



# THE INSIDE STORY OF CAF IN THE UK

**How the Spanish manufacturer is transforming UK rail**



IN PARTNERSHIP WITH **RAIL**



Northern 195113 passes Hest Bank, south of Carnforth, on July 13 2019. At the time this train was commissioned, it was part of the largest European order CAF had ever won. ROBERT FRANCE.

## Welcome

CAF continues to go from strength to strength in the field of sustainable mobility and our presence at Newport is a significant strategic achievement for us, providing a foothold in the UK rail market and, just as importantly, providing us with an opportunity to develop and maintain a legacy for Wales. This will include the training and support of our people, the development of a local supply chain, and to be making a substantial contribution to the UK economy.

I am pleased to see just how quickly and efficiently the team have established world-class processes and commenced manufacture of key contracts for our valued customers. I look forward to the best practice established here being shared across the Group in a continued cycle of improvement. Newport has vast potential and it is my hope that we will build high speed trains here in the near future.

Our people are at our core, and I'm delighted that we have built a strong team in Newport and continue to grow our numbers. We are looking forward to building on our community engagement, and are proud of our promotion of equality, diversity and inclusion through our participation in groups such as Women in Rail.

I would like to thank each and every

member of the CAF team who has contributed to its huge success in recent years in the UK. They continue to make CAF proud and their efforts reinforce CAF's hugely significant decision to open the Newport factory.

We were honoured to welcome His Royal Highness the Prince of Wales to officially open our Newport factory recently and were proud to be able to showcase this facility.



**Andrés Arizkorreta García**  
Group Chief Executive and Chairman, CAF

### EDITORIAL

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# A LAND OF OPPORTUNITY

Back in 2015, when Construcciones y Auxiliar Ferrocarriles was bidding for several UK contracts, and making its presence in this country known, Richard Garner would regularly hear: "what has CAF done since Heathrow Express?"

Five years later, the answer is "quite a lot", and there is even more to come! He joined CAF from National Express East Coast where he was engineering director. Before that he worked for Metronet, one of two companies created to maintain the London Underground network.

At that time CAF's presence in the UK was limited to the Class 332s built for Heathrow Express at its Zaragoza factory in 1997-1998, with additional vehicles delivered in 2002. Additionally, Class 333s were delivered to Northern Spirit in 2001. These were almost identical to the '332s', but with a modified interior layout.

Around the time Garner joined, CAF delivered 27 seven-section trams for the Edinburgh Tram system. Much like those ordered for Midland Metro in later years, the

**CAF is poised to build and supply trains for any sector in the UK and, says Business Development Director RICHARD GARNER, the need for diesel power will be with us for some time to come...**



Scottish fleet is from the Urbos range. They were built at a time when the Edinburgh Trams project was in difficulty and facing the risk of cancellation, however CAF delivered to the required timescale and within budget. In Northern Ireland, you'll see plenty of CAF-built trains operating. The company was the last firm to deliver new diesel multiple units (DMUs) for the UK market, with 20 Class 4000 C4K's entering traffic with Northern Ireland Railways in 2011-2012. These 90mph three-car DMUs followed an order for 23 three-car DMUs (Class 3000s) that CAF

delivered in 2004-2005. Both fleets were delivered within a time period of two years following contract award.

The DMU aspect was crucial in CAF's successful bidding for Northern, where it was able to offer 58 trains that could be delivered at a time when other manufacturers had declared they would no longer build such trains. This formed part of what was, at the time the order was placed, the largest European deal CAF had ever secured, with Arriva ordering 55 diesel trains (later increased to 58) across 149 vehicles, and 43 electric trains split across 141 vehicles. This was worth around £500 million with Eversholt Rail funding the deal.

These were ordered after CAF had won a deal with Serco for 75 Mk 5s that would be used by Caledonian Sleeper. That was a no-brainer according to Garner who revealed that only Serco was the only bidder →

**“There is still a lot of old rolling stock - vehicles that date from the 1980s - and so there are still opportunities for the here and now.”**

*Richard Garner, Business Development Director, CAF*



CAF was able to supply almost 150 diesel vehicles to the Northern franchise as it had a readily available product - the City. On January 28, Northern 195002 stands at Leeds as commuters pour from the platforms and into the city. PAUL BIGLAND.

→ interested in acquiring new vehicles for the new franchise. “The Bidders didn’t find many manufacturers interested because it was such a bespoke contract as well as being the first locomotive-hauled coaches to be produced for the UK in 30 years. The product had to be of the highest quality in order to equip Caledonian Sleeper with the tools to provide a first class hotel service.

The orders have kept coming. TransPennine Express has 66 Mk 5A coaches entering traffic, as well as 12 five-car 125mph Class 397 electric multiple units. West Midlands Trains has 80 Class 196 vehicles, with the first due to be delivered by the end of this year, while Transport for Wales placed an order for 180 Class 197 vehicles across 77 trains.

The Northern Class 195 order was made possible because CAF already had the product. “We had an off-the-shelf, credible DMU product in that market ready for the competition.”

As for the Class 397s, these stylish EMUs have certainly attracted positive reviews, with TPE staff praising them at their Liverpool launch last November. “The ‘397’ is fabulous; it works in so many ways,” says Garner. Much was made by TPE’s engineers of the fact that they were fully engaged in the design process and able to modify various parts of the design. “CAF has a flexible approach to working with customers, but there must be a balance that takes into account time and cost whilst maintaining a good working relationship,” he explains.

CAF has also been successful in the light rail market, delivering 21 Urbos 3 trams to Midland Metro in 2014-2015, before last year winning a deal with the same operator for a further 21 trams. The latest contract features an option for an additional 29 trams should the network be expanded as planned.

Forty-three trains will also be delivered to Docklands Light Railway between 2022 and 2024 by CAF after it won a tender to



One of the 27 Edinburgh Urbos 3 Trams glides along Princes Street in the Scottish capital on January 14. These were the first light-rail vehicles in the UK built by CAF. They arrived in 2011 some three years before the vastly reduced Edinburgh network opened. TONY WINWARD.

replace the existing fleet, as well as supply an additional ten trains.

Asked what CAF’s recent success is down to, Garner replies: “In recent years there has been a number of procurement competitions for rolling stock and I believe our strength in supplying regional, suburban and metro trains along with LRV’s worldwide gives CAF proven solutions to offer to the UK market.

“Our Civity platform has a strong technical base which is adaptable, flexible and brings reliability through its evolution. We are able to provide competitive solutions for high and low volume orders and, as demonstrated, by DLR and Caledonian Sleeper we are able to manage very bespoke rolling stock.”

As a business CAF has expanded globally.

No longer is it about supporting the Spanish rail system – instead some 90% of its business is exports.

Garner explains: “In recent years there has been few orders for rolling stock in Spain, forcing CAF to look elsewhere. Back in 2008, I think it is fair to say that Siemens and Bombardier dominated the rolling stock supply market. Hitachi arrived a little later with their Intercity Express Programme but clearly the UK market was ready for more competitors and in 2010 CAF decided it needed ‘boots on the ground’ to get a better understanding of the market, operators, financiers and stakeholders and start its commercial operations.

“In 2012 CAF was selected by an operator as its preferred rolling stock supplier for the West Coast franchise; which sadly, as we know, the franchise procurement was cancelled for. Whilst disappointing it proved that CAF could offer credible solutions.”

The Class 385 deal was significant for Hitachi but again showed that the dominance of Siemens and Bombardier was under threat. The ‘385’ also demonstrated that new financiers were taking an interest in the rolling stock market. A DfT franchise procurement programme with new financiers created a very different market, one in which CAF could compete and challenge the previous status quo’.

Of course, one issue that has affected CAF has been some delays in new train deliveries.

Garner freely admits that, but without wanting to deflect from its own difficulties, questions asks what other new trains have entered traffic on time. “The one thing it did was expose our experience in introducing new trains here onto the UK rail network. We have



**“We are looking into batteries or hydrogen, and we have experience there, but we believe there will still be a market for diesel for a while yet.”**

*Richard Garner, Business Development Director, CAF*

learnt a lot, and our current programmes are in good shape.

“Overall, people are happy with the trains we have delivered.” Garner recalls an incident in Manchester recently when he was travelling with senior CAF executives who were visiting from Spain.

“We were stood at Manchester Oxford Road and one of our trains came in. One of the station staff asked if we were getting on, and I said ‘no, we are just having a look’. He rolled his eyes thinking we were just looking at trains, but I explained who we were. He then couldn’t stop talking about how good they were and about how much staff love them. And I promise this was not staged!” Garner laughs.

With the Northern contract not far from being complete, what is next for CAF? Is there, perhaps, a concern that the market has peaked?

Garner explains: “Money remains cheap. Financiers are looking for ways to invest in the railway. Some of these companies are managing a lot of people’s pension funds and it could be invested here in the UK. There are plenty of old trains dating from the 1980s and many capacity problems on the network that need more trains. You only have to go and stand on the platforms of Leeds station to see that!

“The Government needs to find ways to enable the market to continue to invest in new trains so we wait with anticipation to see how the Williams Review will shape the future of the railway.”

He also believes that there needs to be a clear strategy for electrification. “If there was

a plan for wires then a lot of new rolling stock could be delivered; and delivered in line with carbon reduction aspirations.

“There is a lot of talk about hydrogen technology solving our emission problems. I wonder whether it will simply further complicate the infrastructure, and take time to both prove and deliver, when passengers need trains now.”

Despite the talk of alternative power, Garner believes there could still be a need for DMUs, or at least hybrid DMUs. “People say they are not going to buy another diesel. I think they can only mean diesel-only. Will we have electrified all of the railway by 2035? This seems unlikely to me.

“We are looking into batteries and hydrogen, and it’s likely we would lead with batteries here in the UK as we have experience in this field, but we continue to explore hydrogen technology.”

Garner starts discussing the battery technology CAF has been considering, as well as the challenges currently faced. “I think five years ago batteries were too big and their life expectancy for a Heavy Rail application were unrealistic, but the technology has changed.

“Their life-cycle costs have also improved dramatically. Back then batteries would probably have needed to be replaced every five years, whereas now it’s more like every 12 years.

“Most trains will be built to last for 30 to 35 years so customers will need to change the batteries maybe twice or possibly only once, because by then technology will have improved even more.

“Battery hybrid trains provide a carbon efficient solution, cost less to operate and the

## BREXIT

The decision by CAF to invest heavily in the UK was taken before the Brexit referendum of June 23 2016. With the UK now having left the European Union, are there concerns that the company may also have to depart these shores? Could this affect future orders?

UK Director Richard Garner explains: “There are three headlines really. The first is will there be tariffs between the UK and the EU?

“Secondly, what affect will this have on the EU/Sterling exchange rate?

“And thirdly, we work ‘just in time’ in terms of delivery to the factory, so any delay at the port could have a serious impact on production.”

whole life costs are comparable if not better than current rolling stock.

Looking to the future franchises, Garner says: “CrossCountry is interesting - surely the next franchise will need to address the capacity issues, and again, what about the DfT’s ambition to reduce emissions?

“If you take into account the Cross Country network which includes a mixture of electrified and non-electrified routes, surely the answer for the future has to be new tri-mode trains utilising battery capability in and out of stations and bringing energy efficiencies when operating in diesel and electric modes, doesn’t it?”

However there remains no decision regarding the franchise itself after bidding was scrapped in September 2018.

East West Rail is also an interesting option for CAF is investigating after it was made clear that wires would not be strung up along the reopened railway. A rolling stock tender was due to be issued in the near future, but that has yet to materialise. Nevertheless Garner and his team remain enthusiastic about such a very high-profile scheme. ■

## CAF UK ORDERS (MAIN LAND)

Train	Operator	Vehicles	Date delivered	Notes
Mk 5	Caledonian Sleeper	75	2018-2019	
Mk 5A	TransPennine Express	66	2018-2019	
Class 195/0	Northern	50	2018-2020	
Class 195/1	Northern	99	2018-2020	
Class 196/0	West Midlands Trains	24	2020	
Class 196/1	West Midlands Trains	56	2019-2020	
Class 197/0	Transport for Wales	102	2020-2022	
Class 197/1	Transport for Wales	78	2020-2022	
Class 331/0	Northern	93	2018-2020	
Class 331/1	Northern	48	2018-2020	
Class 332	Heathrow Express	61	1997-1998/2002	Built in partnership with Siemens
Class 333	Northern	64	2001-2003	Built in partnership with Siemens
Class 397	TransPennine Express	60	2018-2019	
DLR	Docklands Light Railway	215	2022-2024	
Urbos 3 Tram	Edinburgh Trams	27 trams	2011-2012	
Urbos 3 Tram	Midland Metro	21 trams	2013-2015	
Urbos 3 Tram	Midland Metro	21 trams	2021-2022	Option for further 29 trams



Caledonian Sleeper introduced 75 Mk 5s into traffic in 2019. The bespoke vehicles were the first locomotive-hauled coaches ordered for the UK since the Mk 4s in the late 1980s. On June 28 2019, the 2350 London Euston-Glasgow Central/Edinburgh Waverley passes Scout Green (north of Tebay). ROBERT FRANCE.

# INSIDE CAF'S NEW FACTORY

Just east of Newport, next to the South Wales Main Line, stands Britain's newest train factory. CAF has built the £30 million, 15,000ft<sup>2</sup> facility on the Celtic Business Park, adjacent to Llanwern Steelworks and opposite the planned Llanwern railway station.

It chose the site over more than 100 other locations across the UK, citing its close proximity to roads, railways and ports, and the availability of local people with the skills required as key factors in its choice of location. The company was also conscious of plans for major housebuilding projects, as well as the removal of tolls on the Severn Road Bridge (making the area a more attractive area to live and work).

The Welsh Assembly Government has also backed the factory with grant support from its Inward Investment Programme to supplement CAF's own substantial investment.

Staff started working at the Newport

## Vehicles for Northern and West Midlands Trains are being built at the £30m site in Newport, and the company is geared up to win more contracts

factory in September 2018, and it was officially launched by His Royal Highness The Prince of Wales in a special ceremony on February 21.

CAF Rolling Stock UK Chief Operating Officer Darren Cumber explains that "the site was acquired to increase our global capacity, but also shows CAF's commitment to the UK market; remember that this site was not constructed for orders already won.

"This is not the first time that CAF has opened a factory outside its domestic market – CAF's decision making is efficient and very responsive to potential opportunities.

"CAF's approach is to feed the business

and then decide where it will be built. This is a European plant, not a British plant. There is an advantage to this process as it means the speed of decision is quick, because there is a standardisation in the way of working across the business."

Already the factory has been delivering new trains for the UK. As this issue of RAIL went to press, the last of the Class 195 diesel multiple units for Northern were being tested and dispatched. These represented the first order for the site. Not all 101 trains were built at the site, with the Welsh factory focusing on two-car diesel multiple units and an extra

order for three three-car sets, the remaining sets being delivered from Spain.

And in June 2019, CAF won a deal to supply Docklands Light Railway with 43 driverless trains. The intention is for them to be built in Spain, but they could yet end up being a product of the Newport site.

CAF Rolling Stock UK Head of Production Kane Jellyman moved to the factory ahead of its opening, having previously worked for Bombardier.

He explains that there are three production lines at the Newport site. In late January, two rows were focused on Class 196 DMUs for West Midlands Trains (WMT) and the other delivering the final vehicles for Northern.

The first Class 197 DMUs for Transport for Wales are due imminently, and this is a deal he's excited about: "We have our biggest UK order only 14 months after we opened."

Everything bar construction of the bodysells, bogies and the engines can be done at the Newport site. The WMT bodysells are fabricated in CAF's main factory in Beasain (Spain) before being dispatched to the UK, while the Northern bodysells were products of the company's sites at Zaragoza and Irun in Spain before arriving here.

Around 250 staff are employed at Newport (CAF has upwards of 1,000 staff across all its UK operations). Of those 250, some 75%-80% have been recruited locally. Cumber confirmed that: "high on CAF's agenda is the recruitment of graduates and apprentices; something we're reviewing as part of our resource planning."

Jellyman explains: "We held various jobs fairs in the area, one being at the local college. At 5pm we still had over 100 people queuing to register their names. Over 1,000 people registered their interest in working for us."

While Jellyman oversees the construction of the trains, Cumber has responsibility for output of the orders. He explains that Newport carries out testing and commissioning on-site (it has a multi-road testing facility) with further work on the Northern trains completed at Edge Hill depot.

"Wales and Borders will be a build and maintain contract, while West Midlands Trains will maintain the trains with CAF Rail Services providing technical support and spares."

Testing of the first WMT train has already begun. The 80-vehicle order will entail the assembly of 60 vehicles in South Wales, with the rest in Beasain.

CAF has quickly been able to set up a 'beat rate' for trains, with one leaving the site just 60 days after the bodysell arrived from Spain.

Jellyman explains that the first '195' took some ten months to assemble, but that was purely because it was the first from the site. The two-car DMU was actually the 33rd in the 101-train order for Northern, and it was assembled while the factory was still establishing itself.

"We had to recruit staff. And some went to Spain to learn our processes," he says, explaining that when the first Class 195 arrived on-site there were six Team Leaders in place, but they had to visit Irun to learn

**Northern 195024 undergoes final testing at Newport before being dispatched to Edge Hill for testing and commissioning. CAF expects that from the bodysells arriving at the site to entering traffic, assembly and testing should take no more than 90 days.** RICHARD CLINNICK.

the skills CAF required. The Northern trains were assembled at CAF's Irun, Zaragoza and Newport facilities.

Says Jellyman: "It was important that the Team Leaders understand all of CAF's processes and controls within its construction. For example components and parts of the car are tested to destruction - how strong is the vehicle? So we have to understand and replicate that. Then there is control of the welding, the bonding, the electrical components and the torquing."

This has enabled the Newport factory to commit to delivering the first WMT unit by the end of the year. It also demonstrates the importance of standardisation across the CIVITY platform, of which the '195', '196' and '197' are all part.

Land next to the factory is also owned by CAF, and should the company be successful securing further orders then potentially the factory could be expanded onto this site; particularly to accommodate any orders for high speed trains. The existing main sheds could be lengthened to fit the longer high speed trains. Jellyman says more production lines would be installed alongside the existing facility.

CAF has a clear plan for Newport. Jellyman sums it up: "In 14 months we have more than doubled our workforce, won major deals to build trains, some that will be built here in Wales to operate in Wales, and could yet build high-speed trains here. If you cannot be excited about that, I'm not sure this is the place for you." ■



Above: Inside a newly arrived Class 196 bodysell. These are shipped from CAF's Beasain factory in this condition, with the Newport facility then fitting them out. RICHARD CLINNICK.

Above right: Driving vehicles from the final Northern Class 195/1 diesel multiple units await the fitting of their Rolls-Royce MTU engines (seen on pallets to the left of the vehicles) on January 30. This is one of three production lines at Newport, and will shortly be home to Transport for Wales Class 197s undergoing the same process. RICHARD CLINNICK.

Right: The two production lines for the West Midlands Trains Class 196s. On the right are vehicles that have recently arrived from Spain and which are being fitted out internally. On the left are those which have interiors, and which are being fitted with mechanical equipment. When they reach the far end of the shed, the vehicles can then move next door to the test shed. RICHARD CLINNICK.



### CAF UK TRAIN ORDERS

Train	Operator	Newport vehicles	Total vehicle order	Status
Class 195 DMU	Northern	40	149	Final vehicles being tested
Class 196 DMU	West Midlands Trains	60	80	In production. 60 vehicles delivered by end of 2020.
Class 197 DMU	Transport for Wales	180	180	First bodysells due at Newport in March.



**“We have our biggest UK order only 14**



**months after we opened.”**  
**Kane Jellyman, Rolling Stock UK Head of Production, CAF**



Look, no wires! A West Midlands Metro Urbos 3 climbs Pinfold Street on battery power on the catenary-free section of the tram network. MIKE HADDON.

## URBOS TRAMS

CAF believes the growing number of journeys in urban centres, while at the same time working on cutting emissions, means there is a real need for light rail networks; catenary-free systems further boosting that argument.

Within the Urbos family are trams and light rail vehicles that can be specifically designed to meet the operator's requirement. They can be built in formations from three-cars up to nine-cars, and are available in various gauges. All can be fitted with the Greentech system that allows catenary-free running.

There is also a tram-train version, the Urbos TT, designed to operate between the city and nearby villages and towns.

CAF can undertake the works associated with the introduction of light rail including integration with other work including civils, signalling, electrification or maintenance. Its design teams also create different body ends to help adapt the trams to the

personality of the area they are running in.

The trams themselves are built using a modular platform that includes low-floor products meaning they are accessible to all passengers while at the same time being able to be adapted to meet the needs of the town or city they will run in. Their bogies allow the trams to be 350mm above the track, but this can lower to 300mm in access areas.

They are built with wide doors that can be configured in any size and/or number to enable rapid passenger entry and exit, improving the service quality on offer.

The trams themselves are fitted with heating and air-conditioning, as well as passenger information screens. WiFi can also be fitted if required.

Safety systems include a command and control system that is self-diagnostic and can detect track system failures; on-board CCTV, event recorders and obstacle detection systems.

manufacturers continue, but still the only battery train to carry passengers on the national network was a Bombardier Electrostar in 2015 for a six-week period. "Heavy rail has different options," Austen says.

She explains that CAF have proposed electric trains with hybrid battery technology to the market: "For example we have a hybrid solution to operate where there is partial electrification. Operation over a ten-mile gap in overhead wires is achievable today, and this distance will only increase with the further development of battery technologies.

"Where there is no electrification, there is an absolute need to reduce emissions, particularly in and out of stations.

"Cities are restricting the use of diesel cars in city centres, so it's not surprising that we must change our solution to meet that demand. Hybrid battery/diesel solutions will be the next generation of trains to operate on

lines with no electrification and where the route has both long sections of electrification and non-electrification hybrid bi-mode trains will be the answer. The market is changing; battery technology today and tomorrow will present Operators with more efficient trains, competitive maintenance costs and give the Owners a future-proofed train, with a higher residual value. We have to play our part in Plan A".

Back in Zaragoza, at the launch of Northern's Class 331 electric multiple unit in January 2018, CAF was openly discussing the possibility of modifying the trains for hybrid technology in the future. At the recent official launch of its Newport factory, plans for operating the Windermere branch in the Lake District with a hybrid '331' was mentioned.

CAF has led the way in the light-rail sector when it comes to battery technology; it's now well-placed to do the same in heavy rail. ■

next the kinetic energy generated during braking is recovered through the Freedrive system to start the recharging; and finally, back in the catenary sections, or in the charging areas, Freedrive is fully recharged.

With all this battery technology in mind, CAF took further step with the purchase of Solaris. The Polish bus manufacturer was already building electrically-powered vehicles, but the acquisition enabled CAF to broaden its range of products to meet both the current and future needs in the urban transport sector. "Over 35% of Solaris bus and coaches contracts are in low-emission or zero-emission vehicles and the numbers are growing rapidly," says CAF UK Business Development Director Kate Austen.

Austen discusses the Midland Metro scheme, which was the company's second move into light rail in the UK having previously delivered 27 trams to the Edinburgh project. "The infrastructure problems on the Edinburgh tram project have scarred people, and the general costs of electrification remains high, but a catenary free solution goes a long way to address many of the infrastructure problems and associated costs. Many people still have 'distance anxiety', that is how far can a tram travel without the need to recharge. A carefully designed integrated network should be able to cope with congested routes that are shared with other road users. The challenge becomes how long can a tram sit in traffic? Most of the time the tram operates with no less than 50% contingency charge. Placing an emphasis on traffic management will go a long way to reducing the need for such contingency and of course reduce the cost of the tram."

That's light rail, but what about heavy rail? Discussions between operators and

# HYBRID THEORY

The commencement of catenary-free operations on a small section of light rail in Birmingham could have a transformational impact not only on that sector in the UK, but also for heavy rail.

Phase One of West Midlands Metro's Birmingham city centre 'Westside' line is the first overhead-free section of an electrified railway anywhere in the country.

The CAF Urbos 3 trams drop their pantographs at the Grand Central stop and run to the Library stop in Centenary Square, with an intermediate stop at the Town Hall in Victoria Square. They then reverse and continue back to Wolverhampton. By the end of the year they will also operate on catenary-free infrastructure to Wolverhampton railway station on the extension in the West Midlands city.

The trams are designed to run up to 25% of the total system off wire (discontinuous sections). This will represent more than 25km when the full length of 95km is developed (including the extensions to Edgbaston, Wolverhampton, Birmingham Eastside and Brierly Hill).

CAF are world-leading in this area and has been producing catenary-free trams since 2010. They use Greentech which is the On-Board Energy Storage System (OESS) product developed by CAF's Power and Automation division.

It's based on the latest energy storage

**By expanding its technical abilities, CAF is making huge strides towards eliminating the need for unsightly, costly infrastructure, says KATE AUSTEN.**

technology and uses lithium-ion batteries or high power supercapacitors or a combination of both depending upon requirements. In Zaragoza it's supercapacitors; in Birmingham it's batteries only. During trials with the first battery-fitted Urbos 3 in Birmingham, it was able to travel an impressive 29.1 km before its batteries needed recharging.

Battery power is increasingly viewed as a cost-effective way of powering light rail systems due to the constant evolution in technology combined with the efficiency and cost of installation.

With alternative power very much at the forefront of Government policy, and a Network Rail Decarbonisation Strategy due to be published this year, the timing could not have been better for CAF's Urbos 3 trams to begin running in this mode.

In Zaragoza the project to introduce catenary-free operations enabled similar trams to run through the Spanish city without needing unsightly electrification infrastructure. Other projects such as Kaohsiung, Luxembourg or

Newcastle (Australia) and current contracts for Lieja and Parramatta (Australia) give CAF an unprecedented depth of experience with this technology.

What's also beneficial is that because there is less of a need for such infrastructure, the cost of the project drops. Electrification costs associated with the modifying of structures or having to build new ones drive up costs, but catenary-free running removes those needs. Likewise the lack of catenary masts and wires means that light rail services can operate in historic town and city centres without detrimental impact on the cityscape.

Furthermore it enables light rail systems to better integrate with cities and their narrow spaces as the overall width of the track alignment is reduced due to the lack of overhead infrastructure.

Greentech works in four stages: the first is when the vehicle starts running with the system fully charged; then it enters the catenary-free section where the system supplies power for the traction and auxiliary systems;



Running on battery power, a West Midlands Metro tram arrives at the Town Hall stop on the UK's first section of catenary-free railway. MIKE HADDON.

# HIGH SPEED TRAINS

**Newport is a European facility and as such there is no reason why very high speed trains could not be built here, according to CAF UK Director Richard Garner.**

The construction of the Newport facility can support a very high speed train contract; but it is not just the factory they are built in that is critical to success, but also the test and other associated facilities.

Securing an order for high speed trains would mean more than simply delivering trains. He firmly believes CAF's legacy lies in education and partnerships within the local area which are vital for any deal that the company wins, be it here or abroad.

Success in any contract would enable CAF to employ more apprentices and create working partnerships with local education facilities therefore enabling the next generation of railway staff to learn the many different skills required across various disciplines – and not just in train building but in fields such as research and development, infrastructure, testing and planning.

Nowhere is this more relevant than the planned test track in South Wales, the first of its kind in the UK. Branded the Global Centre of Rail Excellence located in the Port Talbot area, the £100 million facility could open in as little as four years' time if permission is granted as planned. It's envisaged that construction would then take

around two years. It will include a 4.2-mile electrified outer loop for trains to run at up to 110mph, and a 2.8-mile inner loop to test infrastructure and other equipment.

At an event to launch the plans in 2019, Minister for Economy, Transport and North Wales Ken Skates said: "We could see the site becoming a UK hub for operational training in a dynamic environment away from the operational network, providing opportunities for people to acquire skills they need for a career in the rail industry."

"The facility will attract further activities and regular visitors to the area, as academics and researchers, engineers, contractors and support teams utilise the site on a project-by-project basis, providing a potential boost to local service industries."

Says Garner in mid-February: "Whilst the core operation is to test trains, the on-site academic facilities would then enable CAF to be further involved in working with universities and colleges," he says before confirming that the company is already working with universities in Cardiff and Swansea.

He says discussions have been held with the National College for Rail which could result in students studying in Wales. "We are



speaking with the College about franchising courses to south Wales. That would be much more beneficial to CAF and the area."

The message is certainly seeping into the consciousness of the Welsh Government. "They are promoting us alongside Aston Martin," says Garner. The luxury car

manufacturer has also recently opened a facility in south Wales, and the two are being used to promote further opportunities for businesses in the country.

In terms of the very high speed train product CAF has its Oaris train which is capable of 225mph running. Garner said: "Our Oaris high speed trains use the latest technology offering high speed travel, which is comfortable, safe and provides digital connectivity to facilitate the busy world that we live in."

"The new high speed trains will meet the highest international standards for passenger experience, noise reduction, and environmental sustainability."

"CAF's Newport facility is able to build any and all rolling stock in CAF's portfolio with little or no modifications, and high speed trains are no exception."

The Oaris platform has been constantly

evolving through decade-long development of a modular platform, for which Norway is the latest customer.

The platform is a non-articulated electric multiple unit with distributed power designed for 220mph running, with an in-service speed of 200mph. In terms of power, this ranges from 7,080hp in a four-car set to 14,160 in an eight-car.

It's currently available in four, six or eight-car formations, with a powered bogies on each vehicle. Electric motors are fitted to both wheelsets.

The design is such that Oaris' power equipment can be adapted for any of the main overhead line electrification systems used across Europe.

Four years of development resulted in the unveiling of a mock-up of the platform in 2010 in Valencia, with construction of a four-car prototype following that same year. It began

**One of the Norwegian Flytoget Oaris trains on test. This is the latest variant of CAF's Very High Speed Train platform, and this will form the basis of its UK offering.** CAF.

testing the following year, reaching speeds of 220mph on the Madrid-Seville route.

CAF has five high speed train fleets in traffic around the world, including in Spain where its Class 120 and '121' trains run operate for RENFE including on the Madrid-Seville route, in Turkey where 12 trains operate the Ankara-Istanbul route for Turkish Railways and in Norway where Flytoget has recently taken delivery of four-car EMUs for its Airport Express and represents the latest development of the Oaris platform.

CAF has, through years of research and design, been able to continually develop and improve what it can offer the market in terms of the latest technology, safety and comfort.

Capacity-wise, more than 500 passenger can be accommodated on the longest trains, but because Oaris is a modular design customers are able to create different configurations depending upon the requirements.

It's clear that CAF continues to push boundaries in development of market-leading products. ■



**An artist's impression of the classic-compatible fleet. These are the trains that would only operate on HS2 should CAF be awarded the construction contract. They were unveiled in June 2019. CAF.**



**“We envisage the site becoming a UK hub for operational training in a dynamic environment away from the operational network.”**  
Ken Skates, Minister for Economy, Transport and North Wales



Northern 195110 crosses Leven Viaduct (Ulverston), with the 1447 Barrow-Manchester Airport on November 10 2019. The need for diesel trains on routes such as the Cumbrian Coast, combined with CAF already offering a proven product, meant the CIVITY Class 195s were the perfect solution for Northern's order. ROBERT FRANCE.

# NORTHERN STARS

**Northern needed a quick fix for its capacity and image issues. CAF was ready with an off-the-shelf solution that has vastly improved rail travel in the region**

In the same week as CAF celebrated the launch of its factory at Newport, 75% of Northern's new trains entered traffic.

After a long and bumpy ride through the past 30 years, commuters in the north of England are increasingly finding their journeys to be a much smoother experience as a result of more than 130 new trains, built by CAF.

Indeed, when Northern was launched in 2016, former Managing Director Alex Hynes spoke of his embarrassment at passengers changing from high-speed trains from London and onto Pacers.

In Spain at the launch of the first Class 331 in January 2018, Northern's attitude was: "If we are to attract people out of cars we need to get rid of the Pacers." And CAF trains are now whisking passengers around the north with a vastly improved level of comfort and reliability.

Both Northern and TransPennine Express are currently introducing fleets of all-new trains built by CAF, as a rail revolution takes place on routes that, in the main, have been neglected when it comes to new stock.

Welcoming nine new trains into traffic on February 17, Arriva Rail UK Managing Director Chris Burchell said: "The new trains are truly transformational and it's great that more than five million journeys have already been made on Northern in more comfort and featuring more state-of-the-art technology than ever before."

Northern Deputy MD Richard Allan explains why they're needed: "The Northern network is busier than it has been for a generation - more than 108 million journeys were made on our services in 2019 and we are committed to delivering a 21st century railway for those customers. The introduction of new trains is at the heart of this transformation."

"These fantastic trains are a true step-change in the travelling experience."

The deal for Northern was not only significant for the operator as it introduced the first new trains into the area since the early 1990s (other than 16 CAF/Siemens trains in the Leeds area), but for the manufacturer it represented at the time the largest European order it had ever received. Initially, the deal

was for 43 three and four-car electric multiple units and 55 two and three-car diesel multiple units. The latter was later extended by a further three trains.

The contract was worth around £500 million, with four sites across two countries involved in the construction and assembly process. A second contract for Northern was also awarded for technical and logistical support for the operator's trains.

One of the key reasons for the contract was the need for diesel trains, which many rival companies had removed from their portfolios; CAF offered a proven design in its CIVITY platform - at the time of the award (2017), the company had been supplying similar trains to Italy and Montenegro, while the state-owned Dutch Rail company NS also had them on order for the Netherlands.

When announcing the Northern deal, CAF was also very clear in acknowledging it as 'strategically instrumental', not only for its size but because it was with the Deutsche Bahn group, which operates more trains across Europe than any other company.

They have proven a hit with passengers. Featuring all the modern on-board facilities you'd expect of a train entering service in 2020, the Northern fleet has carried more than five million passengers since their introduction on July 1 last year.

Key benefits of the new Northern trains include 1/3 and 2/3 saloon door positions, allowing better passenger movement within the carriage. They are also fitted with large vestibules, designed to improve passenger



**“The Northern network is busier than it has been for a generation... The introduction of new trains is at the heart of this transformation.”**

*Richard Allan, Deputy MD, Northern*

flow. The seats have more padding than many new trains as a result of passenger evaluation carried out at Manchester Piccadilly.

CAF used lightweight bogies and aluminium bodysells, which reduces the energy costs and track access charges.

UK Rail Director Richard Garner believes the CAF trains across the north have really helped the company in this country. "We were in the market with a credible product."

For Northern, there remains the possibility of follow-on orders, although decisions will have to wait until the Operator of Last Resort replaces Arriva.

In May 2016, CAF won a £230 million order for two different fleets, albeit from the CIVITY family. TransPennine Express, at the time, operated the busiest trains in the country and desperately needed additional capacity.

Sixty-six Mk 5A coaches and 12 five-car EMU vehicles were ordered, with the first

arriving in the UK two years later. They are currently being introduced onto routes between Liverpool/Manchester-Scarborough/Middlesbrough/Redcar and between Liverpool/Manchester-Glasgow Central/Edinburgh.

The introduction of new locomotive-hauled carriages was seen as the best way for TPE to quickly increase capacity while at the same time being able to extend the trains in the future. Less than two years after the order was placed, CAF had dispatched the first vehicles for testing.

TPE explained at the time that the Class 397s were ideal because they were available, allowing the operator to improve its service quickly.

They were ordered some two months after the Northern trains, and feature the same traction packages as the '331s'. At their launch in Liverpool last year, staff explained their

involvement in the design and just how good the performance was. For TPE it was also crucial that it had an inter-city product as it aimed to move away from the inter-urban market.

At the TPE Nova launch in Liverpool, Managing Director Leo Goodwin told invited guests: "Our vision was for Nova to represent the brightest future for rail in the North, so we are pleased to make this vision a reality for customers, colleagues and businesses who make the TransPennine Express network such a crucial part of our infrastructure here in Liverpool and across the North."

Speaking at the same event, Garner said: "These high-quality, high-performance trains will provide TPE customers across the north of England and Scotland with a transformed onboard experience, making a real difference to this important and busy rail network."

The ability of the new fleets to accelerate better than those they're replacing means there are aspirations to improve journey times to meet the capabilities of the new fleets.

Passengers are experiencing a much-needed improvement in their journeys across the north; CAF is leading the way with its innovative, new trains.

It's what the north needs, and it's what the north deserves. ■

## TPE NOVA CAPACITY VS TRAINS REPLACED

	Standard Class	First Class	Seat gain
Nova 3 (Mk 5As)	257	30	106 against Class 185
Nova 2 (Class 397)	286	22	105 against Class 350/4

## NORTHERN CAPACITY IMPROVEMENT

DMU Class	'142'	'150'	'156'	'158'	'195'
Vehicles per set	2	2 or 3	2	2 or 3	2 or 3
Length	31.10m	39.48m	46.06m	45.14 or 67.71m	48.05 or 71.40m
Seats	121	148	146	146 or 210	123 or 203



TransPennine Express 397007 stands at Manchester Piccadilly. These five-car 125mph electric units allow TPE to not only offer more capacity but also improved journey times against what was previously available. ANDY MASON.

# A POWERFUL PORTFOLIO

**Now that CAF has acquired consultancy company BWB, the Spanish company can offer a much broader, integrated range of services, says RICHARD GARNER**

**W**hen you think of CAF, what's the first thing to come to mind? Train building.

The Spanish firm has been rapidly expanding its portfolio here in the UK, as well as globally, but its reputation is largely built on its train fleets.

However, it does have infrastructure businesses and in 2017 it further boosted its business with the purchase of BWB. The Nottingham-based company is a leading UK design engineering consultants with more than 300 staff, and by joining the CAF family it has been able to bring its own expertise to its parent company, while also being able to engage in rail-based business.

Richard Garner, CAF UK Director explains: "you start to recognise that the work that BWB does would also interest us in rail. It already has a small rail team and has won work with DB Cargo at its Wolverhampton Steel Terminal as it begins tipping its tow in the water."

He says that in a conversation with BWB's business development director, Garner was better able to understand what the newly-acquired company was able to do. "He

explained that they have extensive expertise in the road and logistics sectors and offer a diverse range of services. We called on them to assist us with our gauging studies and that partnership has developed now even further."

With CAF winning a deal to supply 51 two-car and 26 three-car diesel multiple units that will run on regional services between England and Wales, as well as on the Conwy Valley and Cambrian Lines, BWB has been appointed to carry out the work necessary to ensure that these Class 197 DMUs are able to operate on these routes. It will also be involved in preparing two depots (Chester and Machynlleth) for the new trains.

This works hand-in-hand with CAF's own business of offering integrated rail solutions for all types of railway. Feasibility studies, civil engineering design, and signalling work and maintenance and system operation services were already part of the Spanish firm's business portfolio; BWB was positioned alongside CAF TE (Turnkey & Engineering) to bring and strengthen CAF's UK experience.

Within BWB's rail services business it offers planning, design, construction, and operation

**An artist's impression of a CAF Class 197 that will be introduced on Transport for Wales routes from 2022. The trains will be fitted with European Train Control Systems and will be maintained in depots that will require modification. BWB, which CAF acquired in 2017, will carry out the gauging work to ensure the diesel units can run on their planned routes, as well modify the depots for the trains. In the longer term, CAF believes BWB could also supply signalling systems, both for the trains and the routes themselves. KEOLISAMEY.**

and maintenance.

For the planning side, BWB can undertake multi-modal pedestrian and transport modelling, as well as capacity analysis and optimisation. Project feasibility, such as creating outline designs, budgets and a programme for works are also possible.

When it comes to design, BWB offers the complete service. This includes track, signalling (both ERTMS and UK 'legacy' systems), rail structures and depots, rail systems and sub-systems (both on-board and infrastructure), energy collection, catenary-free solutions, visualisation and digital projects, and will soon include electrification. It can also work in the light rail, metro, commuter, high speed, freight and eBus sectors.

One example is iPort at Doncaster where BWB was involved in a number of disciplines including the civils design for the 35-acre rail terminal at the site.

In the light rail sector, BWB has been working with Midland Metro (which uses CAF Urbos trams) to review the current Birmingham-Wolverhampton for any safety concerns.

Already within rail, BWB has worked with CAF to provide project management in supporting the manufacturer's work to secure Certificates of Gauging Compatibility on six new rolling stock contracts. These technical studies must be carried out to ensure the

vehicles can run in the UK.

For construction, BWB is able to deliver procurement strategy, contract management, project management, construction management and supervision, inspection and validation on schemes.

Finally, through its Operation and Maintenance portfolio, BWB is able to be involved in the handover and commissioning, safety integration and risk management. It can also carry out infrastructure and systems renewals and upgrades.

While CAF is one of five shortlisted bidders for the HS2 classic-compatible trains, BWB has already been working on the HS2 project in the Birmingham area. This contract was to deliver a package of pre-demolition utility surveys along the proposed Phase 1 route for HS2 in the city.

Surveys were carried out on 122 buildings at 22 sites between Stoneleigh and Curzon Street, including sites for the latter's station and the Washwood Heath depot. The role of BWB was to locate, identify and verify which

## WHO IS BWB CONSULTING?

BWB Consulting was founded in Nottingham more than 25 years ago, initially as a structural engineering business. Twelve years ago it underwent a management buyout, after which it diversified and developed into an integrated multi-disciplinary consultancy that offers advice to private and public sectors in buildings and the natural environment, as well as transport and infrastructure.

utilities were associated with those structures in order for disconnection and diversionary work to take place.

Buying BWB in 2017 enabled CAF to include the business and its expertise in various bids including for TfW.

At the time of purchase, BWB had recognised that some 70% of the global population would be living in cities by 2030

and that this will undoubtedly present major challenges.

Sustainability combined with climate change are seen as two of the obstacles facing the world's populations in the next decade and that is where BWB is able to bring expertise through smart solutions around buildings, transport and infrastructure.

BWB also enables CAF to offer different solutions when bidding for future contracts – something Garner is already working on.

With BWB as part of the business that is something that could change, Garner believes, as it could look to modify or construct depots to house the new fleets.

Likewise BWB is also exploring the possibility of bidding for signalling contracts in the UK and is investigating the size of the schemes it could be involved in. Garner explains: "European Rail Traffic Management System [ERTMS] will be fitted on our trains, so can we develop that?"

He explains that on the Cambrian route the Class 197s will need equipping with European Train Control System [ETCS], and that that will also need upgrading. "We are talking to Transport for Wales with BWB," he adds.

Garner explains that CAF signalling and CAF TE are working closely with BWB on this.

CAF is able to offer so much more than train building, and are able to offer the complete package for companies that need new trains and new infrastructure. ■



Wagons are unloaded at Doncaster iPort in the 35-acre freight terminal that forms part of the overall facility. BWB carried out the civils design for the rail aspect of the site. GB RAILFREIGHT.



**“They carry out gauging work on motorways. This is similar to what happens on the railway in terms of bridges and vehicles”**

**Richard Garner, UK Director, CAF**



# AN EXPANDING GLOBAL PRESENCE

At the turn of the century, CAF was viewed as a train builder that mainly served its domestic Spanish market and had been doing this successfully in various forms since 1917.

There had been exports, including 30 Class 332/333 trains to the UK in a joint venture with Siemens (for Heathrow Express and Northern Spirit), but the portfolio continued to be driven by Spain's need for rolling stock. In total, almost 1,250 miles of high-speed railways in Spain required trains, and CAF was able to dominate that market for many years.

However, when that market began to decline, CAF made the decision to expand using its extensive experience in serving rail markets. And it has quickly established its presence around the globe, to a point that more than 80% of its orders were for exports in the mid-2010s.

Today, the company is established on six continents, with 39 countries having a CAF presence. Fifteen of those have established offices, while eight have factories. There are 101 train fleets ranging from light rail vehicles and metros to commuter and regional

## CAF has moved beyond its traditional Spanish boundaries and now serves 39 countries on six continents

trains, as well as very high speed trains. Its headquarters may still be in Beasain, nestled in the mountainous Basque country, but make no mistake... this is a global company.

Beasain is also home to its Research and Development operations. And it is the commitment to expanding this sector of the business that has enabled CAF to develop the various products that it is successfully selling to the growing global rail market.

Outside of Spain, the largest market for CAF is currently the UK with 14 train fleets, one office (in Coventry) and one factory (Newport). The UK is also benefiting from CAF's innovative projects, including catenary-free trams.

CAF believes its strength lies in its ability to adapt to the needs of customers. An order for fewer than 80 bespoke carriages? It delivered them for Caledonian Sleeper. Trains that can run through deserts and withstand severe

sandstorms? Delivered for Saudi Arabia. Trams that can run without overhead wires? Built for Zaragoza and Birmingham.

Diesel trains at a time when its rivals didn't believe there was a market? Fifty-eight delivered to Northern with a further 26 on order for West Midlands Trains and 77 for Wales & Borders.

In the most recent financial figures posted by the company in November last year, CAF reported an upward trend in profit that was underpinned by an increase in activity within its European factories.

It also reported 16 contracts, with Italy alone awarding four. A total of nine countries, plus Spain, will receive new products from the CAF portfolio - a far cry from 30 years ago.

The sheer speed of growth in the UK (and globally) should come as no surprise to those who work with and for CAF. This is a company that looks set to grow still further. ■

### CAF'S WORLDWIDE PRESENCE

