

Overview of AIR's SPOT Research Agenda

The American Institutes for Research (AIR) is engaged with TSA's Behavior Detection and Analysis Division (BDAD) to conduct research on the Screening of Passengers by Observation Techniques (SPOT) Program. The work has two goals: (1) help guide the SPOT Program's performance evaluation efforts and (2) examine the scientific evidence base for the behaviorally-based approach that is central to SPOT. This research will build upon the SPOT Validation Study conducted by AIR to examine the extent to which the SPOT approach accurately identified high risk outcomes. It also aligns with GAO recommendations to conduct a broader program evaluation, to provide evidence that SPOT is indeed strengthening aviation security, and to develop more outcome-oriented measures to gauge program effectiveness.

STUDY 1: EXAMINATION OF RACIAL AND NATIONAL ORIGIN (RNO) PROFILING

Purpose. To examine the extent to which racial or ethnic disparity in passenger referral may exist in the SPOT Program. If disparities exist, examine whether these differences may suggest discrimination or bias in the referral process or Behavior Detection Officers' (BDOs') behaviors. AIR will conduct the following tasks in the first six months. In months 7-12, the full-scale data collection will occur.

Task 1. Data Collection Feasibility Study: To prepare for full-scale data collection:

- Examine available traveler demographics data to determine its quality to meet study goals;
- Determine appropriate benchmarks to examine disparity in selection;
- Consider approaches to measure BDO referral accuracy and referral justification;
- Examine implication of changing the SPOT referral procedures and reporting; and
- Design full-scale study, including data collection specifications and training materials.

Task 2. Literature Reviews: Conduct two literature reviews: (1) research on racial and ethnic disparity in selection across various fields; and (2) evidence related to unintentional bias in behavior-based suspicious indicators such as those used in SPOT. These reviews will inform research design and interpretation of results.

Task 3. Focus Groups: Conduct focus groups with BDOs, managers, and others to discuss perspectives on the extent to which disparities due to race, ethnicity, or other demographics exists in SPOT indicators and/or procedures, and whether such disparities are indicative of systematic bias. Additional focus groups may be conducted with members of advocacy groups, who are concerned with this issue for their constituencies.

Task 4. Analysis of TSA Referral Databases: Examine available TSA databases to determine whether similar demographic patterns of referrals exist across various screening programs.

STUDY 2: REFINEMENT OF SUSPICIOUS INDICATORS

Purpose. To optimize the SPOT suspicious indicator set found on the current SPOT Referral Report, including the development of standardized definitions and associated training materials.

Task 1. Review Existing Materials: Systematically review and summarize all program materials and the research base related to SPOT indicators. Update analyses from the SPOT Validation Study completed in 2011. The summary document will be provided to experts for review.

Task 2. Expert Review: Convene a panel of experts to review SPOT indicator summary document (Task 1) and make recommendations regarding indicator refinement. Recommendations may include removing, adding, combining or rewording indicators; developing new operational definitions; and/or changing associated weights. Panel will include experts with deep knowledge of BDAD/SPOT, security screening and deception detection.

Task 3. Human Factors Studies: Design and conduct studies to examine cognitive workload and fatigue as they relate to BDOs' work. Findings will inform the revised indicator list (i.e., maximum number of indicators) and associated BDO training.

Task 4. Training Development: Develop the structure and content for a revised BDO training course based on the revised indicator list and test out the course with a small number of BDOs.

Task 5. Pilot Test Study Design: Develop study methodology and associated materials to pilot test the revised indicator list. Pilot study of refined indicators list will occur in Year 2.

STUDY 3: DEVELOPMENT AND EVALUATION OF EFFECTIVE PERFORMANCE METRICS FOR THE SPOT PROGRAM

Purpose. Support TSA in the development of performance metrics to measure program effectiveness by engaging in the following tasks. In Year 1, Tasks 1 and 2 will be completed, as well as work plans for completing Tasks 3-5.

Task 1. Review, Prioritize, and Refine Proposed Metrics: Determine appropriateness and prioritization of various performance metrics, including key factors that impact BDO performance and measures of program effectiveness.

Task 2. Review and Develop Research Designs: Review current research designs and develop additional rigorous research designs (as needed) to examine the feasibility of implementing and collecting data necessary to calculate performance metrics.

Task 3. Implement Pilot and Research Studies: Conduct pilot and research studies to collect data on targeted program metrics.

Task 4. Analyze Outcomes: Analyze data collected for targeted program metrics and make recommendations about operational implementation.

Task 5. Develop Instruments and Associated Training Materials: Develop instruments for standardized data collection/reporting and training materials and curricula as needed.

INDEPENDENT REVIEW

An independent Technical Advisory Committee (TAC) will be convened to review and comment on study design plans at the outset of the work, as well as interim and final results for each study. Additional meetings with TAC subcommittees will be convened as needed to assure that studies meet appropriate levels of scientific peer review. TAC members will have expertise in racial/ethnic disparity research, selection instrument bias, research methods, study design, program evaluation, performance metrics, behavior detection and the SPOT Program.

RESEARCH TEAM

American Institutes for Research

Tracy Costigan, Ph.D., Principal Research Scientist – TSA SME Panel Principal Investigator.

Dr. Costigan has nearly 20 years of experience in behavioral science research. Technical areas of focus include research design, quantitative methodology, predictive modeling, test development and validation, training evaluation, survey design, behavioral measurement and large scale data analysis. Research areas include workforce and national security issues, behavioral analysis, mental health, and education. Dr. Costigan served as Principal Investigator for Project Hostile Intent (PHI; 2005-2011), which was jointly funded by the US Naval Research Laboratory (NRL) and the Department of Homeland Security's Science and Technology Directorate (DHS S&T). In this capacity, Dr. Costigan provided project direction for all tasks, interacting with clients and Government representatives. Related to the SPOT Program, Dr. Costigan developed the methodology for and led the implementation of the SPOT Validation Study as well as led the data analysis effort. She has briefed the study to the project's independent review panel as well as to the Transportation Security Administration (TSA), DHS, and the US Government Accountability Office (GAO). As Principal Investigator, she also led work on the Identification of Suicide Attack Indicators, a study which involved conducting semi-structured interviews with subject matter experts (SMEs) and eyewitnesses to suicide attacks. PHI work also included developing complex statistical models of non-verbal indicators of deception; development of knowledge tests to evaluate Behavior Detection Officers (BDOs) in a supplemental training course; literature reviews on suicide attack indicators, the casual conversation interview approach, and cross-cultural factors in deception detection; and the development of standardized definitions of SPOT indicators to support training development. In 2011, Dr. Costigan was invited to serve on a SME Panel for TSA to discuss the design of micro-expression training for Transportation Security Officers (TSOs). She recently published a book chapter on validation methods for security measures in *Evidence-Based Counterterrorism Policy* (2012), part of the Springer Series on Evidence-Based Crime Policy. Dr. Costigan holds a Ph.D. in Clinical Psychology from the Medical College of Pennsylvania/Hahnemann University.

Dwayne Norris, Ph.D., Vice President and Director, Workforce Division – TSA SME Panel

Senior Advisor. Dr. Norris is responsible for designing, directing, contributing to, and/or reviewing applied research and consulting projects for both Government agencies and private industry. He has more than 20 years of experience in job/organizational analysis and competency modeling, workforce development, personnel assessment/selection and certification, performance management, measurement, and employment law and litigation support. He also served as a senior technical advisor and quality assurance reviewer for PHI. Dr. Norris holds a Ph.D. in Industrial and Organizational Psychology from Virginia Tech University.

Dan Sherman, Ph.D., Managing Economist – TSA SME Panel Senior Advisor. Dr. Sherman is an expert at executing large-scale economic and statistical analyses, with an emphasis on survey methodology. Responsibilities include working with project directors in the design and execution of projects to assure that they are methodologically rigorous and meet expected standards of quality. Dr. Sherman served as a senior technical advisor and quality assurance reviewer for PHI. Dr. Sherman holds a Ph.D. in Labor Economics from Cornell University.

Cheryl Hendrickson, Ph.D., Principal Research Scientist. Dr. Hendrickson has over 18 years of experience in providing human capital consulting services for federal Government clients in the areas

of job analysis and competency modeling, test development and validation, organizational surveys, training needs assessment, workflow analysis, performance management, and other related areas. Dr. Hendrickson led the BDO Selection System Development task as part of PHI, which involved conducting a comprehensive job analysis for the BDO job. In addition, Dr. Hendrickson served on an independent panel to review TSA's pilot programs and made recommendations for future research in this area. She served as the Project Director for the Insider Threat project and assisted DHS by conducting targeted literature reviews on insider threat and deception detection. This literature review identified scientific research that focused on the effectiveness of behavioral indicators for detection of threats during observations, behavioral detection of cyber threats, and the identification of employees who may be at risk of conducting sabotage. Dr. Hendrickson holds a Ph.D. in Industrial and Organizational Psychology from the University of Nebraska.

Kelley J. Krokos, Ph.D., Principal Research Scientist. Dr. Krokos has been contributing to applied research in the field of industrial-organizational psychology for 18 years. Her expertise and interests focus on defining, measuring, and improving individual, team, multi-team, and organizational performance in a variety of "high risk" work environments including aviation, the military, corrections, police, and healthcare. Clients include the Federal Aviation Administration (FAA), TRICARE Management Activity, US Navy, US Coast Guard, North Carolina Department of Correction, and the NC State Highway Patrol. She routinely employs focus groups, interviews, the critical incident technique, cognitive interviews, surveys, tests, and other data collection techniques with subject matter experts to develop organizational systems, including job analysis, personnel selection (both pre- and post-employment), performance assessment, training development and evaluation, human error analysis, and tool/equipment design and evaluation. She has a long and successful history of direct collaboration with clients during the development and administration of these programs. Dr. Krokos holds a Ph.D. in Industrial and Organizational Psychology from North Carolina State University.

Kimberly Acree Adams, Ph.D., Senior Research Scientist – TSA SME Panel Task Leader. Dr. Adams has over 15 years of experience in leading projects designed to develop and evaluate knowledge tests, performance measures, and structured interviews for the purposes of selection, certification, classification, performance development, and training evaluation. She has applied her diverse skills on a number of projects funded by the federal government (e.g., DHS, FAA, Department of Navy, Centers for Medicare and Medicaid Services (CMS), National Health Services Corp (NHSC)) as well as for clients in the private sector (e.g., Association of American Medical Colleges (AAMC), College Board, American Institute of Certified Public Accountants, Hess Oil Company, Shell Oil Company). Dr. Adams most recently led a literature review of the prevention and mitigation of insider threat for DHS. In addition, she recently completed a project in which she managed the development and evaluation of Aviation Safety Action Program training for Event Review Committees now available to air carriers through FAA. Dr. Adams holds a Ph.D. in Industrial and Organizational Psychology from the University of Houston.

Liza Josias, M.S., Senior Research Analyst – TSA SME Panel Task Leader. Ms. Josias is a human factors engineer specializing in the identification and evaluation of human-systems integration and human performance issues in high-reliability organizations. She has over 10 years' experience evaluating the safety implications of new automation and technologies using a human-centered design approach. She has conducted usability testing of human-computer interfaces, performed hierarchical and cognitive task analyses, led working groups tasked with ameliorating communication and information management errors, developed and delivered human factors training, and investigated safety incidents associated with human-systems integration issues in complex high-

risk systems. Ms. Josias has also conducted research on human factors and aviation systems in Europe, Australia and the United States. As a project manager, Ms. Josias led a team of human factors specialists who worked closely with systems engineers and project managers to identify human factors concerns and integrate human factors considerations into project planning and systems implementation. Recently, Ms. Josias contributed to a conducting targeted literature reviews on insider threat and deception detection for DHS. Ms. Josias holds an M.S. in Human Factors/Ergonomics from San José State University.

Zodie Makonnen, Ed.M., Senior Research Analyst – TSA SME Panel Project Director and Task Leader. Ms. Makonnen has over 20 years of experience in program evaluation and research. Most recently, Ms. Makonnen served as Deputy Project Director for PHI and played a central role in the SPOT Validation Study and the Identification of Suicide Attack Indicators tasks. Responsibilities included developing and refining behavior-based measures of deception and hostile intent through the development of in-depth interview protocols for qualitative interviews with SMEs; conducting interviews and focus groups with a variety of respondents; and conducting extensive literature reviews on a range of issues related to deception and hostile intent. Currently, she serves as Project Director for a grant that involves the independent evaluation of a classroom-based teacher performance evaluation system. Specific project activities include development of evaluation designs and appropriate data collection measures, including surveys and observation, interview and focus group protocols. Ms. Makonnen holds an Ed.M. in Education from Harvard University.

Tanya Taylor, Ph.D., Research Analyst. Dr. Taylor has over a decade of experience in the arena of legal psychology, including research related to interviewing techniques, interrogations, deception detection, false confessions, and judicial decision-making. She has program evaluation and field and laboratory research experience, and has ample training in research design and methodology and advanced statistical procedures. Dr. Taylor led the PHI Deception Modeling team, engaging in fundamental research on deception detection using facial expression and body movement data, applying innovative statistical methodology. In addition, she was a senior staff member for the SPOT Validation Study, involved in data analysis, design, and implementation. Dr. Taylor holds a Ph.D. in Human Behavior and Organizations, with an emphasis in Legal Psychology, from the University of Texas at El Paso.

Emily Baumann, M.S., Research Associate. Ms. Baumann has been involved in DHS- and TSA-sponsored research since 2008. She has supported PHI in the past by assisting the behavioral analysis team with data preparation, conducting statistical analyses, coding and synthesizing qualitative data, conducting unclassified and classified literature reviews related to behavioral indicators of suicide attack, collecting data through site visits and monitoring other data collectors, and contributing to reports. Ms. Baumann has worked the last several years on conducting strategic job analyses and supporting program evaluations and behavioral analyses. Additional research responsibilities have included organizing and conducting SME focus groups and interviews, collecting observation data, contributing to technical reports, and maintaining project budgets and monthly client reports. Ms. Baumann holds an M.S. in Applied Sociology from Clemson University.

Luann Johnson, M.A., Research Associate. Ms. Johnson has been involved in DHS- and TSA-sponsored research since 2008. Ms. Johnson's involvement included on-site data collection for the SPOT Validation Study; co-authoring literature reviews on the casual conversation technique for BDOs and cross-cultural issues in deception detection. As part of the BDO Selection System Development project, she administered pilot and field tests with BDOs. Ms. Johnson was also an integral part of the PHI Identification of Suicide Attack Indicators tasks. Her involvement included

protocol development for SME and eyewitness interviews, and contributing to literature reviews on suicide attackers indicators. Ms. Johnson served as the data collection lead for FAA's validation study of the Air Traffic Selection and Training battery for Tower Cab Controllers. Prior to joining AIR, she served as development officer for an European Union-funded project in Northern Ireland focusing on ways to combat discrimination in the workplace. Ms. Johnson holds an M.A. in International Peace and Conflict Resolution from Arcadia University.

Jacob Miller, M.S., Research Associate. Mr. Miller assists in conducting Human Factors reviews, administering assessments, performing literature reviews, writing annotated bibliographies, and contributing to technical reports. As part of the BDO Selection System Development project, Mr. Miller participated in collecting job analysis data, administering assessments to incumbents, and assisting with data management tasks and responsibilities to measure the validity of the assessments. His education and on the job experience has developed a strong understanding of research and design fundamentals that are valuable in a range of research domains. Mr. Miller holds an MS in Human Factors and Systems from Embry-Riddle Aeronautical University. He currently serves in the Air National Guard and is expected to earn his commission as a Second Lieutenant in May 2013.

Michele Toplitz, B.A., Research Associate. Ms. Toplitz has been involved in DHS- and TSA-sponsored research since 2005. Most recently, she served as a member of the SPOT Validation Study team; her involvement included the development of data collection procedures for BDOs, conduct of airport monitoring visits, and analysis of results for the final report. Ms. Toplitz was also an integral part of the PHI Identification of Suicide Attack Indicators task. Participation included development of interview protocols and training guides, as well as conducting literature reviews on behaviors of suicide attackers with respect to the SPOT indicators. As part of the BDO Selection System Development project, she administered pilot and field tests with BDOs at a number of US airports. Certified in the Facial Action Coding System (FACS), Ms. Toplitz applied this expertise to coding experimental video data and in support of TSA's development of a supplemental training course for BDOs. Ms. Toplitz holds a B.A. in Anthropology/Sociology and Spanish from Lafayette College.

Consultants

Paul Ekman, Ph.D. has conducted pioneering research on emotions and their relation to non-verbal behavior, especially facial expressions, for approximately 60 years. In particular, Dr. Ekman's work focuses on how demeanor—facial expression, gesture, posture, voice, gaze and speech—can provide clues to deception and dangerous intent. Since 2003, Dr. Ekman has consulted with TSA regarding the SPOT Program and has been involved in critical program reviews, including serving as a witness in the 2011 Congressional subcommittee hearing, *Behavioral Science and Security: Evaluating TSA's SPOT Program*. He has also consulted with DHS on the Future Attribute Screening Technology (FAST) programs on automated physiological measurement of malintent. Since 1961, he has received numerous federal grants and contracts to further basic and applied research on deception. Dr. Ekman has published over 100 empirical articles and books on topics related to demeanor and deception.

Christian Meissner, Ph.D. is Professor of Psychology & Criminal Justice and Associate Vice President of Research at the University of Texas at El Paso (UTEP). He is also Director of the UTEP Center for Law & Human Behavior. Dr. Meissner conducts empirical studies on the psychological processes underlying investigative interviews, including issues surrounding eyewitness recall and identification, deception detection, and interrogations. He has published numerous peer-reviewed journal articles and book chapters, and his research has been funded by the National Science

Foundation (NSF), US Department of Defense (DoD), US Department of Justice (DoJ), and DHS. He has served on advisory panels for NSF, the National Academy of Sciences (NAS), DoD, and DHS, and currently serves on the editorial board of several prominent academic journals.

Jack McDevitt, Ph.D. is the Associate Dean for Research, College of Social Sciences and Humanities and is the Director of the Institute on Race and Justice at Northeastern University. Dr. McDevitt's research in the area of criminal justice has involved such issues as arbitrariness in the administration of the death penalty and the role of mandatory sentences in gun control policy. In 1989, he authored the first study of hate-motivated violence which became the basis of *Hate Crime: The Rising Tide of Bigotry and Bloodshed*, co-authored with Jack Levin. He also authored the first national report on hate crime: *The 1990 Hate Crime Resource Book* for the FBI. Dr. McDevitt has done extensive research on law enforcement, with recent work on racial profiling data collection. He served as the principal investigator for a 2000 DoJ-sponsored research project that examined racial profiling data collection systems in five jurisdictions. Additionally, Dr. McDevitt has worked with the states of Rhode Island and Massachusetts on implementing and monitoring data collection systems for police contacts with motorists. Dr. McDevitt has testified as an expert witness before the US Senate Judiciary Committee and the US Civil Rights Commission, and served as a consultant to the FBI, the Bureau of Justice Statistics, the Government and Attorney General of Massachusetts, and numerous local law enforcement agencies. In January 2013, Dr. McDevitt was appointed by Massachusetts House Speaker Robert DeLeo to lead a special commission on gun violence.

Helene Mullaney, M.A., Specialist Master at Deloitte Consulting LLP, has over 24 years of professional experience conducting behavioral analyses in applied settings. Since 2000, her work has focused on identifying patterns of terrorist targeting and threat behaviors in support of security operations. She designed and led a multi-method, multi-data collection effort to identify and validate pre-detonation suicide attack indicators, which included interviewing world-renown subject-matter and security experts. She has 4 years of experience conducting training needs analysis and training evaluation for Intelligence Community and DoD clients, and currently provides process improvement support to an Intel Agency.