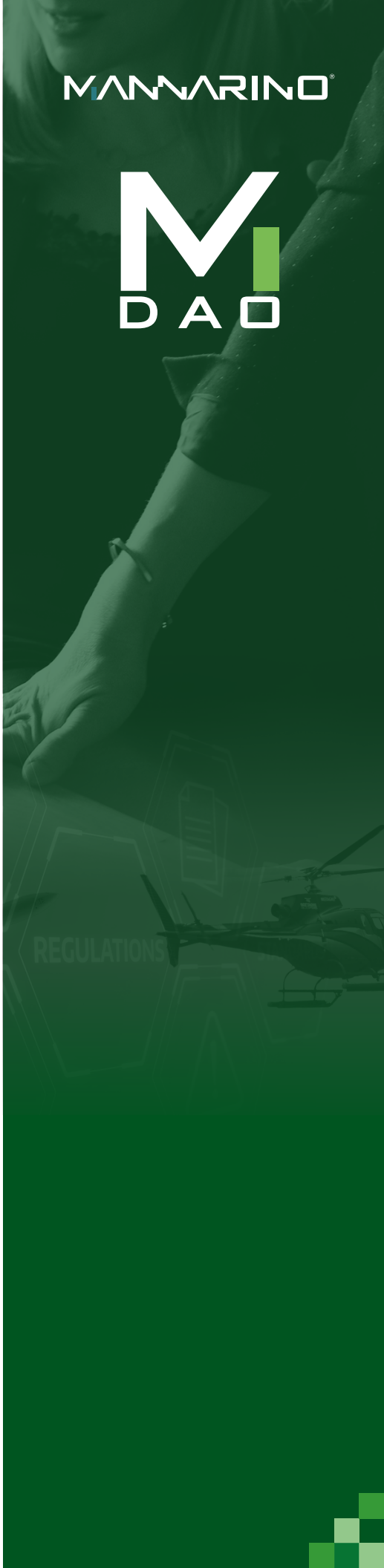
MANNARINO
TRAINING PORTFOLIO

HIGHLY SPECIALIZED TRAINING TO SUPPORT THE DEVELOPMENT AND CERTIFICATION OF SAFETY-CRITICAL SYSTEM WITH A VARIETY OF OFF-THE-SHELF OPTIONS AS WELL AS CUSTOM-TAILORED SOLUTIONS



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ABOUT MANNARINO

PRIVATELY OWNED CANADIAN COMPANY LOCATED IN MONTREAL, QUEBEC

PROVIDING ENGINEERING SERVICES SINCE 1999

- Highly specialized in aerospace / civil certification
- Engineering services: Software, System Engineering, Safety Analysis, Certification
- Software: Low-Level Software + Middleware + Application Software
- Transport Canada DAO for Airborne Software & Electronic Hardware

PROVIDING SOFTWARE PRODUCTS SINCE 2020

- Real-Time Operating System (M-RTOS)
- Board Support Packages (BSPs) & Drivers

WEBINARS SERIES

EDUCATIONAL WEBINAR SERIES

- Targeted to 1st Time Applicants
- Helps Navigate Path to Certification & Safe Operation
- Introduces Major Industry Specifications (i.e. System, SW & HW)
- Each video ~30min

TOPICS

- **Webinar #1 :** Overview of aerospace standards for first-time applicants
- **Webinar #2 :** Introduction to the safety assessment process for civil aircraft, systems and equipment (SAE ARP 4761)
- **Webinar #3 :** Development of civil aircraft & systems (SAE ARP 4754A)
- **Webinar #4 :** Software considerations for airborne systems and equipment certification (RTCA/DO 178C)
- **Webinar #5 :** Design assurance guidance for airborne electronic hardware (RTCA/DO 254)
- **Webinar #6 :** Avionics application software standard interface (ARINC 653)
- **Webinar #7 :** Sample architecture for a UAS within the ARINC 653 context
- **Webinar #8 :** Role-based development using an ARINC 653 compliant RTOS
- **Webinar #9 :** Introduction to CAST 32A for Software Airborne Systems Executing on Multi-Core Processors
- **Webinar #10 :** An Overview on Special Committee EUROCAE WG 117 / RTCA SC-240 Topics of Software Advancement
- **Webinar #11 :** Microprocessor Selection... What Makes it So Difficult

WEBINARS SERIES

1. OVERVIEW OF AEROSPACE STANDARDS FOR FIRST-TIME APPLICANTS

The first in the series focuses on the Certification Basis & Means of Compliance by looking at the latest UAS regulations and standards. Then it lays the groundwork for subsequent webinars by introducing the main aerospace industry standards/guidance material (i.e. SAE ARP4754A/4761, RTCA/DO-178C, and RTCA/DO-254). The webinar ends with a discussion on the challenges first-time applicants face when trying to certify aircraft systems.

2. INTRODUCTION TO THE SAFETY ASSESSMENT PROCESS FOR CIVIL AIRCRAFT, SYSTEMS AND EQUIPMENT (SAE ARP 4761)

The webinar introduces the Safety Process outlined in SAE ARP 4761. It looks at the system safety in the scope of an aircraft development and type certification. Then focuses on the system safety assessment process overview, the system safety assessment processes & analysis methods, and closes with looking at the interfaces with a typical aircraft system development process.

3. DEVELOPMENT OF CIVIL AIRCRAFT & SYSTEMS (SAE ARP 4754A)

The webinar discusses how one can use ARP4754A to demonstrate that a complex system functions as intended and that any unintended functions are identified and eliminated. Specifically, it quickly goes through an overview of what ARP4754A is about and discussed questions that should be asked before starting the application of ARP4754A standard.

4. SOFTWARE CONSIDERATIONS FOR AIRBORNE SYSTEMS AND EQUIPMENT CERTIFICATION (RTCA/DO 178C)

Webinar is an introduction on the DO-178C starting with a historical perspective of the standard. We then present an overview of the document and a high-level description of processes including a focus on the process objectives and the resulting life cycle data from executing these processes as they relate to SW Design Assurance Level.

5. DESIGN ASSURANCE GUIDANCE FOR AIRBORNE ELECTRONIC HARDWARE (RTCA/DO 254)

Webinar starts with an introduction on the DO-254 to understand why and when the DO-254 was developed and how it is applied. Then we present an overview of the document, we will go through the different processes defined in DO-254, along with the objectives an life cycle data that are defined. In this webinar we will not go into detail in all the processes but we will discuss some of the differences between the DO-254 and the DO-178C, which is the guidance material related to the certification of software. To finish we talk about the latest regulation related to the hardware certification, the AMC20-152A and more specifically we will address the certification of the COTS IP.

WEBINARS SERIES

6. AVIONICS APPLICATION SOFTWARE STANDARD INTERFACE (ARINC 653)

Webinar dedicated to the ARINC 653 standard. ARINC 653 standard is the industry de facto standard specifying the standardized interface for a real-time operating system (RTOS). Specific elements that will be presented include:

- System Architecture
- Partition Scheduling & Time Management
- Partition Operating Modes
- Process Management
- Inter-partition communication
- Intra-partition communication
- Interrupt & Memory Block services
- Health Monitoring
- Configuration

7. SAMPLE ARCHITECTURE FOR A UAS WITHIN THE ARINC 653 CONTEXT

Webinar #7 will look at a sample UAS and apply concepts presented in earlier webinars. The webinar start with a look at a sample UAS and its functionalities. The allocation of functional design assurance levels to the UAS functionalities and then looks at how partitioning can be applied to an autopilot subsystem. Finally we show how a software partitioning strategy can be used for effectively certifying products.

8. ROLE-BASED DEVELOPMENT USING AN ARINC 653 COMPLIANT RTOS

The webinar presents the various aspects of using role-based development with an ARINC 653 Compliant RTOS. Then it focuses on the roles of the different actors involved in SW Development. The webinar rounds out with a brief look at a SW integrated development environment that aligns with the role-based development approach.

9. INTRODUCTION TO CAST 32A FOR SOFTWARE AIRBORNE SYSTEMS EXECUTING ON MULTI-CORE PROCESSORS

Webinar to introduce the audience to the CAST-32A concerns and identify topics that impact the safety, performance, and integrity of a software airborne system, executing on Multi-Core Processors. The webinar will also give a brief introduction to concepts that are implemented in the MANNARINO Real-Time Operating System (M-RTOS) that can help address the CAST-32A concerns.

10. AN OVERVIEW ON SPECIAL COMMITTEE EUROCAE WG 117 / RTCA SC-240 TOPICS OF SOFTWARE ADVANCEMENT

Webinar to review the progress in Industry Standards & Guidance Material for certifying Uncrewed Aircraft Systems. We will look at the specific guidance material discussed within the EUROCAE WG-117 / RTCA SC-240 Topics on Software Advancements related to Low Risk SW Certification for UAS.

11. MICROPROCESSOR SELECTION... WHAT MAKES IT SO DIFFICULT

This presentation will look at why is it so difficult to choose a microprocessor. To help developers, we propose a technical approach to processor selection. We will walk the audience through the 6 key elements of the technical approach and look at some of the key questions that need to be answered when selecting a processor.

EDUCATIONAL WEBINARS

1. REGULATORY FRAMEWORK FOR UAVS – HOW CERTIFICATION MAY IMPACT THE RPAS INDUSTRY

DESCRIPTION
Webinar delivered as part of AUVSI XPO 2020 on the state of the RPAS Regulations

DURATION
45 mins

2. SOFTWARE PARTITIONING AS A FLEXIBLE, SAFE & COST EFFECTIVE PATH TO CERTIFICATION

DESCRIPTION
Webinar delivered as part of AUVSI XPO 2020. On Software Partitioning using ARINC-653 complaint Real-Time Operating System and showing how the flexibility & cost effectiveness can be used to support system certification.

DURATION
35 mins

3. ACHIEVING TYPE CERTIFICATION FOR SAFETY CRITICAL EVTOL SYSTEMS

DESCRIPTION
Hosted by Avionics International (Woodrow Bellamy III) with Jaunt Air Mobility (CEO/CTO Martin Peryea), Airbus A3 (CTO Cedric Cocaud), MANNARINO (Amanda Melles) & MicroPiot (Howard Loewen). Webinar describes the certification challenges specific to eVTOL systems and how to align safety critical flight software for functionality with RTCA/DO-178C as well as new airworthiness standards and special conditions being optimized by global regulators.

DURATION
1h 15 mins

SEMINARS

MANNARINO OFFERS A VARIETY OF TRAINING OPTIONS INCLUDING OFF-THE-SHELF SEMINARS ON INDUSTRY GUIDANCE MATERIAL, AS WELL AS CUSTOM-TAILORED SOLUTIONS

- Targeted to technical engineering staff and their managers
- Provides an in-depth look at each standard
- Gives guidance for effective and efficient project execution
- Duration varies for 1-4 days (Each course can also be tailored to specific customer needs)

TECHNICAL SEMINARS

1. Systems Development Assurance & SAE ARP 4754A
2. Safety Assessment Process & SAE ARP 4761 (*coming soon*)
3. Software Aspects of Certification & RTCA DO-178B/C
4. Hardware Aspects of Certification & RTCA DO-254 (*coming soon*)
5. Guidance For Engineers: DO-178C DAL D Systems
6. Avionics Application Software Standard Interface & ARINC 653 (*coming soon*)
7. Integrated Modular Avionics (IMA) Development Guidance and Certification Considerations & RTCA DO-297

MANAGEMENT SEMINAR

1. Management Seminar for RTCA/DO-178B/C, RTCA/DO-254, SAE/ARP4754A

TECHNICAL SEMINARS

1. SYSTEMS DEVELOPMENT ASSURANCE & SAE ARP 4754A

Provides training on the purpose and scope of SAE ARP 4754A including a detailed look at specification processes and objectives. It also discusses interfaces between systems development processes and other related processes (i.e. Safety, Software, & hardware). Each topic includes hands-on workshops with examples of the application of the guidance material.

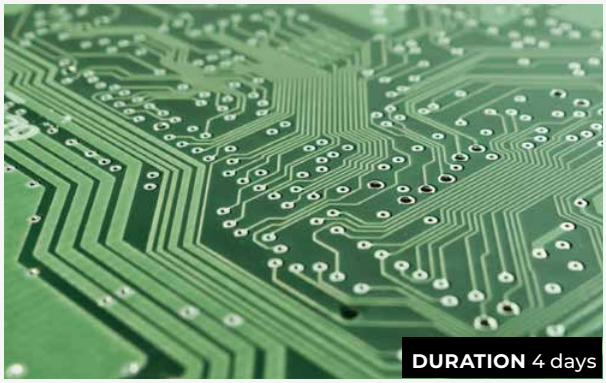
2. SAFETY ASSESSMENT PROCESS & SAE ARP 4761 *(COMING SOON)*

Provides training on the purpose and scope of SAE ARP 4761 including a detailed look at specification processes and objectives. It also discusses the decomposition of the safety assessment from the aircraft to system to item level to ultimately assigning a design assurance level for each item. Each topic includes hands-on workshops with examples of the application of the guidance material.

3. SOFTWARE ASPECTS OF CERTIFICATION & RTCA DO-178B/C

Provides training on the purpose and scope of RTCA DO-178C (and its supplements) including a detailed look at applicable processes and objectives. Provides an understanding of how DO-178B/C fits into the certification process, the system safety assessment process & software levels, and software reviews with certification authorities (SOI 1-4). Each topic includes hands-on workshops with examples of the application of the guidance material.

SEMINARS



4. HARDWARE ASPECTS OF CERTIFICATION & RTCA DO-254 *(COMING SOON)*

Provides training on the purpose and scope of RTCA DO-254 including a detailed look at applicable processes and objectives. Provides an understanding of how DO-254 fits into the certification process, the system safety assessment process & software levels, and software reviews with certification authorities (SOI 1-4). Each topic includes hands-on workshops with examples of the application of the guidance material.

5. GUIDANCE FOR ENGINEERS: DO-178C DAL D SYSTEMS

This training provides a thorough review of the RTCA/DO-178C objectives necessary to achieve compliance for airborne software components assigned DAL D. This condensed version of DO-178C training will present what is needed for an organization to put together the minimum plans, processes and data required to demonstrate compliance to DAL D objectives. In-class workshops will consolidate the learning by providing practical examples of requirements capturing, hardware/software integration tests and problem reports.

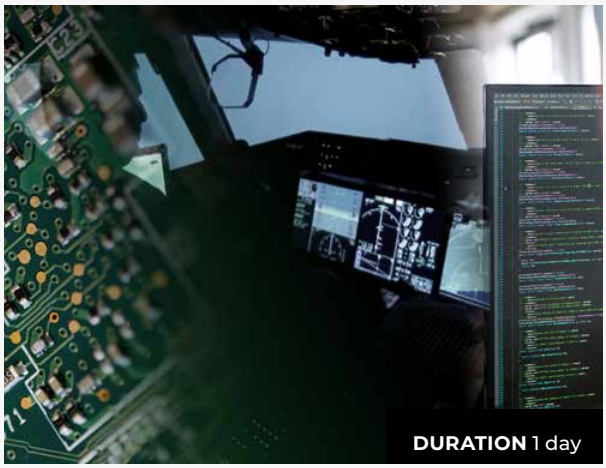
6. AVIONICS APPLICATION SOFTWARE STANDARD INTERFACE & ARINC 653 *(COMING SOON)*

Provides training on the purpose and scope of ARINC 653 (all parts) including a detailed look at the general purpose Application/Executive (APEX) interface (Application Program Interface - API) between the core software of an avionics computer resource and the application software. We look at the concept of robust partitioning and the specific services which allow the application software to control the scheduling, communication, and status information of its internal processing elements. The training uses the MANNARINO Real-Time Operating System (M-RTOS) as part of the hands-on workshops.

7. INTEGRATED MODULAR AVIONICS (IMA) DEVELOPMENT GUIDANCE AND CERTIFICATION CONSIDERATIONS & RTCA DO-297

This course provides the fundamentals for developing and integrating IMA systems, using DO-297 and applicable Advisory Circular material. This course provides the fundamentals for developing and integrating IMA systems, using DO-297 and applicable Advisory Circular material. It presents the definition, tasks and role of each party in the context of component integration, from the platform level to the application, system and aircraft perspective. It presents the approval aspects of the platform in isolation and in conjunction with multiple software applications. It discusses the use of ARINC 653 in IMA systems and as well the system aspects of SAE ARP 4754A in IMA Systems.

MANAGEMENT SEMINARS



1. MANAGEMENT SEMINAR: DO-178B/C, DO-254 & SAE/ARP4754A

This seminar provides a management-level overview of RTCA/DO-178B & C, RTCA/DO-254 & SAE/ARP4754A objectives and associated activities required as part of a certification program. It provides insight on the usual certification pitfalls, processes flaws, project cost, recommended practices and maintainability aspects of these programs. Created for aerospace industry management personnel, this seminar focuses on the most common challenges for development, verification and certification of safety critical equipment.

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MANNARINO

MDAO

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!

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