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CHRISTOPHER B. WATKINS
AIAA Associate Fellow

SYSTEMS ENGINEERING – RESEARCH & DEVELOPMENT – SR. PROJECT MANAGER
Engineering Management / Avionics / Aircraft Computing Systems / Model Based Systems Engineering

Aviation systems architect with 25 years of well-rounded engineering and project management experience that spans numerous areas within the aviation industry:

- Model Based Systems Engineering
- Project Management
- Aircraft Avionics
- Integrated Modular Avionics (IMA)

- Technology Research & Maturation
- Remote Sensing / LIDAR
- Six Sigma Green Belt
- FAA Licensed Private Pilot

Architecting solutions that maximize business potential + customer satisfaction. Develop global partnerships built on trust.

Principal Systems Engineer / Architect:
Model Based Systems Engineering (MBSE) Champion @ Gulfstream. Established SE processes for Gulfstream's preliminary design phase and launched Systems Integration group on program. Avionics System Architect for business, regional and large air transport markets.

Project Management:
Manage R&D projects for future Gulfstream aircraft flight decks. Led GE's Technical Pursuit in China for COMAC C919. Established a US-Chinese Joint Venture: Aviage Systems. Managed R&D program for LIDAR-based optical air data system and directed the first flight test program at Michigan Aerospace.

Research and Innovation:
Lead R&D in Gulfstream Flight Deck Innovation group. Incubate new ideas as well as process-driven technology maturation. Established Gulfstream Advanced Flight Deck research lab. Led early aircraft LIDAR research at Michigan Aerospace.

Published Author / Industry Leadership:
Recognized industry expert for Model Based Systems Engineering and Integrated Modular Avionics (IMA). Published author in textbooks & industry conferences. Committee chair of the Digital Avionics Systems Conference (DASC) for 17 years.

WORK EXPERIENCE

GULFSTREAM AEROSPACE Corporation – Savannah, Georgia   April 2011 – Present
A wholly owned subsidiary of General Dynamics
PRINCIPAL ENGINEER MBE/MBSE (August 2022 – Present)
SR PROJECT MANAGER, FLIGHT DECK INNOVATION (October 2017 – August 2022)
SYSTEMS ENGINEER, ADVANCED AIRCRAFT PROGRAMS, G500 / G600 (April 2011 – October 2017)

Principal Engineer – MBE/MBSE
➢ **Model Based Systems Engineering (MBSE) and Model Based Development (MBD) Champion.** Founder of the Electronic System Architecture Modeling (eSAM) method which leverages MathWorks System Composer. Introduced and demonstrated MBD methods for developing avionics systems that reduce design errors and iterations via early validation of functionality. Implemented MBD solutions for system architecture modeling, control software modeling and aircraft cockpit display content development. Leveraged Virtual Reality technology to immerse designers and customers in functional engineering concepts to gain early feedback.

> **Virtual aircraft systems development.** Introduced quick-turn capability to develop and evaluate new flight deck concepts virtually within flight simulation environments Prepar3D and X-Plane.

Sr. Project Manager – Flight Deck Innovations (FDI)

> **Established Systems Engineering process to capture voice of the customer.** Established a Concept of Operations and Design Intent Document (CDID) process to capture the voice of the customer from sources such as customer advisory boards and insight from real-world experiences attained via stakeholder (ex. Customer Support organization, Gulfstream pilots, flight attendants and aircraft maintenance departments).

> **Lead NextGen Avionics research and development.** Investigate candidate technologies, engage supplier R&D, lead requests for information and proposals (RFIs/RFPs), Evaluate technology in Gulfstream labs, including human-factors studies which formalize pilot feedback.

> **Established Flight Deck Innovations research lab.** Stood-up new lab for research and demonstration of next-generation technology candidates for future Gulfstream aircraft programs. The lab supports quick-turn concept exploration via early system simulation & emulation, as well as hosting of aircraft-representative physical prototypes which demonstrate maturity and enables human factors evaluations.

Systems Engineer – Avionics Systems

> **Flight Management System (FMS) lead.** Led FMS development on G500 and G600 aircraft programs.

> **Systems Change Management (CM) lead.** Established new systems role to control design change across G500 and G600 aircraft. Developed and managed the aircraft integrated schedule across engineering and flight test. Rolled out many new systems processes, including a safety-of-flight regression analysis and test process. Led Test Readiness Reviews (TRRs) for G500 aircraft Power-on and Powered Rollout. Developed and implemented a regression test process to demonstrate continued safety-of-flight after design changes.

> **G500 / G600 avionics computing system integration.** Worked closely with senior management and program VP on Systems Tiger Team to manage supplier integration with the Data Concentration and Network (DCN) avionics computing platform, an Integrated Modular Avionics (IMA) technology.

> **Enhanced Gulfstream's reputation in industry.** Showcased company's leadership in industry through many publications and service on AIAA conference committees, and the AIAA Digital Avionics Technical Committee.

GENERAL ELECTRIC (GE) AVIATION SYSTEMS - Grand Rapids, Michigan   May 2007 – April 2011
GE acquired Smiths Aerospace in May 2007
SYSTEMS ARCHITECT, AVIONICS SYSTEMS (May 2007 – April 2011)
GE Aviation Commercial Excellence Award, 2009

Systems Architect - New Business Development

> **Led winning new business proposals.** Technical lead for COMAC C919 integrated avionics project in China. Led other pursuits across Business Aviation, Regional Transport, and large Air Transport markets.

> **Architected aircraft computing systems supporting new business development.** Developed next generation Integrated Modular Avionics architectures for civil aircraft, including Gulfstream G400/G500/G600/G700/G800.

> **Enhanced GE Aviation Systems' reputation in industry.** Grew company participation at conferences through paper publications, corporate sponsorships, arranging guest speakers, and motivating employees to publish.

Systems Architect – Training Lead

> **Founded and led global training program for GE Aviation Systems.** Developed & delivered biweekly training content, expert speakers, and online portal to reach over 2/3 of the global engineering employee base.

Systems Engineering Lead – Common Core System (CCS) Certification
The CCS is an open-systems Integrated Modular Avionics (IMA) computing platform for the Boeing 787 Dreamliner. CCS was an innovative architecture and FAA certification program.

> **Led the Hosted Function Supplier certification support team.** Facilitated discussions with FAA DERs. Developed an Impact Analysis process which reduced costs for regression testing and hardware upgrades.

> **Led the CCS software and configuration build & delivery team.** Developed an automated build and delivery solution for CCS software and configuration files that supports an FAA "Level A" certified system.

SMITHS AEROSPACE (SMITHS GROUP PLC) - Grand Rapids, Michigan

Nov 2004 – May 2007

BOEING 787 CCS SYSTEMS CERTIFICATION FOCAL (January 2006 – May 2007)
BOEING 787 CCS SYSTEMS ENGINEER (November 2004 – January 2006)
Appointed to Smiths Aerospace Leadership Forum and Leadership Connections Programs

Systems Engineer - Common Core System (CCS) Project

➢ **Technical lead of CCS certification support for external companies integrating with CCS.** One of the first certification programs that applied RTCA DO-297 "IMA Development Guidance & Certification Considerations".
➢ **Led cross-functional certification team for the CCS platform.**
➢ **Reduced complexity for a system-of-systems integration and certification effort.** Resolved integration dependencies with 100+ systems on the Boeing 787 through contract-based approach to systems integration.
➢ **Led System Architecture Development.** Coordinated CCS architecture across the 300+ person team, formalizing architecture in System Description Document.
➢ **Developed verification plan for the CCS.** Responsible for ensuring verification plan compliance with commercial aviation industry certification guidelines: SAE ARP-4754, RTCA DO-178B, and RTCA DO-254.

MICHIGAN AEROSPACE CORPORATION - Ann Arbor, Michigan

Jan 1997 – Nov 2004

Founding employee. Member of original team who formed Michigan Aerospace in 1997, a 26-person company.
PROGRAM MANAGER (November 2000 – November 2004)
RESEARCH ENGINEER (January 1997 – November 2000)

Program Manager – Molecular Optical Air Data System (MOADS)

The Molecular Optical Air Data System (MOADS) is a Light Detection and Ranging (LIDAR) based sensor. It measures air data products (airspeed, air density, temperature, angle of attack/side slip + others) for the aircraft flight data computers and serves as a flush-mounted pitot-static system replacement.

➢ **Managed MOADS development.** Applied atmospheric weather sensors as an aircraft air data sensor.
➢ **Flight test director: prototype avionics system flight tests.** Successful demo on Beechcraft King Air 300.
➢ **Managed Reusable Launch Vehicle Air Data System (RLVADS)**, a MOADS variant designed for an Air Force reusable space vehicle concept. Designed to extend reentry glide range.
➢ **New business development.** Drafted proposals for numerous opportunities and won contracts with NASA, Navy, Air Force, and commercial customers: SBIRs and NASA Advanced Component Technology Programs

Research Engineer – LIDAR Remote Sensing Systems

➢ **Developed control and analysis software for MOADS.**
➢ **Completed MOADS wind tunnel testing.** Validated the instrument's operation and performance.
➢ **Developed control software for GroundWinds**, a LIDAR-based weather station that measures atmospheric wind profiles from 0-20km above ground level. Supported build in New Hampshire and Hawaii (Mauna Loa).
➢ **Designed and built an active control system for a Fabry-Perot etalon (optomechanical system)**

ADVANCED MODULAR POWER SYSTEMS (AMPS) - Ann Arbor, Michigan

Feb 1996 - April 1998

ENGINEERING TECHNICIAN

➢ **Supported space-flight qualification tests for AMTEC/AWCS space shuttle flight-experiment.** Advanced Metal to Energy Conversion (AMTEC) technology, considered by NASA as a possible power source for deep space probes. AMTEC is an alternative energy source that converts thermal energy to electric energy.
➢ **Certified operator of the AMTEC/AWCS space-flight experiment from mission control operations center.**

ENVIRONMENTAL RESEARCH INSTITUTE OF MICHIGAN (ERIM) - Ann Arbor, Michigan

Jan 1996 - July 1997

Now part of General Dynamics Corporation
ENGINEERING TECHNICIAN

➢ **Space Automation & Robotics Center (SpARC).** Supported component testing for robotic space shuttle payload. Completed functional testing of the Automated Wafer Cartridge System (AWCS).
➢ **Developed a thermal control system to regulate satellite calibration electronics in Antarctica.**

EDUCATION

Systems Engineering Fundamentals Graduate Certificate, 2021
Caltech, Pasadena, California – Evaluated course for roll-out within Gulfstream Engineering

M.S. Systems Engineering, 2013 GPA: 4.00
Missouri University of Science and Technology (formerly University of Missouri-Rolla), Rolla, Missouri

Engineering Management Graduate Certificate, 2013, GPA: 4.00
Missouri University of Science and Technology (formerly University of Missouri-Rolla), Rolla, Missouri

Systems Engineering Graduate Certificate, 2009, GPA: 4.00
Missouri University of Science and Technology (formerly University of Missouri-Rolla), Rolla, Missouri

B.S. Electrical Engineering, 1999
Kettering University (formerly GMI Engineering & Management Institute), Flint, Michigan

CO-CURRICULAR ACTIVITIES

➢ Private Pilot
➢ Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA), Life Member, 2005-present

PATENTS & PUBLICATIONS

PATENT
▪ Trend Indications for Avionics Systems, US Patent # 11,378,414. New way to provide aircraft system status information to pilots in a dynamic format to declutter system synoptics during normal system operation, but to expand status for early indication of system parameters that are trending such that they will be out of normal operating condition if mitigation action isn't taken.

▪ Aircraft HUD with Curved Tapes and Flight Mode Annunciation Boxes, US Patent # 10,876,856. New way to display aircraft flight information to pilot in 3D format. Improves ability to monitor rate of change of airspeed and altitude in peripheral vision while pilot focuses attention out the window (notably during takeoff, approach and landing).
https://pdfpiw.uspto.gov/.piw?Docid=10876856

PUBLICATIONS
▪ Auto-Derivation of Functional Flow Block Diagrams from System Architecture using the eSAM Method, Christopher B. Watkins, Jerry Varghese, Michael Knight, Becky Petteys, Jordan Ross and Josh Kahn, AIAA/IEEE 42nd Digital Avionics Systems Conference (DASC), Barcelona, Spain, October 2023. ***Awarded Best Session Paper***

▪ Data-Message Modeling for Multi-Lane Architectures on an IMA Platform using the eSAM Method, Christopher B. Watkins, Jerry Varghese, Michael Knight, Becky Petteys, Jordan Ross and Josh Kahn, AIAA/IEEE 41st Digital Avionics Systems Conference (DASC), San Antonio, TX, October 2022. ***Awarded Best Paper of Conference***

▪ The Electronic System Architecture Modeling Method (eSAM), Chris Watkins, Keynote Presentation, MATLAB EXPO, Online, May 2022
https://www.mathworks.com/videos/the-electronic-system-architecture-modeling-esam-method-1652896544921.html

▪ Safe and Secure Avionics Architectures, Panel @ 4th Workshop on Avionics Systems and Software Engineering (AvioSE), Laurent Meilleur (Vice President @ DDC-I), Matthieu Merckling (IMA Senior Expert @ Diehl Aerospace GmbH), Reinhard Wilhelm (Universität des Saarlandes, Germany), George Romanski (Chief Scientific and Technical Advisor @ FAA), Chris Watkins (Sr. Project Manager @ Gulfstream Aerospace Corporation), February 2022
aviose-workshop.github.io/

- Growth of MBSE @ Gulfstream. Christopher B. Watkins. International Digital Enablement Week (IDEW) 2021, Netherlands, April 2021.
  https://esi.nl/events/2021/idew-2021 (Presentation Slides and Video)

- System Architecture Modeling for Electronic Systems Using MathWorks System Composer and Simulink, Christopher B. Watkins, Jerry Varghese, Michael Knight, Becky Petteys and Jordan Ross, AIAA/IEEE 39th Digital Avionics Systems Conference (DASC), San Antonio, TX, October 2020. ***Awarded Best Session Paper***

- Challenges and Ways Forward for Avionics Platforms and their Development in 2019, Christopher Watkins, Bjoern Annighoefer, Martin Halle, Steven H. VanderLeest, Andreas Schweiger, Marina Reich, Stefan Harwarth, Patrick Deiber, 38th AIAA/IEEE Digital Avionics Systems Conference (DASC), San Diego, CA, September 2019.

- Development of Touchscreen Displays for the Gulfstream G500 and G600 Symmetry™ Flight Deck, Christopher B. Watkins, Colleen Nilson, Susan Taylor, Kristin B. Medin, Igor Kuljanin, Huy B. Nguyen, 37th AIAA/IEEE Digital Avionics Systems Conference (DASC), London, England, September 2018. ***Awarded Best Session Paper***

- Evolution of the Systems Integrator Role and Change Management Process within Highly Integrated Aircraft Systems, Christopher B. Watkins, Timothy Burns, 34th AIAA/IEEE Digital Avionics Systems Conference (DASC), Prague, Czech Republic, September 2015. ***Awarded Best Paper in Session and Track***

- Integrated Modular Avionics – Past, Present and Future, Chris Watkins, Thomas Gaska, Yu Chen, IEEE Aerospace and Electronic Systems Magazine, Vol 30, Issue 9, September 2015.

- Digital Avionics Handbook, Third Edition, chapter entitled "Genesis Platform: An IMA Architecture for Boeing B-787 and Beyond", Chris Watkins, Randy Walter, Cary Spitzer / Uma Ferrell / Thomas Ferrell (editors), CRC Press, Boca Raton, Florida, September 2014.

- Agent-Based Model of Aerial Ad-Hoc Network Market Potential, Christopher B Watkins, Cihan H Dagli, 30th AIAA/IEEE Digital Avionics Systems Conference (DASC), Seattle, Washington, October 2011,
  http://www.watkinsplace.com/publications/Aerial-Ad-Hoc-Network-Watkins-2011.pdf

- Understanding the Implementation of System Architectures in the Context of Distributed Cognition, Christopher B Watkins, Cihan H Dagli, 20th International Council on Systems Engineering (INCOSE), Chicago, Illinois, July 2010,
  http://www.watkinsplace.com/publications/System_Architectures_Distributed_Cognition_INCOSE2010-Watkins.pdf

- Comparing Two Industry Game Changers: Integrated Modular Avionics and the iPhone, Christopher B. Watkins, Randy Walter, 28th AIAA/IEEE Digital Avionics Systems Conference (DASC), Orlando, Florida, October 2009

- 2009 Year-in-Review: Digital Avionics, "Aerospace America" December 2009, Chris Watkins, Jim Rankin, AIAA Digital Avionics Technical Committee, Reston, VA, December 2009.

- 2008 Year-in-Review: Digital Avionics, "Aerospace America" December 2008: 48-49, Chris Watkins, Richard Katz, AIAA Digital Avionics Technical Committee, Reston, VA, December 2008.

- Design Considerations for Systems Hosted on Integrated Modular Avionics Platforms, Christopher B. Watkins, Randy Walter, 27th AIAA/IEEE Digital Avionics Systems Conference (DASC), St. Paul, Minnesota, October 2008 ***Awarded Best Session Paper***

- Transitioning from Federated Avionics Architectures to Integrated Modular Avionics, Christopher B. Watkins, Randy Walter, 26th AIAA/IEEE Digital Avionics Systems Conference (DASC), Dallas, Texas, October 2007.

- Digital Avionics Handbook, Second Edition, chapter entitled "Genesis Platform", Chris Watkins, Randy Walter, Cary Spitzer (editor), CRC Press, Boca Raton, Florida, December 2006.

- Integrated Modular Avionics: Managing the Allocation of Shared Intersystem Resources, Christopher B. Watkins, 25th AIAA/IEEE Digital Avionics Systems Conference (DASC), Portland, Oregon, October 2006.

- Modular Verification: Testing a Subset of Integrated Modular Avionics in Isolation, Christopher B. Watkins, 25th AIAA/IEEE Digital Avionics Systems Conference (DASC), Portland, Oregon, October 2006.

- Molecular Optical Air Data System (MOADS) Prototype II, Christopher B. Watkins, Charles J. Richey, Peter Tchoryk, Jr., Greg A. Ritter, Michael Dehring, Paul B. Hays, Carl A. Nardell, Russell Urzi, International Optical Society (SPIE) Defense and Security Symposium, Orlando, Florida, April 2004.

- Molecular Optical Air Data System (MOADS) Flight Experiment, Christopher B. Watkins, Charles J. Richey, Peter Tchoryk, Jr., Greg A. Ritter, Paul B. Hays, Carl A. Nardell, Theodore C. Willis, Russell Urzi, International Optical Society (SPIE) AeroSense Conference, Orlando, Florida, April 2003.

- Molecular Optical Air Data System (MOADS), Christopher B Watkins, Peter Tchoryk, Jr., Scott Lindemann, Paul B. Hays, Carl A. Nardell. International Optical Society (SPIE) AeroSense Conference, Orlando, Florida, April 2001.