An image I am sure many of us have waited impatiently for, Tornado back in steam and running-in on the Nene Valley Railway. In this edition of TCC we bring you the full story of the cause of the problems that beset ‘The Ebor Flyer’ and the extended repairs that have followed this unfortunate incident.

TCC
EDITORIAL by Graham Langer

With a large crowd expected this year the Convention was spread over three sites, the Dolphin Centre, Darlington Locomotive Works and the Mercure Darlington Kings Hotel for the dinner in the evening. In the event, storm Callum prevented some supporters from reaching Darlington but over 100 people managed to make it to the 25th Annual Convention.

As ever Mark Allatt opened proceedings, launching the meeting with a screening of an edited version of the TVP5 brake system to the MiK3 version, re-metalling of the rod bushes and the installation of ‘Truckmaster’ oil separation gear in the air pipework to reduce the amount of oil finding its way into the brake system. At the same time all the valves were re-lined while the locomotive stood on David’s unique ‘portapit’ – locomotive Maintenance Services not having a pit to use. Rob Morland joined David to run through the electrical work and to explain how the intermittent fault in the TPWS circuit had been identified and resolved (by the use of a simple diode). It was a fault that baffled the experts and led to the piloting of ‘The North Britain’ with class 66. Rob also expanded on the employment of a ‘Raspberry Pi’ computer with the middle big end heat sensor which proved itself on ‘The Flying Scotsman’.

Mark Lippitt referred to the Panama Canal affair, with the locomotive on its high-profile 90mph run, noting that it was a ‘perfect storm’ of four factors that brought the locomotive low; these included standard lubrication, both in terms of oil purity and delivery, valve ring gaps, valve liner alignment and a taper in the bore. The consequence was that the valve heated up to an estimated 800 degrees and stuck in the bore, all the force of the valve gear failure that afflicted Tornado on its completed wheelsets.

As ever, Huw Parker drew on his experience with the Trust to explain the circumstances of the valve gear failure that continued Tornado on its completed wheelsets.

In the past the Trust had something of a reputation for burning team members out. Luckily before he reached this stage Operations Director Graeme Bunker-James advised the Board that he wished to reduce his overall commitment to the Trust after many years of service. Graeme has been involved with the Trust for almost 20 years, ten of which have involved his hand-on operation of Tornado. Despite wishing to step back earlier he felt this wasn’t appropriate after the failure in April; following the successful return of No. 60163 to steam he now wants to follow other avenues of interest both inside and outside the railway which was not possible while Tornado dominated his life – a problem many of us are familiar with! Graeme remains a Trustee and aims to take a full role in current and future A1SLT projects including the P2 and V4 as well as the new train and expanded base in Darlington. However, he has agreed to serve on the SVR (Holdings) PLC Board as a Director, as well as being Vice Chairman of The Gresley Society Trust, which he felt was not compatible with leading the operation of a main line locomotive full-time. Graeme’s service as Operations Director during Tornado’s first 10 years in traffic has been invaluable and we are delighted that he will continue as a Trustee, especially inputting to our long-term development plans.

As The A1 Steam Locomotive Trust continues to grow, it is becoming increasingly important that Trustees are able to step away from their oversight role. As such, there will be a number of changes within the team in the coming months as the roles of our existing Trustees evolve and we seek to bring new people on-board, particularly expanding our capabilities in both engineering and operations. One of these new appointments, albeit not to a board position, is that of Graham Nicholas in the role of Professional Head of Engineering: Graham was formerly responsible for engineering quality, tied-in closely with the certification process for the locomotives with the Trust’s Notified Body (Defra Rail). As a professional railway engineer working as a vehicle acceptance engineer, responsible, for example, for the approval of class 66 locomotives entering the UK, Graham is well qualified for his new role within the Trust. Thank you Graeme for your voluntary efforts as an Engineer Manager to oversee operations at Darlington Locomotive Works.

Finally, one thing that has started to make a significant impact on the money being given to our locomotives is the increasing number of legacies. These will always be hypothesized to the locomotive of your choice and usually towards capital costs associated with them. One feature of these legacies is that we have sometimes been left bundles of shares; although the purpose of the Trust is not to hold financial investments, shares in listed companies have been donated to us in the past and they have always been sold to provide valuable funds for our various projects. We now have a share dealing account with a stock broker and so any shares which are donated to the Trust in the future can more easily be realised.

As ever, thank you for your support of this story, David Elliott now took over the microphone. Recapping on what was described as having been an ‘exciting’ year, Huw Parker.

radius rod. In the ensuing investigation, every valve gear component was measured and NDT testing applied to any part that might have been damaged. Stephenson Engineering came to the rescue by producing replacements in record time and a new valve liner was inserted for the middle cylinder. The locomotive’s return to traffic, however, was delayed by the DB Cargo (DBC) inspection regime and the difficulty in sourcing some parts because British manufacturing seems to be incredibly busy at the moment. After a minute examination of the engine, DBC pronounced themselves happy and the locomotive started a running-in programme on the Nene Valley. David expressed his gratitude to the railway and Ricardo Rail for the way in which they worked with the Trust.
Graeme Bunker-James now took the floor to look at “what happens next” with No. 60163. Once a date has been set for a main line test run, Tornado will be able to resume her work on the ‘big railway’ with a packed programme for 2019. A new tours brochure will be out soon and this will feature a distinct change in direction with a move to more repeat itinerary tours, a more efficient programme that will meet with favour from our industry partners. ‘The Aberdeen’ runs on five days in 2019, utilising the newly refurbished turntable at Ferryhill (once Network Rail had re-connected it!) and ‘The North Briton’ takes in the Settle & Carlisle Railway on six dates. Graeme stressed that there will be more trips from the East Midlands and that the 2019 programme allows the Trust to run some of the train sets lost in 2018. In addition, he was able to announce a new tour, ‘The White Rose’ in April, the first time we have included Harrogate as a destination in one of our trains. Preserved lines will not be ignored and although the diary is yet to be completed, visits to the Bluebell Railway and the Wensleydale Railway have already been indicated.

Chris Walker stepped up to cover what he called “the boring bit”, the finances. He was able to note that turnover was up all round but that Tornado had shown a small loss, mainly because of the cost of getting the locomotive and coaches to the people, and that the Trust investing in a full set of new driving motion components, having the wheel balance weights fitted without the need for dynamic balancing (since this can now be computer predicted), starting the manufacture of the cylinder block and placing an order for the boiler. He was also able to introduce two additional members of the team, Alan Park, who has been employed to work on the electrical side, and Graham Nicholas, who has taken on the role of Professional Head of Engineering after a long association with the Trust and running Tornado on the main line. David also mentioned the fact that the Trust was in the final stages of appointing an Engineering Manager to oversee operations at Darlington Locomotive Works.

Rob Morland now took over from Dave to update Covenantors about the electrical provision for Prince of Wales, noting that the systems fitted to Tornado had proved to be robust and reliable, thanks in no small part to Paul Deplege’s careful planning and executing. With design work now focussed on our big Mikado, a lot of thought is being given to ensuring this is effective for us. As a result of the good work by Anthony Coulth at the NRM, we managed to borrow an original headlamp of the correct pattern from which Alan Park is re-creating to allow us to be able to make our own with full LED internals. David Elliot now re-joined the double act to discuss power generation for No. 2007, covering the need to provide the ‘Ebor Flyer’ introduction a new video shot by Tom Ingall and showing the locomotive emerging from the workshop both with Tom on the footplate! Since he had now become the first person to enjoy this privilege it seemed only fitting that Tom should sign up as a Covenantor. ‘Mark then turned his attention to the fundraising. ‘Eminence sounds like a lot of money to find but the dedication of Covenantors and the success of the various clubs is rapidly reducing the total still required. We now have 870 Covenantors (now over 900) who have donated/dedicated £1.5m (only 25% of whom are A1 Covenantors). The Founders Club raised much more than was anticipated. Dedicated Donations have now raised £265,000 (now over £313,000) of an anticipated £1.1m. The 32nd, only 27% subscribed, The Mikado Club is complete, The Cylinder Club was filled in six months and the good offer of £315 (now over 90) members of The Motion Club with a target of 175 in total. Finally Mark emphasised the growing importance of legacies, stressing that he would always be hypnotised to the donor’s preferred project.

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Covenants fill Darlington Locomotive Works.

After following delays to the introduction of the new Caledonian Sleeper vehicles it may not be until 2020 before the Mikadas are introduced to us, but work continues to identify the most suitable candidates and prepare the refurbishment specification for these, offering comprehensive disabled access, a dedicated support coach and a bespoke kitchen car. While on the subject of ‘future proofing’ our main line operations, Graeme also touched on the strategic aim of creating a third boiler for Nos. 60163 and 2007, something that could cut the time out of traffic for major overhauls from seven to three months.

Paul Bruce took over from Huw with an update on the Whessoe Road site. He paid fulsome tribute to Darlington Borough Council and the Tees Valley Combined Authority for their assistance with the process and although we had missed out on an initial source of grant funding, the development of the Heritage Quarter’ scheme for this part of Darlington in preparation for the bi-centenary celebrations of the Stockton & Darlington Railway in 2025, will facilitate a Heritage Lottery bid in 2019. The aim is to have the whole area transformed by 2023. It fell to Graham Nicholas to play the role of what he described as ‘tail-end Charlie’ and cover progress with our third locomotive, Gresley class V4 No. 6439. In a very short space of time this has moved from a “what if” project to one that now has its first physical components from Malcolm Barlow (via David Buck, owner of Thompson class B1 No. 61306 Mayflower and new Chairman of Steam Dreams) including a chimney casting, tyres, air pump and a complete set of drawings, many of which are common with other classes and some of which bear the signature of Sir Nigel Gresley himself.

Finally, Mark Allatt wrapped up the formal meeting with a question and answer session. Some good enquiries were received from the floor and topics covered included; the linking of boiler funding to the provision of the new coaches, the future of 90mph running for Tornado, the pros and cons of prolonged high-speed running, the future role of the new V4, the challenge of a skills shortage, the coordination of ‘group standards’ with other locomotive owners in the provision of on-board electronics and the allocation of a back-up locomotive for future tours.

After an excellent buffet lunch provided by the Dolphin Centre, Covenantors were taken by vintage bus to Darlington Locomotive Works to view the progress with Prince of Wales for themselves which included a live-streamed walk round tour of the locomotive by David Elliott. The merchandise stand did a steady trade and, more significantly, the team signed numerous people up to the clubs, taking an estimated £20,000 on the day. Even after all this excitement the day was not yet done and some 90 hard-hats turned up to dinner at the Mercure Darlington Kings Hotel that evening, enjoying good food and company and a most entertaining talk by Jonathan Glancey who tried his hardest to inspire us with suggestions for future projects for the Trust to build (a Chapelon 160A! everyone!). The evening was wound up by David Champion’s band performing for us, a novelty for a Convention dinner!
A1 ENGINEERING UPDATE by David Elliott

Our hoped-for quick return to operations following the valve gear failure on ‘The Ebor Flyer’ on 14th April did not happen for a variety of reasons. However, Saturday 6th October was a significant day in the return of Tornado to main line operation. Following two of weeks successful running-in on the Nene Valley railway during which a total of 772 miles were covered, made up of 235 miles light engine and 547 miles loaded, one of DB Cargo’s steam examiners carried out an audit of the condition of the locomotive and the ‘relevant’ paperwork which accompanies it, including test certificates for the boiler and air reservoirs, ultrasonic testing of the axles, spring weights etc. No significant defects were found, although there were a number of minor deferred defects mostly arising from two weeks of continuous activity which were attended to during the A Exam scheduled to start on 11th October.

Following from the investigation and start of the repair process described in TCC 50, some of the subsequent procurement and machining turned out to be protracted. In addition to the essential repairs to the inside valves and valve gear, we decided to refurbish and renew parts of the outside cylinder valve gear whilst the engine was out of service.

The repair has proved to have taken rather longer to complete than we anticipated due to a number of factors, including having the locomotive based a long way from our engineering resources; and that the parts of the British mechanical engineering industry that we rely on being very busy at the moment. This resulted in long lead times to have specialist machining and welding work done.

Some firms were able to help us quickly, in particular Arthur Stephenson Engineers Ltd. of Atherton who were able to forge and machine a new union link and combination lever in a short period of time for the inside valve gear, and to Durham Precision Engineering Ltd. of Newton Aycliffe who rapidly CNC machined a new crosshead drop link.

Right: The combination lever during machining and the newly machined union link.

The combination lever/union link and drop link.

Daniela using the CMD.

The ‘lift’ test in progress.

We were less lucky with the new middle cylinder valve liners, which, notwithstanding the kind ‘loan’ of two castings from LNWR Heritage at Crewe, took a long time to be finish machined, setting back their reinstatement and the subsequent assembly work. Although the outside valves and valve gear were undamaged during the incident, given the problem with the middle valves, it was felt prudent to dismantle and thoroughly measure and inspect them.

In order to gain a better understanding of what had caused the original failure, all three sets of valve liners were measured in three axes by a modern Faro arm and laser tracking system which can accurately measure surfaces curved surfaces. Whilst the outside valve liners were in reasonable condition, there was some scoring so the decision was taken to lightly re-bore them to remove the marks. Metalock Engineering from Coventry carried out the survey and subsequently machined out the inside liners and bored the outside liners.

One of the possible contributors to the seizure of the front middle valve piston was the liner being slightly off centre compared with the axis of the valve chest. A further issue which may have contributed to the failure was that the affected liner had a slight taper from front to back, which would further reduce clearance between the valve piston and the liner at the rear of the valve stroke. We realised that other than the expensive Faro arm method, we had no accurate way of checking the concentricity of liners. The traditional process relied on the accuracy of setting up the boring equipment to ensure that the liners are concentric with the bores. To overcome this problem, I set Daniela Filová (our recently appointed Assistant Mechanical Engineer) the task of designing and supervising manufacture of a piece of equipment to check concentricity.

Daniela came up with a splendid piece of equipment using the 3D CAD and tried it out on Tornado’s valve chests following re-boring. This indicated that the valve liners are now very close to truly concentric with the valve chests.

When the valves are fitted into the valve chests, they should be as close to concentric as possible in the liners so that the nominal 1/32in clearance is equal all round each valve head. It is important that the bearing in the front valve cover and the crosshead supporting the rear of the valve spindle are set up to ensure that the clearance is even. A method was developed to check that with the crosshead in its guide, when the valve spindle is slid into the hole in the crosshead, it lifts between 0.016in and 0.021in (being between half the total clearance of the valves in the liners or slightly more to allow for subsequent wear). To achieve this the crossheads had white metal added to their undersides and were carefully machined to provide the required clearance. The final fitting required an iterative approach, i.e. the crossheads were initially machined slightly oversize and tried in place, followed further machining to achieve the required clearances. With the machine shop being at Loughborough – 1¼ hours drive from Wansford – this proved to be a time-consuming process, especially if the process required repeating as it did on two occasions.
The new liners were shrunk into the cylinder block using Metalock by Serco Railtest at Derby. The good news is that the failure of the combination lever (which flexed until it broke) was a typical ductile failure which is what is to be expected of the relatively soft metal it is made from. The other fractures were consistent with severe forces encountered by the now flaring combination lever and union link. The valve piston is estimated to have reached over 800°C (which is red heat) where it “picked up” in the liner. The materials of the piston head and rings were found to be the correct specification.

A further potential contributor to the failure was lubrication. A comprehensive range of tests were carried out on the lubricator and its atomisers which produce only steam which is fed into the valves and cylinders. Most of these showed the lubricator to be working correctly, however when the lubricator was driven by a lathe to replicate operation on the engine, it was anticipated that the output might fall off at high speeds. However, the opposite was observed in that the ratchet mechanism was turning the pump cam shaft less per stroke at low speed compared with when running fast. After some further investigation, the key which transfers the drive from the ratchet mechanism to the lubricator cam shaft was found to be worn, resulting in some lost motion.

When running fast the momentum in the pump shaft prevented it from slipping backwards during each stroke which resulted in the higher output at speed. The existing inspection regime would not detect the wear in the key as it was only visible when the pump was running with the cover off the ratchet mechanism. To overcome this the maintenance procedure has been altered to remove and specifically check the condition of the key on an annual basis. This is not felt to have been likely to have contributed directly to the failure which took place at high speed. However, it has been felt for some time that the ratchet mechanism is subject to a lot of stress and is a potential single point failure. The ratchet fitted to Tornado since new has a single pawl. The pawl is a spring loaded peg which engages in the teeth of the ratchet wheel to prevent it from turning backwards. We discovered that A4 Pacifics were fitted with a modified ratchet with three pawls acting on the wheel which reduces the risk of the lubricator stopping if a single pawl fails. Tornado now has a three pawl ratchet.

Finally, on lubrication, the oil extracted from the lubricator after the incident was found to be low in viscosity. No firm reason has been discovered for this. However, we are instituting an enhanced inspection regime on new batches of oil including carrying out viscosity tests. It is said that steam locomotives have souls. I am convinced that Tornado had one and she was upset at being broken. This has been demonstrated on several occasions when refitting components (in a process that has been straightforward in the past) not fitting first time and requiring further work! (It sounds more as though she is behaving like a diva – Ed!) Great care has been taken throughout the reassembly process to ensure that adequate clearances have been achieved and the lubrication is fully up to specification. A further interesting discovery concerns valve spindles. They are long, thin bars with heavy piston heads on them and we know from past engineering activity that they tend to become slightly bent over time. This can be checked and rectified by setting up the spindle in a lathe and “clocking” it for concentricity using a dial gauge. A hydraulic jack is placed on the saddle of the lathe and small precise forces applied to the spindle to straighten it. However, having straightened the middle valve spindle with the valve heads removed, and then tested again with the heads fitted, we discovered that the force required to tighten the large nuts which secure the valve heads caused the spindle to distort again – the lesson is to carry out the straightening after the valve heads are fitted.

In summary, we have found four likely contributory factors in the failure. Each one on its own is unlikely to have caused the failure, however coming together, excessive rubbing between a ring or the valve head itself eventually resulted in localised heating which led to a thermal runaway causing the valve head to expand until it became locked in the liner. This stopped the spindle moving which placed a great load into the inside valve gear which was absorbed by flexing the combination lever until it broke. The maintenance instructions for cylinder and valve liner machining and the refitting of valve components, and for lubricator inspection and overhaul have been beefed up to reduce the risk of a repeat of these problems.

We owe thanks to the Nene Valley Railway which has made us most welcome and have gone out of their way to accommodate moves round the yard and the use of their railway to run-in Tornado. We are also grateful for the assistance of many other firms and individuals, including our loyal volunteers. Our especially sincere thanks goes to David Wright’s Locomotive Maintenance Services Ltd. of Loughborough and his staff, particularly Andy Morgan and Andy Meredith who have spent many hours at Loughborough and Wansford manufacturing new components, feeding existing parts and fitting them to the engine.
KEEPING TORNADO ON THE TRACKS by Mark Allatt

Keeping No. 60163 Tornado in top-tip working order is an expensive business as we are being reminded following the locomotive’s failure on ‘The Ebor Flyer’ on Sunday 14th April 2018. Whilst the profit from operating our programme of main line tours and Tornado’s hire fees from heritage railways and working for other rail tour promoters currently covers her day-to-day and year-to-year maintenance costs, they do not at present generate a sufficient surplus to fund her five and ten year overhauls, conservatively estimated at around £500,000 each. Therefore, it is vital for us to continue to maintain (and hopefully grow) Tornado’s on-going Covenant income.

In the last couple of issues of TCC I have written about how the number of individual Covenantors supporting Tornado had gradually declined since a peak of around 1,600 (many more £5pm equivalents) in 2009 to around 1,120 today each person donating an average of around £10pm before Gift Aid. This decline has been mostly due to annul domini and new covenantor recruitment failing to keep pace. We have issued over 2,700 Covenantor numbers since launch but only have around 1,120 on our books, a loss of over 1,500 supporters over the past quarter of a century.

The last few months have seen this attrition stabilise and even start to grow a little with the loss of around six Covenantors per month being matched by the recruitment of slightly over the same number. This is perhaps partly due to the unfortunate events of Saturday 14th April being the number of people who have decided to become covenantors following the publicity surrounding the breakdown. Hopefully the more positive profile generated by last year’s ‘I Love Tornado’ Plaidump, 100mph test run, PADDINGTON 2 movie and our future 90mph operations will continue to help to grow this number. I would therefore urge all our existing A1 Covenantors to help us to recruit new supporters and for P2 Covenantors (around two-thirds of whom are not also A1 covenantors) to come on-board if they are able to. And perhaps each of our existing Covenantors could pledge to recruit a friend or colleague? Now that really would be a great and lasting 10th birthday present for Tornado! YEC

For more information on how you can help to keep Britain’s only new-build main line steam locomotive on the tracks visit www.a1steam.com email enquiries@a1steam.com or call 01325 460163

By donating £601.63 to our ‘I Love 60163’ appeal, you will receive:

- An exclusive ‘I Love 60163’ car sticker
- Access to view Tornado at all reasonable times
- The Trust’s newsletters on a regular basis
- Annual Covenantor Card
- The opportunity to attend the Trust’s Annual Convention
- A special ‘I Love 60163’ day with No. 60163 Tornado
- Your name inscribed on the Roll of Honour at Darlington Locomotive Works.

For more information, please visit www.a1steam.com enquires@a1steam.com or call 01325 460163.

VOLUNTEERS by Mark Grant

Since my last message (TCC50) we of course have not done any main line tours or events. However, our ‘carriage hosts’ and ‘support team’, alongside SRRS (Scottish Railway Preservation Society) stewards, were involved with the RAF100 event on Tuesday (10th) July. We started very early in Lincoln and looked after our passengers on the way down to King’s Cross with No. 60009 Union of South Africa at the head of the train.

We had two ‘special’ limited edition items to promote, a poster and a mug. These are still available to purchase from our website (whilst stocks last). Once in London, some of our team went to get a vantage point to see the flypast, whilst some remained on the train to put orders together and tidy things up. Our return journey was diesel hauled from London Victoria, and we had a good run back to Lincoln with some very satisfied passengers. I’m hoping I can have more to report in the next issue when our locomotive is back in traffic. However, for now, a big thanks to our ‘on board’ team who did a fantastic job, and to all who volunteer in whatever capacity to make our operation run. YEC

Tornado tears past Arksey with ‘The Talisman’. A special ‘I Love 60163’ Birthday present for Victoria, and we had a good run back to Lincoln with some very satisfied passengers. I’m hoping I can have more to report in the next issue when our locomotive is back in traffic. However, for now, a big thanks to our ‘on board’ team who did a fantastic job, and to all who volunteer in whatever capacity to make our operation run. YEC

The repairs to Tornado have included:
- Reboring the outside valve liners
- Manufacturing and fitting of new valve heads
- Remachining and machining of outside valve spindle crossheads
- Rebushing of the outside valve chest covers
- Renewing the left hand outside union link and pins
- Boring oil and replacement of pins in the inside reversing gear
- Exchanging and overhauling the front air pump
- Replacing the blow down valves
- Overhauling the mechanical lubricator and atomisers
- Replacing some of the lubrication pipework
- Fitting of three-pawl ratchet mechanism to lubricator in order to improve reliability
- Following recent tyre turning, acquisition of a replacement set of coupled wheel tyres

It’s hard to believe that No. 60163 Tornado has now been in traffic for over 10 years – and what a decade it has been! Throughout these years we have had many highs and a few unfortunate lows; we have travelled the length and breadth of Great Britain, hauling main line charters and Royal Trains, visiting dozens of heritage railways & centres and making countless appearances in the press, on TV and even in a movie! The nation – and indeed people way beyond our shores – seem to have taken Tornado to their heart.

Unfortunately, Tornado’s 10th Birthday year didn’t quite work out as planned and 2018 has been a challenging year for The A1 Steam Locomotive Trust following No. 60163’s failure on 14th April 2018 hauling her first 90mph train, ‘The Ebor Flyer’. Although much of the repair costs and loss of earnings have been covered by our insurance, unfortunately not all those costs could be recovered.

The opportunity to attend the Trust’s Annual Convention
- A special ‘I Love 60163’ day with No. 60163 Tornado
- Your name inscribed on the Roll of Honour at Darlington Locomotive Works.

By donating £601.63 to our ‘I Love 60163’ appeal to help close the funding gap and raise £60,163 from 100 people each donating £601.63 in up to six payments.

For more information, please visit www.a1steam.com email enquiries@a1steam.com or call 01325 460163.
On the day marking the 50th anniversary of the end of scheduled steam-hauled services on British Railways, The A1 Steam Locomotive Trust announced that it had – thanks to the generosity of its supporters - purchased No. 60163 Tornado’s tender from William Cook Cast Products Ltd following the success of The 163 Pacifics Club fundraising campaign.

Just a week before on Saturday 28th July, over 100 supporters of the Trust gathered at Darlington Locomotive Works to celebrate the tenth birthday of No. 60163 Tornado. The locomotive made its first moves in front of the world’s press on 1st August 2008 and has subsequently become a household name.

Tornado’s tender was leased to the Trust under a 15-year loan agreement which was due to come to an end in 2021. The tender was owned by William Cook Cast Products Ltd (the Trust’s Principal Sponsor) as Chairman Sir Andrew Cook CBE kindly offered to fund the construction of the tender in 2006, allowing funds being raised to be spent on building the engine. By 2014 the Trust had repaid all £1m debt needed to complete Tornado in 2008 and funded the conversion of BR Mk I BCK E2/149 to her support coach. The 163 Pacifics Club was launched in September 2013 to fund the purchase of Tornado’s tender on the lease’s expiration in 2021.

Tornado’s tender is a development of those built for the original Peppercorn class A1s - mainly due to the different operating environment on the modern Network Rail main line. Due to the lack of surviving steam infrastructure, water capacity is at a premium and so Tornado’s tender carries 6,200 gallons, as opposed to 5,000 gallons, and seven tons of coal, rather than nine tons in the original A1s. The tender is also the home for many of Tornado’s other unique features including an alternator, Timken cartridge roller bearings (pre-greased sealed self-contained units which do not have to be fitted in enclosed axleboxes), Train Protection & Warning System (TPWS), National Radio Network (NRN) radio, Global System for Mobile Communications - Railway (GSM-R) radio, GPS tracker and of course the mobile phone charger!

Details of The 163 Pacifics Club:
- The Trust needed to raise £200,000 to purchase Tornado’s tender
- Although Tornado carries the number ‘60163’ - the next in the Peppercorn class A1 series following No. 60162 Saint Johnstoun – her pre-nationalisation LNER number would have been ‘163’
- There were therefore 163 ex-LNER express passenger ‘Pacifics’ (wheel arrangement 4-6-2) from the Gresley class A3s/A4s, Thompson class A1/1 and Peppercorn class A1s available for sponsorship
- Due to popular demand, an additional 46 ‘Pacifics’ were released for sponsorship from the Raven class A2s

Tornado’s tender outside DLW following No. 60163’s overhaul.

Membership of The 163 Pacifics Club grew steadily from its launch in September 2013. In July 2017 the additional Pacifics were added to those available for sponsorship and by September 2017 The 163 Pacifics Club had passed its initial 163 members target.

On 1st August No. 60163 Tornado celebrated her tenth birthday and remains the only now main line steam locomotive to be completed in Britain since 1960, despite over 20 standard gauge new build projects being launched. Tornado’s first 100,000 miles have seen the locomotive criss-cross Great Britain, a testimony to those supporters who stuck with the project over the 18 years that it took to fundraise and build – ‘This locomotive was built and paid for by people who shared a vision and were determined to turn it into reality’.

We are delighted that thanks to the generosity of our dedicated supporters we have raised more than £200,000 plus gift aid through our The 163 Pacifics Club fundraising campaign. This means that we are now in a position to purchase Tornado’s tender from William Cook Cast Products Ltd, thus completing the project to build a new Peppercorn class A1 ‘Pacific’ launched in 1990.

As the Trust’s Principal Sponsor, I believe that the building of Tornado is a great example of ‘The Cook Guiding Principles’ – Nothing in the world can take the place of persistence... persistence and determination alone are omnipotent.”
The atmosphere was electric with anticipation and a little apprehension. When she moved, it brought a lump to the throat. The first time I had seen A1 move since King's Cross circa 1963. Twenty minutes later I got a ‘phone call from my son to say “Dad, I am in a pub in Guildford with my mates and have just seen your engine on the one o'clock news.” Wow!

The second “best memory” was the following January, when I was Train Manager for our first two runs from York to Newcastle and Durham. The crowds on York station were enormous, but when the train moved and accelerated around the double curve north of the station, my thought was, “what have we achieved and now unleashed?” Ten years on, I still get just as excited. The following week we had our first run to London. Seeing people lining the trackside in snow to see us pass was quite humbling but the arrival at King’s Cross was staggering. It was a proud moment for us all.

PHIL CHAMPION

PREVIOUS EDITOR OF TCC

- Most memorable A1 moment? It was 1st August 2008, the day of its public unveiling in full livery. This was very exciting! After that I used to get a call from my brother David with his dog Buddy. Sitting next to David was Dorothy Mather who always gave a good welcome to all A1 people from the past and present. She was a lady in particular it must have been a momentous day. Preparations were still being made on the A1. David Elliott was just getting on with it, quite unfazed by the occasion. A number of A1 people from the past and present were there. So too were TV crews; in fact it was quite a media circus.

The un-named No. 60163 was just outside the open door of the Great A1 Trust’s new building. After a while I saw my brother David with his dog Buddy. Sitting next to David was Dorothy Mather who always gave a good welcome to all A1 people from the past and present. She was a lady in particular it must have been a momentous day. Preparations were still being made on the A1. David Elliott was just getting on with it, quite unfazed by the occasion. A number of A1 people from the past and present were there. So too were TV crews; in fact it was quite a media circus.

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STOP PRESS!
As if Graeme Bunker-James didn't have enough on his plate, Sophie has just "out-shopped" a new Bunker-James! Congratulations to both of them on the arrival of baby Joshua, we look forward to him joining 'The Tornado Team' in due course!

AN A1 AT WETHERSPOONS by Phil Champion
My wife and I spent a weekend in Edinburgh - Royal Wedding weekend as the tour operator put our trip back a fortnight. (Yes, we did see part of it as Barbara took her iPad to take photos and while in the Royal Botanic Gardens cafe she used their wifi to get the BBC (Player). Next morning, we enjoyed the open top bus tour then we both fancied a coffee. Alighting at the final stop and coming round onto Waverley Bridge she spotted a Wetherspoons - 'The Booking Office'. Handy, reasonable prices and free refill, Wetherspoons invariably celebrates the history of the building, if old, and the locality its website states that in 1846, "the North British Railway Company built North Bridge Station at the east end of Nor Loch. Two rival companies each opened a station here, in quick succession. In 1854, all three stations were combined and renamed 'Waverley', after the famous novel by Sir Walter Scott. By 1865, the NBR had 'absorbed' its rivals and built a new station. It rebuilt Waverley again in the 1890s. All that remains of the original North British railway station is the multi remodelled Booking Office... (which) became the Parcels Office for many years. It became a restaurant until Wetherspoons converted it into a pub in 2016. On the wall next to us was a home signal arm (though wrong round with spectacle on the left) and a shunt signal. Due to the pub being very busy plus time constraints we didn't see other items like the NBR mosaic/crest I later saw on the website. We paid a visit to the (downstairs) loos. After opening the door onto the landing, round the corner was a reproduction BR poster for 'The Flying Scotsman' (TFS) with a blue A4 in front of the Scott monument very nice. Turn again and above the mid landing is a striking June 1950 BR poster for TFS with its weekday times from principal stations. The A1 in full steam with the two carriages seen was clearly numbered 60135 on the smokebox though was un-named. Both posters were in black and white except for the blue A4 but it stood out all the more for that. In fact, No. 60135 did haul TFS. Looking at the histories for Nos. 60114 - 60149 which I compiled first for The Pioneer then later the A1 website, you can see that it was this Gateshead engine brought the L. 'Scotsman' into Newcastle on 22nd December 1948 - just over a month after it entered service- and again on 22nd January 1949. As it ranged along the whole ECML between the two capitals it was seen with the down 'Flying Scotsman' on 15th April 1955 having taken over at Grantham. The poster is dated June 1950 and a bit ahead of itself as it shows the early BR emblem on the tender. While A1s were appearing with it by then No. 60135 got its emblem that October when it was repainted blue and named. There would have been more of an Edinburgh connection for this reproduction poster had the engine been named then for it became Midge Wildife. This was a character from Sir Walter Scott's novel 'The Heart of Midlothian' set in Edinburgh. Next time we're in Edinburgh I think we'll be off to 'The Booking Office' for two lattes and a look at the railway memorabilia, particularly those two posters.

BY APPOINTMENT! by Graham Langer
With the Duchess of Sussex very much in the news again, it is amusing to note that Meghan chose a photograph taken by one Gerry Mooney for her official birthday thank-you cards. In case you haven't realised yet, Gerry is a key figure in operating steam in Eire and an occasional member of our support crew. From the Irish Independent, "When Irish Independent photographer Gerry Mooney received a call from Kensington Palace, he thought it was one of his colleagues having a laugh. But once he was assured of their legitimacy, the PA to Duchess of Sussex Meghan Markle asked for permission to use a photo he took of the royal. The photo chosen was one of the Duchess mingling with fans at Trinity College during her visit to Ireland with Prince Harry over the summer; the latest addition to the British royal family was sending out postcards as a thank you to her fans following their best wishes for her 37th birthday. And Gerry's photo was the one they wanted to use for the cover.

Gerry (leaning out of the cab window) with members of the support crew at Paddington station in November 2011.

10th ANNIVERSARY PARTY by Graham Langer
Over 100 supporters of The A1 Steam Locomotive Trust gathered at Darlington Locomotive Works on Saturday 28th July to celebrate the tenth birthday of new steam locomotive No. 60163 Tornado. The locomotive made its first moves in front of the world's press on 1st August 2008 and has subsequently become a household name. Since completion in Darlington in 2008, Tornado has covered over 100,000 miles and seen service on the Network Rail main line and heritage railways right across Great Britain. Highlights have included three Royal Trains including the naming by TRH The Prince of Wales and The Duchess of Cornwall in February 2009; BBC Top Gear ‘Race to the North’ with Jeremy Clarkson on the footplate; ‘The Winton’ train to commemorate the 70th anniversary on the Kinder Transport; the rescuing of stranded commuters in Kent; the re-opening of the Settle to Carlisle Railway; the first steam locomotive in the UK to achieve 100mph for 50 years; featuring in two BBC documentaries, ‘Absolutely Chuffed – the Men Who Built a Steam Engine’ and ‘Tornado the 100mph Steam Engine’, and starring in ‘PADDINGTON 2’ the movie. Tornado’s birthday party featured the showing of both of the BBC’s documentaries on Tornado – narrated by their producer Tom Inglis, a review of Tornado’s first ten years in traffic, a hog roast, a band which included the Trust’s President David Champion and a spectacular Tornado shaped birthday cake. Guests also had the opportunity to see for the first time new Gresley class P2 No. 2007 Prince of Wales and with its eight 6ft 2in driving wheels fitted.

TORNADO AT TEN – PHOTOGRAPHY COMPETITION WINNER
In 2018, we invited both budding and more established photographers to enter their photos of Tornado into a competition. The winner was announced on 30th October 2018 and has received two First Class Dining tickets on a days railtour on Tornado of their choice. The picture on the right is the winning photograph taken by David Newbegin. The judges particularly liked the creative treatment of the photograph.
TORNADO TOUR DIARY - 2019

Below are the future operations Tornado is confirmed to be involved in. More details will be published on www.a1steam.com as trains are finalised. Contact details for tour companies are below.

- Saturday 9th February - 'The North Briton' - East Midlands to Carlisle via the Settle & Carlisle Railway and return – bookings through UK Railtours
- Sunday 3rd March - 'The Auld Reekie' – Doncaster & York to Edinburgh and return – bookings through UK Railtours
- Thursday 14th March - 'The Aberdonian' - Launch Train: Edinburgh to Aberdeen via the Fife Coast – bookings through UK Railtours
- Saturday 23rd March - 'The Bard of Avon' - Manchester Piccadilly to Stratford-Upon-Avon – bookings through UK Railtours
- Saturday 6th April - 'The Devotion' – Birmingham to Plymouth and return (Tornado Bristol – Plymouth – Birmingham) – bookings through UK Railtours
- Saturday 13th April - 'The Border Raiser' - West Midlands to Carlisle via the Settle & Carlisle Railway and return – bookings through UK Railtours
- Saturday 4th May - 'The Yns Mon Express' – East Midlands and North Staffs to Holyhead and return – bookings through UK Railtours
- Saturday 11th May - 'The Mad Hatter' – Darlington, York and Wakefield to Chester – bookings through UK Railtours
- Saturday 8th June – 'The North Briton' – London and East Coast stations to Carlisle via the Settle and Carlisle Railway – bookings through UK Railtours
- Saturday 11th June – ‘Linksgow to Twedbank and return — Scottish Railway Preservation Society
- Saturday 17th June – ‘The North Briton’ – Edinburgh – bookings through UK Railtours
- Saturday 24th August – 'The North Briton' – Grantham, Nottingham, Boston, Chesterfield and Doncaster to Carlisle via the Settle and Carlisle Railway – bookings through UK Railtours
- Saturday 31st August – ‘The Aberdonian’ – Edinburgh to Aberdeen via the Fife Coast – bookings through UK Railtours
- Saturday 7th September – ‘The Aberdeen’ – Edinburgh to Aberdeen via the Fife Coast – bookings through UK Railtours

The Trust respectfully requests that anyone wanting to see Tornado follows the rules of the railway and only goes where permitted.

UK Railtours
www.ukrailtours.co.uk 01488 715950
Pathfinder Tours
www.pathfindertours.co.uk 01453 834141
Torbay Express
www.torbayexpress.co.uk 01325 460163

TORNADO TEAM MEETS PRINCE OF WALES

Following on from the issues we have had with No. 60163 Tornado, the annual Tornado Team Day was cancelled. We took this opportunity to introduce the members of Tornado Team to No. 2007 Prince of Wales. On Sunday 14th October 2018, the children and their parents visited Darlington Locomotive Works (DLW), to take part in a number of activities including a quiz and a demonstration by local artist Stephen Bainbridge. The children then had an opportunity to sketch their own P2, based on the techniques Stephen had shown them.

Right: The Tornado Team at Darlington.

V4 NEWS - PROJECT REACHES PRE-LAUNCH STAGE by Mark Allatt

In early September, The A1 Steam Locomotive Trust announced that it had formed a new subsidiary, The V4 Steam Locomotive Company Limited, to carry out the building of its third new steam locomotive - the yet-to-be-named new Gresley class V4 No. 3403 - as part of its preparations for the formal launch of the project. It was also able to confirm that it had acquired over 500 original class V4 drawings from Malcolm Barlow, a Doncaster scrap dealer who launched the now defunct Gresley V4 Society in 1994 to build a new example of the class.

The London and North Eastern Railway (LNER) class V4 was a class of 2-6-2 steam locomotive designed by Sir Nigel Gresley for mixed-traffic use. It was Gresley’s last design for the LNER before he died in 1941. The class V4 had similarities in its appearance and mechanical layout to the class V2s of which pioneer No. 4771 Green Arrow is preserved as a part of the National Collection. The class V2s, introduced in 1936, had limited route availability and the class V4 was a lightweight alternative, suitable for use over the whole of the LNER network.

Two locomotives were built at the LNER’s Doncaster Works in 1941. The first locomotive, No. 4301 Barrow Cock, had a scaled down version of the Gresley Pacific boiler with a grate area of 27½ sq ft. Its tractive effort of 27,000 lbs was produced by boiler pressure of 250 psi and three cylinders of 15in diameter. The second locomotive, No. 3402, incorporated a fully welded steel firebox and a single thermic syphon for water circulation. It was not named, but was known unofficially as Barrow Hen. The class was tried on the Great Eastern section of the LNER, and was well received, with more power than the existing Gresley class B17 4-6-0s and better riding qualities. It was anticipated that many more would be produced, but after the sudden death of Gresley in April 1941 and his succession by Edward Thompson, no more were built. Instead, the simpler two-cylinder Thompson class B1 4-6-0 was adopted as the LNER’s standard mixed-traffic locomotive and 410 were built between 1942 and 1952. The two locomotives were sent to Scotland for use on the West Highland Line, although their wheel arrangement was not particularly suitable for the line’s steep gradients. The two class V4s were renumbered Nos. 1700/1 in 1946 and later became British Railways Nos. 61700/1. Both locomotives were scrapped in 1957 when their boilers became due for renewal. At its Silver Jubilee Convention in October 2015, The A1 Steam Locomotive Trust announced that it would follow its Peppercorn class A1 4-6-2 No. 60163 Tornado and Gresley class P2 2-8-2 No. 2007 Prince of Wales with the construction of further extinct LNER steam locomotives. The Trust confirmed that it has started work identifying and scanning the original drawings for the Gresley class V4 at the National Railway Museum in York in order that the design book for new locomotive could be created within 3D Computer Aided Design (CAD). In January 2018, the Trust revealed that it had acquired and taken delivery of a complete set of fully-certified tyres for the new Gresley class V4’s pony, Cartersay and Shilhill driving wheels. They were purchased from David Buck, owner of Thompson class B1 4-6-0 No. 6131 and the project team confirm that they were made in South Africa in the late 1950s for Malcolm Barlow, a Doncaster scrap dealer who launched the Gresley V4 Society in 1994 to build a new example of the class. David Buck acquired the parts six months prior in a job lot of items that Malcolm Barlow had salvaged from Doncaster Works on its closure — including a number of class B1 components.

We are now in the pre-launch phase of the project to build our third new main line steam locomotive, with the formation of The V4 Steam Locomotive Company to actually build No. 3403, the opening of both the company and charitable bank accounts and the detailed review of over 500 acquired drawings.

Unlike with our class P2, where we have had to do a considerable amount of development work to complete the job that Sir Nigel Gresley started in 1934, there will be very little redesign work needed as there were no known problems with the Gresley class V4.

Although there is no specific appeal open for No. 3403 yet, any donations made towards it will be ring-fenced for the project.

The next steps will be to launch a website for the project and The Founders Club to fund the early stages of the project. More announcements will be made during 2018 as the project builds up steam.

For more information on how to help, visit www.v4steam.com, email enquiries@v4steam.com or call 01325 460163.
We have a Mikado! No. 2007 stands outside Darlington Locomotive Works with a full set of wheels underneath!
One of eight A1s to emerge in December 1948, No. 60122, as Doncaster Works No. 2039, was the ninth to twelfth A1s so re-liveried. Naming as Curlew was noted on 15th April 1954. During the previous month Nos. 60122 and 60126 had exchanged tender Nos. 740 and 745 during general repairs.

A return to Grantham shed was made on 28th August 1955. Workings continued to Leeds and the North East. Both the up and down ‘Flying Scotsman’ were seen hauled into Newcastle four times between March and June 1956. From September to the following January Curlew hauled the following trains a number of times; 15:00hrs and 17:35hrs King’s Cross-Newcastle; 08:20hrs King’s Cross-Edinburgh; and the 10:20hrs Leeds from the capital. Shorter runs were the 05:50hrs and 06:45hrs King’s Cross-Grantham. The 05:50hrs on Boxing Day was followed by an additional King’s Cross-Hull. Few records exist of No. 60122 on non-passenger trains; one is the 23:00hrs King’s Cross-York parcels on 7th January 1957. The smokebox number plate and handrail were transposed. In July the later BR crest was applied to the tender.

A return to its original shed came on 15th September 1957, when it was recorded working the up ‘Flying Scotsman’ 30th August. A less usual working was the 06:05hrs King’s Cross-Cambridge. On 11th November 1958 the 17:30hrs from Peterborough to the capital was hauled to Hitchin before stabling on Hitchin shed. Re-allocation to Doncaster came on 5th April 1959. Sightings continued in west Yorkshire and Newcastle with servicing on Gateshead and Newcastle with servicing on Gateshead and Newcastle.

In October 1953, affecting the sphere of operations little. The up ‘Bradford Flyer’ was noted on 15th April 1954. During the previous month Nos. 60122 and 60126 had exchanged tender Nos. 740 and 745 during general repairs.

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Withdrawal from service was on 1st January 1962. The final sighting was on 13th January in Doncaster Works yard where it was cut up. During its life, No. 60122 had carried seven different boilers. Curlew’s 14 years of service on the East Coast was less than the A1 average of 15 years two and a half months although five class members had even shorter working lives. Even though it was amongst the first half of the A1s to be built, No. 60122 was just the sixth to be taken out of service at a time when increasing dieselisation was taking away its work.

This history was compiled by Phil Champion based on a database compiled by Tommy Knox and with reference to the RCTS book ‘Locomotives of the LNER Part 2A’ as background.
There has been some significant visual progress with the cladding trial fitting to the frames and a full set of wheels under the engine.

**Wheelsets**
The coupled cannon boxes have been trial fitted to the wheelsets and following some protracted measurements and we are now in a position to finish machine the adjustment rings. Meanwhile, Ian Matthews has made good progress with sculpting the balance weight plates to fit round the spokes. We now have all the wheelsets.

**Frames**
We had an offer from the Bignall group from Newton Aycliffe to arrange for laser measurement of the frames. This took place in collaboration with Hexagon Metrology Ltd as an educational exercise with students from University Technical College of the North at Newton Aycliffe attending. This should help with the final grinding of the hornblock liners to achieve accurate axle alignment. Daniela has produced manufacturing drawings for the outside motion brackets. Having completed her Finite Element Analysis (FEA) training, she has applied it successfully to the motion brackets and will be doing the same to the pony truck frame in the near future.

The pony truck cannonbox is still in the process of being machined following an earlier machining error which required some welding. To enable us to trial fit the pony truck axle and to assist with finding suitable locations for the TPWS antenna and AWS receiver, Daniela has drawn and supervised construction of a wooden mockup by volunteer Terry Graham of the pony truck frame.
Cladding
Ian has largely completed the cladding and has since been working on fitting the front of the cab to the cladding and preparing the spectacle plates to accept the spectacle window frames.

Air pumps
We now have the first overhauled air pump, both the Polish type lubricators and a quantity of spare parts delivered from Meiningen, and steps are being taken to order the overhaul of the second pump.

Boiler
An order has been placed on Meiningen for the updated boiler design including reprofiling the dome to fit inside the cladding (the A1 dome cover is outside the P2 cladding profile at the sides). I visited Meiningen on 17th October to finalise the scope of the design work. Although the boiler for No 2007 is essentially the same as that for Tornado as there have been several modifications and improvements to the original design, the design as a whole needs bringing up to date for certification of the new boiler. We presently have expressions of interest in building the new boiler from a number of suppliers.

Tender
Ian Howitt is making progress with the tender frame having collected the last of the castings from DLW. The tender axles are due any time now and will be sent with the wheels to South Devon Railway Engineering for assembly as soon as they have been inspected. Requests for a quotation for the tender tank have been sought from a number of companies with the necessary skills.

Electrical
Alan Parkin has been retained part time to carry out detailed electrical design. So far he has worked up a design for a modern axle driven alternator as the Stones Altonum alternators used on Tornado and our support coach are becoming hard to find and are very expensive to overhaul. Their regulators are even more problematical as they use 1960s transistors! The new design uses a 28V 180A bus/track alternator with a 2.5:1 step up drive through toothed belts to enable it to be driven by a rail vehicle axle. Mechanically it will be capable of replacing the Stones alternator or a Wolverton type carriage dynamo. Alan is also working on manufacture of a new turbogen turbine wheel (as these are also becoming hard to find) with Durham Precision Engineering of Newton Aycliffe.

He has also visited the National Railway Museum, York to make a detailed 3D model of an original LNER headlamp with the flared lens shield which will enable Rob Morland to start work on the P2 combined head, marker and tail lamps.

3D Transparent Image of the Belt Driven Alternator.

3D Transparent Image of the Belt Driven Alternator.

Above: Turbine wheel parts.

Right: An original LNER lamp and the 3D CAD for a new one.
Design Work
Daniela has almost completed manufacturing drawings for the pony truck frame and has converted the original cast steel outside slider bar brackets to fabrications.

Work on valve gear and the cylinder block has made sporadic progress but has been slowed by the time spent on Tomado’s repair. With the extra design resource we now have, this should be caught up over the next few months.

In early August, The A1 Steam Locomotive Trust announced that it had agreed a £350,000 order for a state-of-the-art electrical system for new Gresley class P2 No. 2007 Prince of Wales. The electrical system, based on that fitted to No. 60163 Tornado, includes systems that generate and store electricity, together with lighting and instrumentation systems. Also included are all current railway safety and communication systems, plus new systems that will soon be needed on the Network Rail main line.

In order to complete No. 2007 Prince of Wales before the end of 2021, the Trust needed start work on the electrical systems during the third quarter of 2018 and at its most recent board meeting, the Trustees reviewed the proposed system’s architecture, key equipment locations, wiring & interconnect, power generation & supply, essential lamps, systems and instrumentation.

The Electrical system for No. 2007 Prince of Wales will be based on that fitted to No. 60163 Tornado which has operated successfully for the past 10 years. It will be based on the following key principles:

- Dual redundant power supplies
- Electronic battery management
- Steam turbine and axle-driven generators
- All LED lighting
- Structured trunking system for wiring
- Military specification components for reliability
- Optimised equipment locations for minimum wiring

The new system will improve on that fitted to Tornado, especially with regard to access and maintenance, and systems will be moved from the engine to the tender where practical. It will use the same tried and tested components for critical systems (including Haber + Suhrer 4GW Traction Cable for all wiring and AB MhL-C 5015 bayonet connectors). Conventional wiring will be used for power and lighting. A bus-based communication system is being considered for instrumentation, along with wireless connectivity where required.

The key elements include:

- Electrical systems: battery boxes (under the cab), control panels (driver’s & fireman’s side roof), distribution boards (under the crew seats), steam turbo-generators (two located on fireman’s side running plate, arranged to look like the feedwater heater on the original class P2 No. 2001 Cock o’ the North) and tender alternator (behind and driven from the rear axle)
- Existing railway safety systems: On-Train Monitoring Recorder (OTMR), Train Protection & Warning System (TPWS) and Global System for Mobile Communications Railway (GSM-R)
- European Train Control System (ETCS) European Vital Computer (EVC), Train Interface Unit (TLU), Judicial Recording Unit (JRU), Euroradio, Balise Transmission Module (BTM) and ETCS Batteries (if required) all in a new locker on front of tender with a filtered air supply for cooling Balise Antenna (under engine), 2-3 Tachometers; 1-2 Doppler Radars; two GSM-R Data Radio Antennas (on rear of tender top); and Driver Machine Interface (DMI)
- Wiring system: a structured stainless steel box trunking system, designed on 3D CAD, will be used for the main ‘spine’ trunks on engine and tender; most of the rest of the conduit will be flexible; visible conduit (e.g. in the cab) will be gavanised tube; an improved system for connecting the cab to the frames will be implemented

- Power generation: a new design for an axle-driven alternator based on an off-the-shelf truck alternator is well underway (output around 140A at 27V DC (4.3KVA); the Trust’s own design of turbo-generator also underway (output around 25A at 27V DC (675VA)) with two fitted with a £7,350 order for a first complete new turbine wheel placed with Durham Precision Engineering; there will also be a shore power supply fitted

- Essential lamps: replicas of the distinctive class P2 lamps will be constructed and fitted with new LED luminaires inside (the P2s didn’t have Stones marker lamps, so will need a combined head, tail and marker lamp within the same housing); the rear of the tender will be equipped with recessed marker/lamps and lamp brackets/plug points for headlamps if needed on heritage railways (or for a main line Plandampf)

- Instrumentation system: drawbar horserpower measurement (effectively a dynamometer car), cameras, pressure sensors, temperature monitors and sensors to monitor important cambox parameters.

The team, led by Electrical Director Rob Morland, includes Alan Parlin (power generation and 3D CAD design), John Moyce (instrumentation), Steve Sims (instrumentation) and Paul Depledge (implementation). The electrical part of the project will run from now through to 2021, in parallel with the mechanical engineering work.

An example of the sort of equipment that will need to be fitted to No. 2007, this is the one of the electrical cubicles under the fireman’s seat in Tornado’s cab.

£350,000 ORDER CONFIRMED FOR ELECTRICAL, SAFETY, TRAIN RECORDING AND COMMUNICATIONS SYSTEMS FOR PRINCE OF WALES by Mark Allatt
P2 ROADSHOWS by Mark Allatt

As you will be aware, in 2018 we are holding a series of presentations in major cities associated with both the original Greatly class P2s and No. 2007 — a slight change from our journey along the route of the East Coast Main Line from London to Aberdeen during 2017.

Our fifth P2 Roadshow this year was held on Saturday 19th May 2018 at Sheffield Hallam University, Sheffield and was attended by 10 people and raised over £1000.

The sixth Roadshow was held on Saturday 9th June 2018 at Glasgow Royal Concert Hall, Glasgow and was attended by 11 people and raised over £1000.

The next Roadshow was at Manchester on the 3rd November at the Manchester Conference Centre which was attended by seven people although it raised over £2000.

The presentations are given by David Elliott and Mark Allatt and are also attended by other volunteers and supporters. Please do come along to support the project, hear the latest news and ask any questions that you may have. Even better if you can bring a friend or two!

For more information visit www.p2steam.com, email enquiries@p2steam.com or call 01325 460163.

P2 DEDICATED DONATIONS UPDATE by Mandy Grant

May to November 2018 has seen an amazing increase in component sponsorship, with 71 individual components being sponsored, raising a further £95,000.00 before gift aid. Components sponsored include:

- Boiler band 7 (rear of firebox in cab)
- 12" Air Brake Cylinder Loco Rear
- Atomiser isolating valve on side of boiler body casing
- Pony truck cannonbox, axle and bearings assembly
- Vacuum ejector elbow into smokebox casting
- Vacuum ejector elbow into smokebox machining and details
- Inside crank pin forging
- Sand pipe RH backward driving
- Multiple Nuts and Bolts

We are most grateful to all of our supporters who have responded to the Dedicated Donations campaign so far!

If you haven’t yet sponsored a component, now is the perfect time, with prices ranging in price from one of over 1,000 driven bolts & nuts for £3.5, to the complete exhaust steam injector for £15.00. Why not treat yourself or a loved one to something different and help us to complete this iconic locomotive by 2021?

If you would like to sponsor a component on No. 2007 Prince of Wales, or you know of a business owner or company who may be interested in sponsoring a component, please contact us at dedicated.donations@p2steam.com.

MANUFACTURERS INVITED TO TENDER FOR THE CONSTRUCTION OF PRINCE OF WALES’ BOILER by Mark Allatt

In early June 2018, The A1 Steam Locomotive Trust went to the market to seek expressions of interest in the manufacture of the boiler for No. 2007 Prince of Wales.

The boiler for No. 2007 will be similar to that which was built by DB Dampflkwerk Meningen, Germany for new Peppercorn A1 class No. 60163 Prince of Wales in 2006/7, being a fully welded design with a steel firebox.

The Trust has decided to carry out competitive tenders for the new boiler. The tendering process is expected to commence during early September 2018.

The tender documents will be available for download on the A1 Steam Locomotive Trust website.

The next roadshows will run from 11:00hrs to 13:00hrs on:

- Saturday 8th December 2018 – Hilton Leeds City Hotel, Leeds.
- Saturday 12th January 2019 – Great Northern Hotel, Peterborough.
- Saturday 2nd March 2019 – Darlington Locomotive Works, Darlington.
- Saturday 6th April 2019 – York – venue to be confirmed.
- Saturday 1st June 2019 – Dundee – venue to be confirmed.
- Saturday 8th June 2019 – Newcastle – venue to be confirmed.
- Saturday 6th July 2019 – Darlington Locomotive Works, Darlington.
- Saturday 14th September 2019 – Location to be confirmed.
- Saturday 2nd November 2019 – Darlington Locomotive Works, Darlington.
- Saturday 7th December 2019 – Location to be confirmed.

To operate a quality management system (QMS), which shall as a minimum include ISO 9000 and which clearly demonstrates adequate control of critical processes including material specification and traceability, weld procedures and welder qualifications.

To have a clear relationship with a mutually agreed notified body to facilitate certification of the boiler to the appropriate National and European Standards.

To support the build programme with a delivery to the standard defined in the tender within the following time frame:

- Delivery required January 2021.

P2 PROGRESS TO DATE

Progress building Britain’s most powerful steam locomotive continues at Darlington Locomotive Works and includes:

- Study into ride and suspension completed using rail industry standard Vampire® software; Finite Element Analysis completed on re-designed crank axle to ensure locomotive complies with modern standards; assessment and notified body appointed to oversee certification – first site visit made
- Smokebox and cab substantially complete
- Crosshead castings received, coupling and connecting rods ordered
- Tender frame construction under way, axlebox and other tender castings delivered from William Cook Cast Products and I D Howitt Ltd of Crofton near Wakefield commissioned to erect tender frame – many detailed parts made including front drag box and brake linkage, castings being machined
- Nameplates and chime whistle delivered
- Over £2m spent, £2.5m raised and £3.1m pledged of the required £5m.

Attention all Boiler Club Members!

P2 Boiler Club Exclusive Badges Are Now Available To Purchase

To purchase your badge please send a cheque for £5 made payable to ‘The P2 Steam Locomotive Company’ and send to The A1 Steam Locomotive Trust, Darlington Locomotive Works, Hopetown Lane, Darlington DL1 6RQ.

The right hand Crosshead - just one of the many items still available to sponsor.

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- Sandpipes LH & RH Leading
- Cartazzi Hornblock Leading RH Poly Pattern
- Spring Casting for Double Buffer LH Casting
- Sw Waft Out Door Escutcheons
- Cladding Sheet 5 LH (firebox front)
- Cladding Sheet 5 RH (firebox front)
- Combined Brake Hanger Bracket and Firebox Support LH poly pattern
- Boiler hand rail knuckle 3 R
- Tender-sprinkler valve
- Cambox Casting LH
- 3x Inlet Valve Tappets
- Crinoine Ring Half 1 RH
- Chime Whistle Isolating Valve on side of boiler Body Casting
- Turbo-Generator Valve Body Casting on Steam Stand
- Buffer Rebound Spring Front RH Buffer
- All tender Wheels, Tyres and Axle boxes
- Intermediate coupled cannonbox, axle and bearing assembly
- Trailing coupled cannonbox, axle and bearing assembly

Frame plates for engine and tender rolled and profiled:
- Engine’s frames erected at Darlington Locomotive Works; all major engine frame stays, brackets, horn blocks, axle boxes and buffers cast (44 in total); over 1,000 fitted and driven bolts ordered and delivered, approximately 800 now fitted to the frames
- All 20 wheels for engine and tender cast and proof casted; roller bearings for all engine and tender wheelsets and engine axles (including crank axle), tyres and crank pins delivered, tender axles, tyres delivered, Cartazzi, pony truck and coupled wheelsets complete
- Preliminary discussions held with boiler manufacturers, with expressions of interest submitted. Forged foundation ring corners manufactured; start made on boiler fittings with castings for combined injector steam and delivery valves, steam stand and valves and superheater header received ready to machine. Boiler cladding trial fitted to engine frames

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- To have a clear relationship with a mutually agreed notified body to facilitate certification of the boiler to the appropriate National and European Standards.
- Ability to deliver on time to an agreed schedule.
Pledges towards building No. 2007 Prince of Wales have passed £3.1m just over four years after the frames were rolled at British Steel's plant in Scunthorpe. Public interest in seeing a new Gresley class P2 become a reality sooner rather than later remains high and almost 900 people have already signed up to the ‘P2 for the price of a pint of beer per week’ (£10 per month or more) Covenant scheme since its launch in March 2014. The average monthly donation is now over £17 per Covenantor (including Gift Aid) and the projected monthly income for our P2 project from the monthly Covenant scheme is now running at around 110% of that of Tomado – a remarkable achievement in such a short period of time and all thanks to the generosity of our supporters. What is even more striking is that only around 30% of A1 Covenantors (36% of P2 Covenantors) are regular donors to both locomotives, meaning that the overwhelming majority of the funds are being given by new supporters of the Trust.

In addition to this core scheme, funds have been raised through The Founders Club with over 360 members donated £1,000 each plus Gift Aid – target 100 people, now closed; The Mikado Club, launched in March 2016 with an initial target of 160 members to wheel the engine and extended in May 2017 to 200 members to also wheel the tender - now fully subscribed with 200 supporters pledging £1,000 each plus Gift Aid and therefore potentially raising £250,000; The Cylinder Club, only launched at our last Convention in October 2017, is now also fully subscribed with 100 people have already pledged £1,000 each plus Gift Aid and therefore potentially raising £125,000; The Boiler Club, over 160 people have pledged £2,000 each to fund the boiler – target of 300 people – meaning two-thirds of the £600,000 target is now pledged; and Dedicated Donations, with over £315,000 from existing supporters sponsoring a variety of components. The Gresley Society Trust has also sponsored the locomotive’s distinctive front-end for which we are most grateful.

There are still a considerable number of wheeling-related Dedicated Donations still available for sponsorship, ranging from a driving wheel spoke at £600 (or from £25 per month for 24 months) to a Cartazzi axlebox casting at £1,300 (or from £50 per month for 26 months) to and driving wheel casting & proof machining at £12,000 (or from £200 per month for 60 months). April 2018 saw the launch of The Motion Club, established to fund the manufacture of the heavy motion for No. 2007, where we have set ourselves the challenge of raising £210,000 from 175 supporters each donating £1,000 plus Gift Aid. In just ten days we had already signed up 24 members of The Motion Club, potenially worth £20,000 including Gift Aid – a remarkable achievement thanks to the generosity of our supporters. As of early September to October we had recruited over 90 members to The Motion Club, with over £100,000 pledged.

We are delighted with the level of support that the project to build Britain’s most powerful steam locomotive has received since its launch. This means over £2m (£40% of the total required) converted into metal, over £2.5m (50%) raised and £3.1m (62%) pledged.

In autumn 2018, we completed the rolling chassis for No. 2007 Prince of Wales. The rolling chassis was substantially complete in the autumn of 2018 and we remain on-track for completion of the new locomotive in 2021. However, to maintain this rate of progress we need to raise more than £700,000 per year, which given the nature of the regular donation scheme becomes more challenging as each year passes. Last financial year we more than achieved our budget of £500,000 and this new financial year we have set a fundraising budget of £700,000.

We would encourage all our supporters who haven’t yet contributed to this exciting project to help us to meet these deadlines by becoming a monthly ‘P2 for the price of a pint of beer a week’ covenantor, joining The Boiler Club, becoming a member of The Motion Club or taking out a Dedicated Donation. It’s time to get on-board!

For more information on how you can help to build Britain’s most powerful steam locomotive visit www.p2steam.com, email enquiries@p2steam.com or call 01325 460163.
LATEST TECHNOLOGY BRINGS NO. 2007 PRINCE OF WALES TO LIFE by Mark Allatt

In mid-August, The A1 Steam Locomotive Trust announced that C3Sixty, a Darlington based company who scan and capture various buildings and projects, had completed a virtual reality 3D tour of Darlington Locomotive Works. The virtual tour allows visitors to the project’s website from across the world to visit Darlington Locomotive Works and see new Gresley class P2 steam locomotive No. 2007 Prince of Wales under construction.

Adam Pomeroy, Managing Director of C3Sixty approached the Trust following a family visit to Darlington Locomotive Works. Having a virtual tour online is perfect for us as it allows our supporters across the globe to look at the construction progress on No. 2007 Prince of Wales.

The virtual tour can be accessed via the projects website at www.p2steam.com. This allows supporters to click through the workshop, look at various videos relating to components and find out more about No. 2007 and its six predecessors. For those with 3D headsets/glasses, the tour can be accessed via the Google icon in the bottom right hand while viewing the tour and following the simple instructions.

COME ON, COME ON, DO THE LOCO-MOTION WITH ME! by Mark Allatt

In April 2018, The A1 Steam Locomotive Trust launched a new appeal to raise the funds to manufacture the motion for new Gresley class P2, No. 2007 Prince of Wales. The Motion Club was established with the aim of raising £210,000 from 175 supporters each donating £1,000 (plus Gift Aid) to the project in up to eight payments of £125 by standing order. In just seven weeks the appeal had already reached over a quarter of its £210,000 target and by early September we had recruited 90 members to The Motion Club, with over £112,000 pledged.

In May we were delighted to announce that we had placed a £220,000 order with Stephenson Engineering Ltd of Atherton, Manchester for the heavy motion No. 2007 Prince of Wales. The order included the forging, machining and heat treatment of the nine heavy motion rods - intermediate coupling rod LH/RH, trailing coupling rod LH/RH, leading couple rod LH/RH, outside connecting rod LH/RH and the inside connecting rod assembly (including strap, gluts and strap nuts and washers) – and the combined piston and rod. The motion is expected to be delivered in batches between December 2018 and December 2019, with the first item, the intermediate coupling rods, expected to be delivered towards the end of December 2018. Orders are to follow for the motion include rod bushes, oil box covers and miscellaneous components.

In return for supporting this appeal, special benefits for members of The Motion Club include:
- Opportunity to buy ticket (seat already reserved) on one of the first trains hauled by No. 2007 Prince of Wales
- Reasonable access to No. 2007 at all times
- Opportunity to visit Darlington Locomotive Works
- Special limited edition version (signed/numbered) of Stuart Black’s drawing of No. 2007 Prince of Wales.

We are delighted with the level of support that the project to build Britain’s most powerful steam locomotive has received since its launch. Thanks to our supporters’ continued generosity, over £3.1m has now been donated or pledged. We now need to turn our attention to the motion as our next major manufacturing challenge. Given the level of support The Motion Club has received in just seven months, we are confident we can raise the additional £110,000 needed to pay for the heavy motion and remain on-track for completion of new Gresley class P2 locomotive, No. 2007 Prince of Wales in 2021.

To become a member of The Motion Club, email enquiries@p2steam.com, call 01325 460163 or visit www.p2steam.com for more information.
**WORKSHOP NOTES**

**MP VISIT TO DARLINGTON LOCOMOTIVE WORKS**

On Saturday 16th May Darlington Jenny Chapman MP visited Darlington Locomotive Works with Nia Griffiths (MP for Llanelli and Shadow Defence Secretary). She was presented with ‘The Dream Team’ painting by Chris Ludlow depicting Prince of Wales and Tornado together to mark Darlington’s 20 year association with The A1 Steam Locomotive Trust.

**COCK O’ THE NORTH IN SUGAR**

In 1934 the newspapers carried a story about a chef modelling No. 2001 in sugar. P2 anyone! One lump or two?

Chris Calver (works guide and volunteer for The A1 Steam Locomotive Trust) sent us the following, “Whilst looking through a family scrap book of newspaper cuttings I came across an article that you might be able to use. Attached are photos of Cock o’ the North in sugar and the accompanying article probably from the Evening Chronicle in Newcastle but I do not have the precise date in 1934... the give-away saying it is on test in Fry’s. The article was probably collected by my mother, then Constance Ferry, before she married my dad James Calver in 1941. One of the reasons she may have collected the article is that the model was to be on display in Newcastle Central Station during Christmas 1934 and a collection was to be made for the Royal Victoria School for the Blind which my grandfather, Lloyds Bank manager Frederick Ferry was a Trustee. The school only exists as a trust now and supports work for the blind although I remember going there in the 1950s and playing with blind children of my age. In the collection there is one other collected railway article about No. 2750 Papyrus gaining the world record on 5th March 1935 with a nice photo of her coming into Newcastle Central Station.”

**P2 MEMORABILIA - JIGSAWS**

Waddingtons 1950s Famous Trains Jigsaw Box and circular jigsaw.

Left: DJ Maw Jigsaw Cock o’ the North in the Highlands.

Above: Jenny receives the print from David Elliott.

Left: Mark Allatt, Nia Griffiths MP, Jenny Chapman MP and David Elliott.

Above: Jigsaw Mammoth No. 29 Cock o’ the North - (Green and black box lid with made up jigsaw in full colour.)

Philmar jigsaw, ‘The Scarborough Flyer’ with Cock o’ the North in Thompson form as a 4-6-2 - wooden jigsaw, box lid and made up illustration.
Paul Bruce at Darlington Locomotive Works in front of No. 0.07 Prince of Wales.

A career railwayman of some 30 years Paul comes from a family of rail workers dating back to 1841. In the 1850s his paternal great, great, great grandfather had a gang of men maintaining the railway between Preston le Skerne and Hartlepool. More recently (the 1920s) his maternal grandfather moved from Gateshead depot to Darlington where he was a blacksmith in the North Road works. Moving south in 1948, after six years in the Royal Electrical and Mechanical Engineers (REME), he became Chief Blacksmith at Stratford Works and created the opportunity for Paul's future parents to meet.

The Bruce family headed north in 1968 when British Railways Eastern Region's HQ was set up in York and Paul continued his inevitable enthusiasm for all things rail and for steam in particular. After A levels in 1979 he deferred the lure of university ‘til later in life and joined British Railways Operations Department in York. Initially in Signalling & Accidents he moved into the maintenance control looking after locomotive maintenance scheduling before taking an area operating role at Bounds Green depot in 1982. Here he met fellow A1 Trust volunteer, Richard Peck, and in 1984 joined Richard at Thornaby depot. This was the period when DMU operations were transferred to T’eeside after the closure of Richard at Thornaby depot. This was the period when DMU operations were transferred to T’side after the closure of Richard at Thornaby depot.

After marrying Sue in 1985, Darlington was once again playing a greater part in the Bruce life and they have made it their home ever since. In 1988 Paul took a role as Operating Manager at Heaton Depot, restructuring the cleaning and operations team to reflect the increasing move of the workload to nights. He set up a dedicated team to look after the presentation of the then ‘Teess-Tyne Pullman’. Looking after two coaches, the team went on to win various awards. A similar venture yielded rewards, and awards, when he managed the postal fleet based there for Rail Express Systems.

After secondment to the Engineering HQ in Derby during the early 1990s he became Fleet Commercial Manager for Regional Railway North East in Leeds. That caused paths to cross again with Richard during negotiations with First North Western for depot servicing. Responsible for managing stores and stock holdings as well as heavy maintenance and train refurbishments it was the period leading into privatisation. This sea change for the railways also saw him at the heart of the regulatory arrangements which underpin privatisation. With a move to York he eventually became Head of Procurement and Head of Property in REME’s successor organisations of Northern Spirit, Arriva Trains North East and Northern Rail. During this time in York Paul changed the face of advertising for ever when he ended up as one of the faces in Arriva’s adverts for Transpennine Express. In 2000 on trains, stations and in newspapers people everywhere were shouting "Nooooo!!", ‘Too late!"

Having long hankered to ‘go it alone’, 2006 saw Paul finally taking the leap into being self-employed and with a specialism in procurement, rail franchising and the Access Regulations he has been kept busy ever since. His commissions have involved mobilising a number of new franchises including East Midlands Trains, Southern Rail, Anglia and more recently Caledonian Sleeper. He has also occupied various interim roles such as Head of Rail Procurement for Stagecoach, Lead Procurement Manager for Tube Lines as well as Lead Procurement and Head of Regulatory for HS1 supporting the sale of the High Speed rail network in 2010.

More recently he could be found around the Highlands of Scotland with Caledonian Sleeper delivering new facilities such as Guest Lounges, introducing wi-fi to Corrour (the UK’s highest and most remote main line station) as well as supporting the introduction of the new MK5 overnight sleeper trains. It was this period in Scotland where he was working with Graeme Bunker-James, Trustee of The A1 Steam Locomotive Trust. After a number of discussions over Merlot, the link to the Trust grew and he took on the role of project manager for the Trust’s new Whessoe Road steam depot which will provide a new home for Tornado. Prince of Wales, the new train Gresley class V4, joining the board of Trustees in 2017. His key area of focus with the Trust is property management but he is also the Trust’s representative on Darlington Council’s Rail Heritage Steering Group Board. This is driving development of the North Road Railway Heritage Quarter and its part in the 2025 celebrations.

Since teenage years he has had a long-standing love of Morgan cars. Having had a range of models and colours his first was recently set free after being part of the family for 35 years. Paul is supported by Sue, two grown up children and an errant young dog who brings a sense of uneasy but great joy - the dog more than Sue. 

The moment so many had waited for, Tornado makes her first moves in steam on the 3rd August 2008.

Summer 1998 – The four 3ft 2in wheels, the rear 3ft 8in pony truck and six 6ft 8in driving wheels were cast by William Cook plc on very advantageous terms to the Trust. Cooks also cast a dummy wheel centre which would be used to test the interference fit with a dummy stub axle to find the correct pressing force required to locate the wheels on the axles. All twelve locomotive tyres were delivered to Ian Riley & Co. at the East Lancashire Railway in Bury ready for fitting to the wheels.

Summer 2003 – The remaining valve gear forgings had been delivered for machining and Utone completed the inside connecting rod and strap. The forging of valve gear components was now complete and they were due to be heat created. Meanwhile, Utone started machining the inside connecting-rod and strap, now that we have been able to calculate the precise length to correct for the growth in the middle cylinder and the final position of the crank axle. A decision had also been taken to issue a Beazer Bonds to finance the construction of the boiler.

Summer 2008 – There can only be one story worth repeating from 2008 in this archive section – Tornado’s first moves in steam at Darlington Locomotive Works!" On the first weekend in August 2008, Tornado moved in steam for the first time, the culmination of 18 years hard work lived and breathed in front of the assembled press, dignitaries and Covenators. Waved away by the Mayor of Darlington and with Dorothy Mather on the footplate, Tornado eased up and down the short length of track laid for the event.

Summer 2013 – In her striking blue livery, Tornado continued to put down solid performances, not least on ‘The Elizabethan’ to Edinburgh on 11th June. Whilst in Scotland No. 60163 ran a series of Fife Circulars for the SRPS before resuming her duties on a number of ‘Cathedrals Expresses’. ‘The Elizabethan’ was also notable for the debut of Tornado’s own, newly refurbished support coach, the removal of which from DLW allowed the works to be cleared for some much-needed maintenance. In other news, the Trust announced early redemption of the £500,000 Beazer Bond issue.
The A1 Steam Locomotive Trust is pleased to display the logos of organisations giving us their ongoing support. Their contribution is gratefully acknowledged.