

Dr Jim Warren

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Chief Science & Technology Officer, Salaria Systems.

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## Professional Summary

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Highly qualified and motivated research and development director, with over 20 years experience in undertaking and directing military and security research. Superb Science and Engineering skills. Excellent ability to interact with military stakeholders at all levels and communicate key science points to stakeholders, whilst translating military requirements to the science community. Led interdisciplinary research teams on behalf of UK MOD on Force Protection Engineering, CIED technologies and IED effects.

## Skills

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- Engineering trained scientist with excellent communication skills.
- Strong record of leading multi-institution teams to deliver goals.
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- Proven record of development and implementation research programmes.
- Explosives Engineering.
- Ballistic Engineering.
- Research .
- Military Engineering.
- Model Validation.
- Superb Military/Science facilitator.
- Experimentation.
- Instrumentation.
- Research Collaboration.
- ISO Systems.

## Qualifications

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University of Sheffield, MEng, Civil & Structural Engineering (1998)

University of Sheffield, PhD (2001)

Member, Institute of Explosives Engineers, MIEExpE

## Summary of career and achievements

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- MEng (1998) and PhD (2001), University of Sheffield.
- 20 years' experience in applied research, primarily defence & security sector projects.
- Extensive experience in environmental and safety testing of ammunition/EOD systems.
- Trusted subject matter expert in blast and ballistic effects for DSTL, UK MOD, UK Centre for Protection of National Infrastructure, and the Metropolitan Police.

## Technical Achievements (unclassified):

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- Developed novel testing methodology for testing steel connections at high strain rates.
- Developed UK MOD standard test methodology for blast testing fibre reinforced concrete.
- Developed a modular, large calibre air cannon for use in high-speed impact studies.
- Developed improved split Hopkinson Bar experiments.
- Developed unique testing facility to study scale vehicle high-speed impact and shock interaction.
- Developed techniques for measuring structural effects of targets inside detonation fireballs.
- Developed techniques for preparation of geotechnical beds with tight moisture content and density tolerances for use in sub-surface blast experiments.
- Designed and developed apparatus for temporal distribution of impulse in variable geometry targets subjected to sub-surface and near-field blast.
- Designed and developed apparatus to measure the impulse effects of various explosives and geotechnical materials due to sub-surface and near-field blast.

## Previous Appointments:

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1998-2001 Postgraduate Research Associate (University of Sheffield)

2001-2014 Post Doctoral Research Associate (University of Sheffield)

2014-2018 Senior Fellow and Blast and Impact Lab Principle (University of Sheffield)

2002-2005 Research and Development Manager Primetake Ltd

2002-2014 Various overseas consultancy UK Govt.

2005-2010 Technical Director Blastech Ltd

2010-2018 Managing Director Blastech Ltd

2018-current Chief Science & Technology Officer, Salaria

## PUBLICATIONS

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- Barr AD, Clarke S, Tyas A & Warren JA (2018) Effect of moisture content on high strain rate compressibility and particle breakage in loose sand. *Experimental Mechanics*.
- Rigby SE, Fay SD, Tyas , Clarke SD, Reay JJ, Warren JA, Gant M & Elgy I (2018) Influence of particle size distribution on the blast pressure profile from explosives buried in saturated soils. *Shock Waves*, 28(3), 613-626.
- Clarke S, Barr A, Warren J & Williams A (2018) Local Variations in Gabion Structures. *International Journal of Protective Structures*.
- Barr AD, Clarke SD, Tyas A & Warren JA (2017) Electromagnetic Interference in Measurements of Radial Stress During Split Hopkinson Pressure Bar Experiments. *Experimental Mechanics*.
- Clarke SD, Fay SD, Warren JA, Tyas A, Rigby SE, Reay JJ, Livesey R & Elgy I (2017) Predicting the role of geotechnical parameters on the output from shallow buried explosives. *International Journal of Impact Engineering*, 102, 117-128.
- Barr A, Clarke SD, Petkovski M, Tyas A, Rigby SE, Warren J & Kerr S (2016) Effects of strain rate and moisture content on the behaviour of sand under one-dimensional compression. *Experimental Mechanics*, 56(9), 1625-1639.
- Barr A, Clarke SD, Rigby SE, Tyas A & Warren JA (2016) Design of a split Hopkinson pressure bar with partial lateral confinement. *Measurement Science and Technology*, 27.
- Rigby SE, Fay SD, Clarke SD, Tyas A, Reay JJ, Warren JA, Gant M & Elgy I (2016) Measuring spatial pressure distribution from explosives buried in dry Leighton Buzzard sand. *International Journal of Impact Engineering*, 96, 89-104.
- Clarke SD, Fay SD, Rigby SE, Tyas A, Warren JA, Reay JJ, Fuller BJ, Gant MTA & Elgy ID (2016) Blast Quantification Using Hopkinson Pressure Bars. *Journal of Visualized Experiments*(113), 1-11.
- Clarke SD, Fay SD, Warren JA, Tyas A, Rigby SE, Reay JJ, Livesey R & Elgy I (2015) Geotechnical causes for variations in output measured from shallow buried charges. *International Journal of Impact Engineering*, 86, 274-283.
  
- Fay SD, Rigby SE, Tyas A, Clarke SD, Reay JJ, Warren JA & Brown R (2015) Displacement timer pins: An experimental method for measuring the dynamic deformation of explosively loaded plates. *International Journal of Impact Engineering*, 86, 124-130.
- Rigby SE, Tyas A, Clarke SD, Fay SD, Reay JJ, Warren JA, Gant M & Elgy I (2015) Observations from Preliminary Experiments on Spatial and Temporal Pressure Measurements from Near-Field Free Air Explosions. *International Journal of Protective Structures*, 6(2), 175-175.
- Rigby SE, Fay SD, Tyas A, Warren JA & Clarke SD (2015) Angle of Incidence Effects on Far-Field Positive and Negative Phase Blast Parameters. *International Journal of Protective Structures*, 6(1), 23-42.
- Clarke SD, Fay SD, Warren JA, Tyas A, Rigby SE & Elgy I (2014) A large scale experimental approach to the measurement of spatially and temporally localised loading from the detonation of shallow-buried explosives. *Measurement Science and Technology*, 26.
- Rigby SE, Tyas A, Bennett T, Fay SD, Clarke SD & Warren JA (2014) A Numerical Investigation of Blast Loading and Clearing on Small Targets. *International Journal of Protective Structures*, 5, 253-274.
- Warren J, Kerr S, Tyas A, Clarke S, Petkovski M, Jardine A, Church P, Gould P & Williams A (2013) Briefing: UK Ministry of Defence force protection engineering programme. *Proceedings of the ICE - Engineering and Computational Mechanics*, 166(EM3), 119-123.

## Conference proceedings papers

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- Barr AD, Clarke SD, Tyas A & Warren J (2017) Particle breakage in partially- saturated sand under dynamic loading. 17th International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS)
- Fuller BJ, Warren JA, Clarke SD, Rigby SE, Tyas A, Barr A, Gant M & Elgy I (2017) Assessing the performance of protective systems subject to buried charge blasts. Proceedings of The 17th International Symposium on the Interaction of the Effects of Munitions with Structures (17th ISIEMS). Bad Neuenahr, Germany, 16 October 2017 - 20 October 2017.
- Langran-Wheeler C, Tyas A, Rigby SE, Stephens CS, Clarke S & Warren J (2017) Characterisation of reflected blast loads in the very near-field from non-spherical explosive charges. Proceedings of The 17th International Symposium on the Interaction of the Effects of Munitions with Structures (17th ISIEMS). Bad Neuenahr, Germany, 16 October 2017 - 20 October 2017.
- Barr AD, Clarke SD, Rigby SE, Tyas A & Warren J (2016) Investigating high strain rate shear in soils using a split Hopkinson pressure bar. 3rd UK Defence Seminar on the High Strain Rate Properties of Soils and Granular Media. Dstl, Porton Down
- Tyas A, Reay JJ, Fay SD, Rigby SE, Warren JA & Pope DJ (2016) Experimental studies of the effect of rapid afterburn on shock development of near-field explosions. Proceedings of the 24th Military Aspects of Blast and Shock. Halifax, Nova Scotia, Canada, 19 September 2016 - 23 September 2016.
- Fuller B, Rigby SE, Tyas A, Clarke SD, Warren JA, Reay J & Gant M (2016) Experimentation and modelling of near field explosions. Proceedings of the 24th Military Aspects of Blast and Shock. Halifax, Nova Scotia, Canada, 19 September 2016 - 23 September 2016.
- Rigby SE, Fay SD, Tyas A, Clarke SD, Reay JJ, Warren JA, Gant M & Elgy I (2016) Localised variations in reflected pressure from explosives buried in uniform and well-graded soils. Proceedings of the 24th Military Aspects of Blast and Shock. Halifax, Nova Scotia, Canada, 19 September 2016 - 23 September 2016.
- Clarke SD, Rigby SE, Tyas A, Fay SD, Reay JJ, Warren JA, Gant M & Elgy I (2016) Reflected pressures from explosives buried in idealised cohesive soils. Proceedings of the 24th Military Aspects of Blast and Shock. Halifax, Nova Scotia, Canada, 19 September 2016 - 23 September 2016.
- Barr A, Clarke SD, Rigby SE, Tyas A & Warren JA (2016) Design of a partially confined split Hopkinson pressure bar. Proceedings of 24th International Symposium on Military Aspects of Blast and Shock
- Clarke SD, Rigby SE, Fay SD, Tyas A, Reay JJ, Warren JA, Gant M, Livesey R & Elgy I (2015) 'Bubble-type' vs 'shock-type' loading from buried explosives. 16th International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS). Destin, FL, USA, 10 November 2015 - 13 November 2015.
- Tyas A, Reay J, Warren JA, Rigby SE, Clarke SD, Fay SD & Pope DJ (2015) Experimental Studies of Blast Wave Development and Target Loading from Near-Field Spherical PETN Explosive Charges. 16th International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS). Destin, FL, USA, 10 November 2015 - 13 November 2015.
- Rigby SE, Tyas A, Clarke SD, Fay SD, Reay JJ, Warren JA & Pope DJ (2015) A Review of UFC-3-340-02 Blast Wave Clearing Predictions. 16th International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS). Destin, FL, USA, 10 November 2015 - 13 November 2015.
- Rigby SE, Tyas A, Clarke SD, Schwer L, Fay SD, Reay JJ & Warren JA (2015) Lateral Clearing of Far-Field Obliquely Reflected Blast Waves. The First International Conference

on Structural Safety under Fire & Blast (CONFAB 2015). Glasgow, UK, 2 September 2015 - 4 September 2015.

- Fuller B, Rigby SE, Tyas A, Clarke SD, Fay SD, Reay JJ, Warren JA & Elgy I (2015) Effect of Spatial Variation of Blast Loading on Response of Plates. Proceedings Of The First International Conference on Structural Safety under Fire & Blast (CONFAB 20. Glasgow, UK, 2 September 2015 - 4 September 2015.
- Rigby SE, Tyas A, Fay SD, Reay JJ, Clarke SD & Warren JA (2015) Finite element simulation of plates under non-uniform blast loads using a point-load method: Blast wave clearing. 11th International Conference on Shock & Impact Loads on Structures. Ottawa, Canada, 14 May 2015 - 15 May 2015.
- Clarke SD, Fay SD, Rigby SE, Tyas A, Warren JA, Reay JJ, Fuller B, Pope DJ, Gant M & Elgy I (2015) Finite element simulation of plates under non-uniform blast loads using a point-load method: Buried explosives. 11th International Conference on Shock & Impact Loads on Structures. Ottawa, Canada, 14 May 2015 - 15 May 2015.
- Rigby SE, Clarke SD, Fay SD, Reay JJ, Tyas A, Warren J, Gant M & Elgy I (2014) Recent developments on the characterisation of blast loading (CoBL). 2nd UK Defence Seminar on the High Strain Rate Properties of Soils and Granular Media. Dstl, Porton Down, 11 December 2014 - 12 December 2014.
- Clarke S, Warren J, Fay S, Rigby S & Tyas A (2014) The influence of Geotechnical Conditions on the Output of Shallow Buried Charges. 2nd UK Defence Seminar on the High Strain Rate Properties of Soils and Granular Media. Dstl, Porton Down, 11 December 2014 - 12 December 2014.
- Barr AD, Clarke SD, Petkovski M, Tyas A, Rigby SE & Warren J (2014) Force Protection Engineering: Soil Research. 2nd UK Defence Seminar on the High Strain Rate Properties of Soils and Granular Media. Dstl, Porton Down, 11 December 2014.
- Rigby SE, Tyas A, Clarke SD, Fay SD, Warren JA, Elgy I & Gant M (2014) Testing Apparatus for the Spatial and Temporal Pressure Measurements from Near-Field Free Air Explosions. 6th International Conference on Protection of Structures against Hazards. Tianjin, China, 16 October 2014 - 17 October 2014.
- Rigby SE, Tyas A, Fay SD, Clarke SD & Warren JA (2014) Validation of Semi- Empirical Blast Pressure Predictions for Far Field Explosions - Is There Inherent Variability in Blast Wave Parameters. 6th International Conference on Protection of Structures against Hazards. Tianjin, China, 16 October 2014 - 17 October 2014.
- Barr A, Clarke SD, Petkovski M, Tyas A, Warren J & Kerr S (2014) Quasi-static and high-strain-rate experiments on sand under one-dimensional compression. Hopkinson Centenary Conference (pp 1-15). Cambridge, UK, 8 September 2014.
- Clarke SD, Fay SD, Tyas A, Warren J, Rigby SE, Elgy I & Livesey R (2014) Repeatability of Buried Charge Testing. Military Aspects of Blast and Shock 23. Oxford, UK, 7 September 2014 - 12 September 2014.
- Fay SD, Clarke SD, Tyas A, Warren J, Rigby SE, Bennett T, Elgy I & Gant M (2014) Measuring the Spatial and Temporal Pressure Variation from Buried Charges. Military Aspects of Blast and Shock 23. Oxford, UK, 7 September 2014 - 12 September 2014.
- Barr A, Clarke S, Petkovski M, Tyas A, Warren J & Kerr S (2014) Strain-rate effects in dry and partially-saturated sand under one-dimensional compression at high pressures. International Symposium on Geomechanics from Micro to Macro. Cambridge, UK, 1 September 2014.
- Clarke SD, Barr A, Petkovski M, Tyas A & Warren JA (2013) Strain rate and moisture effects on sand response. 1st UK Defence Seminar on the High Strain Rate Properties of Soils and Granular Media. QinetiQ Farnborough, 24 September 2013.
- Fay S , Clarke S, Warren JA, Tyas A, Bennett T, Reay J, Elgy I & Gant M (2013) Capturing the spatial and temporal variations in impulse from shallow buried charges. 15th International Symposium on Interaction of the Effects of Munitions with Structures (ISIEMS). Potsdam, Germany, 16 September 2013 - 20 September 2013.

- Clarke S, Warren JA, Fay SD, Tyas A & Rigby SE (2012) The role of geotechnical parameters on the impulse generated by buried charges. MABS 22 Bourges (2012). SPIEZ Switzerland, 4 November 2012 - 9 November 2012.
- Clarke SD, Warren JA & Tyas A (2011) The influence of soil density and moisture content on the impulse from shallow buried explosive charges. 14th International Symposium on Interaction of the Effects of Munitions with Structures (ISIEMS). Seattle, USA, 19 September 2011 - 23 September 2011.