Requirements Traceability Matri

Prepared by George Mitchell 3/20/2026 ***Page 1***

System Architectural		***Conceptua Planning***	
System/Subsystem Boundaries			
		Conceptual Requirements HW/SW/Mechanical and Environment	
ID#	**Desc**	**ID#**	**Desc**
0.0.0	***Stakeholder Req# 0.0.0***	*0.0.0*	*Stakeholder Req# 0.0.0*
0.0 Introduction	*The software is separated into logical partitions to prevent failure propagation between functions*		
1.0 Hardware	*Airframe, motors, engines, electronic speed controllers (ESCs), flight controller, propellers, battery, transmitter, and receiver, Power Supplies separated into logical partitions to prevent failure propagation between partitions.*		

2.0 Software	*Software & Navigation: Flight control software, optional GPS modules for autonomous flight, and sensors. Communication I/O designed to provide predictable timing and*		
3.0 Determinism:	*Communication I/O designed to provide predictable timing and performance, crucial for flight-critical operations.*		
4.0 Safety:	*Compliance with safety standards to ensure the drone is safe for operation.*		
5.0 Partioning, Hardware and Software:	*Core hardware interacting with sensors and actuator*		

5.1 Partioning, Hardware:	*Core hardware interacting with sensors and actuator*		
5.2 Partioning, Software	*Core hardware interacting with sensors and actuator*		
5.3 Operating System/Middleware (RTOS)	*Provides partitioning and safe execution environment (e.g., ARINC 653).*		
4.3 Application Layer:	*Logic, such as navigation, performance calculation, and flight planning, often developed using Model-Based Development.*		

6.0 Traceability and Documentation:	*Every line of code is traced back to a specific requirement, ensuring no undocumented or "dead" code exists.*		
7.0 DAL Certification	*Critical, functions require Design Assurance Levels A or B (DAL A/B), which entail the highest levels of verification, including MC/DC coverage.*		
8.0 Aircraft Sections	*Typically a passenger plane will have 2-3 compartments for cargo. Wide body plane usually has 1 bulk cargo, 1 forward cargo and 1 aft cargo compartment. A narrow body*		
8.1 Aircraft Flight Deck (Cockpit)	*The cockpit of an aircraft is a complex and highly organized space, filled with instruments, controls, and systems that enable safe and efficient flight management.*		
8.1.1. Flight Instruments: Critical Data at a Glance	1. Flight Instruments: Critical Data at a Glance Flight Instrument of an aircraft cockpit Flight Instrument of an aircraft cockpit Flight instruments are the backbone of the cockpit. They provide pilots with essential information regarding the		

8.2 Aircraft Passenger Cabin	*Aircraft cabin systems comprise the integrated technologies and hardware designed to ensure passenger safety, comfort, and operational efficiency throughout a flight. These*		
8.2.1 Environmental Control Systems (ECS)	*The ECS is responsible for maintaining a livable "biosphere" at high altitudes.*		
8.2.1.1 Environmental Control Systems (ECS)	*The ECS is responsible for maintaining a livable "biosphere" at high altitudes.*		
8.2.1.2 Environmental Control Systems (ECS)	*Air Conditioning & Ventilation: Utilizes Air Cycle Machines (ACM) to cool hot engine air before distributing it through the cabin. Modern systems often use HEPA filters to remove*		
8.2.1.3 Environmental Control Systems (ECS)	*Temperature Control: Allows for zoned heating and cooling to accommodate different areas of the aircraft.*		

8.2.2. Cabin Management Systems (CMS)	*Often called the "brain" of the cabin, the CMS integrates various passenger and crew functions into a single digital interface.*		
8.2.2.1 Lighting Control:	*Manages overhead, reading, and "mood" lighting scenarios (e.g., sunrise/sunset) to reduce jet*		
8.2.2.2 Passenger Service:	*Passenger Service: Integrates flight attendant call buttons, "No Smoking" and "Seat Belt" signs, and intercommunication between the crew and cockpit.*		
8.2.2.3 Hardware Integration:	*Controls motorized window shades, galley power, and water/waste monitoring.*		
8.2.3 In-Flight Entertainment and Connectivity (IFEC)	*Modern cabins prioritize digital engagement and productivity.*		
8.2.3.1 IFE Systems:	*IFE Systems: Includes seatback displays, overhead screens, and audio distribution for movies, music, and moving maps.*		
8.2.3.2 Connectivity:	*Provides high-speed Wi-Fi and satellite communication (SATCOM) to enable "virtual offices" in the air.*		

8.2.3 Safety and Utility Systems	*These essential systems are often hidden from passenger view but are critical for operations.*		
8.2.3.1 Oxygen Systems:	*Emergency masks that deploy automatically if cabin pressure is lost.*		
8.2.3.2 Water and Waste:	*Managed by vacuum-based waste systems and freshwater tanks for galleys and lavatories.*		
8.2.3.3 Fire Protection:	*Includes smoke detectors (often embedded in the Cabin Intercommunication Data System) and fire suppression equipment.*		

8.2.4 Cabin Interiors and Furnishings	*Physical components are engineered for extreme durability and weight savings.*		
8.2.4.1 Seating: Engineered	*for Engineered crash safety and ergonomics, often featuring high-tech materials like carbon composites.*		
8.2.4.2 Monuments	*: Fixed structures like galleys, lavatories, and overhead storage bins.*		
8.2.4.3 Insulation:	*Thermal and acoustical linings that protect the cabin from outside temperatures and engine noise.*		
8.2.5 fuselage	*The aircraft fuselage is the main central body or "shell" of an airplane, designed to house the crew, passengers, and cargo while providing structural integrity, aerodynamic shape,*		
8.2.5.1 Doors	*Aircraft doors are highly engineered, secure, and typically use a "plug-type" design that seals tighter as cabin pressure increases, making them impossible to open in*		
8.2.5.1 ***8.2.5.2*** ***8.2.5.3*** ***8.2.5.4*** ***8.2.5.5***	*•Passenger* *•Flight Deck* *•Cargo* *•Equipment* *•Landing Gear*		

8.2.6 Tail	*An aircraft tail, officially known as the empennage, is the structure at the rear of an airplane that provides stability and control during flight. Much like the feathers on an arrow, it*		
8.2.6.1	*•Tail Strike Sensor*		

x **Requirements Tr**

SOI-1 (Planning)		<<========== *SOI-2 (Development an*		
System Planning Docs **PSAC/PSSAC** **Objectives: 7/7**		**System & Safety Requirements** **ARP-4754 & ARP-5761** **DO-178 & DO-254**		**System Safety** **FMA/FM** **ARP-**
ID#	**Desc**	**ID#**	**Desc**	**ID#**
0.0.0	•*SDP* •*SVP* •*SCMP* •*TQP* •*SQAP* •*STP*	*0.0.0*	*System Req# 0.0.0*	*0.0.0*

aceability Matrix Requ

d Test) ========== *SOI-2 (Development and Test)* ========== *SOI-2 (Development*

Requirements IEA/FTA 4761	High Level Requirements DO-178 & DO-254 Objectives: 7		Low Level Requirements DO-178 & DO-254 Objectives: 7	
Desc	**ID#**	**Desc**	**ID#**	**Desc**
System Req# 0.0.0	*0.0.0*	*High Level Req# 0.0.0*	*0.0.0*	*Low Level Req# 0.0.0*

ıirements Traceability Matrix

and Test) ========== *SOI-2 (Development and Test)* ========== *SOI-2 (Development*

DO-178 Software Design Process

(Requirements Decomposition)

Low Level Requirement Test Case		**Low Level Requirements Test Procedure**		**Low Level Re Test C**
ID#	**Desc**	**ID#**	**Desc**	**ID#**
0.0.0	*Low Level TC# 0.0.0*	*0.0.0*	*Low Level TP# 0.0.0*	*0.0.0*

Requirements Traceability Matrix

t and Test) ========== *SOI-2 (Development and Test)* ==========>>				
equirements riteria	**Source Code Object Code Executable Code**		**Executable Code Test Results Objectives: 7**	
Desc	**ID#**	**Desc**	**ID#**	**Desc**
Low Level Test Criteria # 0.0.0	*0.0.0*	*Low Level Test Results # 0.0.0*	*0.0.0*	*Low Level Test Results # 0.0.0*

Requirements Traceability Matrix

<<========== *(SOI - 1 to 3) Testing, Verification & Validation* <<===				
Executable Code Pass/Fail Results		**Integration/Deliverables Performance Tests**		**Integration/D Quality As**
ID#	**Desc**	**ID#**	**Desc**	**ID#**
0.0.0	*Low Level Test Pass/Fail # 0.0.0*	*Performance*	*WCET Tests*	*Factory Floor Regulatory Customer Environment*

Software Co

==========>> *(SOI - 1 to 3) Testing, Verification & Validation* <<==========>> *(SOI - 1 to 3) Testi*				
Deliverables ssurance	**DO-178 Table A-2: Software Development of Requirements Processes**			**DO-178 Table A-3**
Desc	**Objectives #1 to #7**	**Desc**	**Yes/No**	**Objectives #1 to #7**
Acceptance Tests	*1 - 7*	*Table A - 2: Software Development Process*		*1 - 7*

nsideration in Airborne Systen

ng, Verification & Validation << ==========>> (SOI - 1 to 3) Testing, Verification & Validation <<====

DO-178 Software De

(Coding, Testing and

: Software Verification of Requirements Processes		DO-178 Table A-4: Verification of Software Design Processes		
Desc	**Yes/No**	**Objectives #1 to #13**	**Desc**	**Yes/No**
Table A - 3: Software Development Process		*1 -13*	*Table A - 4: Software Development Process*	

ns and Equipment Certificatio

==========>> *(SOI - 1 to 3) Testing, Verification & Validation* << ==========>> *(SOI - 1 to 3) T*

evelopment Process

Verification Process)

DO-178 Table A-5: Verification of Coding & Integration Processes			DO-178 Table A-6: Results of O Integration Process	
Objectives #1 to #9	**Desc**	**Yes/No**	**Objectives #1 to #4**	**Desc**
1 -9	*Table A - 5: Software Development Process*		*1 -5*	*Table A - 6: Software Development Process*

n (SOI Audit)

esting, Verification & Validation ==========>>				========= *(SOI - 1 to*
utputs of	**DO-178 Table A-7: Results of Verification Process**			**DO-178 Quality Ass Peer/**
Yes/No	**Objectives #1 to #9**	**Desc**	**Yes/No**	**ID#**
	1 -9	*Table A - 7: Software Development Process*		*1 - 7*

Requirements Traceability Matrix

) 4) Design, Development and Testing, Verification & Validation << ==========>> (SOI - 1 to 4) Desig				
DO-178 Software Quality Assuranc				
(Software Life Cycle (SDLC) documents,and da				
surance (General) Audit Checklist for All Change Review Compliance		**DO-178 Quality Assurance (General) Audit Checklist for Static Analysis Compliance**		
Desc	**Yes/No**	**LLR ID#**	**Desc**	**Yes/No**
Table A - 2: Software Development Process		*1 - 7*	*SRD* *SDD* *RTM* *SCI* *SQA* *PR* *Deviations*	

Requirements Traceability Matrix

n, Development and Testing, Verification & Validation <<==========>> (SOI - 1 to 4) Design, Develop

ce Process

ata)

Low Level Requirements Problem Report		Low Level Requirements Change Request		DAL-A:C
PR ID#	**Desc**	**CR ID#**	**Desc**	**Objective ID#**
0.0.0	*Problem Report*	*0.0.0*	*Change Request*	*0.0.0*

Requirements Traceability M

ment and Testing, Verification & Validation <<==========>> (SOI - 1 to 4) Design, Development and T

DO-178 Software Design Assuran

(System Safety Assessment (SSA) & Functional Hazard A

atastrophic Failure Condition **Failure rate: ≤ 1x10-9** **Objectives: 71/33**		**DAL-B: Hazardous/Severe-Major Failure Condition** **Failure rate: ≤ 1x10-7** **Objectives: 69/21**		
Desc	**Yes/No**	**Objective ID#**	**Desc**	**Yes/No**
*DAL-B + (**Modified Condition/Decision Coverage - MC/DC**)*		*0.0.0*	*DAL-C + High level of testing and code coverage (**Decision Coverage**)*	

atrix Requirements Tr

esting, Verification & Validation <<==========>> (SOI - 1 to 4) Design, Development and Testing, Veri

ıce Level

nalysis (FHA)

DAL-C: Major Failure Condition **Failure rate: ≤ 1x10-5** **Objectives: 62/8**		**DAL-D: Minor Failure Conditio** **Failure rate: 1x10-5** **Objectives: 26/5**		**DAL-A:C**
Objective ID#	**Desc**	**Objective ID#**	**Desc**	**Objective ID#**
0.0.0	*DAL-D + High level of testing and code coverage (**Statement Coverag** e)*	*0.0.0*	*Basic SDLC processes + High level of testing and code coverage (**Function Coverage**)*	*0.0.0*

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fication & Validation <<==========>> (SOI - 1 to 4) Design, Development and Testing, Verification &

DO-178 COTS Design Assuranc

(System Safety Assessment (SSA) & Functional Hazard A

atastrophic Failure Condition Failure rate: ≤ 1x10-9 Objectives: 71/33		DAL-B: Hazardous/Severe-Major Failure Condition Failure rate: ≤ 1x10-7 Objectives: 69/21		
Desc	**Yes/No**	**Objective ID#**	**Desc**	**Yes/No**
*DAL-B + (**Modified Condition/Decision Coverage - MC/DC**)*		*0.0.0*	*DAL-C + High level of testing and code coverage (**Decision Coverage**)*	

ıirements Traceability Matrix

Validation <<==========>> (SOI - 1 to 4) Design, Development and Testing, Verification & Validation

e Level

nalysis (FHA)

DAL-C: Major Failure Condition **Failure rate: ≤ 1x10-5** **Objectives: 62/8**		**DAL-D: Minor Failure Condition** **Failure rate: 1x10-5** **Objectives: 26/5**		**DO-178**
Objective ID#	**Desc**	**Objective ID#**	**Desc**	**Objective ID#**
0.0.0	*DAL-D + High level of testing and code coverage (**Statement Coverag** e)*	*0.0.0*	*Basic SDLC processes + High level of testing and code coverage (**Function Coverage**)*	*0.0.0*

Requirements Traceability Matrix

ı <<==========>> <<==========>> *(SOI - 1 to 4) Design, Development and Testing, Verific*				
DO-178 SOI-4 Cer				
(SOI-1 to 3 Audit + Statemen				
3 SOI-1 Certification Process		**DO-178 SOI-2 Certification Process**		
Desc	**Yes/No**	**Objective ID#**	**Desc**	**Yes/No**
SOI-1 (Planning)		*0.0.0*	*SOI-1 (Design & Development)*	

Requirements Traceability Matrix

ation & Validation <<==========>> (SOI - 1 to 4) Design, Development and Testing, Verification & Va

tification Process

nt of Accomplishment (SAS))

DO-178 SOI-3 Certification Process			DO-178 SOI-4 Certification P	
Objective ID#	**Desc**	**Yes/No**	**Objective ID#**	**Desc**
0.0.0	*SOI-3 (Verification & Validation)*		*0.0.0*	*SOI-1 to 3 + STR SCI SQA PR SCAR SAS*

lidation ==========
rocess
Yes/No