

# Chris Wells

Executive Consultant Braking Engineer

PROFILE

## KEY SKILLS

- Extensive experience in the engineering and application of all types of railway braking systems and associated sub-systems and equipment;
- A customer-friendly, confident and outgoing person – able to easily and effectively communicate with persons at all levels;
- An ability to identify opportunities for product and process improvements and influences upon 'parallel' projects and business activities;
- A 'self-starter' who can work either as an individual or as part of a team, regardless of the work and the environment in which it is being conducted;
- Well structured problem investigation and solution.

## EXPERIENCE OVERVIEW

Chris's specialism is railway braking and associated systems and equipment – this has been his focus for the last 25 years, working upon all types of systems, ranging from those suited to small mines and quarry vehicles to the largest of main-line passenger and freight vehicles and metros.

Chris has worked for train manufacturers and brake equipment suppliers within the UK and overseas as a braking system specialist covering system concept and definition, design, procurement, installation, testing, evaluation and maintenance and the generation of safety case and vehicle acceptance / approval documentation, both directly and in supervising the work of others. The work is very challenging and it demands a strict discipline for safety and reliability, whilst striving for high levels of performance in many other areas, including cost effectiveness. He has also represented Vehicle Acceptance Bodies, Notified Bodies and Independent Safety Assessors in connection with brake systems work and he is an accredited RISAS Technical Expert for brake systems and brake system components. Chris is also involved with the generation of new European standards and technical specifications for train braking and he is a very active member of various CEN and British Standards Institution working groups and braking committees.

Prior to pursuing a career in this field, Chris has worked on 'heavy' engineering projects such as free-steered rough-terrain vehicles, plant and excavation equipment, mining equipment and conveyors, etc., right through to 'lighter' products such as medical equipment and domestic appliances, etc.

Chris formed a consultancy in 2004; Railway Braking Associates Limited, in response to the growing rail industry need for a more cost-effective approach to train systems engineering and the trend towards employing engineering expertise on an 'as and when required' basis. This has enabled him to deploy his knowledge and skills within the rail industry in a more cost-effective manner than that possible whilst working continuously for one or other of the large train engineering service companies.

## MISSION AND ATTRIBUTES

Chris's goal is to provide his fullest possible support either directly or indirectly to his employer and he derives a great deal of satisfaction from carrying out high quality work and providing good value.

Chris is very patient by nature and he is consistent and methodical. He can lead a group or team and in so doing readily motivate others to a common goal. Chris is a 'lateral thinker' and mindful of all of the consequences of his actions upon the people around him and the success of his employer's business and he takes pride in being extremely flexible and adaptive to the requirements of any project. Chris is fully computer literate and he is self-sufficient with respect to business administration and communication.

## PERSONAL

Age: 57 years (DOB: 05-06-1957)

British Citizen

Married, with 5 non-dependent children

Location: United Kingdom - Midlands

Full Motor Car and Motorcycle Driving Licence

Languages: Fluent English

Interests include; narrowboats and canals, home and motor vehicle DIY, country walking, playing guitar, gardening and landscaping.



## EDUCATION AND TRAINING

### Education

Sept. 1976 – May 1977      Trent Polytechnic, Nottingham  
City and Guilds of London Institute Full Technological Certificate  
(Engineering Production)

### Apprenticeship

Sept. 1972 – Aug. 1977      Apprenticed as a Draughtsman at Beechdale Engineering Limited, Nottingham in addition to broad based Technician training in accordance with E.I.T.B recommendations and training manuals.

### Training

Various courses, including: Design Management, RAMS (Reliability, Availability, Maintainability and Safety), Safety Management, Time Management Skills, Quality Auditing, RCM (Reliability Centred Maintenance), Presentation Skills, and Network Rail – PTS and First Aid Certification.

Chris regularly interrogates relevant railway industry databases (e.g. NIR, RSSB and RISAS, etc.), attends industry seminars and exhibitions and he reviews RAIB investigation reports, so as to maintain his continuous professional development and an up to date awareness of all issues pertinent to the scope of his work. A more detailed training record is available upon request.

## SELECTION OF PROJECT EXPERIENCE

2012 – 2015

### ***Bombardier Transportation***

#### ***Brake System Troubleshooting / Development on behalf of Railway Braking Associates***

Supported Bombardier Transportation by investigating a number of new build issues and in-service performance and operational issues experienced on a range of rolling stock, and thereafter delivered cost-effective and approved solutions. Additionally, Chris has delivered the ongoing development of the brake system for the London Underground SSL rolling stock, and defined the brake system solution for the NTfL bid for London Underground.

The work was varied and at times very challenging indeed, requiring the solutions to be delivered in very tight timescales and budgets. Bombardier Transportation has been through a period of restructuring so as to maintain a competitive edge, particularly in the UK rolling stock market. As such, engineering and testing resources became limited, requiring that all team members be versatile and adaptive to the work concerned. It has been necessary at all times to carefully control and focus allocated resources, and brake supplier activities, and planning and monitoring of work has been intense.

Work has been carried out to improve the performance of the Electrostar brake control system, particularly in the areas of friction brake and electro-dynamic (ED) blending, wheel slide protection (WSP) and brake system monitoring, requiring changes to both brake hardware and software. These improvements have been introduced into revenue earning service on the CL377/6, CL377/7 and CL387 Southern Railway EMU fleets. Friction brake and ED brake blending improvements have been introduced to the London Underground SSL fleet, along with a number of improvements to the brake system and the train control and monitoring system (TCMS) interactions, again requiring changes to brake control hardware and software. Major modifications have also been carried out to the train borne sanding system, and there have been numerous adaptations implemented to the train maintenance policy to improve maintenance efficiency.

The delivery of ad hoc brake systems engineering advice to colleagues engaged in other Bombardier Transportation projects, and carrying out peer review work has continued during the course of this assignment.

### ***Applus Idiada***

#### ***Project Management of a Dynamometer Test Laboratory***

Applus Idiada had recently acquired a dynamometer test laboratory located in Hinckley, Leicestershire, and required a project manager to supervise the day to day activities of the dynamometer technicians, and office administrators, whilst assuring that the laboratory equipment and essential services were properly and safely maintained and suitably developed.

The assignment entailed liaising with key customers to negotiate and finalise dynamometer test specifications and test schedules for a range of automotive and commercial vehicle disc and drum brake products and components. Thereafter, the focus was upon achieving the efficient and timely delivery of comprehensive and accurate test reporting. Laboratory cost-effectiveness was very dependent upon maintaining near 24/7 operation of the dynamometers, and achieving this goal could be very challenging indeed, often requiring some very innovative thinking and close teamwork. Operational safety was paramount, especially when considering that some products and components were tested to destruction, requiring that testing be carried out with high speeds and loads, and at high temperatures whilst containing and disposing of wear particles, etc. Railway orientated safety management experience proved to be very useful whilst carrying out this assignment.

## **2004 – 2011**

### ***Bombardier Transportation – Class 378 EMU Re-engineering the E\* EMU Brake System on behalf of Railway Braking Associates***

The Class 378 EMU is a derivative of the Electrostar (E\*) EMU. Although the basic architecture of the brake control and main air system remained principally similar to that used on previous E\* projects, extensive modifications were carried out at sub-system and component levels and the system monitoring and diagnostics were significantly enhanced. The work, which was mostly carried out at the Bombardier Transportation facility in Derby, UK, entailed the generation of design specifications, supplier management, supporting the internal / customer design scrutiny processes, supporting production / manufacturing, generation of type test specifications and supporting the test team during the execution of the testing involved and subsequent analysis. Reports were generated demonstrating conformance to the current NNTR's (Railway Group Standards) to the exacting requirements of the Notified Body. A great deal of ad hoc brake systems engineering advice was also provided to colleagues engaged in other Bombardier Transportation multiple unit and bogie projects during the course of this assignment.

### ***RIQC – Member of the QSS Group – RISAS Assessment Technical Expert (Brakes) support on behalf of Railway Braking Associates***

Supported RIQC; an accredited RISAB, by carrying out several RISAS assessments. The role as Technical Expert (Brakes) was to support the RIQC assessment team by carrying out a detailed and thorough technical assessment of the brake related work undertaken and the competency of the personnel involved using in-depth knowledge and experience of brake systems and equipment. The assessment was executed in accordance with strictly laid down criteria for 'standard' work and for work involving 'engineering change'. A pre-cursor to fulfilling this role entailed successfully completing a personal professional interview / review and competency assessment by RSSB. The findings of the assessment were captured in an extensive and concise report document.

### ***Irwin Mitchell Solicitors – Investigation of a Fatality Expert Witness support on behalf of Railway Braking Associates***

Supported Irwin Mitchell Solicitors (IMS) in connection with an investigation of a fatality involving a tram. The work was very challenging indeed and entailed carrying out meticulous scrutiny of evidence deemed admissible by the Coroner, whilst also keeping an open mind about aspects and influences of potential relevance to any legal proceedings that may have followed the inquest. The work was carried out in a strict legal framework and, whilst principally concerning the tram braking performance, extended to other aspects such as scrutinising the conduct of the driver of the tram, the conduct of the operator control room / incident response personnel, the conduct of the BTP officers and other emergency services at the scene of this incident and their conduct during the follow-up investigation. A very detailed report was prepared on the basis of the aggregated evidence and presented to the client, who in turn made representations to the Coroner. Recommendations were included in this report regarding the need to further investigate a number of inconsistencies in the evidence, some of which were factual and some proposed likely on the balance of probabilities.

***Association of Train Operating Companies (ATOC Limited)  
TSI-CRS drafting on behalf of Railway Braking Associates***

In parallel with continuing EN standards development work, represented ATOC Limited as a member of the CER Expert Core Team (Braking). The project entailed working with other experts from SNCF, SNCB, DB, FS, etc. in the generation of brake system specific interoperability requirements for inclusion in the TSI-CRS (Technical Specification for Interoperability – Conventional Rail System).

***Siemens AG – Diesel Locomotive Product Platform  
Appraisal of AAR / APTA Requirements on behalf of Railway Braking Associates***

Carried out a very detailed appraisal of AAR (Association of American Railroads) and APTA (American Public Transportation Association) requirements as they apply to diesel locomotives and in so doing identified the impact that they could have on a brake system that has to date been based upon the requirements of the UIC (International Union of Railways). Some FRA (Federal Railroad Administration) requirements were also taken into account. All critical issues were identified and some recommendations were made for how these significant differences could be reconciled. The work also entailed the creation of a very detailed functionality diagram and supporting guidance notes for a typical AAR locomotive brake and main air system for use by Siemens AG engineers as a design / training aid.

***Overseas Client (CONFIDENTIAL)  
Marketing Strategy / Product Validation Plan on behalf of Railway Braking Associates***

Generated a very detailed marketing strategy for the deployment of several items of brake system equipment within the UK on behalf of an overseas client – this included the identification of key stakeholders and their relationships with competitors and an estimate of turnover. A product design and product validation plan was also compiled to describe essential steps/measures necessary for proving the efficacy of the products. The strategy and plan were presented in a brainstorming/workshop facilitated on the client's premises - the client is now implementing the strategy and plan.

**2000 – 2004**

***Sheffield University – Department of Mechanical Engineering  
Lecture to MSc Students on behalf of Railway Braking Associates***

Preparation and presentation of a 'Railway Braking' lecture to MSc students. The essential features for railway brake systems were described in detail. Brake system evolution was then discussed and several worked examples presented, along with some suggestions as to how train brake systems might be developed in terms of performance enhancements and cost-effectiveness.

***Midland Mainline HST Power Car  
Assessment of WSP upgrade on behalf of AEA Technology Rail (Notified Body)***

Role: Assessor – Design and testing for the WSP system upgrade. The work entailed detailed scrutiny of the WSP system and its interaction with the train brake and main air supply and traction systems. The objectives were to confirm overall compliance with the TSI for Rolling Stock and with Railway Group Standards, these being the 'Notified National Standards' applicable at the time the assessment was carried out.

***Plasser & Theurer MFS Power Wagon & RM900-RT High-Output Ballast Cleaner  
Design scrutiny/ testing on behalf of AEA Technology Rail (Vehicle Acceptance Body)***

Role: Assessor - Carried out scrutiny of the design and testing for the brake and main air systems. The work entailed detailed scrutiny of the brake and associated air system design from a safety perspective and to confirm compliance with Railway Group Standards. The work also entailed carrying out vehicle examinations and on-track stopping performance testing both in the UK and on Austrian rail infrastructure and very detailed results analysis. An alternative testing methodology was developed as a substitute for 'slip-coupling' testing. This methodology was presented to the RSAB with a view to it being incorporated into Railway Group Standards for use more generally by the rail industry.

***Plasser & Theurer 08-16 4x4 C80 Compact Tamper  
Investigation of vehicle brake performance on behalf of AEA Technology Rail***

The vehicle operator had been experiencing an unacceptable degree of wheel tread damage and the drivers had complained that the service brake often exhibited an "all or nothing" characteristic. The brake system design was reviewed – a representative vehicle was examined and extensive static testing was carried out with a view to determining the cause of the wheel tread damage and why the brake exhibited this "all or nothing" characteristic. Several potential causes were identified - recommendations were made for how the risk of wheel tread damage could be significantly reduced and how the brake control could be adapted so as to improve the resolution for the driver.

***Class 390 'Virgin Pendolino' Trains  
Investigation of WSP and DNRA performance on behalf of AEA Technology Rail***

A number of vehicles had suffered serious wheel tread damage symptomatic of locked axles. Vehicle maintenance, including interrogation of the WSP (Wheel Slide Protection) system and DNRA (Detection of Non-Rotating Axles) system monitoring functions, had failed to identify any fault conditions. An investigation was carried out on behalf of the train builder; Alstom Transportation Limited. The system self-test and monitoring regimes were audited and some on-track testing in induced low wheel/rail adhesion conditions was carried out and results used to help verify the system performance. Some significant weaknesses were highlighted within the monitoring and self-test regimes and recommendations were made for corrective action.

**< 2000**

***Establish a new UK operation for Knorr-Bremse (1998 –2000)***

Knorr-Bremse had recognised the potential for deployment of its brake system and main air system products within the UK railway market and as such, the need for local product and customer support. Technical communications channels had to be established and all of the relevant UK requirements disseminated throughout the Knorr-Bremse domain. The work entailed an introduction of many 'new' working practices to the company, particularly those practices associated with the safety management of the design, construction and testing and maintenance processes. As Knorr-Bremse is an international company, it was necessary to bridge many cultural and language gaps. The requirements were conveyed principally by written definition in the form of plans, specifications and guidance notes, supported by many presentations and engineering based workshops. This work was carried out in parallel to providing day-to-day support to Knorr-Bremse UK customers.

## **CAREER HISTORY**

### ***2004 – Present Executive Consultant (Director), Railway Braking Associates Limited***

Chris decided to set up his own independent consultancy in August 2004. His perception was that the rail industry was about to enter new phase of business streamlining and reorganisation and that the industry would be seeking much better value for all monies spent. Chris has the right balance of technical, commercial and operational experience and skills required for the creation, development and validation of a total brake system design solution for all types of rail vehicles and their sub-system elements and he now offers these to the industry in a more cost-effective package via his company. Active as a principal UK expert in industry braking related working groups, task forces and committees.

### ***2000 – 2004 Executive Consultant, AEA Technology Rail***

Represented the company in connection with all aspects of railway braking and interactions between the train brakes and the railway infrastructure. Also supported AEA colleagues and clients in other areas using his skill and experience with hazard identification and risk mitigation. Managed allocated projects/staff and undertook a pro-active approach to the identification and acquisition of new brakes related projects for the company. Active as a principal UK expert in industry braking related working groups and committees.

### ***1998 – 2000 Systems Engineering Manager, Knorr-Bremse (UK)***

Established local engineering and technical support for all of the company products used within the UK. Interpreted customer specifications and requirements and thereafter, defined appropriate system designs, component designs and processes compatible with the overall vehicle concept. Produced safety, design, procurement, installation and test specifications and witnessed type testing and investigative testing as required. Disseminated related information to other company departments located elsewhere in Europe. Managed product verification and validation for UK applications and obtained or prepared the associated documentation. Carried out system/equipment performance evaluation and where necessary, attended investigations on-site and/or on maintenance depots and formulated product/process improvements.

### ***1990 – 1998 Systems Engineer – Brakes & Pneumatics, BREL >> Adtranz***

Interpreted customer specifications and defined appropriate system designs compatible with the overall railway vehicle and/or bogie concept. Responsible for ensuring that the appropriate system/equipment was designed, procured, installed and tested. Active as a principal UK expert in industry braking related working groups and committees.

### ***1982 – 1990 Project Designer, Becorit (GB) Limited***

### ***1979 – 1982 Design Draughtsman, Loughborough Consultants Limited***

### ***1978 – 1979 Draughtsman – Special Projects, Beechdale Engineering Limited***

### ***1977 – 1978 Draughtsman, Brush Electrical Machines***

### ***1972 – 1977 Apprentice Draughtsman, Beechdale Engineering Limited***

## PROFESSIONAL ACTIVITIES AND MEMBERSHIP

- Member British Standards Institution (BSI) RAE/4 Technical Committee – Braking;

Chris regularly participates in RAE/4 committee meetings to discuss technical issues that have, or could have, an effect on railway braking and to review new and emerging UK and European standards and codes of practice, etc.; this being with a view to proposing modifications and new content for national and international standards. The membership includes representatives from several brake system manufacturers, train manufacturers, train leasing companies, train operators and train engineering service companies, etc.

- Principal UK Expert to CEN/TC256/SC3/WG47 – Braking - Main Line Railways;

Chris represents BSI at working group and task force meetings and he (along with a number of experts that represent other national standards bodies) is responsible for the generation of new EN standards for railway braking. These standards cover the brake systems of locomotive hauled trains in general, passenger coaches and more recently, high-speed and conventional rolling stock. This work is very closely related to the EU Directives for the interoperability of high-speed and conventional rolling stock and corresponding TSI's. Chris was appointed the Task Force Leader role for the review and subsequent update of CEN EN14487 – Railway applications – Braking - Generic vocabulary in February 2014, his activities in this respect being funded by the RSSB.

- Member of Rail Safety & Standards Board (RSSB) Brakes Mirror Group

This group has a similar remit to the BSI RAE/4 Technical Committee but activities are focussed upon on matters specifically of relevance to the safety of the UK main line railway.

- Member of the V/T SIC Adhesion Research Group (ARG)
- Referee for selected technical papers for IMechE Professional Engineering Publishing.
- Delivering railway braking lectures at Birmingham University for MSc Railway Systems Engineering students.

## FURTHER INFORMATION

Further information can be provided upon request.

## CONTACT INFORMATION

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