

John W. Brooks, Ph.D., P. E.

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Education

Ph.D. Electrical Engineering, University of Alabama in Huntsville, Huntsville, AL
M.S. Electrical Engineering, University of Alabama in Huntsville, Huntsville, AL
B.S. Electrical Engineering, University of Florida, Gainesville, FL

Experience Summary

Dr. Brooks is a Consulting Engineer and Licensed Professional Engineer (PE) with significant technical and managerial experience covering all aspects of radar, communications, controls, and missile system analysis and simulation.

Dr. Brooks earned the Ph. D. degree in Electrical Engineering in 2000, and published a dissertation “[The Detection of Buried Non-Metallic Anti-personnel Land Mines.](#)” In 1998, he earned the title of Professional Engineer (P.E.), and is licensed to practice Engineering in the State of Alabama.

Dr. Brooks has 20 years’ experience modeling, simulating and developing guidance and control solutions using Mathworks® products, including MATLAB®, SIMULINK®, and the associated toolboxes and blocksets including, but not limited to, Aerospace, Control Design, Communications, and Signal Processing. He is a consultant for The Mathworks® and is certified to teach basic and advanced courses on a number of products, on behalf of The Mathworks®.

Specific areas of core capabilities include:

- **Sensors/Radars;** Dr. Brooks has experience in all aspects of radar modeling, simulation and design, including phased arrays (UEWR, AEGIS, SBX etc.) Includes specific experience in radar tracking of exo- and endoatmospheric targets (Extended and Non-Linear Kalman Filters).
- **Missiles/Interceptors;** Dr. Brooks has specific experience in algorithm verification and validation of the THAAD missile guidance and control system. Specific experience modeling the trajectories of kill vehicles and targets. Specific experience modeling intercept engagements and focal plane array response to target acquisition and tracking.
- **Model-Based Design:** Dr. Brooks has applied Mathworks® products to [Model Based Design](#) for real-time embedded processors.

Recent Accomplishments

- From June 2009 to the present, Dr. Brooks performed the complete system design, and directed the implementation and testing, of a proprietary truck-mounted Ground Penetrating Radar (GPR). The GPR has recently passed all test criteria and exceeded performance expectations. Dr. Brooks designed the system utilizing the latest digital waveform and signal/image processing technologies, in conjunction with the suite of Mathworks® Model-Based tools, allowing significant reduction in radar component count and dramatically enhancing target image performance. All data can be collected at normal road speeds, eliminating the need to close portions of roads or bridges.

- From 2007 to 2009, Dr. Brooks supported [Northrop Grumman Information Systems](#) in developing MATLAB[®]-based tools for analyzing missile and re-entry vehicle (RV) trajectories and visualizing 3 – dimensional exo- and endoatmospheric engagements. The visualization tools permitted precise characterization of the various phased array radar (**UEWR**, **AEGIS**, **SBX**) covariances in single and fused tracking modes, and provided detailed visualization of sensor hand-over throughout the trajectories of the RV, decoys and debris. He also developed a Solar-Lunar ephemeris tool, integrated into the trajectory analysis capability, for the determination of Solar and Lunar exclusion epochs. During this period, Dr. Brooks supported the proposal efforts for the Integrated Air and Missile Defense Battle Command System (IBCS) Program, which was subsequently awarded to Northrop Grumman.
- In 2007, Dr. Brooks provided engineering design services to [CrossRate Technology](#) in their successful development of a robust Enhanced LORAN (eLORAN) receiver system. He used the Mathworks[®] Signal Processing Toolbox and Simulink[®] Signal Processing Blockset[®], in conjunction with the Simulink[®] Coder[®] and Real-Time Embedded Coder[®], with the Texas Instruments Code Composer Studio to prototype and design the initial eLORAN processor front-end.
- In 2006, Dr. Brooks served as an Engineering Consultant to [DRS Test & Energy Management, Inc.](#), of Huntsville, AL, providing analysis and simulation support on the [Future Combat Systems \(FCS\) Manned Ground Vehicle \(MGV\)](#) program. He used the Mathworks[®] Physical Modeling tools (SimPowerSystems[®], SimMechanics[®], SimDriveline[®]) to model and simulate the interaction of hybrid vehicle electronic and mechanical subsystems and battery power balancing.
- In 2006, Dr. Brooks completed a 3 - year Engineering Consulting effort for [Northrop Grumman Information Systems](#) of Huntsville, AL, in the modeling, simulation and design of stabilization control algorithms for the Sea-Based X-Band Radar (**SBX**) In-Flight Interceptor Communications System (IFICS) Data Terminal (IDT) antenna, a communications component of the overall National Missile Defense (NMD) program. The algorithm design was accomplished using Simulink[®] and the Control design tools; the design was implemented by NGMS and successfully tested first in May 2004 at Johnson Space Center in Houston, and validated during sea trial in the Gulf of Mexico in September 2005.
- Prior to these efforts, Dr. Brooks provided Engineering Consulting Services to Titan (Formerly JAYCOR) in the analysis and simulation of their Stand-off Mine Detection Radar System (vehicle-mounted bistatic GPR), and conducted detailed analyses and modeling for the detection of hidden nuclear devices at ports of entry into the US.

Senior Systems Engineer *Northrop Grumman, Huntsville, AL*

August 1999 to November 2000

- Provided broad-scale technical support to the In-Flight Interceptor Communications System (IFICS) component of the NMD Program. Conducted pre- and post-flight analyses and modeling, including trajectory and error covariance analyses. Developed a detailed modem model using the MATLAB[®]/Simulink[®] Real-Time Workshop[®] (Simulink Coder[®]).

Invited Researcher, [Vrije Universiteit Brussel, Brussels, Belgium](#)

Feb. 1999 to July 1999

- Developed ground penetrating radar (GPR) test plans for European Commission (EC) humanitarian demining program. Designed and validated three adaptive algorithms in MATLAB[®] to reduce GPR clutter and identify nonmetallic anti-personnel land mines. Dr. Brooks designed the data collection protocols for the data taken at the VUB lab.

Senior Scientist, [Applied Data Trends](#), *Huntsville, AL*

1997 to Feb. 1999

- Modeled, simulated and designed the control system for a precision satellite communications system using Mathworks[®] products. Conducted communications channel characterizations for the communications system, employing the MATLAB[®] Communications Toolbox and Simulink[®] Communications Blockset.

Senior Scientist, Tec-Masters, Inc., Huntsville, AL

1995-1997

- Flight Test Software Verification/Validation Engineer for six flights of the Terminal High-Altitude Area Defense (THAAD) missile system; performed data analysis of telemetry from those flight tests. Modeled and simulated the seeker platform stabilization system for THAAD using the Mathworks® System Identification Toolbox and associated Control Toolbox. He conducted system identification studies of the system and refined the model parameters to match measured responses. Developed wavelet-based target detection algorithms for the THAAD IR seeker, with the Mathworks® Wavelet Toolbox.

Principal Engineer, Dynetics, Inc., Huntsville, AL

1990-1995

- Section Manager, Intelligence Systems. Conducted several analyses of radar signal processing algorithms and techniques. Modeled satellite orbits and communications links. Developed radar superresolution algorithms based on linear frequency modulation (LFM) envelope processing. Translated several technical documents of Soviet missile systems from Russian and German into English.

Director, Signal Analysis Lab , European Command (EUCOM) Joint Intelligence Center, Stuttgart, Germany

1986-1990

- Served as Chief, Technical Electronic Intelligence Plans and Programs Division, and Chief, Signal Analysis Division, Directorate of Electronic Intelligence Technology, Joint Intelligence Center, Headquarters, United States European Command.

In this capacity, he supervised a team of 20 engineers and technicians involved in the processing of electronic intelligence data collected within Europe, and developed engineering models of Soviet land-based and airborne electronic systems.

- Planned, coordinated and directed the exploitation and analysis of a number of Soviet and Warsaw Pact electronic weapons systems.

Senior Program Manager, Directorate of Electronic Combat, Headquarters, U.S. Air Force, The Pentagon, Washington, D.C.

1982-1986

- Senior Program Manager in the Electronic Warfare Branch, Operations Division, Directorate of Electronic Combat, Deputy Chief of Staff, Plans and Operations, HQ USAF, Washington, D.C.,
- Lead engineer and Program Manager for the USAF Electronic Countermeasures/Countercountermeasures (ECM/ECCM) program, including Expendable Countermeasures. Coordinated the development of the ECM/ECCM systems for the F-15, F-4, F-111 fighter aircraft, Air-Force-wide.
- Founding member of the National Wartime Reserve Modes (WARM) committee, and served on several subcommittees with NSA and CIA participation. He was Chairman of the USAF Electronic Warfare Integrated Reprogramming (EWIR) program, and coordinated and directed the world-wide electronic warfare reprogramming exercises SERENE BYTE.
- As a voting member of the Air Staff Board, he was the technical advisor to the Air Force Chief of Staff on all USAF research and development programs. Was required to decide the technical merit of hundreds of Air Force R&D programs and recommend necessary funding levels for those programs. This required a broad understanding of a number of engineering disciplines beyond electrical engineering, to include aerospace and mechanical engineering.
- Was the Directorate Technical Lead on several USAF intelligence programs, and was the directorate Tactical Exploitation of National Capabilities (TENCAP) POC.

- AS Senior Analyst in the Special Projects Division, Directorate of Electronic Combat, Deputy Chief of Staff, Research, Development and Acquisition, HQ, USAF, Washington, D.C., he was a senior analyst in a DIA – sponsored exploitation program that lead to dramatic modifications to USAF electronic warfare doctrine and design.

Program Manager , *7113 Special Activities Squadron, Wiesbaden, Germany*
1979-1982

- Responsible for overall program management of a USD100M system upgrade for NATO. Performed the redesign and coordinated the installation of three electronics facilities. Conducted site surveys of the facilities and developed specifications for the electrical power equipment, antenna pedestal/reflector subassembly and the RF receiver front-end.
- Special Operations Liaison Officer (SOLO), Office of Military Cooperation, Cairo, Egypt (1980). Planned and coordinated cooperative military operations between the Egyptian and U.S. Air Forces.

Project Engineer , *Rome Air Development Center, Griffiss Air Force Base, Rome, New York*
1977-1979

- Project Engineer for the USAF Bistatic Radar program. Designed several mathematical models for bistatic radar coverage in a clutter and electromagnetic countermeasures (ECM) environment. Designed algorithms for the USAF E-3A AWACS radar to be used in a bistatic mode. Member, The Technical Cooperation Panel, a joint USAF/RSRE (Now DERA) radar R&D program.

Publications

- J. W. Brooks and M. W. Maier, "Object Classification by System Identification and Feature Extraction Methods Applied to Estimation of SEM Parameters," *Proc. 1994 IEEE Nat'l Radar Conf.*, Atlanta, GA, USA, 29-31 March 1994, pp. 200-205
- J. W. Brooks, *Estimation Of SEM Parameters And Supervised Learning Applied To Target Classification*, Master's Thesis, University of Alabama in Huntsville, AL., 1994
- J. W. Brooks and N. J. Corron, "Resolving Closely Spaced Targets Using Linear FM Envelope Processing," *Proc. 1995 IEEE Int'l Radar Conf.*, Wash. D.C., USA, 08-11 May 1995, pp. 62-66
- J. W. Brooks and M. W. Maier, "Application of System Identification and Neural Networks to Classification of Land Mines," *Proc. EUREL/IEE Conf. Detection of Abandoned Land Mines, Pub. No. 431*, Edinburgh, UK, 7-9 October 1996, pp. 46-50
- J. W. Brooks, M. W. Maier and S. R. Vechinski, "Applying System Identification and Neural Networks to the Efficient Discrimination of Unexploded Ordnance," *Proc. IEEE Aerospace 97 Conference*, pp. 449-467.
- J. W. Brooks, "[A Survey of Modern Signal Processing Methods and their Application to Sustainable Humanitarian Demining.](#)" *Proc. Int'l Workshop on Sustainable Humanitarian Demining, SusDem '97*, 29 September-01 October 1997, Zagreb, Croatia, pp. S5.41-S5.49
- J. W. Brooks, J.-D. Nicoud, "Applications of GPR Technology to Humanitarian Demining Operations in Cambodia: Lessons Learned," *Proc. Third International Symposium on Technology and the Mine Problem*, 6-9 April 1998, Naval Postgraduate School Monterey, CA.
- J.-D. Nicoud, J. W. Brooks, "[Report on the DeTec-2 Testing in Cambodia, November 18-21, 1997.](#)" *The Journal of Humanitarian Demining*, James Madison University, Harrisonburg, Va., June 1998
- J. W. Brooks, L. van Kempen, H. Sahli, "[Ground Penetrating Radar Data Processing: Clutter Characterization and Removal](#)", Vrije Universiteit Brussel Technical Report IRIS-tr-0059, VUB-ETRO Department, November 1999.
- J. W. Brooks, "[Wavelet-based Feature Extraction for GPR Detection of Non-Metallic Antipersonnel Land Mines.](#)" *Proc. SPIE Detection and Remediation Technologies for Mines and Minelike Targets V*, Orlando, Florida USA, August 2000, Vol 4038, pp. 1028-1036
- J. Brooks, L. van Kempen and H. Sahli, "[A Primary Study in Adaptive Reduction and Buried Minelike Target Enhancement From GPR Data](#)", *Proc. SPIE, Detection and Remediation Technologies for Mines and Minelike Targets V*, Orlando, Florida USA, August 2000, Vol 4038, pp. 1183-1192
- L. van Kempen, H. Sahli, J. Brooks, and J. Cornelis, "[New Results on Clutter Reduction and Parameter Estimation for Landmine Detection Using GPR](#)", *GPR 2000*, Eighth International Conference on Ground Penetrating Radar, Gold Coast, Australia, May 23-26, 2000, pp 872-879
- J. W. Brooks, *The Detection of Buried Non-Metallic Anti-Personnel Land Mines*, Ph. D. Dissertation, the University of Alabama in Huntsville, August 2000, (5 Mb .pdf file)