inbound and outbound taxiing process.

The trials will certainly involve narrowbody A320 and B737 aircraft and will be integrated within normal operations at Schiphol. The feasibility of sustainable taxiing as determined by these trials will include the impact on ATC procedures and requirements, and identification of potential future developments to support ATC.

Schoofs continues: "Our ambitions for the roll-out of standardised sustainable

taxiing operations are very clear, and detailed by our roadmap Sustainable Taxiing. As with any radical innovation, many of the specifics and exact characteristics of the solution aren't yet (fully) understood. But as part of our second feasibility study, this trial will help us test many of our key hypotheses and serve as a platform to learn as much about the concept and our future plans as possible.

"To have a fully standardised sustainable taxiing operation at one of the largest European airports will certainly require a substantial number of TaxiBots or other vehicles. The operating entity, its business model and underlying financial streams are all part of the steps we are concurrently taking to learn more about realising this ambition." ■

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