Georgia Institute of Technology
Georgia Tech Research Institute

BIOGRAPHICAL SKETCH

WILLIAM DALE BLAIR
Principal Research Scientist
Sensors and Electromagnetic Applications Laboratory
Air Missile and Defense Division

Education

Ph.D., Electrical Engineering University of Virginia	1998
Master of Science, Electrical Engineering Tennessee Technological University	1987
Bachelors of Science, Electrical Engineering Tennessee Technological University	1985

Employment History

Principal Research Engineer, Georgia Institute of Technology	2001-Present
Senior Research Engineer, Georgia Institute of Technology	1997-2001
Senior Electrical Engineer, Naval Surface Warfare Center, Dahlgren Division	1996-1997
Electrical Engineer, Naval Surface Warfare Center, Dahlgren Division	1990-1996
Electrical Engineer, FMC Corporation, Naval Systems Division	1987-1990

Experience Summary

William Dale Blair, Ph.D., joined the Georgia Tech Research Institute (GTRI) as a Senior Research Engineer in 1997 and was promoted to Principal Research Engineer in 2001. He is a recognized expert in the area of multitarget-multisensor tracking that includes optimal estimation, statistical signal processing, decision theory, radar resource allocation, radar signal processing, and radar systems modeling and simulation. In 2001, he was selected as the IEEE Young Radar Engineer of the Year, and he was elected to Fellow of the IEEE in 2002. He served as Editor for Radar Systems and Editor-In-Chief of the *IEEE Transactions on Aerospace and Electronic Systems* from 1996 through 2005, and he is the founding Editor-In-Chief for the *Journal for Advances in Information Fusion.* Dr. Blair is co-editor and co-author of the Multitarget-Multisensor Tracking: Applications and Advances III. He has co-authored 28 refereed journal articles, 25 refereed conference papers, numerous other papers and reports, and three book chapters. Dr. Blair is internationally recognized for conceptualizing and developing benchmark problems for comparison and evaluation of target tracking algorithms. A tracking benchmark is a computer simulation program that includes the salient features of the sensor system of interest and provides a "level playing field" for the evaluation and comparison of tracking algorithms. Dr. Blair developed NSWC Tracking Benchmarks I and II, originated ONR/NSWC Tracking Benchmarks III and IV, and leads the development team for other benchmarks. Dr. Blair was invited to serve (and currently serves) as the technical lead of the multi-organizational development team for the multiplatform-multisensor-multitarget tracking benchmark that has become known as the BMD Benchmark. Dr. Blair is internationally recognized for his contributions to radar resource allocation for single and multiple sensor systems. He developed the concept of information-based radar resource allocation that attempts to match the information procured by the radar to the information needed by the system that it supports. The efficiency of the technique was demonstrated through a real-time experiment with the SPY-1 radar. Dr. Blair is nationally recognized for his contributions to monopulse processing for unresolved measurements of closely-spaced objects or a target in the presence of sea-surface induced multipath. Dr. Blair was a leader in recognizing the problem of merged measurements and advocating the application of statistically rigorous techniques in target tracking. In 2002, Dr. Blair led a successful proposal effort for the

development of algorithms for Multisource Integration (MSI) for the E-2C aircraft. The GTRI proposal was one of three proposals that were selected for a phase I award from 22 submissions. He also served as a member the Tracking and CID Alternatives Identification and Evaluation Team (TCAIET) for SIAP JPO. Since 2005, he has served as the technical lead for the FFRDC/UARC team responsible for independent assessment of C2BMC algorithms for the Ballistic Missile Defense System (BMDS). Dr. Blair has served as a technical expert in panel discussions related to data and information fusion at various conferences that include 2nd International Conference on Information Fusion in Paris, France in 2000, SPIE Defense and Security Sensing Symposium in Orlando, FL in 2008, and 11th International Conference on Information Fusion in Cologne, Germany in 2008. He has been invited to give seminars in the United Kingdom; University of Buffalo; University of Virginia; University of Connecticut, and Atlanta Chapter of the IEEE AESS. He has been invited to contribute papers to numerous conferences and give talks at many workshops. He has served or serves as a consultant to the Applied Physics Laboratory of The Johns Hopkins University, Raytheon Systems Company, Numerica Corporation, SPARTA Inc., Trex Enterprises, Inc., and Toyon, Inc.

Dr. Blair has demonstrated his leadership in developing and managing technical thrusts in the area of multitarget-multisensor tracking at the Naval Surface Warfare Center, Dahlgren Division, (NSWCDD) and the Georgia Institute of Technology. While at NSWCDD, Dr. Blair developed a technical thrust in the area of target tracking and provided leadership to a small group of engineers that became known internationally for their contributions. When Dr. Blair joined NSWCDD in 1990, NSWCDD had basically no ongoing research in the area of target tracking. From 1990 through 1997, Dr. Blair developed and managed 12 projects for a total value of approximately four million dollars in the area of target tracking. The projects resulted in numerous publications and experiments that have changed the specifications for future naval radar systems. For example, in 1996, Dr. Blair and a team of engineers and scientist at NSWCDD conducted a real-time experiment with the SPY-1 radar and demonstrated that the radar time and energy used for tracking could be reduced by 60% through the use of the IMM estimator and adaptive revisit times. Since joining GIT, he has established a technical thrust in the area of target tracking and sensor fusion and provides leadership to a group of research engineers that are known for their contributions. In 1998, he founded and continues to organize the annual ONR/GTRI Workshop on Target Tracking and Sensor Fusion. Since 1998, Dr. Blair has developed and managed numerous projects for a total value of approximately 25 million dollars in the area of target tracking and sensor fusion. Dr. Blair worked with personnel of the Ballistic Missile Defense Organization (BMDO), now the Missile Defense Agency (MDA), and the Office of Naval Research (ONR) to develop tracking benchmarks for development and assessment of algorithms for multiplatform-multisensor-multitarget tracking problems. The development of these benchmarks have become a core business for GTRI and Dr. Blair serves as the technical lead for a multi-organizational team that develops the benchmark software. The benchmarks include the Joint Composite Tracking Network (JCTN) Benchmark for BMDO, Electronic Support Measures (ESM) Benchmark for NAVSEA, the Ballistic Missile Defense (BMD) Benchmark for MDA, and the Integrated Air, Missile Defense (IAMD) Benchmark for SIAP JPO, the Bio/Chem Benchmark for the Defense Threat Reduction Agency (DTRA), and Electronic Attack (EA) Benchmark for ONR and AFRL. GTRI serves as the configuration manager for the benchmark software that is distributed periodically to recipients throughout the DoD industry and laboratories. A critical result of the JCTN Benchmark is the mathematical formulation and implementation of the metrics for a Single Integrated Air Picture (SIAP). These SIAP metrics are becoming accepted as a standard throughout the DoD and have been recognized positively in the Office of the Secretary of Defense and the Ministry of Defense in the United Kingdom. The BMD Benchmark serves as the modeling and simulation tool of the Missile Defense National Team (MDNT-B) for development and assessment of algorithms for the C2BMC of the BMDS. Since 2005, Dr. Blair has served as the lead for the FFRDC/UARC team (i.e., Blue Ribbon Assessment Team or BRAT) that is responsible for the independent assessment of C2BMC algorithms for the BMDS. Through Dr. Blair's leadership, the BRAT has become an integral part of the C2BMC development process and a trusted source of technical expertise for the both the government and the contactor.

Dr. Blair is the originator, coordinator, and primary lecturer in the short course *Target Tracking in Sensor Systems* that has been offered annually since 2002 through the Department of Distance Learning and Profession Education (DLPE) at the Georgia Institute of Technology. This course was developed to teach target tracking concepts and develop a better appreciation of the sensors that are utilized in target tracking systems. In order to address the demands for the material on target tracking, the short course *Target Tracking Concepts* was originated. This

course has been taught to students with various backgrounds in Las Vegas and Huntsville, AL and on site for Lockheed-Martin, MITRE, Boeing, and NSWCDD Port Hueneme. In 2009, Dr. Blair introduced a new series of courses focused on advanced topics in target tracking. For the first year, the new course focused on ballistic missile defense with *Advanced Target Tracking for Ballistic Missile Defense 2009*, while the topic for 2010 will be air defense. Dr. Blair has also served as a member of a graduate advisory committee for two Ph.D. candidates, two MSEE candidates, and directed a co-op student and two graduate research assistants.

Dr. Blair is active in professional societies. He serves as a member of the Board of Governors (BoG) for the IEEE Aerospace and Electronic Systems Society (AESS) and is associate vice president for publications and head of the strategic planning committee. He is a member of the executive board of the International Society for Information Fusion (ISIF), where he has served as vice president for conferences since 2005.

Current Fields of Interest

Multitarget-multisensor tracking, modeling and simulation of stochastic systems, sensor system design, optimal estimation and control, and statistical signal processing, radar resource allocation and control

PUBLICATIONS/TECHNICAL ACCOMPLISHMENTS

Published Books and Parts of Books

1. Blair, W. D., Register, A. H., and West, P. D., "Multiple Target Tracking," in Principles of Modern Radar: Vol. II (M. L. Melvin, editor), SciTech Publishing, Inc. Publication expected in 2011.
2. Blair, W. D., "Radar Tracking Algorithms," in Principles of Modern Radar: Vol. I (M. Richards, J. E. Sheer, and W. A. Holms, editors), SciTech Publishing, Inc. Publication expected in May 2010.
3. Bar-Shalom, Y., and Blair, W. D., editors, Multitarget-Multisensor Tracking: Applications and Advances III, Norwood, Massachusetts: Artech House (2000).
4. Blair, W. D., and Keel, B. M., "Radar Systems Modeling for Tracking," in Multitarget-Multisensor Tracking: Applications and Advances III (Y. Bar-Shalom and W. D. Blair, editors), Norwood, Massachusetts: Artech House (2000).
5. Moore, J. R., and Blair, W. D., "Practical Aspects of Multisensor Tracking," in Multitarget-Multisensor Tracking: Applications and Advances III (Y. Bar-Shalom and W. D. Blair, editors), Norwood, Massachusetts: Artech House (2000).

Published Journal Papers (refereed)

1. Blair, W. D., "Design of Nearly Constant Velocity Filters for Tracking Maneuvering Targets" *IEEE Trans. on Aerospace and Electronic Systems,* in preparation.
2. Ender, T. Miceli, P., Blair, W. D., West, P. D., Leurck, R., Weaver, B., and Mavris, D., "Systems-of-Systems Analysis of Ballistic Missile Defense Architecture Effectiveness through Surrogate Modeling and Simulation" *IEEE Journal on System Engineering,* under review by MDA for public release.
3. Miceli, P., and Blair, W.D., "Performance Prediction of Multisensor Tracking Systems for Single Maneuvering Targets," *Journal for Advances in Information Fusion,* accepted for publication in 2010.
4. Palkki, R. A., Lanterman, A. D., and Blair, W. D., "Addressing Track Hypothesis Coalescence in Sequential K-Best Multiple Hypothesis Tracking," *IEEE Trans. on Aerospace and Electronic Systems,* schedule for publication in 2010.
5. Ehrman, L. M., and Blair, W. D., "Using Target RCS When Tracking Multiple Rayleigh Targets," *IEEE Transactions on Aerospace and Electronic Systems,* scheduled for publication in 2010.
6. Ehrman, L. M., and Blair, W. D., "Impact of Noncoherent Pulse Integration on RCS-Aided Tracking," *IEEE Transactions on Aerospace and Electronic Systems,* Vol. 45, No. 4, October 2009, pp. 1573-1579.
7. Jain, V., and Blair, W. D., "Filter Design for Steady-State Tracking of Maneuvering Targets with LFM Waveforms," *IEEE Transactions on Aerospace and Electronic Systems,* Vol. 45, No. 2, April 2009, pp. 765-773.

8. Kaplan, L. M., Bar-Shalom, Y., and Blair, W. D., "Assignment Costs for Multiple Sensor Track-to-Track Association," *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 44, No. 2, April 2008, pp. 655-675.
9. Willett. P.K., Blair, W. D., and Zhang, X. "The Multi-Target Monopulse CRLB for Matched Filter Samples," *IEEE Transactions on Signal Processing,* Vol. 55, No. 9, August 2007, pp. 4183-4197.
10. Ogle, T. L., and Blair, W. D., "Fixed-Lag Alpha-Beta Filter for Target Trajectory Smoothing," *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 40, No. 4, October. 2004, pp. 1417-1421.
11. Willett, P.K., Blair, W.D., and Bar-Shalom, Y., "Correlation between Horizontal and Vertical Monopulse Measurements," *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 39, No. 2, April 2003, pp. 533-549.
12. Sinha, A., Bar-Shalom, Y., Blair, W.D., and Kirubarajan, T., "Radar Measurement Extraction in the Presence of Sea-Surface Multipath," *IEEE Transactions on Aerospace and Electronic Systems,* Vol. 39, No. 2, April 2003, pp. 550-567.
13. Blair, W. D., and Brandt-Pearce, M., "Monopulse DOA Estimation for Two Unresolved Rayleigh Targets," *IEEE Transactions Aerospace Electronic Systems*, Vol. 37, No. 2, April 2001, pp. 452-469.
14. Wong, W., and Blair, W. D., "Steady-State Tracking with LFM Waveforms," *IEEE Transactions Aerospace Electronic Systems*, Vol. AES-36, No. 2, April 2000, pp. 701-709.
15. Blair, W. D., Watson, G. A., Kirubarajan, T., and Bar-Shalom, Y., "Benchmark for Radar Allocation and Tracking Targets in ECM," *IEEE Transactions Aerospace Electronic Systems*, Vol. 34, No. 4, October 1998, pp. 1097-1114.
16. Kirubarajan, T., Bar-Shalom, Y., Blair, W. D., and Watson, G. A., "IMMPDAF for Radar Management and Tracking Benchmark with ECM," *IEEE Transactions Aerospace Electronic Systems*, Vol. 34, No. 4, October 1998, pp. 1115-1134.
17. Blair, W. D., and Brandt-Pearce, M., "Statistical Description of Monopulse Parameters for Tracking Rayleigh Targets," *IEEE Transactions Aerospace Electronic Systems*, Vol. 34, No. 2, April 1998, pp. 597-611.
18. Blair, W. D., and Brandt-Pearce, M., "Unresolved Rayleigh Target Detection Using Monopulse Measurements," *IEEE Transactions Aerospace Electronic Systems*, Vol. 34, No. 2, April 1998, pp. 543-552.
19. Groves, G. W., Blair, W. D., and Chow, W. C., "Probability Distribution of the Complex Monopulse Ratio with Arbitrary Correlation between the Channels," *IEEE Transactions Aerospace Electronic Systems*, Vol. 33, No. 4, October 1997, pp. 1345-1350.
20. Daeipour, E., Blair, W. D., and Bar-Shalom, Y., "Bias Compensation and Tracking with Monopulse Radars in the Presence of Multipath," *IEEE Transactions Aerospace Electronic Systems*, Vol. 33, No. 3, July 1997, pp. 863-882.
21. Blair, W. D., and Bar-Shalom, Y., "Tracking Maneuvering Targets with Multiple Sensors: Does More Data Always Mean Better Estimates?" *IEEE Transactions Aerospace Electronic Systems*, Vol. 32, No. 1, January 1996, pp. 450-456.
22. Helmick, R. E., Blair, W. D., and Hoffman, S. A., "One Step Fixed-Lag Smoothers for Markovian Switching Systems," *IEEE Transactions on Automatic Control*, Vol. 41, No. 7, July 1996, pp. 1051-1056.
23. Helmick, R. E., Blair, W. D., and Hoffman, R. A., "Fixed-Interval Smoothing for Markov Switching System," *IEEE Transactions on Information Theory,* Vol. 41, No. 6, November 1995, pp. 1845-1855.
24. Watson G. A., and Blair, W. D., "Interacting Acceleration Compensation Algorithm for Tracking Maneuvering Targets," *IEEE Transactions Aerospace Electronic Systems*, Vol. 31, No. 3, July 1995, pp. 1152-1159.
25. Bar-Shalom, Y., Kumar, A., Blair, W. D., and Groves G. W., "Tracking Low Elevation Targets in the Presence of Multipath Propagation," *IEEE Transactions Aerospace Electronic Systems*, Vol. 30, No. 3, July 1994, pp. 973-929.
26. Hoffman, S. A., and Blair, W. D., "Comments on the Alpha-Beta-Gamma Tracking Filter With a Noisy Jerk as the Maneuver Model'," *IEEE Transactions Aerospace Electronic Systems*, Vol. 30, No. 3, July 1994, pp. 925-927.

27. Blair, W. D., "Fixed-Gain Two-Stage Estimators for Tracking Maneuvering Targets," *IEEE Transactions Aerospace Electronic Systems*, Vol. 28, No. 3, July 1993, pp. 1004-1014.

    Blair, W. D., Conte, J. E., and Rice, T. R., "An Instructive Example of Homomorphic Signal Processing," *IEEE Transactions Education*, Vol. 38, No. 3, August 1995, pp. 211-216.

28. Alouani, A. T., Rice, T. R., and Blair, W. D., "Optimality of Two-Stage State Estimation in the Presence of Random Bias," *IEEE Transactions Automatic Control*, Vol. 38, No. 8, August 1993, pp. 1279-1283.

29. Alouani, A. T., and Blair, W. D., "Use of Kinematic Constraint in Tracking Constant Speed, Maneuvering Targets," *IEEE Transactions Automatic Control*, Vol. 38, No. 7, July 1993, pp. 1107-1111.

Published Papers (non-refereed)

1. Blair, W. D., and Brandt-Pearce, M., Monopulse Processing for Tracking Unresolved Targets, Naval Surface Warfare Center Dahlgren Division, NSWCDD/TR-97/167, September 1997.
2. Blair, W. D., Watson, G. A., Lepp, A., Curry, J., Pilson, G., Jeleniewski, Y., Do, T., Strock, M., Information-Based Radar Resource Allocation: FY 96 Test-Of-Concept Experiment (TOCE), Naval Surface Warfare Center Dahlgren Division, NSWCDD/TR-97/22, February 1997.
3. Groves, G. W., Conte, J. E., and Blair, W. D., Low Elevation Monopulse Radar and Tracking Simulation *(LEMRATS),* Naval Surface Warfare Center Dahlgren Division, NSWCDD/TR-97/30, March 1997.
4. Blair, W. D., and Watson, G. A., *Benchmark Problem for Radar Resource Allocation and Target Tracking in Presence of ECM,* Naval Surface Warfare Center Dahlgren Division, NSWCDD/TR-96/10, September 1996.
5. Hoffman S. A., and Blair W. D., *Target Tracking Filter Study for Command-All-the-Way Intercepts,* Naval Surface Warfare Center Dahlgren Division, NSWCDD/ TR-94/343, December 1994.
6. Hoffman S. A., and Blair, W. D., *Analysis of Track Filtering for AEGIS Command-All-the-Way Intercepts,* Naval Surface Warfare Center Dahlgren Division, NSWCDD/TR-94/341, December 1994 (Confidential).
7. Groves, G. W. Conte, J. E., and Blair, W. D., *Preliminary Analysis of Vertical-Motion Detection for Low Elevation Targets with Doppler Processing at W-Band*, Naval Surface Warfare Center Dahlgren Division, NSWCDD/TR-94/351, October 1994.
8. Groves, G. W., and Blair, W. D., *Statistical Studies of the Monopulse Ratio,* Naval Surface Warfare Center Dahlgren Division, NSWCDD/TR-94/97, July 1994.
9. Hilton, D., Martin, D. A., and Blair, W. D., *Tracking With Time-Delayed Data in Multisensor Systems,* Naval Surface Warfare Center, NSWCDD/TR-93/351, August 1993.
10. Groves, G. W., Blair, W. D., and Gray J. E., *Some Concepts for Target Trajectory Prediction,* Naval Surface Warfare Center, NSWCDD/TR-93/445, October 1993.
11. Blair, W. D., *Fixed-Gain Two-Stage Estimators for Tracking Maneuvering Targets,* Naval Surface Warfare Center, NSWCDD/TR-92/297, July 1992.
12. Lambertson, H., and Blair, W. D., *Ship Motion-Induced Range Rate Correction for AEGIS/SARTIS,* Naval Surface Warfare Center, NSWCDD/TN-92/211, September 1992.
13. Helmick, R. E., Blair, W. D., Fennemore, C., and Rice, T. R., "Multi-Sensor Integration and Data Fusion in the Surface Navy," Naval Surface Warfare Center Technical Digest, Vol. 2, No. 1, September 1992, pp. 36-49.
14. Blair, W. D., "Target State Estimation and Prediction for Tactical Weapons Fire Control," *Naval Surface Warfare Center Technical Digest*, Vol. 1, No. 1, September 1991, pp. 72-83.
15. Blair, W. D., Watson, G. A., and Alouani, A. T., *Use of Kinematic Constraint in Tracking Constant Speed, Maneuvering Targets*, Naval Surface Warfare Center, NAVSWC TR 91-561, November 1991.
16. Parker, J. D., and Blair, W. D., *Use of Target-Oriented Process Noise in Tracking Targets,* Naval Surface Warfare Center, NAVSWC TR 91-701, November 1991.
17. Alouani, A. T., Rice, T. R., and Blair, W. D., *Two-Stage Kalman Estimator for State Estimation in the Presence of Random Bias and for Tracking Maneuvering Targets*, Naval Surface Warfare Center, NAVSWC TR 91-256, May 1991.

18. Blair, W. D., and Ross, S., *Preliminary Study of the Performance of PHALANX Close-In Weapon System (CIWS) with Electro -Optical Tracking (U),* Naval Surface Warfare Center, NSWCDD TR 90-77, March 1990.
19. Blair, W. D., and Price, E. L., *Some Alternatives in Fire Control Processing for PHALANX CIWS (U),* Naval Surface Warfare Center, NSWC TR 88-143, 1988.
20. Blair, W. D., "Mathematical Modeling of the Hitachi HPR10II Process Robot," Masters Thesis, Tennessee Technological University, March 1987.
21. Blair, W. D., and Anderson, J. N., "Identification of the Kinematic, Dynamic, and Actuator Models for the Hitachi HPR10II Process Robot," Technical Report Eng-MC-87-1, Center for Manufacturing Research, Tennessee Technological University, January 1987.

Invited Conference Presentations

1. Wong, W., and Blair, W. D., "Steady-State Tracking with LFM Waveforms," *Proceedings of 32nd IEEE Southeastern Symposium on System Theory*, Tallahassee, Florida, March 5-7, 2000, pp. 69-73.
2. Blair, W. D., "Filtering Settling for Radar Tracking with LFM Waveforms," *Proceedings of 31st IEEE Southeastern Symposium on System Theory*, Auburn, Alabama, March 21-23, 1999, pp. 300-304.
3. Blair, W. D., "NNJPDA for Possibly Merged Monopulse Measurements," *Proceedings of 31st IEEE Southeastern Symposium on System Theory*, Auburn, Alabama, March 21-23, 1999, pp. 295-299.
4. Blair, W. D., Watson, G. A., and Brandt-Pearce, M., "Monopulse Processing for DOA Estimation of Two Unresolved Rayleigh Targets With Known Relative RCS," *Proceedings of 29th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 1997.
5. Blair, W. D., and Brandt-Pearce, M., "On the Probability Distribution of Monopulse Measurements of Low-Elevation Targets in the Presence of Sea-Surface Induce Multipath," *Proceedings of 29th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 1997.
6. Groves, G. W., and Blair, W. D., "Simulation of Narrow-Band Monopulse Measurements of Closely-Spaced Targets," *Proceedings of 29th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 1997.
7. Chen, R. and Blair, W. D., "Aeolotropic Filter Design and Measurement Gating for Remote Tracking With Gridlock Error," *Proceedings of 29th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 1997.
8. Blair, W. D., and Brandt-Pearce, M., "Discrimination of Target and RGPO Echoes Using Frequency Diversity," *Proceedings of 29th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 1997.
9. Blair, W. D. and Brandt-Pearce, M., "Statistical Description of Monopulse Parameters for Tracking Rayleigh Targets," *Proceedings of 29th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 1997.
10. Blair, W. D., and Brandt-Pearce, M., "Detection of Multiple Unresolved Rayleigh Targets Using Quadrature Monopulse Measurements," *Proceedings of 28th IEEE Southeastern Symposium on System Theory*, Baton Rouge, Louisiana, April 1996, pp. 285-289.
11. Blair, W. D., and Brandt-Pearce, M., "Estimation and Discrimination for Swerling Targets," *Proceedings of 28th IEEE Southeastern Symposium on System Theory*, Baton Rouge, Louisiana, April 1996, pp. 280-284.
12. Blair, W. D., Watson, G. A., Gentry, G. L., and Hoffman, S. A., "Benchmark Problem for Beam Pointing Control of Phased Array Radar Against Maneuvering Targets In the Presence of False Alarms and ECM," *Proceedings of 1995 American Control Conference*, Seattle, Washington, June 1995.
13. Groves, G. W., and Blair, W. D., "Some Concepts for Target Trajectory Prediction for Ship Self Defense," *Proceedings of 1995 American Control Conference*, Seattle, Washington, June 1995
14. Blair, W. D., Watson, G. A., and Hoffman, S. A., "Benchmark Problem for Beam Pointing Control of Phased Array Radar Against Maneuvering Targets," *Proceedings of 1994 American Control Conference*, Baltimore, Maryland, June 1994, pp. 2071-2075.

15. Blair, W. D., and Kazakos, D., “Tracking Maneuvering Targets with Multiple, Intermittent Sensors,” *Proceedings of 27th Annual Asilomar Conference on Signal, Systems, and Computers*, Pacific Grove, California, November 1993.
16. Blair, W. D., and Watson, G. A., “A Two-Stage Alpha, Beta, Gamma, Lambda Estimator for Tracking Constant Speed, Maneuvering Targets,” *Proceedings of 1992 American Control Conference*, Chicago, Illinois, June 1992.

Conference Presentations with Proceedings (refereed)

1. Smith, L., Register, A., Blair, W. D., and Levedahl, M., “A Track Purity Approach to Track Metrics,” *Proceedings of the 2010 IEEE Aerospace Conference,* Big Sky, Montana, March 2010.
2. Register, A. H., Mallick, M., Blair, W. D., Burton, C., and Burns, P. D., “Detection and Diagnosis of Radar Modeling Errors Using Covariance Consistency,” *Proceedings of the 2009 IEEE Aerospace Conference,* Big Sky, Montana, March 2009.
3. Willett, P. K., Blair, W. D., and Zhang, X., “Performance Limits for Monopulse Matched Filter Samples,” *Proceedings of the 2009 IEEE Aerospace Conference,* Big Sky, Montana, March 2009.
4. Blair, W. D., “Design of Nearly Constant Velocity Filters for Tracking Maneuvering Targets,” Proceedings of the *11th International Conference on Information Fusion*, Cologne , Germany, June 30 - July 3, 2008.
5. Register, A. H., Blair, W. D., Ehrman, L. M., and Willett, P. K., “Using Measured RCS in a Serial, Decentralized Fusion Approach to Radar-Target Classification,” *Proceedings of the 2008 IEEE Aerospace Conference,* Big Sky, Montana, March 2008.
6. Ehrman, L. M., and Blair, W. D., “Probabilistic Data Association with Amplitude Information Versus the Strongest Neighbor Filter,” *Proceedings of the 2007 IEEE Aerospace Conference,* Big Sky, Montana, March 2007.
7. Ehrman, L. M., and Blair, W. D., “Exploiting Target Amplitudes to Improve Measurement-to-Track Association in Multiple Target Tracking,” Proceedings of the *9th International Conference on Information Fusion*, Florence, Italy, July 11-14, 2006.
8. Kaplan, L. M., Blair, W. D., and Bar-Shalom, Y., “Simulation Studies of Multisensor Track Association and Fusion Methods,” *Proceedings of the 2006 IEEE Aerospace Conference*, Big Sky, Montana, March 4-10, 2006.
9. Kaplan, L. M., and Blair, W. D., “Assignment Costs for Multiple Sensor Track-to-Track Association,” *Proceedings of the 7th International Conference on Information Fusion*, Stockholm, Sweden, June 28-July 1, 2004.
10. Burns, P.D., and Blair, W. D., “Optimal Phased Array Radar Beam Pointing For MTT,” *Proceedings of the 2004 IEEE Aerospace Conference*, Big Sky, Montana, March 6-12, 2004.
11. Ogle, T. L., Blair, W. D., and Brown, G. C., “Tracking Separating Targets with a Monopulse Radar: Idealized Resolution,” Proceedings of the *6th International Conference on Information Fusion,* Cairns Queensland, Australia, July 2003.
12. Hoffman, S. A., and Blair, W. D., Tracking, “Guidance, and Sensor Resource Management for Command-All-the-Way Intercepts,” *Proceedings of 34th IEEE Conference on Decision and Control*, New Orleans, Louisiana, December 1995.
13. Helmick, R. E., Blair, W. D., and Hoffman, S. A., “One Step Fixed-Lag Smoothers for Markovian Switching Systems,” *Proceedings of 1994 American Control Conference*, Baltimore, Maryland, June 1994, pp. 782-786.
14. Blair, W. D. and Kazakos, D., “Estimation and Detection for Systems with Second Order Markovian Switching Coefficients,” *Proceedings of 1994 American Control Conference*, Baltimore, Maryland, June 1994, pp. 1427-1428.
15. Watson, G. A., and Blair, W. D. “Revisit Time Calculation and Waveform Control for a Multifunction Radar,” *Proceedings of 32nd IEEE Conference on Decision and Control*, San Antonio, Texas, December 1993.

16. Helmick, R. E., Blair, W. D., and Hoffman, S. A., "Interacting Multiple Model Approach to Fixed-Interval Smoothing," *Proceedings of 32nd IEEE Conference on Decision and Control*, San Antonio, Texas, December 1993.
17. Watson, G. A., and Blair, W. D. "Revisit Time Calculation and Waveform Control for a Multifunction Radar," *Proceedings of 32nd IEEE Conference on Decision and Control*, San Antonio, Texas, December 1993.
18. Helmick, R. E., Blair, W. D., and Hoffman, S. A., "Interacting Multiple Model Approach to Fixed-Interval Smoothing," *Proceedings of 32nd IEEE Conference on Decision and Control*, San Antonio, Texas, December 1993.
19. Blair, W. D. and Kazakos, D., "Second Order Interacting Multiple Model Algorithm for System with Markov Switching Coefficients," *Proceedings of 1993 American Control Conference*, San Francisco, California, June 1993.
20. Blair, W. D., and Watson, G. A., "Interacting Multiple Bias Model Algorithm With Application to Tracking Maneuvering Targets," *Proceedings of 31st IEEE Conference on Decision and Control*, Tucson, Arizona, December 1992.
21. Blair, W. D., "A Two-Stage Alpha, Beta, Gamma Estimator for Tracking Maneuvering Targets," *Proceedings of 1992 American Control Conference*, Chicago, Illinois, June 1992.
22. Alouani, A. T., Rice, T. R., and Blair, W. D., "Two-Stage Estimator for State Estimation in the Presence of Dynamical Stochastic Bias," *Proceedings of 1992 American Control Conference*, Chicago, Illinois, June 1992.
23. Dela Cruz, E. J., Alouani, A. T., Rice, T. R., and Blair, W. D., "On Multisensor Track Alignment," *Proceedings of 31st IEEE Conference on Decision and Control*, December 1992.
24. Dela Cruz, E. J., Alouani, A. T., Blair, W. D., and Rice, T. R., "Estimation of Tilt Errors in Multisensor Systems," *Proceedings of IEEE Southeastcon' 92*, Birmingham, Alabama, April 1992.
25. Dela Cruz, E. J., Alouani, A. T., Rice, T. R., and Blair, W. D., "Estimation of Sensor Bias in Multisensor Systems," *Proceedings of IEEE Southeastcon' 92*, Birmingham, Alabama, April 1992.
26. Alouani, A. T., Xia, P., Rice, T. R., and Blair, W. D., "A Two-Stage Kalman Estimator for State Estimation in the Presence of Random Bias and Tracking Maneuvering Targets," *Proceedings 30th IEEE Conference on Decision and Control*, Brighton, United Kingdom, December 1991, pp. 2059-2062.
27. Alouani, A. T., and Blair, W. D., "Use of Kinematic Constraint in Tracking Constant Speed, Maneuvering Targets," *Proceedings 30th IEEE Conference on Decision and Control*, Brighton, United Kingdom, December 1991, pp. 2055-2058.

Conference Presentations with Proceedings (non-refereed)

1. Ehrman, L. M., Burns, P. D., and Blair, W. D., "Determining the Optimal Correlation Time Frame for Multisensor Correlation" in *Signal and Data Processing for Small Targets 2008,* SPIE 6969*,* Orlando, Florida (2008).
2. Smith, D. L., and Blair, W. D., "Parameter Estimation for Censored Exponential Random Variables," *Proceedings of 40th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 2008. pp. 289-292.
3. Dunham, D. T., Ehrman, L. M., Blair, W. D., and Frost, S. A., "Simulation Assessment of RCS-Aided in Multiple Target Tracking," in *Signal and Data Processing for Small Targets 2007, SPIE 6699*, San Diego, CA (2007).
4. Ehrman, L.M., and Blair, W. D., "RCS-Aided Tracking: Does It Always Improve Data Association," *Proceedings of the 2007 IEEE Radar Conference*, Boston, MA, 2007.
5. Ehrman, L. M., Blair, W. D., and Willett, P., "Estimating DOA and SNR of Separating Objects," in *Signal and Data Processing for Small Targets 2006,* SPIE 6236, Orlando, Florida (2006).
6. Ehrman, L. M., and Blair, W. D., "Exploiting Target Amplitude Information to Improve Multiple Target Tracking," in *Signal and Data Processing for Small Targets 2006,* SPIE 6236, Orlando, Florida (2006).

7. Vineet, J., Ehrman, L. M., and Blair, W. D., “Estimating the DOA Mean and Variance of Off-Boresight Target Using Monopulse Radar,” *Proceedings of 38th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 5-7, 2006, pp. 85-88.
8. Ehrman, L. M., and Blair, W. D., “Using Target RCS to Aid Measurement-to-Track Association in Multi-Target Tracking,” *Proceedings of 38th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 5-7, 2006, pp. 89-93.
9. Palkki, R. D., Lanterman, A. D., and Blair, W. D., “Addressing Track Coalescence in Sequential K-Best Multiple Hypothesis Tracking,” *Proceedings of 38th IEEE Southeastern Symposium on System Theory*, Cookeville, Tennessee, March 5-7, 2006, pp. 94-98.
10. Burns, P. D., and Blair, W. D., “Self-Calibration from Measurements of Targets with Known Dynamics,” in *Signal and Data Processing for Small Targets 2005,* SPIE 5913, San Diego, California (2005).
11. Burns, P. D., Blair, W. D., Burton, C., Cheek, F., Flaherty, M., and Walker, B., "Data Registration Fusing Low Earth Orbit Satellites," *Proceedings of the National Fire Control Symposium*, Orlando, CA, 2005.
12. Burns, P., and Blair, W. D., “Sensor Bias Estimation from Measurements of Know Trajectories” *Proceedings of 37th IEEE Southeastern Symposium on System Theory*, Auburn, Alabama, March 11-13, 2005.
13. Willett, P. K., Blair, W. D., and Ogle, T. L., “Multitarget Tracking and Monopulse Signal Processing for Spawning Targets,” in *Signal and Data Processing for Small Targets 2004,* SPIE 5428, Orlando, Florida, pp. 429-431 (2004).
14. Kerce, J. C., Blair, W. D., and Brown, G. C. “Modeling Refraction Errors for Simulation Studies for Multisensor Tracking,” *Proceedings of 36th IEEE Southeastern Symposium on System Theory*, Atlanta, Georgia, March 14-16, 2004, pp. 97-101.
15. Ogle, T L., Blair, W. D., Levin, T.J., and Harrigan, K. W., “Multiplatform-Multisensor Tracking with Surveillance Radars,” *Proceedings of 36th IEEE Southeastern Symposium on System Theory*, Atlanta, Georgia, March 14-16, 2004, pp. 190-194.
16. Chiarfair, D., Blair, W. D., and West, P. D., “Implementation of a 3-D Assignment Algorithm in Matlab,” *Proceedings of 36th IEEE Southeastern Symposium on System Theory*, Atlanta, Georgia, March 14-16, 2004, pp. 200-204.
17. Sinha, A., Blair, W. D., Kirubarajan, T., and Bar-Shalom, Y., “Maximum Likelihood Angle Extractor in the Presence in the Presence of Sea-Surface Multipath,” *Proceedings of the 2003 IEEE Radar Conference*, 2003.
18. Slocumb, B. J., and Blair, W. D., “Maximum Likelihood Narrowband Radar Data Segmentation and Cerntroid Processing,” in *Signal and Data Processing for Small Targets 2003,* SPIE 5204, San Diego, California, pp. 648-660 (2003).
19. Brown, G. C., Blair, W. D., and Ogle, T. L., “AOA Estimation with Merged Measurements form Squint Beam Monopulse Data in Conjunction with Multiple Range Samples,” in *Signal and Data Processing for Small Targets 2003,* SPIE 5204, San Diego, California, pp. 446-458 (2003).
20. Willett, P. K., Blair, W. D., Ogle, T. L., Register, A. H., and Brown, G. C., “Comparison of Methods for Tracking Separating Targets with a Monopulse Radar,” in *Signal and Data Processing for Small Targets 2003,* SPIE 5204, San Diego, California, pp. 118-131 (2003).
21. Drummond, O. E., Blair, W. D., Brown, G. C., Ogle, T. L., Bar-Shalom, Y., Cooperman, R. L., and Barker, W. H., “Performance Assessment and Comparison of Various Tracklet Methods for Maneuvering Targets,” in *Signal Processing, Sensor Fusion, and Target Recognition XII, SPIE 5096*, Orlando, Florida, pp. 514-539 (2003).
22. Slocumb, B. J., and Blair, W. D., “EM-Based Measurement Fusion for HRR Radar Centroid Processing,” in *Signal and Data Processing for Small Targets 2002,* SPIE 4728, Orlando, Florida, pp. 80-91 (2002).
23. Abhijit, S. W., Blair, W. D., Kirubarajan, T., and Bar-Shalom, Y., “Maximum Likelihood Angle Extractor in the Presence of Sea-Surface Induced Multipath,” in *Signal and Data Processing for Small Targets 2002,* SPIE 4728, Orlando, Florida, pp. 68-80 (2002).

24. Slocumb, B. J., and Blair, W. D., “Probability-of-Detect-Based Beam Pointing for Multitarget Tracking with Electronically Scanned Radars,” in Sig*nal and Data Processing for Small Targets 2002,* SPIE 4728, Orlando, Florida, pp. 138-145 (2002).

25. Blair, W. D., and Brandt-Pearce, M., “Statistics of Monopulse Measurements of Rayleigh Targets in the Presence of Specular and Diffuse Multipath,” *Proceeding of 2001 IEEE Radar Conference,* Atlanta, Georgia, May 2001.

26. Blair, W. D., and Brown, G. C., “Probabilistic Data Association Filter with Binomial Distributed False Alarms for Radar Tracking,” in *Signal and Data Processing for Small Targets 2001,* SPIE 4473, San Diego, California, pp. 414-422 (2001).

27. Blair, W. D., and Brown, G. C., “Use of Joint Data Association Probabilities for Covariance Consistency,” in *Signal and Data Processing for Small Targets 2001,* SPIE 4473, San Diego, California, pp. 582-587 (2001).

28. Brown, G. C., Blair, W. D., and Diaz, D. A., “Track Management Technique for Electronically Scanned Radars,” in *Signal and Data Processing for Small Targets 2000, SPIE 4048*, Orlando, Florida, pp. 203-210 (2000).

29. Blair, W. D., Watson, G. A., and Brandt-Pearce, M., “NNJPDA for Tracking Closely Spaced Rayleigh Targets with Possibly Merged Measurements,” in *Signal and Data Processing for Small Targets 1999,* SPIE 3809, San Diego, California, pp. 396-409 (1999).

30. Blair, W. D., and Brandt-Pearce, M., “Statistics of Monopulse Measurements for Tracking Targets in the Presence of Sea-Surface Induced Multipath,” *Proceedings of 1998 IEEE Aerospace Conference,* Snowmass, Colorado, March 1998.

31. Blair, W. D., Watson, G. A., and Brandt-Pearce, M., “Monopulse Tracking of Two Unresolved Rayleigh Targets,” in *Signal and Data Processing for Small Targets 1997,* SPIE 3163, San Diego, CA, pp. 452-464 (1997).

32. Watson, G. A., and Blair, W. D., “Beam-Pointing Control of an Electronically Scanned Radar in the Presence of Jamming,” in *Signal and Data Processing for Small Targets 1997,* SPIE 3163, San Diego, CA, pp. 98-110 (1997).

33. Watson, G. A., Blair, W. D., and Rice, T. R., “Enhanced Electronically Scanned Array Resource Management through Multisensor Integration,” in *Signal and Data Processing for Small Targets 1997,* SPIE 3163, San Diego, CA, pp. 329-331 (1997).

34. Blair, W. D., and Brandt-Pearce, M. “Tracking Multiple Unresolved Rayleigh Targets With a Monopulse Radar,” in *Signal and Data Processing for Small Targets 1996, SPIE 2759*, Orlando, Florida, pp. 465-476 (1996).

35. Blair, W. D., and Brandt-Pearce, M., “Radar Waveform Requirements for Reliable Detection of an Aircraft-Launched Missile,” in *Acquisition, Tracking, and Pointing X, SPIE 2739*, Orlando, Florida, pp. 145-155 (1996).

36. Chen, R. and Blair, W. D., “Optimal Measurement Scheduling for Track Accuracy Control for Cued Target Acquisition,” in *Signal and Data Processing for Small Targets 1996, SPIE 2759*, Orlando, Florida, pp. 406-417, (1996).

37. Blair, W. D., and Brandt-Pearce, M., “Signal Amplitude Conditioned Density Function for Monopulse Measurements of Fixed-Amplitude Targets,” *Proceedings 1996 IEEE National Radar Conference*, Ann Arbor, Michigan, May 13-16,1996, pp. 374-379.

38. Conte, J. E., Groves, G. W., and Blair, W. D., “Low Elevation Monopulse Radar and Tracking Simulation (LEMRATS),” in *Acquisition, Tracking, and Pointing X, SPIE 2739*, Orlando, Florida, pp. 133-144 (1996).

39. Watson G. A., and Blair, W. D., “Solution To Second Benchmark Problem for Tracking Maneuvering Targets In the Presence of False Alarms and ECM,” in *Signal and Data Processing of Small Targets 1995, SPIE 2561*, San Diego, California, pp. 263-274 (1995).

40. Groves, G. W., Blair, W. D., and Conte, J. E., “Simultaneous Estimation of the Specular Sea Reflection Coefficient and Tracking for Low-Elevation Targets,” in *Signal and Data Processing of Small Targets 1995, SPIE 2561*, San Diego, California, pp. 287-298 (1995).

41. Watson G. A., and Blair, W. D., “Revisit Control of a Phased Array Radar for Maneuvering Targets In the Presence of False Alarms Using the IMM-IPDAF,” in *Proceedings of the Acquisition, Tracking, and Pointing IX, SPIE 2468*, Orlando, Florida, pp. 318-329 (1995).
42. Hoffman S. A., and Blair, W. D., “Interacting Multiple Model Algorithm for Tracking Maneuvering Targets With a Phased Array Radar for Command-All-The-Way Intercepts,” *Proceedings of 1994 National Fire Control Symposium*, Boulder, Colorado, August 1994.
43. Blair, W. D., “Toward the Integration of Tracking and Signal Processing for Phased Array Radar,” in *Signal and Data Processing for Small Targets 1994, SPIE 2235*, Orlando, Florida, pp. 303-316 (1994).
44. Watson, G. A., and Blair, W. D., “Revisit Control of a Phased Array Radar for Tracking Maneuvering Target When Supported by a Precision ESM Sensor,” in *Signal and Data Processing for Small Targets 1994, SPIE 2235*, Orlando, Florida, pp. 448-459 (1994).
45. Helmick, R. E., Conte, J. E., Hoffman, S. A., and Blair, W. D., “One-Step Fixed-Lag IMM Smoothing for Alignment of Asynchronous Sensors,” in *Signal and Data Processing for Small Targets 1994, SPIE 2235*, Orlando, Florida, pp. 507-518 (1994).
46. Watson, G. A. and Blair, W. D., “IMM Algorithm for Solution To Benchmark Problem for Tracking Maneuvering Targets,” in *Proceedings of the Acquisition, Tracking, and Pointing IX, SPIE 2221*, Orlando, Florida, pp. 476-488 (1994).
47. Watson, G. A., and Blair, W. D., “Comparison of Track Loss Performance of Single and Multiple Model Tracking Algorithms,” in *Proceedings of the Acquisition, Tracking, and Pointing IX, SPIE 2221*, Orlando, Florida, pp. 489-500 (1994).
48. Watson, G. A., and Blair, W. D., “Tracking Performance of a Phased Array Radar Control With Revisit Time Controlled Using the IMM Algorithm,” *Proceedings of IEEE 1994 National Radar Conference*, Atlanta, Georgia, March 1994.
49. Blair, W. D., Groves, G. W., Bar-Shalom, Y., and Daeipour, E., “Frequency Agility and Fusion for Tracking Targets in the Presence of Multipath Propagation,” *Proceedings of IEEE 1994 National Radar Conference*, Atlanta, Georgia, March 1994.
50. Helmick, R. E., Blair, W. D., and Hoffman, S. A., “Trajectory Reconstruction Using Fixed-Interval Smoothers for Systems with Markovian Switching Coefficients,” *Proceedings of 1993 Symposium on Command and Control Research*, National Defense University, Ft. NcNair, Washington, DC, June 1993.
51. Watson, G. A., and Blair, W. D., “Interacting Acceleration Compensation Algorithm for Tracking Maneuvering Targets,” *Proceedings of 1993 IEEE National Radar Conference*, Boston, Massachusetts, April 1993.
52. Watson, G. A., and Blair, W. D., “Multiple Model Estimation for Control of a Phased Array Radar,” in *Signal and Data Processing of Small Targets 1993, SPIE 1954*, Orlando, Florida, pp. 275-286 (1993).
53. Watson, G. A., and Blair, W. D., “Tracking with Multiple Sensors Using the Interacting Multiple Model Algorithm,” in *Signal and Data Processing of Small Targets 1993, SPIE 1954*, Orlando, Florida, pp. 438-449, (1993).
54. Blair, W. D., and Watson, G. A., “Tracking Maneuvering Targets with the Second Order Multiple Model Algorithm,” in *Signal and Data Processing of Small Targets 1993, SPIE 1954*, Orlando, Florida, pp. 518-529 (1993).
55. Groves, G. W., Blair, W. D., and Gray, J. E., “Some Concepts for Trajectory Prediction for Maneuvering Targets,” *Proceedings of 1992 Symposium on Command and Control Research*, Monterey, California, June 1992.
56. Blair, W. D., and Watson, G. A., “The IMM Algorithm and Periodic Data,” in *Acquisition, Tracking, and Pointing VI, SPIE 1697*, Orlando, Florida, pp. 83-91 (1992).
57. Blair, W. D., Rice, T. R., McDole, B. S., and Sproul, E. M., “A Least-Squares Approach to Asynchronous Data Fusion,” in *Acquisition, Tracking, and Pointing VI*, SPIE 1697, Orlando, Florida, pp. 130-141 (1992).
58. Watson, G. A., and Blair, W. D., “The IMM Algorithm for Tracking Targets That Maneuver Through Coordinated Turns,” in *Signal and Data Processing of Small Targets 1992, SPIE 1698*, Orlando, Florida, pp. 236-247 (1992).

59. Dela Cruz, E. J., Alouani, A. T., Rice, T. R., and Blair, W. D., “Sensor Registration in Multisensor Systems,” in *Signal and Data Processing of Small Targets 1991, SPIE 1698*, pp. 382-393 (1992).
60. Alouani, A. T., Xia, P., Rice, T. R., and Blair, W. D., “Two-Stage Kalman Estimator for Tracking Maneuvering Targets,” *Proceedings of 1991 IEEE International Conference on Systems, Man, and Cybernetics*, Charlottesville, Virginia, October 1991, pp. 761-766.
61. Blair, W. D., and Parker, J. D., “Use of Target-Oriented Process Noise in Tracking Maneuvering Targets,” *Proceedings of 29th Allerton Conference on Communication, Control and Computing*, Monticello, Illinois, October 1991.
62. Blair, W. D.,“A Two-Stage Alpha, Beta, Gamma Estimator,” *Proceedings of 29th Allerton Conference on Communication, Control and Computing*, Monticello, Illinois, October 1991.
63. Blair, W. D., and Boyd, M. D., “Two-Stage Alpha, Beta, Gamma Estimator for Tracking Maneuvering Targets With a Radar,” *Proceedings of 1991 Symposium on Command and Control Research*, National Defense University, Ft. NcNair, June 1991.
64. Alouani, A. T., Blair, W. D., and Rice, T. R., “On Multi-Sensor Data Fusion,” *Proceedings of The International Association the Science and Technology of Development (IASTED), International Symposium on Manufacturing and Robotics*, Lugano, Switzerland, June 1991.
65. Alouani, A. T., Blair, W. D., and Rice, T. R., “Two-Stage Kalman Estimator for Tracking Maneuvering Targets,” *Proceedings of 1991 IEEE International Conference on Systems, Man, and Cybernetics,* 1991.
66. Blair, W. D., Watson, G. A., and Rice, T. R., “Interacting Multiple Model Filter for Tracking Maneuvering Targets in Spherical Coordinates,” *Proceedings of IEEE Southeastcon'91*, Williamsburg, Virginia, April 1991, pp. 1055-1059.
67. Blair, W. D., Rice, T. R., Alouani, A. T., and Xia, P., “Asynchronous Data Fusion for Target Tracking with a Multi-Tasking Radar and Optical Sensor,” in *Acquisition, Pointing, and Tracking V, SPIE 1482*, Orlando, Florida, pp. 234-245 (1991).
68. Blair, W. D., Watson, G. A., and Rice, T. R., “Tracking Maneuvering Targets with an Interacting Multiple Model Filter Containing Exponentially-Correlated Acceleration Models,” *Proceedings of 23rd Southeastern Symposium on System Theory*, Columbia, South Carolina, March 1991, pp. 224-228.
69. Blair, W. D., Gray, J. E., and Boyd, M. D., “Design Analysis for Two-Stage Alpha, Beta, Gamma Estimator,” *Proceedings of IEEE Southeastcon'91*, Williamsburg, Virginia, April 1991, pp. 1049-1054.
70. Blair, W. D., Watson, G. A., and Alouani, A. T., “Tracking Constant Speed Targets Using a Kinematic Constraint,” *Proceedings of 23rd Southeastern Symposium on System Theory*, Columbia, South Carolina, March 1991, pp. 233-238.
71. Alouani, A. T., Blair, W. D., and Watson, G. A., “Bias and Observability Analysis of Target Tracking Filters Using a Kinematic Constraint,” *Proceedings of 23rd Southeastern Symposium on System Theory*, Columbia, South Carolina, March 1991, pp. 229-232.
72. Watson, G. A., and Blair, W. D., “Constant Speed Prediction for Maneuvering Targets Using a Three Dimensional Turning Rate,” *Proceedings of 23rd Southeastern Symposium on System Theory*, Columbia, South Carolina, March 1991, pp. 239-243.
73. Rice, T. R., Gray, J. E., and Blair, W. D., “Signal Distortions That Result from Minimum Phase Signal Recovery Using Cepstral Processing,” *Proceedings of 23rd Southeastern Symposium on System Theory*, Columbia, South Carolina, March 1991.
74. Blair, W. D., Rice, T. R., and Watson, G. A., “Interacting Multiple Model Filter for Tracking Maneuvering Targets in the Spherical Coordinates,” *Proceedings of IEEE Southeastcon’ 91*, Williamsburg, VA, 1991, pp. 1055-1059.
75. Blair, W. D., Conte, J. E., and Rice, T. R., “Distortion Analysis of Signals Recovered Using Cepstral Processing,” *Proceedings of 1991 Conference on Information Sciences and Systems*, March 1991.
76. Blair, W. D., Boyd, M. D., and Gray, J. E., “Target Tracking for Multi-Radar Target Modulation Identification,” *Proceedings of 1990 U.S. DoD Joint Service Combat Systems Identification Conference*, Monterey, California, December 1990.

77. Blair, W. D., and Anderson, J. N., "Kinematic, Dynamic, and Actuator Model Definitions for the Hitachi HPR10II Process Robot," *Proceedings of SDRC I-DEAS Users' Conference*, October 1987, pp. 39-51.
78. Blair, W. D., and Anderson, J. N., "Identification of the Kinematic, Dynamic, and Actuator Parameters for the Hitachi HPR10II Process Robot," *Proceedings of 19th Southeastern Symposium on System Theory*, March 1987, pp. 447-452.

Conference Presentations without Proceedings

1. "Multiplatform-Multisensor Tracking Architectures and Technical Issues," Third ONR/GTRI Workshop on Target Tracking and Sensor Fusion, Atlanta, Georgia 2000.
2. "Technical Issues and Recent Advances in Target Tracking," Second ONR/GTRI Workshop on Target Tracking and Sensor Fusion, Atlanta, Georgia 1999.
3. "NSWC Tracking Benchmark II: Radar Resource Allocation and Tracking Maneuvering Targets in the Presence of ECM," ONR/GTRI Workshop on Target Tracking and Sensor Fusion, Atlanta, Georgia 1998.
4. "Technical Issues in Target Tracking," Office of Naval Research Workshop on Target Tracking, Dahlgren, Virginia, 1997.
5. "Technical Issues in Target Tracking," Office of Naval Research Workshop on Target Tracking, San Diego, California, 1995.
6. "Use of Kinematic Constraints in Tracking Maneuvering Targets through Coordinated Turns," Office of Naval Research Workshop on Target Tracking, China Lake, California, 1994.
7. Second Navy Research and Development (R&D) Information Exchange Conference, Naval Weapons Center, China Lake, California, 1991.

Evidence of Technical Accomplishment

BMD Benchmark: Utilized by the Missile Defense National Team B (MDNT-B) as the software environment for development and assessment of the C2BMC algorithms for the BMDS.

US Navy Direction to Contractors: Formulated the concept and directed the development of the hardware/software and execution of a real-time experiment that resulted in the US Navy directing the contractors of a new phased array radar to use the advanced algorithms demonstrated in the experiment.

Software: Formulated the concept and directed the implementation of the software for the NSWC Tracking Benchmark II, documented in Section F (Published Papers (non-refereed)) and Section E (Published Papers (refereed)). Approximately 100 requests from throughout the world have been made for the software.

Research Recognition Awards

2002 IEEE Fellow

2001 IEEE Young Radar Engineer of the Year, 2001

Outstanding Independent Exploratory Development Project, Naval Surface Warfare Center, Dahlgren Division, 1994

Nominated, *1992 NSWC Science and Technology Award*, Naval Surface Warfare Center, Dahlgren Division,1992

Technical Excellence Award, "Significant, original contributions made in the field of target tracking and trajectory prediction which will enable a naval fire control system to better engage fast, highly maneuvering targets," Naval Surface Warfare Center, Dahlgren Division, July 1991.

TEACHING/INSTRUCTION/STUDENT DEVELOPMENT

A. Continuing Education Courses Taught

Lecturer and coordinator, *Target Tracking in Sensor Systems,* Georgia Institute of Technology, 2002-2009.

Lecture and coordinator, *Target Tracking Concepts,* Georgia Institute of Technology, 2003-2009.

Lecturer, *Principles of Modern Radar,* Continuing Education, Georgia Institute of Technology,1998-2004.

Lecturer, *Space-Based Radar,* Continuing Education, Georgia Institute of Technology, 2000-2006.

Lecturer, *Phased-Array Radar System Design,* Continuing Education, Georgia Institute of Technology, April 2000-2010.

Lecturer, *Surveillance, Low Observables, and Tracking: Algorithm Selection and Real Data Applications,* UCLA Extension, University of California, Los Angeles, California, January 1998.

Lecturer, *Surveillance, Tracking, and Fusion: Algorithms and Real Data Applications,* UCLA Extension, University of California, Los Angeles, California, January 1993-1994.

D. Individual Student Guidance/Development

1. Graduate Research Assistants and/or Co-op students trained.

Larry Donnie Smith, PhD in ECE, GRA

Donnie is investigating various issues associated with tracking with monopulse radars.

Ryan Pallki, PhD in ECE, GRA

Ryan is investigating chemical identification under a poisson model for Raman spectroscopy. He developed a mathematical model and derived the Cramer-Rao Lower Bound that was used for assessment of the performance of several algorithms.

Ryan Pallki, MS in ECE, GRA

Ryan investigated the general conditions under which sequential K-best data association is preferable to probabilistic data association. Using the track loss ratio as the primary performance metric, he compared the two methods under varying false alarm densities and missed-detection probabilities.

Jain Vineet, MS in EE, GRA

Vineet developed a Matlab function for maximizing the probability of missile acquisition. He also investigated the use of the unscented transform for the inverse of monopulse response function.

Winnie Wong, MS in EE, GRA

Winnie conducted theoretical analysis of stochastic systems and developed closed-form expressions for the steady-state Kalman filter gains for tracking LFM radar waveforms. She also conducted a first-order analysis of the radar requirements for autonomous landing of an aircraft on an aircraft carrier. A technical memorandum on the landing problem was written and included in the final report to the US Navy.

Daniel A. Diaz, BS in Computer Engineering, Co-op

Danny developed the Composite Track Plotter and software tools for the JCTN Benchmark Software that is distributed to numerous companies and laboratories throughout the defense industry. Danny also made significant contributions to the testing of advanced tracking techniques.

SERVICE

A. Professional Activities

Member, Institute of Electrical and Electronics Engineers (IEEE),
Student Member, 1982-1986
Member, 1987-1997
Senior Member, 1997-2001
Fellow Member, 2002-Present
Member, IEEE Aerospace and Electronic Systems Society, 1991-Present
Member, IEEE Information Theory Society, 1994-1999
Member, IEEE Control Systems Society, 1985-1999
Member, IEEE Engineering Education Society, 1991-2002
Board of Governors, IEEE Aerospace and Electronic Systems Society, 1998-2003, 2005-2010
Associate Vice President for Publications, IEEE Aerospace and Electronics Systems Society, 2008-2010

Fellows Evaluation Committee, IEEE Aerospace and Electronics Systems Society, 2005-2010
Finance Chair, Eleventh International Conference on Information Fusion, 2009
Member, Board of Directors, International Society for Information Fusion, 2004-2006
President, International Society for Information Fusion, 2005
Vice President for Conferences, International Society for Information Fusion, 2005-2010
General Chair, 36th IEEE Southeastern Symposium on Systems Theory, 2004
Steering Chair, Fifth International Conference on Information Fusion, 2002
Technical Program Co-Chair, IEEE Radar Conference, 2001.
Editor-In-Chief, IEEE Transactions on Aerospace and Electronic Systems, 1999-2006
Editor of Radar Systems, IEEE Transactions on Aerospace and Electronic Systems, 1996-1999
Founding Editor-In-Chief, Journal of Advances in Information Fusion, 2005-Present
Co-Chair, Technical Program Committee, IEEE Radar Conference, 2001
Member, Association of Old Crows, 1994-2000
Member, Technical Program Committee, IEEE Southeastern Symposium on Systems Theory, 1997
Member, Technical Program Committee, IEEE Conference on Decision and Control, 1995
Organizer and Coordinator NSWCDD Estimation and Control Working Group, 1992-93
Committee, Technical Program Committee Member, NSWCDD Data Fusion Symposium, 1994

B. On-Campus Committees

Graduate Advisory Committee, Ryan Palkki, Ph.D. in ECE, "Chemical Identification Under a Possion Model for Raman Spectroscopy, Georgia Institute of Technology, 2009

Graduate Advisory Committee, Jenelle Armstrong Piepmeier, Ph.D. in ME, "A Dynamic Quasi-Newton Method for Model Independent Visual Servoing," Georgia Institute of Technology, 1999

C. Outside Professional Activities/Consulting

Engineering consultant in the area of multiplatform-multitarget-multisensor tracking in contract for the Joint Single Integrated Air Picture, Toyon, Inc., 2008

Engineering consultant in the area of launch point determination using data from multiple sensors, Trek Enterprises, Inc., 1998

Engineering consultant in the area of multisensor-multitarget tracking, SPARTA, Inc. in support of the Joint SIAP Systems Engineering Organization, 2004-2007

Engineering consultant in the area of multitarget-multisensor target tracking, Applied Physics Laboratory of The Johns Hopkins University, 1998-2002

Engineering consultant in the area of multitarget-multisensor target tracking, Raytheon Systems Company, 1999-Present.

Graduate Committee Member, P. Xia, MS in EE, Tennessee Technological University, 1994.

Graduate Committee Member, E. J. Dela Crus, MS in EE, Tennessee Technological University, 1994.

D. Civic Activities

Coach, U-11 Basketball, Northwest Cobb YMCA, 2005
Coach, U-8 and U-12, Basketball, Northwest Cobb YMCA, 2004
Coach, U-10 Basketball, Northwest Cobb YMCA, 2002
Coach, U-8 Soccer, Southwest Cobb Soccer League, 2001
Coach, U-6 Soccer, Southwest Cobb Soccer League, 2000

OTHER CONTRIBUTIONS

A. Seminar Presentation

1. "Design of Nearly Constant Velocity Filters for Tracking Maneuvering Targets," ECE Department, University of Virginia, October 2009
2. "Multiplatform-Multisensor Tracking," DERA Portsdown, Portsmouth, United Kingdom, September 2000
3. "Derivation of the Interacting Multiple Model Algorithm for Systems with Markovian Switching Coefficients," Applied Physics Laboratory, The Johns Hopkins University, Laurel Maryland, September 1999
4. "Derivation of the Probabilistic Data Association Filter," Applied Physics Laboratory, The Johns Hopkins University, Laurel Maryland, September 1999
5. "Information-Based Radar Resource Allocation," Atlanta Chapter of the IEEE Aerospace and Electronic Systems Society, Smyrna, Georgia, November 1997
6. "Recent Accomplishments and Future Directions in Target Tracking," *Fall 1998 EE Eminent Speaker Series,* University of Buffalo, State University of New York, December 1998
7. "Tracking Maneuvering Targets Through Coordinated Turns," Electrical and Systems Engineering Department Colloquium, University of Connecticut, Storrs, Connecticut, September 1991

B. Special Activities

Founder/Coordinator of the ongoing series of the *ONR/GTRI Workshop on Target Tracking and Sensor Fusion.* Under the sponsorship of ONR, GTRI hosted the first three of these workshops at the Cobb County Facility. The *Fourth ONR/GTRI Workshop on Target Tracking and Sensor Fusion* was hosted by Naval Post Graduate School in Monterey, California in 2001. The workshops since 2001 were held in the following locations.

5. *Fifth ONR/GTRI Workshop* - Naval Underwater Warfare Center in Newport, Rhode Island, 2002.
6. *Sixth ONR/GTRI Workshop* - San Diego, California, 2003.
7. *Seventh ONR/GTRI Workshop* - Key West, Florida, 2004.
8. *Eighth ONR/GTRI Workshop* - Maui, Hawaii, 2005.
9. *Ninth ONR/GTRI Workshop* - Gatlinburg, Tennessee, 2006.
10. *Tenth ONR/GTRI Workshop*- Naval Post Graduate School in Monterey, California, 2007.
11. *Eleventh ONR/GTRI Workshop* - Williamsburg, Virginia, 2008.
12. *Twelfth ONR/GTRI Workshop* - La Jolla, California, 2009.

NATIONAL AND INTERNATIONAL PROFESSIONAL RECOGNITION

A. Honors and Awards

Panel Member, *Future Directions in Data Fusion*, Plenary Session, 2nd International Conference on Information Fusion, Paris, France, July 2000.
Senior Member, Institute of Electrical Engineer, 1997
IEEE Young Radar Engineer of the Year, 2001
Fellow Member, Institute of Electrical Engineer, 2002

B. Invited Conference Session Chairmanships

Co-Organizer, Co-Chair, Invited Session,
32nd Southeastern Symposium on Systems Theory, 2000
31st Southeastern Symposium on Systems Theory, 1999
1995 American Control Conference
1994 American Control Conference
1992 American Control Conference

C. Patents

1. Alouani, A. T., Blair, W. D., and Rice, T. R., Two-Stage Target Tracking System, No. 5,214,433, May 25, 1993.
2. Blair, W. D., Watson, G. A., and Rice, T. R., Interacting Multiple Bias Model Filter System for Tracking Maneuvering Targets, No. 5,325,098, June 28, 1994.

D. Editorial and Reviewer Work for Technical Journals

Editor-in-Chief (Founding), Journal of Advances in Information Fusion, 2005-Present.

Editor-in-Chief, IEEE Transactions on Aerospace and Electronic Systems, 1999-2006.
Deputy Editor-in-Chief, IEEE Transactions on Aerospace and Electronic Systems, 1998
Editor for Radar Systems, IEEE Transactions on Aerospace and Electronic Systems, 1997-1999
IEEE Transactions on Aerospace and Electronic Systems, 1993-Present

IEEE Transactions on Automatic Control, 1993, 1995, 1996
IEEE Transactions on Signal Processing, 1996.

E. Technical Reviewer

International Radar Conference, 2008, 2010
IEEE Radar Conference 2002, 2008
International Conference on Information Fusion 2009
IEEE Conference on Decision and Control, 1994-98
IEEE Conference on Decision and Control, 1991-92

F. Membership on Boards National Committees. etc,

Board of Governors, IEEE Aerospace and Electronic Systems Society, 1998-2003, 2005-2010

Board of Directors, International Society of Information Fusion, 2004-2006

President, International Society of Information Fusion, 2005

PROFESSIONAL DEVELOPMENT

Short courses attended:

Military Data Fusion, 2000
Theater Missile Defense, 1998
Spread Spectrum Communications, 1996
Electronic Warfare, 1996
Introduction C Programming, 1996
Phased Array Radar Systems, 1995
Monopulse Radar, 1994
Coherent Radar Performance Estimation, 1993
Passive Surveillance and Target Tracking, 1991
Multitarget/Multisensor Tracking, 1987