

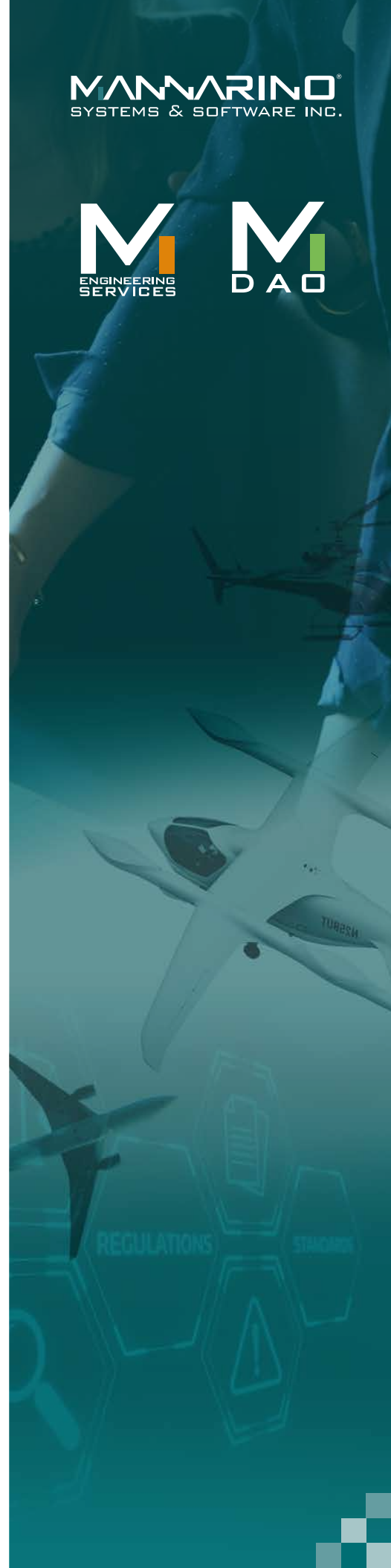


ENGINEERING. CERTIFICATION. EXPERTISE.

SAFETY-CRITICAL SYSTEMS, SAFETY, SOFTWARE
& ELECTRONIC HARDWARE ENGINEERING,
CERTIFICATION AND TRAINING SERVICES



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Brochure





MANNARINO AT A GLANCE

Founded in 1999 by John Mannarino, MANNARINO is privately held, its success lying largely in the unique skill set of the senior management team and the expertise and professionalism of the engineering staff.

MANNARINO is a lean, customer-focused service organization with an engineering staff proudly serving an ever expanding wide range of customers.

Located in Montreal (Quebec) Canada, a strategically located global aerospace hub. MANNARINO is well situated to address the needs of major OEMs and integrators locally, nationally and internationally, as Montreal is a gateway to Europe and the US markets.

MANNARINO's multilingual staff allows its expertise to bridge many cultures and provides breadth to its offering.

PROGRAM MANAGEMENT

Our Program Managers and Engineering Project Leaders are highly experienced engineers in the aerospace & defence sectors. Program Managers ensure the MANNARINO teams are focused on all engineering deliverables and are keenly aware of schedule and cost.

Regular program status updates are provided to our customers to ensure compliance with program costs and milestones. Depending on the program size, MANNARINO can produce the following industry standard Program Management deliverables:

MANNARINO PROVIDES:

- Safety-Critical Systems, Safety, Software and Airborne Electronic Hardware Engineering Services to the Aerospace, Defense, Space, Simulation, Rail, and Power Generation Industries
- Transport Canada Civil Aviation (TCCA) Design Approval Representative (DAR) delegate services for airborne software (RTCA/DO-178B/C) and Airborne Electronic Hardware (AEH) (RTCA/DO-254)
- MANNARINO is an accredited Design Approval Organization (DAO) and certification services are provided under the auspices of the MANNARINO DAO
- Training in all aspects of the development and certification of airborne systems, software and electronic hardware

PROGRAM MANAGEMENT PLAN

- Work Breakdown Structure (WBS)
- Opportunities/Risk Registry
- Scope, Schedule & Cost Estimates
- Budget Baseline Definition & Updates
- Change Proposal & Approval Process
- Periodic Program Status Reports With:
 - Project Status, Risk & Opportunities
 - Cost/Budget Status
 - Project Earned Value
 - Cost Performance Index
 - Schedule Performance Index
 - Activity Forecast

SOFTWARE ENGINEERING

The MANNARINO software engineering expertise covers a wide range of activities including:

COMPLETE SOFTWARE LIFE CYCLE SUPPORT FOR RTCA/DO-178B/C - DESIGN ASSURANCE LEVEL A TO D AND RTCA/DO-278/A - LEVEL 1 TO 6, INCLUDING:

- Planning, Development, Verification
- Quality Assurance
- Configuration Management
- Certification Liaison

AIRBORNE EMBEDDED SOFTWARE

- Avionics Software (including IMA and Federated Systems)
- Aircraft Sub-Systems Software Development (eg. Engine Control System Software (FADEC), Health & Usage Monitoring Systems (HUMS) Software)
- Ground Support Equipment (GSE) Software Design

SOFTWARE FUNCTIONALITY, DESIGN & DEVELOPMENT

- Real-Time Operating System (RTOS) Software Design
- Low Level Drivers
- Application Software (AS) Design & Development
- Fault Management/BIT Functionality
- Scheduling & Software Partitioning
- Serial Buses (ARINC, UART, CAN, etc.)
- Software Testing, Verification & Validation

LANGUAGES, MICROPROCESSORS & PROTOCOLS

- Languages, Including Hand-coding (Assembly, Ada, C/C++, Visual Basic)
- PowerPC, ARM, Intel Microprocessors
- Aerospace Communication Protocols (e.g. ARINC 429, CANBus, SPI, RS232/422/485, AFDX, etc.)

INTEGRATED DEVELOPMENT ENVIRONMENTS (IDE)

- MANNARINO Workbench
- IAR Embeded Workbench, CodeWarrior, RSLogix 5000, Allan Bradley Controller, Pilz

TOOL EXPERIENCE

- Model-based Development Tools (Beacon, SCADE, MatLab)
- Verification Tools [Open & Closed Loop Bench; Emulation/debugging probes (iSystem, Lauterbach, Agilent, IAR); Logic Analyzer; Coverage Tools (RTRT, VectorCast, McCabelQ)]
- Requirements Management Tools (IBM Rational DOORS and DXL scripting)
- Polarion

SYSTEMS ENGINEERING

The MANNARINO systems engineering expertise covers a wide range of activities including:

CERTIFICATION SUPPORT INCLUDING:

- TCCA/FAA/EASA Engine & Airframe Certification
- RTCA/DO-178C, RTCA/DO-278/A & RTCA/DO-254 Support
- Liaison With Certification Authorities

REQUIREMENTS MANAGEMENT

- System Requirements Definition, Compliance Analysis & Validation
- Decomposition of Systems to Component Requirements
- Experts in Requirements Management Toolset
- Hardware-in-the Loop Requirements Testing

OTHER AREAS OF SYSTEMS ENGINEERING INCLUDE:

- Control System Configuration
- System Development, Verification/Validation per SAE ARP 4754A
- Safety Analysis per SAE ARP 4761
- Control Law Design And Operability/Stability Analysis
- Operability Analysis
- Real Time & Non-Real Time System Modeling/Simulation
- Dynamic Analysis
- Aircraft Simulators, Power Generation & Rail Systems Development
- Engine & Flight Test Support

“Our passion comes from years of commitment and dedication.

— JOHN MANNARINO”

ELECTRONIC HARDWARE ENGINEERING

The MANNARINO engineering expertise covers a wide range of activities including:

- Complete Hardware Life Cycle Support for Programmable Devices (FPGA/PLD/ASIC)
- RTCA/DO-254 Requirements, Design, Verification and Validation

- Verification Support for Circuit Card Assembly Compliance to RTCA/DO-254
- **Languages:** VHDL, Verilog, SystemVerilog
- **IDE:** ModelSim, MircoSemi Libero

AEROSPACE CERTIFICATION

MANNARINO has significant experience in the aerospace certification process per the following guidelines and aerospace recommended practices:

- SAE ARP 4761 - Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment
- SAE ARP 4754A - Guidelines for Development of Civil Aircraft and Systems
- RTCA/DO-178B/C - Software Considerations in Airborne Systems and Equipment Certification
- RTCA/DO-278/A - Guidelines for Communication, Navigation, Surveillance and Air Traffic Management Systems Software Integrity Assurance
- RTCA/DO-254 - Design Assurance Guidance for Airborne Electronic Hardware

MANNARINO has led and participated in program audits with the following certification authorities and/or associate delegates:

- Federal Aviation Administration (FAA)
- Transport Canada Civil Aviation (TCCA)
- European Aviation Safety Agency (EASA)
- National Civil Aviation Agency of Brazil (ANAC)
- Directorate of Technical Airworthiness and Engineering Support (DTAES)



Transport
Canada



AIRBORNE SOFTWARE & ELECTRONIC HARDWARE APPROVALS/CERTIFICATION (DARs)

TRANSPORT CANADA CIVIL AVIATION (TCCA) DELEGATE SERVICES

To further complement our offering to our customers, MANNARINO provides Transport Canada Civil Aviation (TCCA) delegate services. TCCA Design Approval Representatives (DAR) are on staff for the following disciplines:

- Airborne Software (RTCA/DO-178B/C)
- Airborne Electronic Hardware (AEH) (RTCA/DO-254)

MANNARINO DESIGN APPROVAL ORGANIZATION (DAO)

MANNARINO is a TCCA accredited Design Approval Organization (DAO) and delegate/certification services are provided under the auspices of the MANNARINO DAO.

ADDITIONAL MANNARINO SERVICES

MANNARINO is highly specialized in the following areas:

TRAINING IN THE DEVELOPMENT OF AIRBORNE SOFTWARE (RTCA/DO-178B/C)

- MANNARINO offers a variety of training options including off-the-shelf seminars on industry guidance material, as well as custom-tailored solutions
 - RTCA/DO-178B/C Seminar with Optional day focusing on RTCA/DO-178C Supplements & Tool Qualification
 - RTCA/DO-278A Seminar
 - RTCA/DO-254 Seminar
 - SAE ARP 4754A & ARP 4761 Seminar

- Engagement RTCA - MANNARINO also teamed with the RTCA (Radio Technical Commission for Aeronautics) to offer similar courses to the industry in its Washington, DC training facility. The following seminars are available:

- Guidance for Engineers: DO-178C DAL D Systems
- Management Seminar: DO-178B/C, DO-254 & SAE/ARP 4754A
- Guidelines for Development of Civil Aircraft and Systems (SAE/ARP 4754A)
- Integrated Modular Avionics (IMA) Development Guidance and Certification, RTCA/DO-297

INDUSTRIAL GAS TURBINE CONTROLS SOFTWARE & SIMULATION

- Systems and Software Requirements Development
- Software Design
- Systems and Software Verification/Validation Testing

RTCA



ABOUT MANNARINO

With over 20 years of experience and an industry-recognized expertise in safety-critical systems and software engineering, MANNARINO exemplifies quality and consistency at its best!

CONTACT US

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