

**Activities in 2009**  
**of the research group of Prof. Paulo M. S. T. de Castro**  
 Faculdade de Engenharia da Universidade do Porto,  
 and LAETA (IDMEC-FEUP and INEGI)  
 December 2009

*23 December 2009*

**Main contributors in 2009**

- Daniel F. C. Peixoto (doctoral student)
- Miguel A. V. de Figueiredo (director, LET / DEMec / FEUP)
- Paulo M. S. Tavares de Castro (professor, FEUP)
- Pedro M. G. P. Moreira (researcher, INEGI – LOME)
- Ricardo A. S. de Castro (INEGI - LOME junior researcher within the FCT programme *Bolsas de Integração na Investigação*, supervised by P. M. G. P. Moreira)
- Sérgio M. O. Tavares (doctoral student)
- Stefan D. Pastrama (professor, Universitatea Politehnica Bucuresti)
- Valentin Richter-Trummer (doctoral student)

**Projects**

- FCT, “WELDING – Fiber Bragg grating sensors for modeling of friction stir welding (FSW) and laser beam welding (LBW)”, contract FCT PTDC/EME-TME/66362/2006, July 2007 - June 2009, closure extended to December 2009.
- MIT-Portugal Programme, “New design concepts for aeronautical products welded by friction stir”, 2007 – 2010.
- ESA, Technology and Research Programme “Damage tolerance of cryogenic pressure vessels”, coord. MT-Aerospace (with INEGI), 2008-2009.

**Proposals**

- PTDC/EME-PME/100204/2008, Railways - rolling contact fatigue, with IST (Manuel Freitas *et al.*) and FCTUC (A. D. Castanhola Batista *et al.*). Approved; contract pending.
- PTDC/EME-TME/099692/2008, Use of fibre Bragg sensors in welding: reduction of fabrication residual stress, and subsequent structural monitoring - "WELSTRESS" with INESC-Porto (J. L. Santos *et al.*). Rejected.

**Doctorates (all current)**

- Sérgio M. O. Tavares, “New design concepts for aeronautical products welded by friction stir”, FEUP – Doctoral Programme in Leaders for Technological Industries (MIT-Portugal Programme, focus Engineering Design and Advanced Manufacturing – EDAM); supervisor: Paulo MST de Castro; co-supervisors: Pedro Vilaça (IST), Jorge dos Santos (GKSS, Germany). Start: Sept. 2007; work to be performed in Portugal, Germany (GKSS) and USA (MIT, Jan.-July 2009).
- Valentin J. Richter-Trummer, “Integrated design solutions for structures manufactured with FSW, including effects of residual stresses and damage tolerance criteria”, FEUP, Doctoral Programme in Mechanical Engineering, supervisor: Paulo MST de Castro; co-supervisors Pedro Vilaça (IST), Jorge dos Santos (GKSS, Germany). Start: March 2008; work to be performed in Portugal and Germany (GKSS).
- Carlos Miguel Correia Albuquerque, Advanced methodologies for fatigue analysis of high speed railways bridges; FEUP Doctoral Programme in Civil Engineering; supervisor: Rui Calçada (Depart. of Civil Engng., FEUP); co supervisor: Paulo M. S. T. de Castro. Start 2008.

- Plácido Manuel Pinto Afonso, Relationships between S&T research and design in Portugal and Finland; FEUP Doctoral Programme in Industrial Engineering and Management; work at FEUP and Taideteollinen korkeakoulu Helsinki (University of Art and Design Helsinki); superv. In Finland: Tapio Yli-Viikari; FEUP supervisor: A. Torres Marques; FEUP co-supervisor: P. M. S. T. de Castro. Start: Oct. 2008.
- Daniel F. C. Peixoto, Railways - rolling contact fatigue; FEUP, Doctoral Programme in Mechanical Engineering, supervisor: Paulo M. S. T. de Castro; co-supervisor Luís A. A. Ferreira. Star: October 2009.

## Master degrees

### 1st semester 2008/2009

- Afonso de Sousa Tavares Nogueira, subject: analysis of buses structures, CaetanoBus, Vila Nova de Gaia. Supervisor at CaetanoBus: Filipe Fernandes; co-supervisors FEUP: Mário Vaz, Paulo M. S. T. de Castro and Miguel A. V. de Figueiredo.
- Miguel Alves Ribeiro Veloso de Castro, subject: procedures to remedy press brakes' deformation, ADIRA, Porto. Supervisor at ADIRA: J. Bessa Pacheco; co-supervisor FEUP: Paulo M. S. T. de Castro.

### 2nd semester 2008/2009

- Albino Santos, subject: steel structures, MARTIFER, Oliveira de Frades. Supervisor at MARTIFER: Pedro Duarte; co-supervisores FEUP: Paulo M. S. T. de Castro and Miguel A. V. de Figueiredo.
- António Pedro Costa Lopes, subject: structural connections in buses' structures; CaetanoBus, Vila Nova de Gaia. Supervisor at CaetanoBus: Filipe Fernandes; co-supervisor FEUP: P. M. S. T. de Castro.
- Miguel Estrela, subject: optimization of laser cutting machine, ADIRA, Porto. Supervisor at ADIRA: Tiago Brito e Faro; co-supervisor FEUP: P. M. S. T. de Castro.
- Ricardo Filipe Sotto-Mayor Correia, subject: design of drilling machine, Braga e Barbosa / EFI Máquinas, Trofa. Supervisor at the firm: Tomás Oliveira; co-supervisors FEUP: Luís A. A. Ferreira, Paulo M. S. T. de Castro.

## Publications

### Papers in publications listed in ISI 'Web of Knowledge'

- S. M. O. Tavares, R. A. S. Castro, V. Richter-Trummer, P. Vilaça, P. M. G. P. Moreira, P. M. S. T. de Castro, "Friction stir welding of T-joints with dissimilar aluminium alloys: mechanical joint characterization", ***Science and Technology of Welding and Joining***, accepted 2009.
- P. M. G. P. Moreira, S. D. Pastrama, P. M. S. T. de Castro, 'Three-dimensional stress intensity factor calibration for a stiffened cracked plate', ***Engineering Fracture Mechanics***, vol.76, (14), Sept. 2009, pp.2298-2308.
- D. F. C. Peixoto, L. A. A. Ferreira, P. M. S. T. de Castro, 'Application of the Dang Van fatigue criterion to the rail/wheel contact problem', ***Materials Science Forum***, vols. 636-637, 2010, pp.1178-1185.
- S. M. O. Tavares, V. Richter-Trummer, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Fatigue crack growth modeling in stiffened panels considering residual stress effects', ***Materials Science Forum***, vols. 636-637, 2010, pp.1172-1177.
- P. M. G. P. Moreira, V. Richter-Trummer, S. M. O. Tavares, P. M. S. T. de Castro, 'Characterization of fatigue crack growth rate of AA6056 T651 and T6: Application to predict fatigue behaviour of stiffened panels', ***Materials Science Forum***, vols. 636-637, 2010, pp.1511-1517.
- P. M. G. P. Moreira, P. F. P. de Matos, S. D. Pastrama, P. P. Camanho, P. M. S. T. de Castro, 'Fatigue life prediction of a cracked lap splice specimen using fracture mechanics parameters', ***University Politehnica of Bucharest Scientific Bulletin, Series D: Mechanical Engineering***, vol. 71, (3), 2009, pp.51-62
- A. M. P. de Jesus, M. A. V. Figueiredo, A. S. Ribeiro, P. M. S. T. de Castro, A. A. Fernandes, 'Residual lifetime assessment of an ancient riveted steel road bridge', ***Strain***, on-line: March 2009.

## Papers in national journals

### Submitted

- P. M. G. P. Moreira, V. Richter-Trummer, R. A. M. da Silva, M. A. V. de Figueiredo, P. M. S. T. de Castro, 'Residual stress evaluation of a MIG butt welded aluminium alloy plate'. Re-submitted after revision to *Mecânica Experimental*.

### Published

- P. M. G. P. Moreira, A. M. P. de Jesus, A. S. Ribeiro, P. M. S. T. de Castro, "Fatigue crack growth behaviour of friction stir welded 6082-T6 aluminium alloy, *Mecânica Experimental*, nº16, 2009, pp.99-106.
- D. F. C. Peixoto, L. A. Ferreira, P. M. S. T. de Castro, "O critério de Dang Van para dimensionamento à fadiga: comparação com outros critérios", *Manutenção*, nº101, 2º trimestre 2009, pp.22-27.

## International conferences

- M. Windisch (presenter), N. Eigen, U. Glaser, H. Masny, G. Bartesch, M. Wimmer, U. Dufert, H.-U. Jüngling, G. Sinnema, K.-H. Trautmann, J. Schneider, P. M. G. P. Moreira, A. M. P. de Jesus, P. C. M. Azevedo, M. V. A. de Figueiredo, P. M. S. Tavares de Castro, E. Sattler, "Damage tolerance characterization of 2195 base material and friction stir welds", Workshop on Fracture Control of Spacecraft, Launchers and their Payloads and Experiments, ESA/ESTEC, Noordwijk, The Netherlands, **9 - 10 February 2009**.  
<http://www.congrex.nl/09c11/programme.asp>
- D. F. C. Peixoto, L. A. A. Ferreira, P. M. S. T. de Castro, 'Application of the Dang Van fatigue criterion to the rail/wheel contact problem', poster presented at the V International Materials Symposium MATERIAIS 2009 (XIV meeting of SPM - Sociedade Portuguesa de Materiais), Lisbon, **5-8 April 2009**.
- S. M. O. Tavares, V. Richter-Trummer, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Fatigue crack growth modeling in stiffened panels considering residual stress effects', paper presented at the V International Materials Symposium MATERIAIS 2009 (XIV meeting of SPM - Sociedade Portuguesa de Materiais), Lisbon, **5-8 April 2009**.
- P. M. G. P. Moreira, V. Richter-Trummer, S. M. O. Tavares, P. M. S. T. de Castro, 'Characterization of fatigue crack growth rate of AA6056 T651 and T6: Application to predict fatigue behaviour of stiffened panels', poster presented at the V International Materials Symposium MATERIAIS 2009 (XIV meeting of SPM - Sociedade Portuguesa de Materiais), Lisbon, **5-8 April 2009**.
- D. F. C. Peixoto, L. A. Ferreira, P. M. S. T. de Castro, "Application of the Dang Van fatigue criterion to the rail/wheel contact problem", IBERTRIB 2009 – V Congresso Ibérico de Tribologia, Coimbra, Portugal, **17-18 June 2009**.
- S. M. O. Tavares, V. Richter-Trummer, P. C. M. Azevedo, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Integral lightweight structures: fatigue and damage tolerance', Proceedings of AES – ATEMA' 2009 Third International Conference: Advances and Trends in Engineering Materials and their Application, Montréal, Canada: **July 6 -10, 2009**, pp.65-71, ISBN 0-9780479
- V. Richter-Trummer, S. M. O. Tavares, D. F. C. Peixoto, S. F. Silva, O. Frazão, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Welding monitoring using FBG sensors', Proceedings of AES – ATEMA' 2009 Third International Conference: Advances and Trends in Engineering Materials and their Application, Montréal, Canada: **July 6 -10, 2009**, pp.73-79, ISBN 0-9780479.
- V. Richter-Trummer, D. Peixoto, P.M.G.P. Moreira, S. F. O. Silva, O. Frazão, P.M.S.T. de Castro, 'Calibration of FBG sensors for measurement of temperature and strain using thermal stresses', paper S0103\_P0382, 3rd International Conference on Integrity, Reliability and Failure, Porto/Portugal, **20-24 July 2009**.
- D. F. C. Peixoto, L. A. A. Ferreira, P. M. S. T. de Castro, 'Application of the Dang Van fatigue criterion to the rail/wheel contact problem', paper B2-335, World Tribology Congress 2009, Kyoto, Japan, **September 6-11, 2009**, abstract in: proceedings, p.538.

- S. M. O. Tavares, V. Richter-Trummer, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Fatigue behavior of lightweight integral panels', abstract in: 7th EUROMECH Solid Mechanics Conference, vol. Lectures and General Sessions, J. Ambrósio, M. T. Silva, eds., Lisbon, Portugal, **Sept. 7-11, 2009**, pp.417-418 <sup>1</sup>.
- V. Richter-Trummer, S. M. O. Tavares, D. F. C. Peixoto, S. F. Silva, O. Frazão, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Calibration of Fibre Bragg Grating (FBG) sensors and their use for welding monitoring', abstract in: 7th EUROMECH Solid Mechanics Conference, vol. Lectures and General Sessions, J. Ambrósio, M. T. Silva, eds., Lisbon, Portugal, **Sept. 7-11, 2009**, pp.331-332.
- V. Richter-Trummer, E. A. Marques, F. J. P. Chaves, J. M. R. S. Tavares, L. F. M. da Silva, P. M. S. T. de Castro, 'Analysis of the crack growth behavior in a double cantilever beam adhesive fracture test using digital image processing techniques', abstract in: 7<sup>th</sup> EUROMECH Solid Mechanics Conference, vol. Mini-Symposia, J. Ambrósio, M. T. Silva, eds., Lisbon, Portugal, **Sept. 7-11, 2009**, pp.223-224.
- S. M. O. Tavares, P. M. S. T. de Castro, 'Advanced manufacturing for improved engineering design: the case of friction stir welding in aeronautics', Proceedings of the First International Conference on Integration of Design, Engineering and Management for innovation IDEMI'09, Porto, Portugal, **September 14-15, 2009** <sup>2</sup>.
- J. M. A. Estrela, J. Figueira, T. Brito e Faro, P. M. S. T. de Castro, 'Rationalization of the laser cutting machine ADIRA CCL 3015', Proceedings of the First International Conference on Integration of Design, Engineering and Management for innovation IDEMI'09, Porto, Portugal, **September 14-15, 2009**.
- A. J. J. Gomes, P. M. S. T. de Castro, 'Product development methods and SME's: Tension between formal structured methods and informal approaches', Proceedings of the First International Conference on Integration of Design, Engineering and Management for innovation IDEMI'09, Porto, Portugal, **September 14-15, 2009**.
- M. Windisch, U. Glaser, K.-H. Trautmann, P. M. S. T. de Castro, E. Sattler, "Damage tolerance characterization of 2195 base material and friction stir welds", 11<sup>th</sup> European Spacecraft Structures, Materials and Mechanical Testing Conference (SSMMT), Toulouse, **15-17 Sept 2009**. <http://www.ecssmmt.com/>
- N. Eigen, U. Glaser, G. Sinnema, P. M. G. P. Moreira, J. Shneider, E. Sattler, "Microstructure and properties of AA 2195 base material and friction stir welds", 11<sup>th</sup> European Spacecraft Structures, Materials and Mechanical Testing Conference (SSMMT), Toulouse, **15-17 Sept 2009**. <http://www.ecssmmt.com/>

#### National conferences

- D. F. C. Peixoto, L. A. Ferreira, P. M. S. T. de Castro, 'O critério de Dang Van para dimensionamento à fadiga: comparação com outros critérios', 5<sup>o</sup> Encontro Nacional do Colégio de engenharia Mecânica da Ordem dos Engenheiros, Guimarães, **13-14 February 2009**.
- V. Richter-Trummer, S. O. Silva, O. Frazão, S. M. O. Tavares, P. M. G. P. Moreira, P. M. S. T. de Castro, 'O ensaio de flexão em 4 pontos para calibração de deformação usando sensores de Bragg', 5<sup>o</sup> Encontro Nacional do Colégio de engenharia Mecânica da Ordem dos Engenheiros, Guimarães, **13-14 February 2009**.
- S. M. O. Tavares, B. Hohmann, "Non-destructive testing for friction stir welds in aeronautics", poster presentation, First Annual MIT-Portugal Program Conference: Engineering for Better Jobs" at Centro Cultural de Belém, Lisbon, Portugal, on **July 7**,

<sup>1</sup> Unfortunately the 'cd' distributed by the organizers of the 7th EUROMECH Solid Mechanics Conference contains a mistake: although the file of this full paper (12 pages) is recorded in the 'cd' (pap\_0758\_GS-MM.pdf in folder papers\GS-MM), in the index it is mistakenly identified as *R. Perales, G. Saussine, F. Radjai 'Optimization of the Tamping Process to Reduce Track Settlement'* ! Furthermore, although the abstract is correctly printed in the proceedings book (J. Ambrósio, M. T. Silva, eds, 'Book of Abstracts, lectures and General Sessions', p.417, in the index of this volume (page xviii) it is again mistakenly identified as *R. Perales et al.* !

<sup>2</sup> Unfortunately the 'cd' distributed by the organizers of IDEMI'09 contains a mistake: although the file of this full paper (14 pages) is recorded in the 'cd', its link to the index is broken, so the paper is not accessible !

**2009.** Also, in the same event: P. M. S. T. de Castro, Research team: S. M. O. Tavares (including a 6-months stay at MIT under the supervision of T. Eagar), P. Vilaça (IST, Lisbon), J. dos Santos (GKSS, Geesthacht), 'New design concepts for aeronautical applications by friction stir welding', in: A. M. Cunha, O. S. Carneiro, eds., 'Proceedings of the first MIT-Portugal Annual Conference 7<sup>th</sup> July 2009', pp.54-55, ISBN: 978-972-8692-41-4.

[http://www.mitportugal.org/index.php?option=com\\_docman&task=doc\\_download&gid=363&Itemid=383](http://www.mitportugal.org/index.php?option=com_docman&task=doc_download&gid=363&Itemid=383)

- C. M. C. Albuquerque, P. M. S. Tavares de Castro, R. A. B. Calçada, 'Aplicação da mecânica da fractura no contexto da análise dinâmica de estruturas pelo método da sobreposição modal', VII Congresso de Construção Metálica e Mista, Lisboa, **19-20 Nov. 2009.** in: VII Congresso de Construção Metálica e Mista, L Simões da Silva *et al*, eds, CMM, 2009, ISBN 978-989-95605-1-2, pp.II-195 – II-204.

### Other communications

- V. Richter-Trummer, 'Integrated design solutions for structures manufactured with FSW, including effects of residual stresses and damage tolerance criteria', seminar of the FEUP Doctoral Programme in Mechanical Engineering, Porto, **20 Feb. 2009.**
- Paulo M. S. T. de Castro (presenter) and co-authors Sérgio M. O. Tavares, Valentin Richter-Trummer, Paulo F. P. de Matos, Pedro M. G. P. Moreira, Lucas F. M. da Silva, 'Fatigue crack propagation in Al-alloy panels', Seminar at Imperial College, Department of Aeronautics, (invitation of Dr. S. T. Pinho, senior lecturer at ICLondon), **22 May 2009.**
- P. M. S. T. de Castro, 'Fatigue crack propagation in Al-alloy panels' in: "Couplage Fatigue – Comportement Dynamique, Séminaire dans le cadre du CISIT", IUT-A, Univ. Sci. Tech. Lille, (invitation of Prof. Gérard Mesmacque, USTLille), **12 June 2009.**
- P. M. S. T. de Castro, concise presentation of the status of Sérgio Tavares' doctoral thesis; requested by MIT-Portugal programme, in: "MIT-Portugal Research Projects - EDAM Early Projects Follow-Up Meeting" at the Universidade do Minho, Guimarães, Portugal, on **June 18, 2009.**
- P. M. S. T. de Castro, invited presentation at the Design Studio, FEUP: after-lunch presentation on the context of Sérgio Tavares' doctoral thesis and FSW work of the Univ. Porto, **July 1, 2009.**
- P. M. S. T. de Castro, 'O(s) sector(es) da aeronáutica e do espaço: percepções de um universitário do Porto', Workshop POOL NET (CENTIMFE), Évora, **15 Oct. 2009.**
- P. M. G. P. Moreira, 'FSW: apresentação do processo e resultados de investigação', presented at: Seminário Processos de Soldadura Emergentes: Friction Stir Welding', INEGI, Porto, **26 Oct. 2009.**
- P. M. S. T. de Castro, 'Projectos de investigação envolvendo o processo FSW', presented at: Seminário Processos de Soldadura Emergentes: Friction Stir Welding', INEGI, Porto, **26 Oct. 2009.**
- S. M. O. Tavares, M. A. V. de Figueiredo, Processos de soldadura emergentes: friction stir welding - aplicação à soldadura de ligas e Materiais dissimilares', presented at: Seminário Processos de Soldadura Emergentes: Friction Stir Welding', INEGI, Porto, **26 Oct. 2009.**
- V. Richter-Trummer, 'Campos de temperatura e tensões residuais em soldaduras por FSW', presented at: Seminário Processos de Soldadura Emergentes: Friction Stir Welding', INEGI, Porto, **26 Oct. 2009.**
- P. M. P. Afonso, 'Portugal Finland design project and programme from the other side of Europe: from the drawing to the design of Product Service Systems', seminar of the FEUP Doctoral Programme in Industrial Engineering and Management, FEUP, **13 Nov. 2009.**
- R. A. S. de Castro, (INEGI - LOME junior researcher within the FCT programme *Bolsas de Integração na Investigação*, supervised by P. M. G. P. Moreira), presentation: "Experimental characterization of residual stress fields in t-joints welded by friction stir welding", at INEGI/IDMEC, **16 Nov. 2009.**

### Reports, internal reports and working documents

- V. Richter-Trummer, 'Comparison of the x-ray and the hole drilling method for surface residual stress measurements' IMAGINE project, working document of work performed at GKSS, **18 March 2009**, (restricted circulation).
- V. Richter-Trummer, 'Integrated design solutions for structures manufactured with FSW, including effects of residual stresses and damage tolerance criteria', First year progress report, FEUP, Porto, Portugal, **12 May 2009** (restricted circulation).
- V. Richter-Trummer, D. Peixoto, M.A.V. Figueiredo, S.F. Silva, O. Frazão 'WELDING' MIG welding test, **20 May 2009**.
- D. F. C. Peixoto, 'Critério de Dang Van: Representação dos ciclos de carga de um veio sujeito a diversos tipos de carregamento', IDMEC internal report, **28 May 2009**.
- V. Richter-Trummer, L. Bergmann, P. Picard, Klinge Jr., 'Verformungsmessung während der spanenden Bearbeitung von AA7075-T73', IMAGINE project, working document of work performed at GKSS, **15 June 2009**, (restricted circulation).
- V. Richter-Trummer, L. Bergmann, P. Picard, Klinge Jr., 'Verformungsmessung während der spanenden Bearbeitung von AA7075-T73; Einfluss der Walz- und Bearbeitungsrichtung IMAGINE', IMAGINE project, working document of work performed at GKSS, **17 June 2009**, (restricted circulation).
- V. Richter-Trummer, D. Peixoto, J. Almeida, 'FSW welding experiment - simultaneous measurement of strain and temperature using optical and electrical sensors', FCT 'WELDING' project working document, **24 July 2009**.
- P. M. G. P. Moreira, S. D. Pastrama, "Cultural Agreement Portugal/Romania: Work developed in the frame of the project: Structural integrity of integral stiffened plates", INEGI - Instituto de Engenharia Mecânica e Gestão Industrial, Porto, Portugal, and University Politehnica of Bucharest, Romania, **1 Sept. 2009**.
- V. Richter-Trummer *et al*, 'Distortion of AA7075-T73 during high speed machining', IMAGINE project, working document, **20 Oct. 2009**, (restricted circulation).
- P. M. P. Afonso, 'Portugal Finland design project and programme from the other side of Europe: from the drawing to the design of Product Service Systems' **Oct. 2009**.
- C. Albuquerque, 'Cálculos justificativos das dimensões dos provetes e das cargas a aplicar no ensaio de taxa de propagação de fenda', **Nov. 2009**.
- P. M. G. P. Moreira, INEGI - LOME report to GKSS on residual stress measurements using HDT (services contracted through P. M. G. P. Moreira), **Nov. 2009**.
- V. Richter-Trummer, M. Borgães, 'Bi-axial fatigue crack propagation testing distortion of specimen 2198 - 3', GKSS Forschungszentrum Geesthacht GmbH, Institute of Materials Science, Materials Mechanics and Joining, Solid-State Joining Processes, **13 November 2009**, (restricted circulation).
- V. Richter-Trummer (rapporteur), J. Knaack, K.-H. Balzereit, M. Beltrão, A. Roos, O. Kreienbring, "Bi-axial fatigue crack propagation testing", GKSS Forschungszentrum Geesthacht GmbH, Institute of Materials Science, Materials Mechanics and Joining, Solid-State Joining Processes, **27 November 2009**, (restricted circulation).
- V. Richter-Trummer (rapporteur), J. Knaack, K.-H. Balzereit, M. Beltrão, A. Roos, O. Kreienbring, "Bi-axial fatigue crack propagation testing", GKSS Forschungszentrum Geesthacht GmbH, Institute of Materials Science, Materials Mechanics and Joining, Solid-State Joining Processes, **11 December 2009**, (restricted circulation).

#### Book review

- P. M. S. T. de Castro, "Book review: U Zerbst, M Schödel, S Webster, R Ainsworth, "Fitness-for-Service Fracture Assessment of Structures Containing Cracks: A Workbook based on the European SINTAP/FITNET procedure", Academic Press, 2007", invited book review for **Engineering Failure Analysis**, review invited by the journal; submitted Oct. 2009.

#### Patents

- Response to *Relatório de Exame do Pedido de Patente de Invenção Nacional nº 103867*, September 2009 (application: S. M. O. Tavares *et al*, "Soldadura por fricção linear - Soldaduras em T", nº.103867), **Sept. 28, 2009**; further response: **Nov. 13, 2009**.
- Decision: Patente em Portugal nº.103867 'Soldadura por fricção linear - soldaduras em T' ( UPIN Pat.27 ), **Boletim da Propriedade Industrial**, (233), 2009 , **Nov. 30, 2009**, [www.inpi.pt](http://www.inpi.pt)

### Project reports

- Final report FCT project POCI/V.5/C0006/2005 "European Rail Research Network of Excellence EURNEX" submitted on-line, **March 2009**; FCT evaluation ('A') received on 29 April 2009.
- Final report FCT project REEQ/375/EME/2005 submitted on-line, **15 April 2009**.
- P. M. G. P. Moreira, S. D. Pastrama, "Cultural Agreement Portugal/Romania: Work developed in the frame of the project: Structural integrity of integral stiffened plates", INEGI - Instituto de Engenharia Mecânica e Gestão Industrial, Porto, Portugal, and University Politehnica of Bucharest, Romania, **1 Sept. 2009**.
- Progress periodical report FCT project PTDC/EME-TME/66362/2006 "'WELDING' - Fiber Bragg grating sensors for modelling of friction stir welding (FSW) and laser beam welding (LBW)", 2nd progress report: period January 1, 2008 - December 31, 2008, submitted on-line, **Oct. 2009**.

### Meetings of projects of the group

- ESA / ESTEC, final meeting and public presentation of project Technology and Research Programme "Damage tolerance of cryogenic pressure vessels", 2008-2009, coord. MT-Aerospace (Portuguese partner: INEGI), Noordwijk, the Netherlands, **June 23, 2009**.

### Conferences, meetings and short courses attended; internships and stays at labs.

#### Daniel F. C. Peixoto

- **Guimarães**, Portugal, 5º Encontro Nacional do Colégio de engenharia Mecânica da Ordem dos Engenheiros, **13-14 February 2009**.
- **Lisbon**, Portugal, V International Materials Symposium MATERIAIS 2009 (XIV meeting of SPM - Sociedade Portuguesa de Materiais), **5-8 April 2009**.
- **Porto**, Portugal, 3rd International Conference on Integrity, Reliability and Failure, **20-24 July 2009**.
- **Porto**, Portugal, attendance (partial) of short course: "The taming of the shrew: specificities of the use of English in academic and professional settings", taught by Dr. Deolinda Adão, director of Portuguese Studies Program at UC Berkeley, **July 2009**.

#### Pedro M. G. P. Moreira (INEGI - LOME)

- **Lisbon**, Portugal, V International Materials Symposium MATERIAIS 2009 (XIV meeting of SPM - Sociedade Portuguesa de Materiais), **5-8 April 2009**.
- **Noordwijk**, the Netherlands, ESA / ESTEC, final meeting and public presentation of project Technology and Research Programme "Damage tolerance of cryogenic pressure vessels", 2008-2009, coord. MT-Aerospace (Portuguese partner: INEGI), **June 23, 2009**.
- **Porto**, Portugal, 3rd International Conference on Integrity, Reliability and Failure, **20-24 July 2009**.
- **Bucharest**, Romania, stay at the Universitatea Politehnica Bucuresti, project funded by FCT submitted by P. M. G. P. Moreira in the frame of the Cultural Agreement Portugal / Romania, **1-7 July 2009**. (Stefan Dan Pastrama visited Porto on 15-22 June 2009).

#### Paulo M. S. T. de Castro

- **Lisbon**, Portugal, V International Materials Symposium MATERIAIS 2009 (XIV meeting of SPM - Sociedade Portuguesa de Materiais), **5-8 April 2009**.
- **Noordwijk**, the Netherlands, ESA / ESTEC, final meeting and public presentation of project Technology and Research Programme "Damage tolerance of cryogenic pressure vessels", 2008-2009, coord. MT-Aerospace (Portuguese partner: INEGI), **June 23, 2009**.
- **London**, UK, Seminar at Imperial College, Department of Aeronautics, by Paulo M. S. T. de Castro (presenter) and co-authors Sérgio M. O. Tavares, Valentin Richter-Trummer, Paulo F. P. de Matos, Pedro M. G. P. Moreira, Lucas F. M. da Silva, 'Fatigue crack propagation in Al-alloy panels', **22 May 2009**.

- **Lille**, France, visit May 2009 as invited professor, and lecture 'Fatigue crack propagation in Al-alloy panels' in: "Couplage Fatigue – Comportement Dynamique, Séminaire dans le cadre du CISIT", IUT-A, Univ. Sci. Tech. Lille, **12 June 2009**.
- **Montréal**, Canada, AES – ATEMA' 2009 Third International Conference: Advances and Trends in Engineering Materials and their Application, **July 6 -10, 2009**.
- **Porto**, Portugal, First International Conference on Integration of Design, Engineering and Management for Innovation IDEMI'09, Porto, Portugal, **September 14-15, 2009**.
- **Amadora**, Portugal, Workshop Railway Maintenance Research, at EMEF, Railways Technology and Innovation Unit, **Oct. 1, 2009**.
- **Évora**, Portugal, Workshop POOL NET (CENTIMFE), **15 Oct. 2009**.
- **Lisbon**, Portugal, Seminário Mobilidade, Câmara de Comércio e Indústria Luso-Francesa, **18 Nov. 2009**.

#### **Stefan D. Pastrama (Universitatea Politehnica Bucuresti)**

- Visit to **Porto**, exchange project submitted by P. M. G. P. Moreira in the frame of the Portugal-Romania cooperation agreement, **15-22 June 2009**.

#### **S. M. O. Tavares**

- **Cambridge, MA**, USA, stay at MIT for work with Prof. T. Eagar, **Jan. – July 2009**.
- **Dayton, OH**, USA, attendance of AEROMAT 2009 conf., **June 7-11, 2009**.
- **Cambridge, MA**, USA, attendance of Second International Engineering Systems Symposium, Engineering Systems: Achievements and Challenges, MIT, **June 15-17, 2009**.
- **Lisbon**, Portugal, 7th EUROMECH Solid Mechanics Conference, **Sept. 7-11, 2009**.
- **Porto**, Portugal, First International Conference on Integration of Design, Engineering and Management for Innovation IDEMI'09, Porto, Portugal, **September 14-15, 2009**.
- **Bremem**, and **Hamburg**, Germany, internship at AIRBUS, **October 2009 – April 2010**.
- **Geesthacht**, Germany, 'COINS' EU project meeting and workshop, at GKSS, (as a member of the AIRBUS group of participants), **8-10 December 2009**

#### **Valentin Richter-Trummer**

- **Geesthacht**, Germany, stay at GKSS, Solid State Joining Processes Department, working with Dr. Jorge dos Santos, Sept. 2008 - May 2009; Sept.-Dec. 2009.
- **Montréal**, Canada, AES – ATEMA' 2009 Third International Conference: Advances and Trends in Engineering Materials and their Application, **July 6 -10, 2009**.
- **Porto**, Portugal, 3rd International Conference on Integrity, Reliability and Failure, **20-24 July 2009**.
- **Lisbon**, Portugal, 7th EUROMECH Solid Mechanics Conference, **7-11 September 2009**.
- **Geesthacht**, Germany, 'COINS' EU project meeting and workshop, at GKSS, (as a member of the GKSS group of participants), **8-10 December 2009**.

#### **Networks**

- PMST de Castro, AA Fernandes, European Rail Research Network of Excellence EURNEX, since 2004.
- PMST de Castro, EASN - European Aeronautics Science Network, since 2005.

#### **Editorial boards**

PMST de Castro:

- ***Fatigue and Fracture of Engineering Materials and Structures***, (J Wiley-Blackwell), ISSN 8756-758X
- ***International Journal of Structural Integrity***, (EMERALD), ISSN 1757-9864, since 2008
- ***Mechanika***, (Kaunas University of Technology), ISSN 1392-1207
- ***UPB Scientific Bulletin, Series D: Mechanical Engineering***, (Universitatea Politehnica Bucuresti), ISSN 14542358, since 2008

#### **Refereeing in 2009 for journals**



- P. M. S. T. de Castro, *Composite Structures, Computational Materials Science, Engineering Fracture Mechanics, Fatigue and Fracture of Engineering Materials and Structures, International Journal of Fatigue, International Journal of Structural Integrity, Materials Science Forum, Mecânica Experimental*.
- P. M. G. P. Moreira, *International Journal of Fatigue, Journal of Materials Engineering and Performance, Materials Science Forum*.

#### for conferences

- P. M. S. T. de Castro, *Materiais 2009*, Lisbon; *Mesomechanics 2009*, Oxford.
- P. M. G. P. Moreira, *Materiais 2009*, Lisbon.

#### Organization of eventsLis

- Lecture by A. A. Fernandes, 'Metodologias de decisão em projecto', at INEGI/IDMEC building, Porto, 14 May 2009.
- 'Seminário Processos de Soldadura Emergentes: Friction Stir Welding', INEGI, Porto, 26 Oct. 2009, organized by P. M. G. P. Moreira (INEGI - LOME).
- Iberian Conference on Fracture and Structural Integrity CIFIE'2010, Porto **17-19 March 2010, P. M. S. T. de Castro, chair**.
- 1st International Conference of the Journal of Structural Integrity IJSI'2012, Porto, FEUP, 25-28 June 2012, **P. M. S. T. de Castro, chair**.



#### Scientific committees of conferences

- P. M. S. T. de Castro, "Composites2009" – 2nd ECCOMAS Thematic Conference on the Mechanical Response of Composites, April 1-3, 2009, Imperial College London, (member of the Scientific Committee).
- P. M. S. T. de Castro, *Materiais 2009* "Recent Advances in Characterization, Processing, Design and Modeling of Structural and Functional Materials", (XIV Meeting of the Sociedade Portuguesa de Materiais, and V International Materials Symposium), Lisbon, IST, April 5-8, 2009 (member of the Scientific Advisory Committee).
- P. M. S. T. de Castro, *Mesomechanics 2009*, University of Oxford, UK, 24-26 June 2009 (member of the Scientific Committee).
- P. M. S. T. de Castro, *Mesomechanics 2010*, Taipei, Taiwan, 21-25 June 2010, (member of the International Scientific Committee).
- P. M. S. T. de Castro, 2<sup>nd</sup> International Conference of Engineering against Fracture ICEAF II, Patras, Greece, 22-24 June 2011 (member of the Scientific Committee).

#### Impacts

- Previous work of the group (Porto members) was the object of at least 54 citations in 2009 up to the 5<sup>th</sup> Dec. 2009 as recorded in the SCOPUS database.
- Previous work of the group (Porto members) was the object of at least 370 citations up to the 5<sup>th</sup> Dec 2009 as recorded in the SCOPUS database<sup>3</sup>.

#### Equipment

- **10%** (cash contribution) of the total investment of Experimental Equipment for the Structural Integrity Unit of IDMEC-Pólo FEUP proposal submitted to FCT, April de 2002,

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<sup>3</sup> for author P M S T de Castro.

contract FCT Project REEQ/375/EME/2005. The remaining **90%** were integrally paid for by FCT.

- Maintenance and re-calibration of the MTS (100kN capacity) and MTS (250 kN capacity) machines of LET/FEUP, paid for by project FCT PTDC/EME-TME/66362/2006 (**50%**) and projects of P. P. Camanho (**50%**).
- Up-grade / repair of hydraulic pump of MTS (250 kN capacity), **100%** paid for by project FCT PTDC/EME-TME/66362/2006.

### Visitors

Among many others, the following visitors were welcomed at FEUP:

- Nelson Guedes de Alcântara, Universidade Federal de São Carlos, Brasil, **8 June 2009**.
- Stefan Dan Pastrama, Universitatea Politehnica Bucuresti, (exchange project submitted by P. M. G. P. Moreira in the frame of the Cultural Agreement Portugal/Romania and funded by FCT), **15-22 June 2009**.
- Pascal Ghys, ALSTOM Transport, Rolling Stock Engineering, Structural Calculations Department Manager, France, **21 July 2009**.
- Maria Eugênia Mosconi de Gouvêa, Directora da Faculdade de Engenharia da Universidade do Estado do Rio de Janeiro, Brasil, **31 August 2009**.
- Susana Moretto, ALSTOM Transport, High Speed Market Developer, Portugal, **21 Sept., 30 Sept. 2009**
- Daniel Cadet, ALSTOM Transport, France, **30 Sept. 2009**.
- Tapio Kalevi Yli-Viikari, Vice-Dean, Taideteollinen korkeakoulu – TaiK (University of Art and Design Helsinki), Finland, **13 Nov. 2009**.

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- Fernando M. F. de Oliveira, FEUP, Portugal
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