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Editor's NOTES

Mike Bryant

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Welcome to the summer 2023 issue of the magazine.

This issue majors on a number of topics, not least that of tugs and tractors – the subject not only of one of its three features, but also of articles on the innovative WheelTug design and TowFLEXX electric tow tractors.

This issue's other features cover the subjects of ramp and airfield training, and of autonomous GSE. The first is of supreme importance, as it has been since the dawn of airport apron operations, while autonomy in the equipment used to support ramp work is likely to be a growing theme for big hub airports and smaller airfields alike.

The other major theme of this issue is sustainability. The move towards greener apron operations, and the non-diesel-powered GSE that forms a big part of that goal, continues to gain momentum, and we talk with a number of airside players about how environmental responsibility is informing and guiding their strategic priorities. For example, Yves Crespel explains how Alvest and its group companies such as TLD are placing emphasis on greener GSE.

We meet with Hervé Gueusquin of Paris-based Air Business Corporation (ABC) about how his company is going to offer its own brand of electric GSE, and also with Mike Cardy of UK-based Airside Airport Equipment, who explains how he is still busy at the tender age of 75.

JCAI, Inc's Jeff Cambell tells us all about the company's digital infrastructure and systems that support airport de-icing facilities and processes, while ABM Aviation's Cara Buckland gives her insight into the role of a ground service provider's airside bussing manager.

Plus, Aviramp's Terri Smart-Jewkes brings us up to date with the latest news from the UK-based provider of innovative boarding ramps.

Finally, we hear all about the training programmes offered by the IGA Academy at Istanbul Airport and look forward to *Airside International*'s sister conference and exhibition, GSE&RAMP-OPS Global 2023, which will take place in June in Seville.

We hope that you can be there, and I hope you enjoy this issue.

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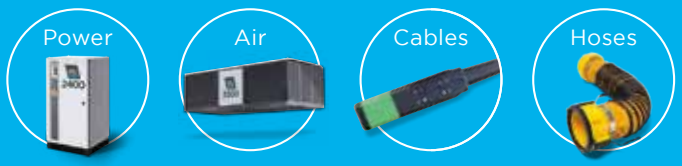

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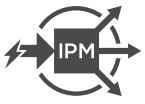

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Greener tugs and tractors

The drive to battery-powered GSE continues, nowhere more so than in the field of those pushback tugs and baggage and cargo tractors that are a regular feature of airport aprons. Manufacturers are responding to customer demands…

Amongst the most well known of the tug and tractor manufacturers is Germany-based TREPEL Airport Equipment, which offers its range of CHALLENGER pushbacks to the on-airport handling market, as well as its relatively new CHARGER 380 towbarless aircraft tractor and a wide selection of loaders and transporters.

Across its CHALLENGER conventional aircraft tractor fleet, models are capable of pushing back as well as repositioning and maintenance towing all of today's commercial aircraft – everything from the smallest CHALLENGER 150 that is suitable for narrowbodied aircraft right up to the CHALLENGER 700, which is able to handle A380s.

As well as diesel versions, TREPEL's CHALLENGER 150 and 280 models are available in electric battery-powered variants.

TREPEL says that the CHARGER 380 is the most powerful and capable towbarless tractor in its class. It can push back aircraft as large as the B777 and A340 (though not the A380). With high engine power – of which more later – it has a fast towing speed and comes with over-steer protection (with anti-collision and obstacle detection protection as options), as well as hydro-pneumatic suspension.

The CHARGER 380 is a modular, very versatile tractor, TREPEL sales manager Philippe de Soyres observes, not least in the range of power options available. In its basic diesel variant, equipped with either a 231kW or 309kW Stage 5 engine, it is ideal for long-distance towing as well as inter-gate towing and high-speed maintenance tows.

But battery-powered and hybrid variants

are also available. The 98kW lithium-ion battery version is suitable for pushback operations and limited short-distance towing, but this can be up-powered by the addition of a 100kW Deutz engine to create a hybrid vehicle that can also be used for long-range towing.

Another variant is available in the form of a twin battery-powered vehicle. This version has been successfully trialled by Dutch flag-carrier KLM at Amsterdam Airport Schiphol. The twin battery variant requires fast charging for efficient deployment, and is then able to perform long-distance and fast towing. This vehicle is now available for sale.

The CHARGER 380 (in diesel form) was first launched in 2019 at *inter airport* Europe. Of course, Covid hit not too long afterwards, which dramatically affected demand for GSE of all kinds. Nevertheless, the diesel-powered CHARGER 380 is now in operation with a number of customers, who have – says de Soyres – offered some very positive feedback on its performance.

Going electric

The aforementioned CHALLENGER 150e is able to push back A320 Family and B737 narrowbodies but can also handle aircraft as large as B757s. While not at all common in Europe, the B757 is still operated by many carriers in the US. The 150e has therefore proved very popular in the North American market, de Soyres informs, adding that generally demand for electric tractors continues to rise in Europe and across the Atlantic.

Indeed, he points to very high demand for battery-powered variants, much higher than for diesel variants, in markets such as Scandinavia. And, as demand for greener GSE in most regions around the world continues to grow quickly, TREPEL is considering offering other models of its tractor portfolio in electric form.

It's not easy in all cases – a battery-powered variant of the big CHALLENGER 550, for example, would require a lot of energy and be very expensive to purchase (though the operating costs would actually be comparatively low, since the lithium batteries would not require too much maintenance compared to a diesel engine).

"But eventually there will be demand for battery power even here," says de Soyres. Perhaps especially when the price of lithium batteries does eventually come down.

Another challenge lies in the fact that many airports have yet to put in sufficient charging infrastructure to meet demand for greener ramp operations – but the will from the handlers is there, de Soyres believes, so the airport operators will follow in time.

Supply chain problems

As the Covid-19 pandemic receded, so demand for GSE increased – for TREPEL as for so many other manufacturers. Yet

A LEKTRO 89 at work

there were, and still are, challenges on the supply side of the equation to cope with. Chips for onboard charging have been in short supply, for example, as have been many more basic manufactured parts.

Lead times have increased markedly, with delivery times from new orders now upwards of nine months, says de Soyres. This is not good news for suppliers, nor for purchasers – the ground service providers. But handlers have been very understanding of the new reality, de Soyres remarks, just as they have been about the need for prices to rise at a time of such high inflation in Europe and elsewhere. "We, and handlers, have had to adapt," he says.

Finally, TREPEL also now has available a pushback and towbarless tractor simulator that it calls the Chariot. It has been acquired and is now in use with a German and a Japanese customer – Fraport and Japan Airport Service Co Ltd respectively.

'A new standard'

JBT AeroTech launched its all-new B80 cargo tractor last year. In so doing, the company says, it "introduced the GSE community to a new standard of cargo tractors".

Managing engineer of tractor product Ed Sachs, director of business development and marketing Todd Tanner and global marketing manager Suzanne Woodward explain: "We were receiving requests from our customers for a cargo tractor with a more robust build and a smoother ride. The B80 was developed in response to those requests."

And the unit is proving very popular. "Our launch customers have been very receptive to the B80 tractor," they confirm. "It seems to be filling the identified need."

Moreover, "We see growing demand elsewhere as word of the B80's performance spreads. We believe the B80 is a great cargo tractor package and its acceptance will continue growing.

"In the near future, we [expect to] see an electric version of the B80 coming to market. We continue to look to new design and power train enhancements that will ensure the B80 is a hit with the market – now and into the future."

The new tractor offers something slightly different to other models. A heavy-duty, highly reliable, mid-size tow tractor, its rugged chassis and power train were identified by JBT customers as critically needed upgrades, the JBT team recalls. They also expressed a desire for a smoother, safer, more comfortable ride.

"JBT worked to bring all those elements together in the B80," the team recalls. "And, as always, JBT GSE is designed and built to be highly reliable, easy to maintain, and a breeze to operate. The B80 checks all those boxes."

In terms of pushbacks, JBT's B950 was released in 2018. Given the onset of the pandemic soon afterwards and all that that has entailed, the unit still seems relatively new. "The B950 is an excellent example of JBT AeroTech continuing to bring value to the market," Sachs, Tanner and Woodward assert. "It fills a needed void for towing and pushback operations in the most commonly used range of aircraft."

Both the B950 and the B80 offer environmentally friendly options. JBT's commitment to sustainability began with the electrification of its tractor line in the form of the B650 and B250 models, and it will continue with electric power for the B80, B950 and B350 pushback.

Meanwhile, "With its fully electric LEKTRO models, LEKTRO led the industry when it joined JBT [in 2019] and will continue to lead with new value-engineered units that are upgraded to the latest electrical power technologies," the JBT team declare.

"We continue to enhance our LEKTRO products," they continue. "New electrical drive systems are being explored. Battery technology continues to improve, giving JBT the ability to fill different needs for our customers. Our equipment is designed to the client's needs and that includes how big and powerful the battery pack is."

Sustainability and environmental performance are key concerns for its customers and JBT is reacting to that. "Our value engineering process and alternate power solutions will continue to be in demand," Sachs, Tanner and Woodward say. "Sustainability is the future, and JBT AeroTech is leading the way.

"JBT helps our customers succeed by giving them solutions to make better use of the world's precious resources. Zero-emissions equipment like LEKTRO and continuing to engineer solutions that are moving our world toward a more sustainable tomorrow are our expectations."

Customer concerns

The initial phases of the pandemic certainly caused a downturn in the aviation sector, and it was painful for all of us, the JBT team admits. "However,

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we have seen strong rebounds in cargo, commercial and business aviation. We do not see a long-term purchasing shift by the market for new equipment. What we do see are customers being more concerned about supply chain, sourcing, spare parts inventory and product support."

Indeed, with cargo operations ramping up during the pandemic and the recent return of passenger traffic, JBT AeroTech tractors and LEKTRO's towbarless, all-electric positioners continue to win strong demand, JBT says. Both commercial aviation and the cargo sector have shown significant recovery and this is being seen in orders for JBT products. "This, coupled with our commitment to providing sustainable GSE solutions, has resulted in a strong recovery for our global operations," say Sachs, Tanner and Woodward.

However, the supply chain problems that so many GSE manufacturers are suffering from have had an impact. "We have found that communication with our customers has never been more important than right now during these current fluctuations," they add.

"But our focus on the customer and the overall commitment by the JBT AeroTech team has allowed us to work with our customers to effectively meet their needs. Our reputation as a solution-provider offering world-class support has provided lasting customer relationships.

"Longstanding customer relationships and multiple product options have been key in maintaining meaningful dialogue with our customers and they with us. We want to align needs, expectations and performance for the complete satisfaction of our customers."

Green Endurance

Another of the big players in the tugs and tractors market launched a new product last year. And, like JBT and TREPEL, it is looking to a greener future for GSE.

Textron GSE, which offers a range of baggage and cargo tractors, conventional and towbarless pushbacks, as well as belt loaders, de-icers and air starts, launched the all-electric lithium-powered TUG Endurance™ baggage tractor at the GSE Expo in Paris in autumn/fall last year and has plans to release an all-electric cargo tractor.

Its TUG 1™ is available with a lithium-powered electric drive train, and the company confirms that it is committed to electrifying additional products in its range to provide more sustainable options for its customers.

"Textron GSE is committed to sustainability, offering customers a choice of electric, diesel and gas powertrains in several models," Matt Chaffin, Textron GSE's vice president and general manager, affirms. "With many customers sharing that commitment to sustainability, there is a clear path to electrification, with strong demand for electric equipment in North America, Europe, Asia and the Middle East.

"At present, the TUG Endurance baggage tractor, TUG 660 belt loader and the TUG 1 narrowbody pushback are all available with lithium drivetrains, with more to join the electric line-up in the near future."

In addition to new electric equipment, Textron GSE is developing a solution for customers looking to repower their internal combustion engine tractors and belt loaders with more efficient lithium powertrains.

Plus, in its efforts to work with customers to provide purpose-built equipment for their operations, Textron GSE is actively working to offer more electric GSE solutions to the market. The company aims to have 80% of its range available with electric or hybrid drivetrains by 2035.

Meanwhile, across the portfolio: "Textron GSE is experiencing high demand for its products," says Chaffin. "The increased number of flights and desire for air travel indicates that demand for GSE products will remain strong," he adds positively.

In response to the pandemic and subsequent fallout in the aviation industry, Textron GSE took steps to secure the business in anticipation of its recovery. This recovery came quickly in North America's domestic market, but there was a slight lag in Europe and the Middle East.

Airline and GSE activity has since resumed in all three regions, Chaffin

Textron's lithium battery-powered TUG Endurance

observes. "As air travel has continued to recover, Textron GSE saw an increase in demand for new equipment, with aged equipment having been scrapped during the pandemic. Now, the industry is facing supply chain constraints which result in extended lead times that customers must consider when planning for replacements."

Finally, "Although like many other OEMs [original equipment manufacturers] in the ground support industry, supply chain constraints have impacted Textron GSE's operations, the company is actively working with suppliers to mitigate these challenges and continues to communicate with customers to ensure they can plan their equipment purchases accordingly."

Mototok: electric and remote-controlled tugs

Other tug and tractor suppliers specialise entirely in electric units. Thilo Wiers-Keiser, head of sales & marketing at Mototok, the Krefeld, Germany-headquartered supplier of electric and remote-controlled tugs, says that this last year – one without Covid restrictions – has been very successful for the company. "We have seen very good business with our MRO [maintenance, repair and overhaul] and military customers. For ground handling we see great potential in the next years, especially with our new Spacer 8600 NG.

"Electric movement of aircraft is the trend for the future," he continues. "Intelligent concepts are needed to make electric pushbacks possible."

Likewise, Wiers-Keiser anticipates growing demand for remote-controlled tugs, not least because they enable safer operations and are easier to operate.

Mototok's new-generation Spacer 8600 machine has a lot of "smart improvements", he notes. "For example, the onboard towbar can be used to move the machine easily with any tractor from

The Goldhofer SHERPA E

point A to B. The machine becomes more maintenance-free than before." Plus, customers can choose between using an onboard-charger or an external one.

Bliss-Fox Panus GSE

Neil Bennett, senior sales and marketing manager at Chonburi, Thailand-headquartered Bliss-Fox Panus GSE, agrees that electrification is the largest point of discussion for customers and potential customers today. "Our plans focus on these products going forward," he confirms.

Bliss-Fox Panus GSE's primary and most popular line-up of tugs includes its Fox 4, 8 and 16 D and E (diesel and electric) product lines. "We do sell other models of course but these remain our most popular," he informs.

As with other tug and tractor suppliers, Bliss-Fox Panus GSE's business is enjoying a significant recovery in demand in the GSE market since the worst of the Covid-19 crisis, and it is looking to ramp up production capacity as required. "Post-Covid, expansion is being cautiously reviewed on a weekly basis for continued growth opportunities," Bennett notes.

Infrastructure availability remains a bottleneck, especially in terms of the battery-powered products on which Bliss-Fox Panus GSE is looking to concentrate its efforts. However, progress is being made. Last year, Bliss-Fox Panus GSE sold a Fox 16E to Indian airport operator GMR. "Our standard Fox 16D chassis has provided a great platform to introduce the Fox 16E," Bennett declares. "Some minor adjustments have been made [to the unit] and operator training has been successfully completed."

Panus Bliss-Fox GSE has plans for developing further models but cannot disclose them at this time, he says, adding: "There are exciting times ahead."

Pent-up demand

Stavros Hatziioannou, vice president of sales & service of Memmingen, Germany-based Goldhofer Airport Technology, explains that the tug and tractor manufacturer is seeing demand now back at the level of the pre-pandemic period. Moreover, "A certain increased pent-up demand compared to the pandemic period is currently noticeable."

However, he adds: "The extent to which this current demand situation proves to be stable must be verified through constant market observation."

Goldhofer has launched a project to consolidate and expand its market position in the towbarless tractor market. Meanwhile, the demand for electric variants of its various tractors, its SHERPA E and PHOENIX E units, is steadily increasing. "This is especially true in regions and for customers where the electric infrastructure is already sufficiently developed or where emission regulations or legal framework conditions prescribe this," Hatziioannou observes. "The demand trend for the 'greener models' will become stronger and more sustainable in the future."

He continues: "The existing electrified vehicle series of SHERPA, BISON and PHOENIX are currently undergoing a permanent model update, as further developments are taking place in the field of electromobility components.

"These further developments must be sensibly implemented in the existing vehicle landscape. In this context, the possibilities of the available charging options are constantly being expanded: for example, the possibility of a gate charger. The integration of an eGPU [electric ground power unit] is also part of the current development programme."

Battery technology for GSE is changing all the time, notes Hatziioannou. "In particular, the topic of increased performance or improved power density in the area of battery technology is currently being pushed by manufacturers. But this also results in price increases due to the current situation of the global raw materials market."

For Goldhofer, unlike for some manufacturers, however: "The difficulties and problems which arose in the area of the procurement market have been solved for the most part, such that the existing needs of our customers can still be fulfilled to a large extent."

While it will be a challenge for companies such as to maintain supply chains at this level in the future, "At present, we are in a period in which demand from the aviation industry is being met," Hatziioannou concludes. ■

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The Aurrigo Auto-Dolly at Singapore Changi Airport's Terminal 2, with a Singapore Airlines A380 in the background

Autonomous GSE: is it the future?

Airport operators are looking to support their human workforces with autonomous vehicles that can operate safely in an airside environment. Many believe these vehicles could offer significant efficiency gains as well as cost savings

One of the specialists in autonomous GSE is Coventry, UK-headquartered Aurrigo. Its background is in the automotive sector, an industry in which it remains active, but it established an aviation technology division in 2019 to design and develop a range of on-airport autonomous vehicles, and it now offers a suite of products that include its battery-powered autonomous Auto-Dolly and Auto-DollyTug as well as its Auto-Sim airport simulation software.

Aurrigo's prototype Auto-Dolly baggage transport vehicle underwent intensive testing as a proof of concept at London Heathrow International Airport's Terminal 5 in 2019. Perhaps partly off the back of that, it also subsequently attracted the attention of Changi Airport Group (CAG), operator of Singapore Changi Airport, a Southeast Asian hub gateway and perhaps one of the world's most technologically savvy airports.

Miles Garner, Aurrigo's sales and marketing director, recalls that CAG and Aurrigo agreed two pieces of work – testing on the latter's autonomous baggage unit at Changi and also exploitation of its Auto-Sim simulation tool to analyse possible layouts of the gateway's planned Terminal 5, which is expected to be operational by the mid-2030s.

Phase 1 of the trials of the Auto-Dolly at Changi saw the battery-powered baggage transporter carry a ULD from the baggage

conveyor area and move autonomously along Changi airside roadways.

Also forming part of the tests has been Aurrigo's Auto-DollyTug, which can not only carry a standard ULD, like the Auto-Dolly, but also tow three conventional dollies, each with their own ULD. It has the capacity to carry 1.5 tons and tow a further 7.5 tons.

Like its sister vehicle, the Auto-DollyTug is entirely electric and autonomous, though it could be manually operated if desired.

According to CAG, the recently completed Phase 1 trials "effectively demonstrated" the ability of the equipment to travel autonomously along airside roadways, as well as within the baggage handling area.

The potential of the Auto-Dolly and its sister unit, the Auto-DollyTug, is significant for an airport operator such as CAG, which is on the lookout for ways to support a labour force that was impacted by Covid and the drift of actual or potential employees away to other professions.

Changi's Terminal 5 Specialised Systems (T5SS) team is working closely with Aurrigo on these autonomous baggage tractor movement trials, choosing this particular airside operations task to concentrate upon because this function requires the highest number of airside drivers.

"Autonomous solutions also offer opportunities to improve baggage delivery efficiency, which in turn, enhances passenger service levels," CAG says.

The airport operator signed a multi-year agreement with Aurrigo (announced on 28 October 2022) for the next phase of development of the latter's Auto-Dolly at the gateway. Then in February this year it was confirmed that Aurrigo had agreed a multi-year partnership with CAG that "provides an opportunity for the further development of Aurrigo's autonomous solutions at Changi Airport". It also allows Aurrigo to demonstrate and showcase the technology to other airports and stakeholders.

Aurrigo currently maintains a team of eight at Singapore Changi, primarily local engineers and hardware or software developers.

The autonomous baggage tractor trials at Changi are being partially funded by the Civil Aviation Authority of Singapore (CAAS) through its Aviation Development Fund (ADF), which supports initiatives to improve productivity in Singapore's aviation sector through the use of innovative solutions.

Phase 2

Following the successful conclusion of Phase 1 testing and the signing of the multi-year partnership agreement earlier this year, Changi's Terminal 2 is now hosting Phase 2 trials that take in a greater level of complexity; the vehicle is being deployed up to a simulated aircraft

An autonomous baggage tractor was tested at Frankfurt Airport earlier this year

stand and an actual decommissioned aircraft located in a secluded airside area.

Benefiting from its small footprint and tight turning radius, the Auto-Dolly can manoeuvre itself closely and precisely next to an aircraft. And because it can transfer a ULD directly to and from a loader, the normal process of intermediate transfer of a ULD using a transporter can be eliminated. Changi is the first airport in the world to test the Aurrigo equipment's ability to perform autonomous loading and unloading of ULDs at an aircraft stand.

As a safeguard during the trials, a safety operator is currently being deployed on both the Auto-Dolly and Auto-DollyTug at all times, in the event that manual control needs to be restored at any time. The next step is to trial the Auto-Dolly and Auto-DollyTug without a safety operator involved.

According to CAG: "Observations and data from the trials will help Changi to refine and sharpen the concept of operations in the push towards the airport's vision of the future, where a combination of multi-skilled airside workers will be augmented by different types of autonomous vehicles to deliver seamless operations."

Electric and autonomous

While CAG has been keen to stress the value of autonomous GSE in an aviation sector that is currently hampered by labour shortages, Garner also points to the value of Aurrigo's aviation vehicles all being battery-powered.

In a world where the issue of sustainability has become so much more important, those airport operators and ground service providers looking to switch from diesel to electric might also be attracted to the Aurrigo portfolio of products.

Meanwhile, Garner suggests that the growing appeal of autonomous GSE was further boosted by the Covid crisis, which not only highlighted the value of autonomy when labour is scarce but also created a situation that required all the players in the aviation industry to carefully examine their bottom line and secure all possible cost-saving efficiencies.

Fraport looks at autonomous baggage tractor potential

CAG and London Heathrow are by no means the only air gateways looking at the potential for moving baggage across their facilities by autonomous tractor. Earlier this year, Germany-heaquartered airport operator Fraport trialled an autonomous baggage and cargo tractor at its flagship hub of Frankfurt Airport.

The electric vehicle operated along an 8.2km route within the gateway's secure airside environment. The aim of the testing was to determine whether – and under what conditions – such an autonomous vehicle might support regular baggage and cargo operations on the apron.

The test route started in the eastern section of Frankfurt Airport's apron in the baggage handling facility at Terminal 2, before the autonomous vehicle headed south towards what will be the gateway's future Terminal 3.

According to Fraport, the three different segments of the test route each presented particular challenges, including operating inside the baggage handling facility amongst other traffic and people, as well as in the open where there are few other vehicles.

To ensure results reflected genuine airside operating conditions, the test drives took place both during the day and at night, and in different types of weather.

The vehicle operated at a maximum speed of 13km/h and towed up to three baggage trailers or two large cargo trailers. A safety driver was present at each test drive, able to intervene if required.

Eric Agthe, project manager for process and product development at Fraport, comments: "Autonomous vehicles are a very promising future option for us as an airport operator." He notes that, while Fraport had previously trialled self-driving vehicles, deployment on the apron on such a long route represented something completely new.

"The fact that we are tackling these kinds of innovative projects, despite the challenging operating conditions, once again emphasises our role as a future-focused company," he remarks.

A Fraport spokesperson tells *Airside* that the tests started in February this year and lasted until the end of March. With the trials studying "the operational

use-case for baggage transport between terminals", the specific result that Fraport was looking to confirm was the achievement of "a safe, secure, reliable operation within normal traffic conditions (ie, mixed traffic) within the safety area of Frankfurt Airport at all times", Fraport says. In addition, the airport operator wanted to assess battery power usage and see whether such units' "operational integration into current processes" could be easily achieved.

The tractor involved was the Autonom Tract-135 from Charlatte Autonom, the latter having been established in October 2018 as a partnership between Navya, which specialises in the supply of autonomous driving systems, and Charlatte Manutention, one of the world's leading manufacturers of electric and thermal industrial and airport vehicles. The intention was to develop self-driving tractor solutions for industrial sites and airports.

At Frankfurt, the Tract-135 used a global navigation satellite system (GNSS), light detection and ranging (LIDAR) and 3G/4G data communication to navigate on a pre-programmed map of the test track, moving through several stations along the route.

There was no other party involved in the trials, the project being undertaken under the supervision of the ground handling department of Fraport.

The results of the testing are now being assessed by the airport operator. Fraport is also considering what other forms of GSE might be suitable for autonomous operation in an airport environment, and is of the opinion that autonomous vehicles could provide significant support in daily ground handling operations.

Dennis Stein, vice president division development, logistics, and IT, says: "For Fraport, this project is of high importance because of its potential to facilitate more efficient deployment of staff in the future.

"Due to the size of the airport apron, our employees often have to cover long distances. If parts of these routes could be operated using autonomous vehicles, this would give the Ground Services teams more flexibility to handle flights even more efficiently."

> ***Autonomous vehicles are a very promising future option for us as an airport operator***
>
> ***Eric Agthe,***
> *Fraport*

WFS tests AGV at Barcelona

Elsewhere, Worldwide Flight Services

(WFS) – the world's biggest cargo handler – is currently engaged in proof-of-concept trials for an autonomous vehicle moving cargo between its warehouse and the apron at Josep Tarradellas Barcelona-El Prat Airport in Barcelona, Spain.

The tests form part of a wider programme of collaboration concerning innovation between WFS and Aena, Spain's national airport operator, which is responsible for 46 airports and two heliports across the country.

The project is said to be aligned with the first automated ground vehicle (AGV) guidelines being developed by IATA's Ground Operations Automation and Digitization working group (GAD), which WFS has also been participating in.

WFS and Aena are joined in the 10-week trial by other three partners: GSE supplier FASEREK; intralogistics solutions provider MOVVO; and SIMAI, a specialist producer of tow tractors.

The proof-of-concept trial in Barcelona is monitoring the vehicle's ability to drive smoothly at a constant speed, as well as safety, flexible routing, monitoring and the traceability of the AGV operation. The tow tractor is able to recognise its environment, position itself accurately, detect obstacles and act to allow traffic to pass and to avoid collisions. WFS provided telemetry and the geolocation technology was supplied by XOPS.

The first phase of the Barcelona trial involves cargo transport operations between the WFS cargo terminal and Terminal 1 using a ramp tractor equipped with AGV technology along a planned, point-to-point route of 2,300m.

The trials are scheduled to continue until mid-May.

Says Jordi Campderrós, PMO manager at WFS: "AGV technology is already well-established in other industries. One of our partners, MOVVO, already has different autonomous fleets running, mostly in the automotive industry in Barcelona. Through our test project, WFS will learn about the viability of automated vehicles in a busy airport tarmac environment to help us understand any limitations or challenges we will need to overcome before any future deployment of this technology at airports around the world.

WFS has tested an automated guided vehicle for cargo transport at Spain's Barcelona Airport

"We have selected Barcelona for this trial because of the progressive approach of Aena to automation and sustainability, and because the perimetral tarmac road linking WFS's premises and Terminal 1 provides an ideal environment to conduct this assessment.

"Given that WFS handles cargo on board more than 25,000 import and export flights a year at Barcelona, and more than 42,000 flights in Madrid, the future benefits of AGV technology are obvious in terms of productivity gains, safety, and sustainability, and this can ultimately be replicated at airports across the globe."

Plus, WFS expects to a pilot AGV programme in its cargo warehouse in Barcelona.

Schiphol trials automated buses on the apron

Royal Schiphol Group, operator of Amsterdam Schiphol Airport, future-looking experts nlmtd and transformation and innovation consultancy TNW Programs are this spring collaborating on the trial of self-driving buses at the Dutch capital's gateway as the first phase of co-operation into further smart and autonomous technology use at Schiphol.

According to Jan Zekveld, head of innovation at Royal Schiphol Group, nlmtd and TNW have extensive in-house expertise and a large, global network of start-ups and innovation partners that Schiphol can draw upon.

Zekveld observes: "We need innovation to achieve our ambition: to become the world's most sustainable airport. We anticipate that daily operations on Schiphol's apron will have changed significantly by 2050. Ground-based activities such as baggage transport, passenger transport and aircraft towing will not only be clean, but also smart and autonomous. We have already taken the first steps in this field with TNW and nlmtd."

Pieter Paul van Oerle, founder of nlmtd partner Ecosystem Orchestration, remarks: "Self-driving buses are a first project we are collaborating on, and after that we will quickly pick up the pace by consistently connecting Schiphol with the best possible partners."

And Arno Nijhof, director of TNW programs, adds: "Where many companies scale back their innovation efforts in difficult times, Schiphol sees innovation as a solution. We can't wait to find solutions in the market that enable autonomous transport or make work lighter for employees, and to collaborate with external innovators to improve air quality." ■

Happy 30th Birthday!

Earlier this year, Aurrigo celebrated its 30th year in business. Originally called RDM Group, the company was formed by brothers David and Graham Keene. "A lot has happened over the last three decades and we are very proud that we still call Coventry 'home', and we still employ some of the outstanding staff that helped us in the early days," declares David Keene, CEO of Aurrigo International.

"Initially, we were very much focused on automotive wiring harnesses and exploring the world of telematics, which led to our tracking technology being used in the 2012 Olympic Games in London – a sign of how we were about to have a major say on the future of transport."

He continues: "In 2015, the UK Automotive Council (on which I attended right from the inauguration 15 years ago) announced the first major investment into Connected and Automated Vehicles (CAV) and we saw this as the ideal opportunity to develop our first driverless vehicles in the form of two-seater pods.

"We built the drive-by-wire platform for the vehicles and tried to partner with an automated driving software stack provider, but this was not practical, so in 2018 we made the decision to bring everything in house to develop the software ourselves and Aurrigo was born."

The last five years have seen Aurrigo become an important player in the development of autonomous vehicles for first- and last-mile transport solutions and for on-airport baggage movement.

Its listing on the AIM, a sub-market of the London Stock Exchange, last year raised £8 million (US$9.8 million) to fund strategic expansion plans that have seen the workforce increase to 75 across the company's HQ in the UK and international offices in Australia, Canada, the US and Singapore. An ongoing recruitment drive is expected to attract more electronics and software engineers, manufacturing specialists and business development experts.

David Keene concludes: "30 years is a tremendous achievement and one we are marking with our staff, who have, and always will be, our biggest asset. It's great that we still have people working here that have been with us from the early days." ■

Three items of electric TLD GSE, including passenger stairs equipped with solar panels that can be seen at the rear

Sustainability and innovation

Yves Crespel, Alvest's group communication director and group talent director, explains how the multifaceted GSE group is playing its part in moving ramp operations towards a greener future – and it is innovating to do so

Do you see the move toward greater sustainability in GSE as one of the big trends that will dominate GSE supply in coming years/decades? Is that the sort of thing that your customers are telling you?

Yes, the move toward greater sustainability in GSE is likely to be a dominant trend in the coming years and decades. With increasing awareness of environmental issues, many industries are prioritising sustainability and seeking more eco-friendly alternatives.

As a result, the demand for sustainable GSE is undeniably growing. Hence our Leaner & Greener® approach to airport operations.

[Through a programme of continuous innovation and commitment to quality, TLD's mission is to help make aviation leaner – more efficient – and greener – more environmentally friendly.]

How is Alvest shaping the way it works and the products it offers with this in mind?

We are actively involved in setting international standards for an ethical and responsible aviation industry. To address these challenges, [Alvest Group company] TLD has pioneered electric GSE

for more than 20 years now and continues to innovate with electric drivelines associated with alternative power sources (batteries, hybrid, pluggable hybrid or fuel cells), allowing our customers to adapt their GSE to the infrastructure to which they have access.

How quickly are you moving away from diesel engines to all-electric battery or hybrid vehicles?

We announced during GSE Expo [in Paris last year] that we would stop producing GSE with internal combustion engines by 2025. This will be the case. All our GSE today is eGSE-ready and compatible.

Customers can choose electric today and adapt their power sources in the future, in a very flexible way, to remain adapted to their infrastructure and efficient on the ramp.

TLD electric passenger stairs

Is battery power, and even hybrid,

A fully electric TLD loader with the company's ipHS pluggable hybrid power pack technology

suitable for all GSE though? Even the bigger pushbacks or de-icers, for example?

Definitely yes! Today all of our equipment runs electric, including the largest pushbacks. The way we have conceived our iBS [intelligent battery system] allows our customers to run them over multiple units over time, from a very demanding unit, energy consumption-wise, to a less demanding one – from a TPX [towbarless aircraft tractor] to an NBL [belt loader].

[iBS is a modular battery unit, consisting of individual 80 VDC packs that can be combined like building blocks to create batteries with 22kWh increments (e.g. 44, 66, 88kWh or higher). iBS can be used on all TLD GSE electric product lines.]

Do you believe that hydrogen fuel cell technology will become a viable alternative to diesel GSE?

Yes, I believe that hydrogen fuel cell technology has the potential to become a viable alternative to internal combustion engines (ICE) for GSE. It offers zero emissions, quiet operation and high energy density, which makes it an attractive option for sustainable GSE.

The need for on-airport hydrogen sources is a debate to be had, however. There will eventually be a balance between cost efficiency and ease of use.

Do you think the Covid-19 pandemic and the shortage of manpower that many ramp operators felt when the industry began to recover, has given automation a boost? Are handlers and airport operators looking for ways to cut back on manpower (and associated costs) more than ever?

Growing autonomous operations is a critical pillar for leaner aviation. Not only it will bring efficiency and reduce costs for ground handlers, but it will also increase safety and reduce the human error factor.

How is Alvest/TLD supporting the move towards greater automation? Is ADAS an important step down this road, for instance?

Alvest/TLD is supporting the move towards greater automation by developing and implementing advanced driver assistance systems [ADAS] for GSE. ADAS is an important step towards greater automation as it enables GSE to operate more efficiently, reduces accidents, and enhances safety and productivity for operators. With real operations around the world, our TractEasy driverless tow tractor is the illustration of such a move.

We are also the only group to run level 4 autonomous pieces of GSE airside. ■

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Ramp and airfield training

Training ramp operators to be able to work safely and effectively in the busy, dangerous environment of the airport ramp is just as important as ever, and the big ground service providers are investing heavily in their training programmes

Steve Clark, dnata's head of global training, leads a team that was set up just a few years ago by the Dubai-headquartered aviation services provider to take on responsibility for network-wide training standards and delivery.

Previously, decisions on training requirements had been left to a greater extent in the hands of local stations, but dnata came to be recognise that it needed standardisation and consistency across all areas of its business across the world, including in the field of the training it offers and delivers at all its stations.

Clark and his team at dnata headquarters are there to drive training processes for all employees, to ensure that its operations teams are safe, effective and efficient. That is, after all, the point of training, he says. Of course, training will be adapted to take in local requirements or operational needs but, at its core, dnata's standard training programme is designed to ensure that a high quality of handling and aircraft turnaround performance will be the norm whatever the dnata station.

The basic dnata training programme for its ground handlers is centred on the business's own dnata Ground Operations Manual (dGOM), itself based on the

International Air Transport Association's Ground Operations Manual (IGOM). The programme sets high standards of competence in all aspects of aircraft turnarounds, training dnata ramp handlers according to standard operating procedures (SOPs) that are applicable right across its network.

The standard programme incorporates all the elements of ramp operations that any apron-based handler will require, including an introduction to aviation, safety and security, and so on. Task-related training is then provided depending on the role that an individual will be taking up within the business.

For those who will be working at some of dnata's smaller stations and who are likely to have to fulfil several handling roles, their follow-on training is likely to be more complex, and may well also include training specific to the local regulatory or operational environment. And there is a hugely diverse mix of

operating environments across the worldwide dnata station network, Clark points out.

All training is carried out at the local station level; there is no benefit in recalling trainees to Dubai, he continues. Supporting the vital practical training that is provided to everyone, eLearning

A dnata handler at work at Singapore Changi Airport

We want to be an industry leader in [ramp training], as in other areas

***Steve Clark,** dnata*

tools are also made available. These are produced in Dubai but are of course accessible globally.

New entrants to dnata continue with on-the-job training, partly as this is mandated in many instances by the requirements of such baselines as IATA's Airport Handling Manual (AHM) or Dangerous Goods Regulations (DGR) – perhaps every 36 months or so. But all dnata's training procedures are, in essence, always ongoing, says Clark – "maintaining operational competencies to ensure we give our [airline clients] what they want and what they need", as well as keeping dnata's staff safe.

For example, training teams periodically go out to stations across the network to observe how aircraft turnarounds are handled, while dnata leadership teams will also oversee turnarounds to ensure that SOPs are followed. Moreover, local team leaders are encouraged to report on what they see on a day-to-day basis and identify where competencies might be slipping.

When an individual ramp handler

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EFM offers pushback simulator option

As we have seen, handlers have many tools to offer training to their employees. For instance, German handler EFM, a subsidiary of the airline Deutsche Lufthansa and Munich Airport Company (FMG), has a tow tractor simulator on which it trains its employees.

EFM is responsible for all pushback and towing activity at Munich Airport and, in winter, it also handles all aircraft de-icing undertaken at the gateway. Its simulator was declared operational in January 2020 following five months of development in collaboration with ATCSim of Kaufbeuren, Bavaria.

ATCSim is a software company focused primarily on developing and building air traffic control simulators. This pushback sim was their first simulator of this kind, notes Christoph Titze, and was developed jointly by the two businesses.

Titze was, until March 2021, managing director of EFM, and played a leading role in driving the simulator project for the company. Now, he acts as a senior consultant to EFM.

The simulator has places for two trainees and one trainer. Each trainee position can be operated separately, so the simulator can train two students independently from each other.

Experience shows that EFM can train three or four students per month on the simulator, or about 50 students a year.

High demand for simulator time means that there is a need to speed up the training in order to increase the number of trainees per month. Moreover, EFM also offers lessons in the simulator for other handling companies or self-handling airlines.

Says Titze: "The goal was to reduce the training time by half, for example from four to six weeks in former days to two to three weeks [with the help of the simulator].

"In January 2020 we had the first two students undertake the first simulator training, and students only need eight days before they are ready for their first live pushback. This was the final proof of concept we had.

"The trainer decides when the student is ready for live operation. In live operation the trainee is still accompanied by a trainer, but with much less attention necessary as the trainee has had the chance to do up to 500 pushbacks in the sim. The student is much more familiar with the whole scene and physical challenges involving the aircraft and the vehicle."

With regard to the potential for offering an aircraft de-icing simulator, Titze is aware of the de-icing simulator that Vestergaard has and, he says, "It could be possible that EFM will also invest in this kind of simulator in the near future, but there are no actual plans for this yet." ■

returns to the apron after a time away – perhaps following maternity or paternity leave, for instance – they will be reassessed to ensure they are fit for operational work. If an individual is promoted to a more senior position, they will be provided with any additional training they will require in their new position.

Plus, says Clark, the aviation industry is – quite rightly – heavily regulated and monitored, and both internal and external audits (the latter carried out by customer carriers amongst others) also provide further data on operational performance in terms of adherence to SOPs that can be fed back into dnata training programmes and delivery schedules.

Ongoing improvement

Clark is keen to constantly improve what he and his team offer and provide on a daily basis. One way to do this is by leveraging the efficiencies that dnata adopted during the Covid crisis, he considers. Another is by benefiting from new technologies that are becoming available – such as virtual reality (VR) technology, which Clark believes can be used in a focused way to support the more traditional classroom- and ramp-based elements of training.

dnata has already run a pilot VR training exercise at one of its stations that demonstrated the potential value of the technology as part of a training delivery mix, Clark confirms.

Other technologies and systems, including artificial intelligence (AI), learning management systems and personalised training programmes, also represent potential opportunities for improving dnata's training provision, he adds.

"We want to be an industry leader in [ramp training], as in other areas," Clark concludes. "And there is an appetite for rapid improvement wherever possible across the aviation business," not least because of the effects – and learnings – that arose from the Covid crisis.

Global standards

Lukas Wopmann, program manager Swissport Academy at global handler

Swissport International AG, explains that Swissport maintains what it calls a Standard Training Program – "a company global standard that we are very proud of, as it serves all our colleagues working on the ramp around the world".

As for the training each individual handler receives, he says: "The technical training of our ramp colleagues is defined into job role, the functions within the role and the tasks required to complete the function safely and efficiently.

"Within each airport, the functions of the ramp colleague may vary, from our large hub operations where job roles are very dedicated to ensure safe, efficient and quality operations, to small locations where the role may have many functions within it to give flexibility.

"The key is, each task training has a specific training module and these can be combined at each location according to their operational needs to ensure the same high standard of safety, efficiency and quality are delivered by our colleagues whether working on the ramp in South Korea, Boston, Rome or Zurich – the same training is applied."

Indeed, each task has its own dedicated and maintained training module, available in many languages, but all exactly the same, and thereby driving standardisation within the organisation, Wopmann notes.

Follow-up training is available as needed, in part because a number of training topics are required under national law to be subject to refresher training. In other fields, mainly task-related training, a handler must ensure its ramp workers remain competent in the task. Swissport, among other organisations, has worked with industry trade bodies to modernise the way this is now performed, Wopmann informs. "It is possible to confirm competence by a recurrent assessment process which has rigour and structure," he says.

Handlers' training programmes must conform to certain requirements set by national authorities. Says Wopmann: "Of course where there is a pertinent national law, we ensure we comply with it to the fullest extent; for some topics not covered directly under national law, we apply our internal standards to ensure all colleagues are trained according to the industry guidance (specifically, IATA AHM1110).

"This harmonised global industry guidance serves to support a global standard for technical training across all our locations and helps our customer airlines to recognise that guidance is being met or exceeded, and so remove any additional cost on the airline to provide training when training has already taken place."

Finally, Wopmann adds: "All of our training is subject to annual review, and this includes changes in regulation, such as the IATA Live Animal Regulations 2023, and other relevant regulatory or legislative changes. We also take the opportunity to review any safety learnings and introduce these topics as part of our safety management system (SMS) process." ■

Supporting safe and efficient ramp operations

The International Air Transport Association (IATA) offers training to support safe and efficient operations for most sectors of the aviation industry. In the area of ground operations, its training covers a wide spectrum: starting with brief eLearning and self-study courses for new joiners and awareness level topics right up to highly technical and business management topics, like SMS [safety management system] Implementation, Station Management and Standard Ground Handling Agreements.

According to Dimitrios Sanos, senior product manager airport, fuel and ground operations training for IATA, "Our aim is to meet the training needs of all audiences. For new entrants, where higher throughput is needed, we offer eLearning and self-study courses (for example Aircraft Marshalling eLearning), as well as train-the-trainer options.

"Then, for higher level specialisation, there are specially designed courses that cover the needs of the future supervisors and leaders to effectively manage their ground operations units."

One of the features of all these courses is to help participants understand what the needs are of "the other side", Sanos continues, namely: the airport activities of airlines on one hand and the service providers on the other.

One of the current priorities of the industry is to attract and retain talent, he notes. And one of the roles of training programmes and training organisations is – or should be – to show new entrants a career path. "Obviously, training alone cannot support career development. A blend of training and experience can boost a career within the ground operations sector.

"Another area of focus for us is to ensure we maximise training knowledge retention. This is one of the main reasons that in 2018 we introduced virtual reality (VR) training modules. Our platform, RampVR, is a modern tool offered to instructors to let trainees test their knowledge and immediately apply what they have learned. VR has a unique advantage of being able to simulate the live airside environment, which can be difficult to access in reality."

Certifying competency is a great concept that is "not easy to implement", Sanos suggests. But he believes IATA has made very good steps towards that, starting with Dangerous Goods Regulations (DGR) training. Certainly, the completion of an IATA training course shows a satisfactory level of understanding of the topics, and the correct and consistent application of knowledge should be an integral part of the training programme, as well as the supervision and oversight of operations," he adds.

IATA training courses are based on internationally recognised standards – mainly its own Airport Handling Manual (AHM) and IATA Ground Operations Manual (IGOM). "Standardisation is key in aviation, so standardised training is what we offer to employees," Sanos informs.

"This ensures that they have transferable skills and that ground services providers are able to secure qualified manpower."

Of course, the big handlers with extensive operations in several countries have internal training programmes of their own to cover their needs but they very often complement their own training offering by selectively sending some employees to attend IATA training courses too. Or they might invite IATA to deliver in-house classes. "These are their preferred options to close knowledge gaps, ensuring that they receive compliant and up-to-date training," Sanos advises.

*IATA's **Dimitrios Sanos***

There are ongoing trends in ramp handling that are being reflected in changing course content. "For our industry, one of the very few positive side effects of the pandemic is that all of us became more flexible and resourceful," says Sanos. "In the training domain, we had to react fast, trying out several new methods to achieve the same targets.

"Live-virtual classes served the purpose during lockdowns and for some brief and less technical topics, they have become a more permanent option. Also, blending training methods gives more flexible options to trainees and more affordable training programmes to companies. For example, the use of quick eLearning courses before a classroom session can meet some needs, reducing the duration of the session." ■

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Training aviation professionals of today and tomorrow

The IGA Academy, an offshoot of Turkey's Istanbul Airport, offers a wide-ranging aviation-related training curriculum for current and future aviation professionals, including airport personnel such as ramp handlers, baggage handlers and cargo handlers

The IGA Academy aims to provide high-quality training and certification programmes to help current and future aviation professionals to develop the skills and knowledge they need to perform their jobs effectively.

Its training programmes are designed to meet the standards set by international aviation organisations, providing airside training to the airport's own staff and to other national and international students.

As well as classroom-based training, it also offers hands-on airside training on the ramp. Moreover, in addition to its standard courses, the Academy offers extra practical training opportunities in which students can put their theoretical knowledge into practice. This includes extended field tours and a complementary five-day on-the-job training course.

The learning methodologies of today's generation are more evidence-based, learner-centric, data-driven and technology-enabled, a spokesperson for the Academy tells *Airside*. "The most important value of our training programmes is to provide a unique experience that closes the gap between theory and practice."

The spokesperson continues: "We promise to teach using the latest technology and with evidence-based learning methodology. The 'practice makes perfect' saying is rusty. Perfect practice makes perfect. Therefore, what is vital is not the quantity but the quality of practice. This is what makes IGA unique."

The Academy also offers Secondee Programmes (employee exchange programmes) with other international airports.

Having been accredited as an Airports Council International (ACI) Training Center as well as a Regional Training Partner of the International Air Transport Association (IATA), the IGA Academy is also in the process of working towards TRAINAIR PLUS Programme (TPP) accreditation from the International Civil Aviation Organization (ICAO).

Basic training programmes offered by the Academy include: Airport Safety and Basic Operation Training; Training in Runway Safety and Runway Infringement Prevention; Apron Management and Apron Safety Training; Runway, Apron and Taxiway Control Training; Wild Animal and Bird Counter-Measure Training; Basic ARFF Training in Rescue and Firefighting; Training in Physical Characteristics of Runways, Aprons and Taxiways; and Operations in Adverse Weather Conditions Training, amongst many others. ■

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WheelTug signs up another customer

Low-cost carrier Vueling, part of the Anglo-Spanish airline group IAG, has signed a letter of intent for the acquisition of a large number of WheelTug units. When installed on an aircraft nose wheel, the innovative system can drive the aeroplane towards or away from a gate. The aeroplane continues to be manoeuvred from the aircraft flight deck

Using the power of the aircraft's own auxiliary power unit (APU), WheelTug drives the machine either on to or away from a stand, obviating the need for the aircraft's engines to run on power – they can remain on 'idle' – or for a separate pushback tug to be used at that point.

The aircraft's pilot or co-pilot controls the movement of the aircraft from the flight deck. A camera system called WheelTug Vision can be fitted as part of the WheelTug product to offer the aircrew all-round visibility from near ground level. This is thought to improve overall safety (for example, allowing the flight deck crew to confirm flap settings or cargo door closure), while also reducing the need for wing walkers at a time when ground handling staff levels are at a premium at numerous airports around the world.

The system is said to lower average total ground time, as well as reducing aircraft fuel burn, minimising engine and brake wear and significantly lowering

pushback costs. Total ground time is the time an aircraft spends on the ground, from wheels down to wheels up, including turnaround time at the gate. WheelTug shortens this period because the system significantly expedites pushback manoeuvring, eliminating the time needed for pushback tug disconnect, the removal of safety pins, the removal of communications equipment and the departure of the tug from the scene.

Without WheelTug, this all typically takes three to five minutes for each flight, not counting all the issues/problems that can occur and not counting the knock-on effect at adjacent gates where nowadays all traffic has to stop when an aircraft is pushed back by the tug and needs to start its engines (thus generating jet blast), in order to start taxiing forward.

Eliminating jet blast on congested apron areas is a significant benefit, and noise is significantly reduced too, while harmful emissions produced by aircraft engines during taxiing are also mitigated through the use of WhelTug.

The new agreement is provisionally for Vueling to take 150 WheelTug systems, confirms Jan Vana, director of WheelTug plc, though this number is subject to change. Such an acquisition would be very much in line with the Spanish airline's strategy of environmental responsibility, he observes, the WheelTug

'Operational robustness'

Franc Sanmartí, director of sustainability & government affairs at Vueling, confirms that, while WheelTug is still certifying the device, "We will help them to speed [this process] up as much as we can.

"There are no timelines yet [on delivery of WheelTug systems to the carrier] as it is a complex process that depends on many stakeholders and authorities but we will help WheelTug speed up the certification process so we can take advantage of its benefits as soon as possible."

Of the reasons for the decision to go with the innovative tug system, he says: "Our aim is to reduce emissions and noise, and increase operational robustness/ground operations predictability with WheelTug."

As for parent carrier IAG's role in that decision, "We work closely with IAG on all decisions," Sanmartí advises. ■

Vueling's ***Franc Sanmarti***

system allowing aircraft to taxi thanks to the power of an electric motor rather than through the use of an aeroplane's engines, as well as reducing reliance on traditional pushback tractors.

Indeed, Oliver Iffert, chief operations officer of Vueling, remarks: "Vueling's commitment to sustainability is resounding and, as part of IAG, we are committed to achieving net-zero CO_2 emissions by 2050.

"Partnerships such as this one with WheelTug are fully aligned with our work to optimise the efficiency of our operations and allow us to continue to move towards our objectives both in the short and long term."

The deal concerns more than just orders, however. In what is being described by both parties as a partnership, Vueling will also help WheelTug in its efforts to gain supplemental type certificates (STCs) for the system.

"Such airline support is very important for us," Vana notes. There is no specific timeline for the delivery of WheelTug systems to Vueling, which currently operates a fleet of 125 Airbus A319, A320, A320neo and A321 aircraft.

Vueling has become the first low-cost airline in Europe to formalise a partnership with WheelTug, although the latter does have LOIs already signed with LCCs in other regions such as Volaris of Mexico. Vana believes that WheelTug is ideal for LCC use, as it speeds up turnaround times as well as minimising emissions and noise and reducing costs.

Today, WheelTug has LOIs signed for equipping the aircraft of more than 25 airlines (the exact number is unknown because airline groups such as Hainan Airlines Group have placed LOIs on behalf of an unspecified number of carriers within their group).

The system is currently undergoing a feasibility study at Prague Airport in the Czech Republic, adding to a trial that took place (at a public demonstration) at Memphis Airport in the US in 2020 as well as a feasibility study that took place at Mumbai in India.

WheelTug plc is working with a sustainable taxiing taskforce led by global airport trade body Airports Council International (ACI) and EUROCONTROL, the pan-European organisation dedicated to supporting European aviation, Vana informs. As well as the 'onboard' WheelTug system, the taskforce is looking at the 'offboard' TaxiBot semi-robotic tractor (which is also pilot-controlled), developed by IAI with TLD (part of the Alvest Group) as alternatives to aircraft engine-powered taxiing.

Vana confirms that WheelTug hopes for the system to be 737NG type certified and available for operational use in the second half of next year, with other narrowbody aircraft type-certified variants to follow after that. ■

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Bussing it for ABM

Cara Buckland is relatively new to the airside bussing manager role at ABM Aviation, but is clearly settling in very quickly. She talks about her experiences in the position

When did you take on the new position and which role had you occupied previously?

I started the role in November 2022. Previously, I worked on the ground at the Covid test site at Gatwick Airport, before moving into a planning role in November 2021 and then transitioning into my current role.

Can you tell us what the responsibilities of this position are?

My responsibility is the day to day running of the bussing operation. This includes managing the co-ordination of the airside drivers and optimisation of the fleet of 14 buses and two minibuses.

Part of my role is ensuring prompt and efficient use of resources for passenger and crew transport and managing reporting for airlines and the airport. I also maintain and manage resource and fleet levels while supporting the daily ABM aircraft cleaning operation and daily auditing to ensure safe working.

How many people do you have on your team, and are they predominantly male?

There are 35 drivers and four allocators in the team. We have one woman in that team. I also work alongside another

bussing manager, who is male.

Pre-Covid, we were seeing more female applicants for the role of PCV [passenger carrying vehicle] driver. It would be nice to see more women joining us on the Gatwick bussing operation in the future.

Is it a challenge to work in a predominantly male environment?

I will admit that there was some apprehension about moving into such a male-dominated work environment. I wasn't sure if being a younger female might affect how I was accepted.

Although my apprehension is an example of how many women feel in the workplace, I was pleasantly surprised at how I was welcomed into the role. Everyone has been very helpful in assisting learning the role. It's great to see that the bias we know exists isn't something that inevitably plays out.

How has the role changed – if at all – as a result of Covid, would you say? Are customer expectations now different at all?

As aviation continues on its recovery journey, the entire aviation industry is focused on ensuring excellent passenger experience because, ultimately, we want them to come back.

We are expecting the summer period to be busier than ever and so it's all hands on deck to ensure we're ready.

How, long-term, do you think that airside bussing might change? How will ABM adapt and evolve as a result?

I think the airside operation will continue to grow as aviation gets busier following the pandemic.

Electric vehicles will absolutely be part of the future and will be a focus as we see the industry stabilise. ABM has been working on this change for some time – trialling electric buses has been under way across the business and we have already taken delivery of electric buses at Gatwick, as well as the first of two fully electric boarding vehicles for passengers with reduced mobility or injuries at our Manchester operation. ■

***Cara Buckland** is airside bussing manager at ABM Aviation*

A look ahead to GSE&RAMP-OPS Global 2023

This summer will see the GSE&RAMP-OPS Global 2023 conference and exhibition from Eva International Media, publisher of *Airside International*, take place in Seville. It will be this year's only show in Europe dedicated specifically to GSE, its buyers, operators and providers

Between 19 and 21 June, the annual conference that complements *Airside* magazine, GSE&RAMP-OPS Global, will be held in Seville, southern Spain.

The location will be the Barceló Sevilla Hotel in the centre of the capital and largest city of Spain's Andalusia province. The country's fourth-largest city, Seville is famous for its beauty, its culture and its history. It will make a fine location for what will be the first face-to-face GSE&RAMP-OPS Global 2023 event since the Covid crisis.

Industry leaders will come together for a co-located conference and exhibition that will provide an excellent opportunity for networking between suppliers, buyers and operators.

Those attending can meet with decision-makers in pre-arranged 1-2-1 meeting sessions, allowing for in-depth conversations and the opportunity to connect with industry peers. Plus, as informal networking is so vital, there will be both a welcoming reception and networking dinner during the event, to promote relaxed and personal connections.

The conference will cover trending industry topics, including: Preventing Aircraft Damage – Ramp Training – New Technologies and Innovations – eGSE targets – Airport Infrastructure – GSE Pooling – Autonomous GSE – Ramp Safety – Industry Standardisation – IATA IGOM Portal – Recruitment and Retaining Staff – Industry Success Stories.

Speakers will be specialists with a wealth of experience coming from a variety of industry groups including ground handling agents, GSE suppliers, airlines and airport operators.

The GSE&RAMP-OPS Global event will host at least 40 exhibiting ground support equipment suppliers, IT companies and the latest ramp innovators. Already booked to attend are GSE and system suppliers including:

ADAPT GSE
Aviaco GSE
Aviramp
Bombelli Airport Equipment
Charlatte Manutention
CIMC-Airmarrel
COBUS Industries
DENGE Airport Equipment
Dynell
EINSA
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Miles GSE
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Mototok
Power Stow
Rushlift GSE
Sinepower

Textron
Timsan
TIPS GSE
TREPEL Airport Equipment
Vestergaard
XOPS

As well as suppliers of airport equipment and services, important buyers will also be in attendance. For example: Robert Powell, vice-president technical services at dnata will be chairing the event; Paul Drever, general manager – GSE engineering and standards at Menzies Aviation will be speaking at the conference; Francisco Garcia, operations support manager at WFS Spain will also be speaking; and David Ucles of Iberia Airport Services and Arzu Buyukdurmus of Celebi Aviation have also confirmed they will be in Seville in June, representing some of the biggest GSE buyers in the industry.

Other confirmed speakers at the conference include: Noor Salman, head of environment and sustainability at dnata; Danny Vranckx, CEO of Aviaco GSE; Fabio Gamba, managing director of the Airport Services Association (ASA); Stuart Maddocks, co-founder and director of Calibrate Learning; Jaume Graells, general manager at MOVVO Robotics; Simon Zitcers, chief operating officer of Almaty Airport; Surafel Saketa, country manager Qatar for Ethiopian Airlines; Kjell Mathisen, corporate training manager at Aviator; Helmuth von Grolman, CEO of Colibri Energy; Thomas Weintraub, CEO of CAI ZHI; and Adrian Dunne, executive vice-president and chief operating officer at Norwegian.

*Norwegian's **Adrian Dunne***

This year's conference will again be moderated by experienced aviation professional Chris Notter.

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The Cotswold Airport B747 party plane

Still going strong

This March, Mike Cardy, owner and managing director of Airside Airport Equipment, turned 75. He might be one of the more mature experts in GSE, but he is still going strong

Cardy established the previous incarnation of Airside Airport Equipment, Airside GSE, back in 2003, and his experience in the field of GSE pre-dates that by decades – indeed, Cardy has been involved in ground support equipment in one way or another for some 55 years.

His training and background is in engineering, and he has worked in designing and building GSE both for himself and for other well-known suppliers over a long and busy career.

Today, Airside Airport Equipment supplies a huge range of new and refurbished GSE, including water and toilet service units, towbars and passenger stairs to name a few, for sale or rental.

It also offers new airside ramp equipment such as shear and bypass pins, wheel chocks, marshalling wands, cones, passenger inward guidance systems (PIGS) and runway barriers that can be modified to meet customer requirements – including having the name of a customer branded on the equipment. All these items are of high-specification British manufacturing standard, Cardy notes, and orders can be for hundreds at a time.

Plus, Airside Airport Equipment acts as the UK sales representative for JMS, doing a lot of business for the German GSE provider, and also markets and offers refurbished bigger lines of GSE such as de-icers, buses and tractors on behalf of a UK-based partner.

Cardy and his team even supplied equipment such as a combined air-conditioning/heating unit and two sets of passenger stairs for the decommissioned B747 based at the UK's Cotswold Airport that is hired out for private events. They

have also been involved with providing retro-design stairs for the VC10 aircraft at Brooklands in Surrey, in the UK; an electro-hydraulic belt loader for the new Global 7500 executive jet owned by JCB; a range of runway barriers for airports; bespoke passenger stairs destined for the Falklands; electric self-propelled water and toilet units for executive aircraft; an electro-hydraulic towable ambulift destined for Sharjah; and equipment for various film shoots.

Plus, Airside Airport Equipment designed a towbar for a Sunseeker boatyard to move 50-ton luxury yachts.

Business for the Farnborough Airport, Hampshire, UK-based Airside Airport Equipment was hit hard by the Covid-19 pandemic, but demand has picked up since the worst of the crisis. Orders for towable water and toilet service units from customers including BAE Systems and even as far afield as Africa have kept the company busy, Cardy informs. Now,

Cardy and his team supplied stairs for the VC-10 at Brooklands in the UK

"It's always busy," he says, and indeed such has been the upturn in demand that he is currently looking for new staff, notably an experienced fitter/engineer for his workshop in Farnborough.

The factory is located close to the company's office at Farnborough Airport. There is plenty of development under way at the busy business/executive aviation airport (most famous for the hectic biennial Farnborough International Airshow), including the building of a large new hangar and new aircraft parking area. It's a nice place to work, and a great place to meet people in the aviation business, Cardy says. ■

A TowFLEXX TF5 handles a Bombardier Global 6000 – with just a single operator

Electric, remote-controlled tugs offer an alternative

Visbek, Germany-headquartered TowFLEXX offers a different sort of option for moving aircraft on an airfield ramp or within aircraft hangars. Its small, electric tow tractors are ideal for manoeuvring smaller aircraft of up to 86 tonnes in confined areas, but the company is also now looking to offer tugs for bigger aircraft that would include commercial narrowbody jets

TowFLEXX is not a new company. It has been operating for more than 20 years and has an interesting history. It was established by Hanns Schickling, who set up the company to operate under the brand SchleppMAXXE; this was changed to TowFLEXX in 2017 to appeal to a more international market, explains current chief operating officer Steffen Hake. TowFLEXX's current CEO is Hanns' son, Axel, who took over the reins in 2018.

Hanns Schickling was already in business – in the furniture business in fact, and one of his products was a patented desk that moved up and down by means of an electric motor. He also happened to have his own aircraft, and he wanted an alternative to manual pushbacks of the aeroplane. He saw the possibility of electric machines that would move his aircraft without any anyone needing to break sweat, and the idea for what would become TowFLEXX and its electric tow tractors was born.

The first such unit was manufactured some two decades ago, as today in Visbek, and was designed for moving small, piston-powered aeroplanes, but the portfolio and the machines' capability have developed significantly since. TowFLEXX's tug variants – apart from the original ones all are towbarless – can today handle a wide range of aircraft, ranging from small aircraft and turboprops right up to 86-tonne business/cargo jets.

A 360° turntable manoeuvring capability offers a unique option for turning an aircraft on the spot that is ideal for those operating in confined areas looking to avoid any possibility of 'hangar rash' (damage-causing collisions).

All TowFLEXX's tow tractors are fully electric, without any hydraulic mechanism. This keeps maintenance requirements down and avoids fluid leakages, Hake points out.

The larger units are remote-controlled, a development that dates back to about 2010, when the company designed its first such unit for the Swiss military.

The TowFLEXX HD190 can pull aircraft the size of a Hercules, such as this C130H of the US Air Force

A US subsidiary operating out of Pennsylvania was established about eight years ago and the family furniture business even still exists, though as an entirely separate entity.

Demonstrating capability

TowFLEXX demonstrated its TF5

A TowFLEXX TF4 manoeuvres a Hawker Beechjet 400A

tow tractor at the recent *inter airport* Southeast Asia (IASEA) international exhibition alongside its regional distributor, Sanxing Pte Ltd. Representatives of the company received some good, useful feedback on the model, says Hake, as well as meeting with potential new buyers. Indeed, "It was a great success to be there in person," he declares.

The TF5 can tow aircraft of up to 60 tonnes maximum take-off weight (MTOW), its smaller TF1, 2, 3 and 4 models being able to handle smaller aircraft of 2, 4, 9 and 14 tonnes MTOW respectively.

But TowFLEXX has big plans to handle bigger aircraft. It recently developed the HD190 model specifically for the US Air Force, which wanted it to tow C130 Hercules aircraft. Moreover, because the HD190 can be palletised and carried on board a C130, the unit is eminently suitable for out-of-area, remote deployments.

Crucially, TowFLEXX is working on a slightly bigger version of the HD190 that will be applicable to the civilian market and for handling narrowbody commercial jets. This would significantly expand the company's target market away from military users and from civilian fixed-base operators (FBOs), maintenance, repair and overhaul (MROs) companies and corporate flight departments to commercial airlines and handlers/ground service providers (GSPs).

Going electric

Demand for electric tow tractors is increasing quickly and Hake sees no reason why this trend won't continue in the future.

"Environmental sustainability is now so key, in this industry as in so many others," he says. "We want to contribute with sustainable machines for a greener future."

TowFLEXX has heard from both current and potential customers of the significance they attach to environmentally friendly GSE, not least in meetings with individuals at the IASEA event in Singapore earlier this year.

On the subject of sustainability, TowFLEXX now also offers a solar-charging option for its electric tugs. A box fitted with solar panels can provide recharge capability for its tow tractors right on the ramp while being utilised as a garage.

Meanwhile, there is also growing interest in the value of remote-controlled tugs, Hake continues. These can significantly reduce manpower requirements, he advises, pointing by way of example to a customer who used to require between eight and 10 people to move military F-16 fighters into and out of a hangar, while the use of a remote-controlled tug has reduced the necessary manpower to just three.

Remote operation of a tug also enables the operator to stand back from the tow operation and ensure that there is minimal possibility of collision between an aircraft and ground equipment or infrastructure.

Remote-controlled tow operations can be supported by the capability that TowFLEXX has developed in collaboration with Hamburg, Germany-based Evitado Technologies, a specialist in 3D LIDAR (light detection and ranging) technology. With a virtual map of an operating environment such as a hangar programmed into the memory of a TowFLEXX tug, such a unit equipped with LIDAR capability can automatically slow and then stop when the possibility of a collision with a ground obstacle arises.

LIDAR cameras have already been fitted to a TowFLEXX TF5 to demonstrate the feasibility and value of the system.

TowFLEXX has been working with Evitado on this capability for two years now, and the former is in discussions with customers about the value of the technology. It represents an initial but important step on the road towards autonomous GSE operations, Hake argues. ■

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Charlatte T135 battery-powered tractor

ABC offers own-brand electric GSE

Paris-based GSE specialist Air Business Corporation (ABC) is spreading its wings and looking to become a one-stop shop for GSE operators' needs

ABC is headquartered at Paris Roissy Charles de Gaulle International Airport, from where over the last few years it has offered a range of GSE equipment and related services. Comprising four brands – ABC Ground Support Equipment (ABC GSE); ABC Air Business Consultants;

ABC Air Business College; and ABC Charter and VIP flights – it has provided education and training, consultancy, and VIP and charter flights, as well as buying, refurbishing and selling GSE.

But it is now beginning a new line: selling completely new GSE, while particularly specialising in battery-powered GSE. ABC president Hervé Gueusquin reveals that the company has partnered with a Chinese manufacturer of lithium batteries that will equip ABC's GSE to meet the ever-growing demand for more environmentally friendly ramp equipment.

The company will initially offer electric tractors and belt loaders, but will soon expand into other lines of electric GSE, Gueusquin confirms. ABC will continue to offer training and consultancy as required by its GSE customers, old and new, some of whom might need familiarisation training with battery-powered GSE.

While it has previously supplied electric equipment that it provided on a 're-sale basis' for its GSE manufacturer partners, this will be the first time the company is offering them to the market as ABC-branded equipment.

ABC will also offer a versatile range of financing options, including lease-to-own for either new or refurbished GSE it supplies, as well as an array of spare parts. As such, Gueusquin is confident that ABC will offer a full-spectrum range of GSE products and services. ■

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Intelligent management of on-airport de-icing

JCAI, Inc is a Canada-based specialist in digital infrastructure and systems intended for supporting airport de-icing facilities and processes. Its SmartPad and Icelink solutions combine the company's advanced visual communication systems with digital technology to offer a high level of visibility of the activities undertaken by those involved in an airport de-icing event

Jeff Campbell is the owner and president of JCAI, Inc (JCAII), which was first established by signage specialists about 15 years ago. He explains that the Cambridge, Ontario-based company's visual communication systems are intended to make an airport de-icing process not dissimilar to what might be experienced at an automatic car wash.

Sophisticated electronic message boards (EMBs, which can be fixed or mobile in design) and other signage offer pilots all the information they need, while state-of-the art lighting systems (some proprietary to JCAII, some not) guide the way.

Digital messages provide guidance to pilots as they enter a de-icing area or pad, while control

JCAII's de-icing management and reporting software products offer powerful capabilities

lighting automatically guides the crew to the correct position and simultaneously warns of any 'no-go' areas. This all facilitates precise aircraft positioning and removes the need for human marshalling.

JCAII's first foray into the airport market was at Toronto Pearson Airport and involved the deployment of its EMBs. Since then, it has significantly developed its range of EMBs and signs, but also moved into digital platforms that monitor and guide the whole de-icing process.

Its software solutions also offer a means to capture and allow subsequent analysis of the data recorded during that process – thereby providing a tool that can maximise future safety of aircraft de-icing at an airport.

Icelink and SmartPad

JCAII's Icelink web-based software links a de-icing operator's assets and airport operator, and potentially flight deck as well, to facilitate safe and efficient de-

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De-icing under way at Canada's Toronto Pearson Airport. JCAII's first foray into the airport market was at Toronto Pearson Airport and involved the deployment of its EMBs

icing processes. The purpose-built system "provides the speed and agility required to manage airport [de-icing] operations safely and efficiently", JCAII says.

As a web-based de-icing management system, Icelink Deicer and Truck modules enable de-icer ground service providers to link their ramp assets throughout the de-icing process in such a way as to optimise their performance. The system offers real-time status updates and electronic synchronisation of the trucks' work, accessed via web-connected devices like iPads or smartphones.

Icelink also offers a detailed reporting capability that enables on-the-ground users and managers to assess ongoing performance and see where the job might be done better. It collects data relating to a de-icing event that is not only available for future assessment, but can also be used by management to make changes 'on the fly' during a de-icing process.

The Icelink de-icing ground co-ordination system can be extended to an aircraft flight deck through the Icelink PILOT application, which can be made available via pilots' flight bags.

Calgary Airport in Canada is amongst those customers that have a suite of JCAII services, and it is currently trialling the new Icelink PILOT application.

Meanwhile, JCAII's SmartPad software is intended for those operating specialist aircraft de-icing pads. Complementing the EMBs and signage offered by JCAII, SmartPad offers an overview to the pad operator of what is occurring, and where, on a real-time basis. In essence, it offers a digitised operations centre for gate, stand and pad de-icing.

SmartPad can be integrated with customers' own systems, including tower control systems.

The software is in use at Memphis International Airport, home hub to FedEx and its huge fleet of freighters, and thus one of the biggest air cargo gateways in the world.

Meanwhile, both Icelink and SmartPad are in use at Chicago O'Hare International Airport in Illinois in the US. And in December, United Airlines inked a deal with JCAII that will see the carrier take up the cloud-based Icelink system for all its stations across the Continental US.

Icelink is to be integrated into United's business intelligence systems to provide real-time control and analysis capability. The carrier will have a system-wide view of all relevant de-icing operations, and builds on the successful O'Hare installation of Icelink and SmartPad, where United is among the carriers to benefit.

Other airports, including London Heathrow in the UK, Amsterdam Airport Schiphol in the Netherlands and Toronto Pearson in Canada also use JCAII systems to a greater or lesser extent.

Thus, for example, JCAII was contracted to provide both Icelink and SmartPad, including its latest generation of EMBs, for Schiphol in 2022. According to JCAII, "This investment by the airport is an evolution of the co-operation between Schiphol Airport and JCAII since 2011. Icelink and Icelink SmartPad represent a software and hardware upgrade after over a decade of success with JCAII's previous product generation."

And at Toronto, the Greater Toronto Airport Authority (GTAA) has awarded JCAII a contract to provide its latest EMBs at one of the world's largest centralised de-icing facilities. These EMBs can be fully integrated into Icelink and SmartPad as necessary.

As well as the airlines and airport operators, JCAII also targets the de-icers. Integrated Deicing Services (IDS), for example, active right across the US and into Canada, is a big customer.

Increasing demand

JCAII's de-icing management and reporting software products offer powerful capabilities that gateways and de-icing service providers looking at digitalisation as a way to achieve greater efficiency certainly ought to consider, Campbell believes.

Of course, the de-icing process is, by its very nature, seasonal, and so not always at the forefront of people's minds. But the development of Icelink and SmartPad offers airport authorities and de-icing operators the data to assess their own efficiencies and to see how their processes might be improved.

JCAII itself has modelled how much greater efficiency can be achieved through the use of its platforms. Having data to hand on throughput times, volumes of glycol used and full asset geolocation and status makes it much easier to see how much time might be saved during a de-icing process (itself of huge financial value in these days of such constricted airline operating schedules) and how much de-icing/anti-icing fluid saving could be saved in better managed and co-ordinated de-icing procedures.

Perhaps as a result, JCAII is growing quickly. From a workforce of around 10 people about 18 months ago, it now has a staff complement of about 35, many previously self-employed contractors who have been attracted to move in-house as well as new employees taken on from outside the business, many of them to work in research and development for the company. ■

Aviramp boarding bridges at La Reunion

Aviramp steps up

Telford, UK-based Aviramp, a specialist in manufacturing fully portable boarding ramps and bridges that can be used in place of conventional passenger steps and for ambulifts in many cases, is continuing to meet the growing demand for its innovative products

Aviramp's suite of boarding ramps takes in its Lite, Domestic, Regional, Continental and International models that together can service all aircraft types, including widebodies.

The company's global sales & marketing director, Terri Smart-Jewkes, says that Aviramp is currently scaling up its operations to prepare for "the next swathe of orders". Such orders would build on recent successes. Recently, Aviramp has delivered ramps into airports in the US, New Zealand and South Africa.

However, says Smart-Jewkes, "There is one order that really does stand out for us all, and resonates with everyone, particularly our CEO – it is the latest from Roland Garros Airport on Reunion island in the Indian Ocean."

Aviramp sold its very first product to La Reunion over 10 years ago, so this latest order is a significant milestone for the business.; another six units are scheduled for manufacture and delivery this year. They will be produced at Aviramp's Telford factory, just as the first ramp for Reunion was more than a decade ago.

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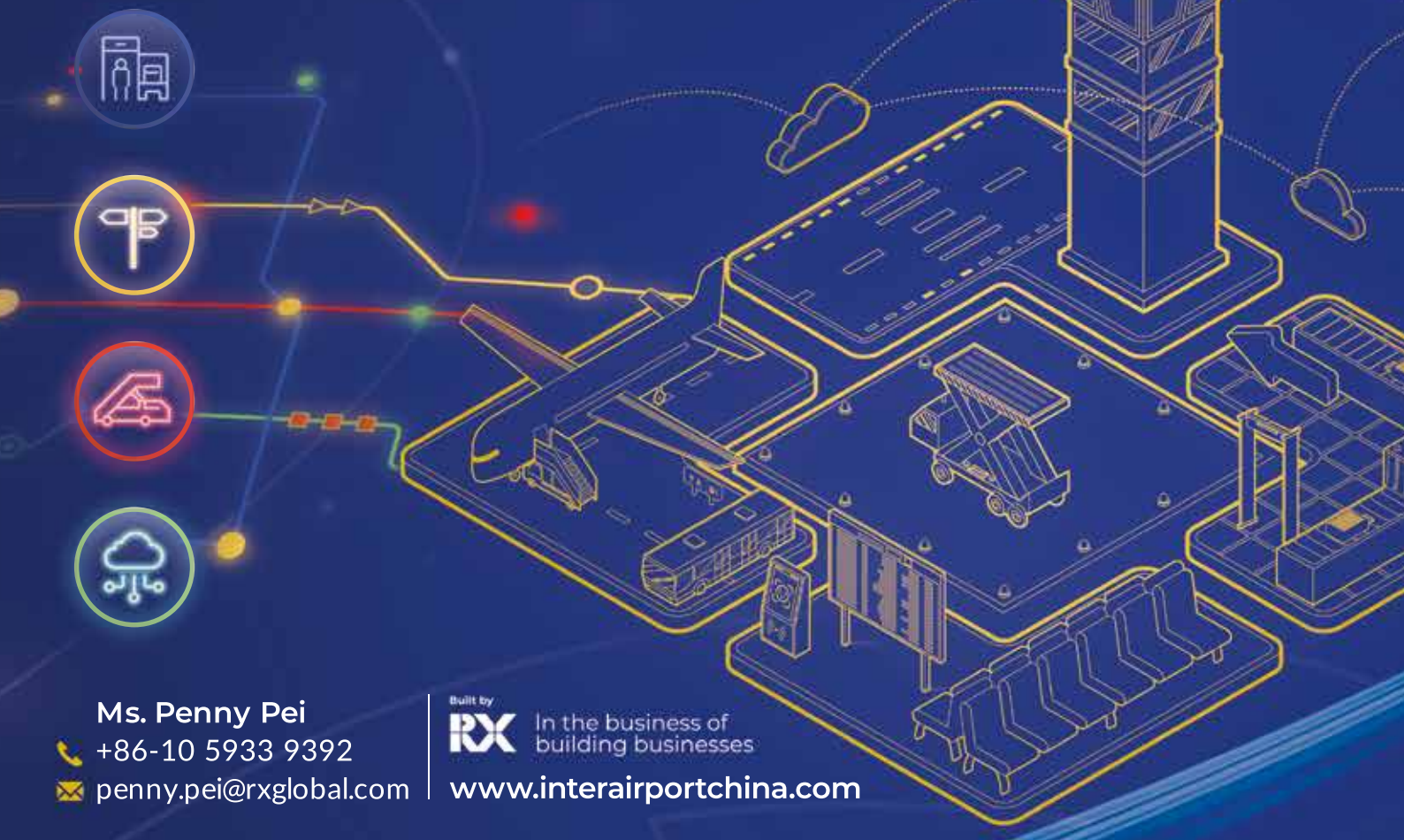

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This La Reunion order is a true testament to the product and its many benefits

***Terri Smart-Jewkes,** Aviramp*

This order will mean that Aviramp units will be operational at both airports on La Reunion island – Roland Garros and Saint-Pierre Pierrefonds.

The six units will comprise three solar-powered International models (one of which will be used as a static fixed terminal bridge, while the others will serve remote stands) along with two solar-powered Continentals and a manual Lite model.

"This La Reunion order is a true testament to the product and its many benefits," Smart-Jewkes declares. "An existing diesel Aviramp is still performing its duty for the airport 10 years after delivery, substantiating our claims that our boarding ramps and bridges are low-maintenance and remain in fantastic shape."

The solar-powered Aviramps will streamline operations further at La Reunion, while being environmentally friendly and sustainable, she continues, although: "Our range of motorised mobile passenger boarding ramps and bridges still delivers the same core benefits in diesel or solar [variants].

"They improve safety by eliminating falls from steps. They drive faster turnarounds, with a proven 30% faster deplaning process, as highlighted by independent trials at London Gatwick. This is why so many airlines have always remained a huge champion of our products, and a massive influencer with airport operators and ground support staff."

She adds: "What is more, our product range delivers significant cost savings, by reducing the need for ambulifts and invesment in expensive maintenance programmes – not to mention it being a one-person operation. Aviramp also offers a seamless, all-inclusive passenger experience for everyone, including greater dignity for passengers with reduced mobility (PRMs).

"Therefore, it really does give a massive return on so many different levels." ■

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