



**ALERT**  
AWARENESS AND LOCALIZATION  
OF EXPLOSIVES-RELATED THREATS

Awareness and Localization of Explosives-Related Threats (ALERT)

*ALERT is supported by the Department of Homeland Security (DHS)  
Science and Technology (S&T) Directorate through the  
Office of University Programs (OUP)*

**Advanced Development for Security Applications (ADSA) Workshop 22:  
Reducing Operator Cognitive Load in Aviation Security  
Virtual Workshop**

Session 3

December 1, 2020, 11 AM - 1 PM ET

## SPEAKER BIOGRAPHIES



**Nathan Adderson**

*SEATAC International Airport, Seattle Office of Intelligence*

Nathan Adderson supports TSA leadership at Seattle-Tacoma International Airport, TSA operations in Washington State, and works with local, state, and federal agencies to protect commerce and the movement of people. His work focuses on intelligence sharing, information dissemination to key stakeholders, and risk analysis to provide insights into current and emerging threats. Nathan is a graduate of the University of Washington, where in 1999 he earned a Bachelor of Arts in Near Eastern Civilizations and in 2004 a Masters in Middle East Studies at the Jackson School of International Studies.



**Toby Breckon**

*Durham University*

Toby Breckon is currently a Professor within Engineering and Computer Science, Durham University. His key research interests lie in the domain of computer vision and image processing and he leads a range of research activity in this area spanning autonomous vehicles, robotic sensing, automated visual surveillance and security X-ray image understanding.

Work from his research team has had significant impact across the aviation security sector, wide area surveillance within global defence and security (UK SAPIENT programme, 2013-2016; MoD Grand Challenge - R.J. Mitchell Trophy, (2008), IET Innovation Award (2009)) and in sensing systems for intelligent transport. He received the Royal Photographic Society Selwyn Award for early-career contribution to imaging science (2011).

Prof. Breckon holds a PhD in informatics (computer vision) from the University of Edinburgh. He has been a visiting member of faculty at the Ecole Supérieure des Technologies Industrielles Avancées (France), Northwestern Polytechnical University (China), Shanghai Jiao Tong University (China) and Waseda University (Japan).

Prof. Breckon is a Chartered Engineer, Chartered Scientist and a Fellow of both the British Computer Society (FBCS) and Institute for Engineering & Technology (FBCS). In addition, he is an Accredited Senior Imaging Scientist and Fellow of the Royal Photographic Society (ASIS FRPS).



**ALERT**  
AWARENESS AND LOCALIZATION  
OF EXPLOSIVES-RELATED THREATS

## Awareness and Localization of Explosives-Related Threats (ALERT)

*ALERT is supported by the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate through the Office of University Programs (OUP)*



**David Castañón**

*Boston University*

Professor David Castañón received his Ph.D. degree in Applied Mathematics from the Massachusetts Institute of Technology in 1976. He was chief scientist at ALPHATECH, Inc. in Burlington, MA until 1990, when he joined Boston University's Department of Electrical and Computer Engineering. He is a past president of the IEEE Control Systems Society and received the Society's Distinguished Member Award. He also served on the Air Force Scientific Advisory Board. At Boston University, he served as Department Chair, and as co-director of the Center for Information and Systems Engineering. He is currently a Thrust Leader in the Department of Homeland Security's ALERT Center of Excellence on explosives detection, in charge of Video

Analytics and Signature Analysis. His research interests include stochastic control, estimation, game theory and optimization, with applications to inverse problems, object recognition, sensor management, and security.



**David Coccarelli**

*Quadridox*

Dr. David Coccarelli has spent most of his professional and academic careers working on image reconstruction and system analysis as they pertain to X-ray systems. He has worked in the aviation security space since 2014 when he started research into X-ray simulation and system analysis as a graduate student at Duke University. He wrote his dissertation on information-theoretic analysis of X-ray systems and helped to develop a number of X-ray simulation and analysis tools. Dr. Coccarelli has been the Vice President of Operations at

Quadridox, Inc. since 2019 where he helps lead the transition of novel technologies from academia to industry.



**Harry Collins**

*Cardiff University*

Harry Collins is Distinguished Research Professor at Cardiff University. He is an elected Fellow of the British Academy and winner of the Bernal prize for social studies of science. His c25 books cover, among other things, sociology of scientific knowledge, artificial intelligence, the nature of expertise, tacit knowledge, and technology in sport. His contemporaneous study of the detection of gravitational waves has been continuing since 1972 and he has written four books and many papers on the topic. He is currently looking at the impact of the coronavirus lockdown on science due to the ending of face-to-face conferences and workshops.



**Carl R. Crawford**

*Csuptwo*

Carl Crawford is president of Csuptwo, LLC, a technology development and consulting company in the fields of medical imaging and explosive detection for Homeland Security. He has been a technical innovator in the fields of computerized imaging for more than thirty years. His technology has resulted in 90 U.S. Patents. Dr. Crawford was the Technical Vice President of Corporate Imaging Systems at Analogic Corporation, Peabody, Massachusetts, where he led the application of signal and image processing techniques for medical and security scanners. He developed the reconstruction and explosive detection algorithms for a computerized tomographic (CT) scanner deployed in airports worldwide. He was also employed at General Electric Medical Systems, Milwaukee, Wisconsin, where he invented the enabling technologies for helical scanning for medical CT scanners and physiological motion compensation for projection-based imaging systems. At Elscint, Haifa, Israel, he developed technology for cardiac CT scanners. He also has developed technology for magnetic resonance imaging (MRI), single photon emission tomography (SPECT), positron emission tomography (PET), ultrasound imaging, dual energy imaging and automated threat detection algorithms. He has a PHD in electrical engineering from Purdue University. He is a Fellow of the IEEE and a Fellow of the American Association of Physicists in Medicine (AAPM).



**Joel Greenberg**

*Quadridox*

Dr. Joel Greenberg is the co-founder, President and CEO of Quadridox, which is focused on developing novel X-ray imaging tools and products. At Quadridox, his focus is on developing physics-based simulation software for synthetic data generation and system design as well as the development of X-ray diffraction tomography systems for application in a variety of fields. His technical background stems from his parallel role as an Associate Research Professor in the Department of Electrical and Computer Engineering and a member of the faculty of Medical Physics at Duke University. While Dr. Greenberg has worked in a range of areas, including cold atom physics and nonlinear optics, his current research is focused on computational sensing across the electromagnetic spectrum (from ELF to X-rays) and its application to areas such as medicine and security. He developed coded aperture X-ray diffraction tomography and pioneered its application to soft tissue analysis and explosives detection, helped develop Quadridox's X-ray simulation tool QSim, and has worked to help build a community of scientists via his role as the chair of the SPIE Anomaly Detection and Imaging with X-rays (ADIX) annual meeting. Dr. Greenberg received his B.S.E. in mechanical engineering from Princeton University and his PhD in physics from Duke University.



**Lambertus Hesselink**

*Stanford University*

Dr. Lambertus Hesselink is Professor of Electrical Engineering and Applied physics, by courtesy. He received his PhD from Caltech. He has presented over 270 keynote and invited presentations at scientific meetings, he has organized over 80 scientific meetings, published over 500 papers in scientific journals, over 15 book chapters, was an editor of Applied Optics, Applied Scientific Research, IEEE Transaction on Visualization, and has over 100 issued and pending patent applications worldwide. He was a visiting Professor at Tsinghua University China, Japan, Europe, and has mentored over 85 PH.D graduate students.



**ALERT**  
AWARENESS AND LOCALIZATION  
OF EXPLOSIVES-RELATED THREATS

## Awareness and Localization of Explosives-Related Threats (ALERT)

*ALERT is supported by the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate through the Office of University Programs (OUP)*

Professor Hesselink is a member of the Royal Dutch Academy of Arts and Sciences, a Fellow of the OSA and SPIE, he was a member to the Airforce Scientific Advisory Board, a co-designer of the Astronaut Memorial, and a member of the Hubble Space Telescope committee charged with fixing the Hubble Telescope resolution problem, a Fulbright scholar among other noteworthy accomplishments.

He has founded three successful startup companies.



**James Intriligator**

*Tufts University*

James Intriligator is the director of the Human Factors Engineering Program at Tufts University (Boston, USA). He is a Professor of the Practice in the Department of Mechanical Engineering (School of Engineering). An interest in vision and the brain originally brought James to Harvard where he earned his Ph.D. in cognitive neuroscience (1997). After a postdoc in neurology at Beth Israel Deaconess Medical Center, he left academia for five years and worked in high-tech consulting firms as an entrepreneur, offerings designer, and innovation catalyst. In 2003, he merged his business experience with his scientific expertise and went to Bangor University (UK) as a pioneer in the field of consumer psychology. In his 13 years at Bangor, Intriligator created

Europe's leading consumer psychology master's programs and co-developed several multidisciplinary design programs (*Enterprise by Design* and *Social Enterprise Accelerator*). He was named a UK National Teaching Fellow in 2014. He joined Tufts University in 2016 to lead the university's renowned Human Factors Engineering program into its next phase of innovation and growth. Intriligator is the author of over 50 publications in fields as diverse as neuroscience, neurology, consumer psychology, physics, and literary criticism. Intriligator's latest research is primarily in the domain of developing next-generation human-machine systems. This broad area covers everything from assistive and social robots, to baggage screeners, to VR systems, to military and medical devices. In addition to his work within the university, he also works with global organizations as well as local social-enterprise and social-justice groups. Since arriving at Tufts Intriligator has been nominated for a *Tufts Distinction Award*, shortlisted for *Professor of the Year*, and won a university-wide *Teaching with Technology* award.



**Chris Larkee**

*Marquette University*

Chris Larkee is the technology specialist for the Visualization Laboratory at Marquette University. He has 15 years experience in computer animation, media production, and broadcast engineering. In 2006, he received a BFA from UW-Milwaukee in filmmaking and computer graphics. Over the next 5 years, he coordinated Discovery World's video production studio, creating dozens of videos and multimedia projects about science and art education and developing innovative open-source video workflows. Since 2014, he has served a lead role in Marquette University's Visualization Laboratory, working with faculty and graduate students in the development of customized immersive environment software to implement

their concepts for research and learning. Chris's skills include programming, 3-D modelling, and interactive user experience design.



**ALERT**  
AWARENESS AND LOCALIZATION  
OF EXPLOSIVES-RELATED THREATS

## Awareness and Localization of Explosives-Related Threats (ALERT)

*ALERT is supported by the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate through the Office of University Programs (OUP)*



**Harry E. Martz**

*Lawrence Livermore National Laboratory*

Harry Martz is the Director for Non-destructive Characterization Institute and a distinguished member of the technical staff at Lawrence Livermore National Laboratory. He is also Principal Investigator (PI) on Department of Homeland Security, Science and Technology, Homemade Explosives Identification, Detection and Mitigation (*HEIDM*) program. Harry joined the Laboratory to develop the area of X-ray imaging and proton energy loss computed tomography for the non-destructive inspection of materials, components, and assemblies. He received his M.S. and Ph.D. in Nuclear Physics/Inorganic Chemistry from Florida State University, and his B.S. in Chemistry from Siena College. Harry has applied CT to inspect one-millimeter sized laser targets, automobile and aircraft components, reactor-fuel tubes, new production reactor target particles, high explosives, explosive shape charges, dinosaur eggs, concrete and for non-destructive radioactive assay of waste drum contents. Recent R&D efforts include CT imaging for conventional and homemade explosives detection in luggage and radiographic imaging of cargo to detect special nuclear materials and radiological dispersal devices.



**Matthew Merzbacher**

*Alameda County Community Food Bank*

Dr. Merzbacher recently retired from his position as Director of Certification and Qualification at Smiths Detection. There, and before that at Morpho Detection, Matthew was responsible for detection testing across products for explosives, chemical, and radiation detection. He also served as co-chair of the ANSI standards group on image quality for CT-based explosives detection systems and chaired the NEMA DICOS Threat Detection Working Group. Matthew joined InVision Technologies in 2003 as a Research Scientist in the Machine Vision group before taking over as manager of that group. Dr. Merzbacher has a Ph.D. in Computer Science from UCLA, specializing in data mining. He has several patents on image processing for explosives detection. He spends his time in the more rewarding pursuits of hiking and volunteering at the local food bank.



**Laura Parker**

*Department of Homeland Security*

Laura Parker is the Senior Advisor for Sensors in the Science and Technology Directorate at the Department of Homeland Security. She is also the Program Manager for the ALERT Center of Excellence, a DHS-sponsored consortium of universities led by Northeastern University to perform research that address explosive threats. Laura, most recently, was the Program Manager for the Next Generation Explosives Trace Detection Program focused on developing advanced explosives trace detectors for use at checkpoints and other DHS operational environments. Laura has worked on a variety of research projects focused on explosives screening technologies to include algorithm and hardware development and interfacing with DHS components such as Transportation Security Administration, Customs and Border Protection, US Secret Service, the US Coast Guard and other government agencies. Previously, Laura worked as a contractor providing technical and programmatic support of chemical and biological defense and explosives programs for several Department of Defense (DoD) offices. She also performed research in several US Navy laboratories in the field of energetic materials. She obtained her Ph.D. in chemistry from the Pennsylvania State University.



**ALERT**  
AWARENESS AND LOCALIZATION  
OF EXPLOSIVES-RELATED THREATS

## Awareness and Localization of Explosives-Related Threats (ALERT)

*ALERT is supported by the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate through the Office of University Programs (OUP)*



**Franco Rupcich**

*Cich Solutions*

Franco Rupcich graduated with a BS in Biomedical Engineering and Mathematics at Marquette University in 2008 and went on to earn his PhD in Biomedical Engineering at Marquette University in 2013, specializing in CT Image Quality and Dose Reduction Methods. He has worked as a Systems Engineer at Baxter and Hospira and currently works as a Senior Systems Engineer at GE Healthcare, where he leads the design, development, and testing of Dose and Automated Exposure Control features for the Premium CT segment. He has also supported numerous ALERT projects, including Task Orders 4 and 7 (ATR and AATR projects), as well as the Simulated Air Cargo and Opioid Detection projects.



**Michael B. Silevitch**

*Northeastern University*

Michael B. Silevitch is currently the Robert D. Black Professor of Engineering at Northeastern University in Boston, an elected life fellow of the IEEE, the Director of the Homeland Security Center of Excellence for Awareness and Localization of Explosives Related Threats (ALERT), and the Director of the Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (Gordon-CenSSIS), a graduated National Science Foundation Engineering Research Center (ERC). His training has encompassed both physics and electrical engineering disciplines. An author/co-author of over 65 journal papers, his research interests include laboratory and space plasma dynamics, nonlinear statistical mechanics, and K-12 science and mathematics curriculum implementation. Prof. Silevitch is also the creator of the Gordon Engineering Leadership (GEL) Program at Northeastern University, a graduate curriculum offered through the College of Engineering, with the mission of creating an elite cadre of engineering leaders. He and the current GEL Director, Simon Pitts, were awarded the 2015 Bernard M. Gordon Prize for Engineering Education by the National Academy of Engineering (NAE).



**Austin Silva**

*Sandia National Laboratories*

Austin Silva is a Cognitive Scientist at Sandia National Laboratories. His research interests focus on the intersection of human cognition, novel technologies, and learning. Previous projects he has led have focused on evaluating physiological and cognitive fatigue in an array of operational environments related to national security. He currently leads the Open Threat Assessment Platform's (OTAP) Open Platform Software Library (OPSL) Team. Austin received his Bachelor's in Electrical Engineering from the New Mexico Institute of Mining & Technology and his Master's from Harvard University in Mind, Brain, & Education.