AW DRONES

Drone standards state-of-the-art - Data collection and classification framework

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This project has received funding from European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No°824292.

- What we want to do…
- Approach
- Data Sources
- Structuring
  - Domains
  - Mapping to Requirements from the SORA
- Status of the work and way forward

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What we want to do…

Data collection and analysis 1st step

Gather standards applicable to mass market drones which are

already in use or in development

and develop a structured overview document

Support EASA and EC in the progress of a drone regulatory framework by

providing an overview of available support of regulation

show documents & standards that support current approach proposed by SORA and allow conclusions on gaps

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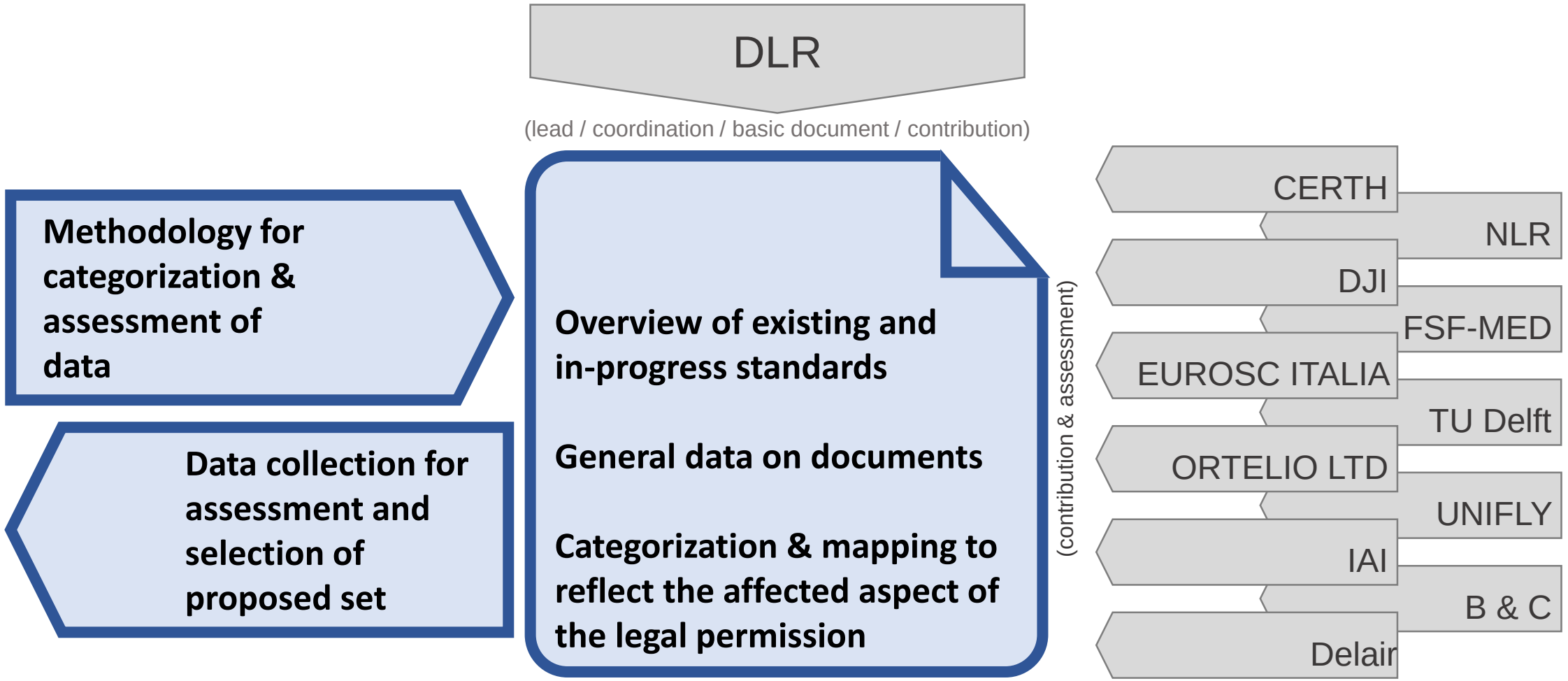
Structure of Approach



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Data Sources

Data Collection of Drone (-related) Standards

Standards Data

- ☑ EUSCG Rolling development plan
- ☑ ANSI Standardization Roadmap for Unmanned Aircraft Sytems
- ☑ ASTM UAS Roadmap
- Collection of other applicable standards (ASTM, ISO, DIN, RTCA, SAE, …)

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Structuring of Data

Data Collection of Drone (-related) Standards

General Data

Domain
Topic | Subtopic

Document Data
Type | N° | Title | Organization | Status | Description

Drone Category
Open | Spec | Cert

Mapping to SORA requirements

Standards Data

- EUSCG Rolling development plan
- ANSI Standardization Roadmap for Unmanned Aircraft Systems
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Categorization to Domains

General	Design & Airworthiness (at product level)		Avionics & Equipment	Personnel	U-Space	Operations		Oversight
Definitions	Manufacturer organization (design & production)	Maintenance	General	Remote Pilot Competence	General	General	Marking and Registration	Notified bodies and Qualified Entities
Classfication of UAS Operations	Design	Management of Continuous Airworthiness	Communication	UAS Maintenance personnel competence	E-Identification	Security (operator's responsibility)	Level of Automation/ Autonomy	
Manuals	Production	Electromagnetic Compatibility and Lightning Protection	Detect and Avoid	Additional crew members competence	Service Providers	Operator organization	RPS Service Provider	
Classification of Drones	Systems safety assessement	Software Development & Assurance	Navigation	Human Factors	Tracking	C2 Link Service Provider	Take-off/Landing zones (Urban Vertiports)	
	Electrical System	Emergency capabilities & Health monitoring	Lights	Instructors	Geo-awareness	Standard Scenarios	Ground Handling Service	
	Propulsion systems	Structures	Cyber-security	Examiners		UAS-ATM (IFR above VLL and below FL 600)	Accident/Incident investigation	
	Fuel	Flight Handling	Instruments	Assessors		Risk Assessment (Operations)		
	Noise & Environment	Perfomance	Traffic surveillance (tracking)	Training Organizations				
	Level of Automation/ Autonomy	Ground Control Station	Command and Control (C2) Link					
	Flight Control System							

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Categorization to Domains - Revised

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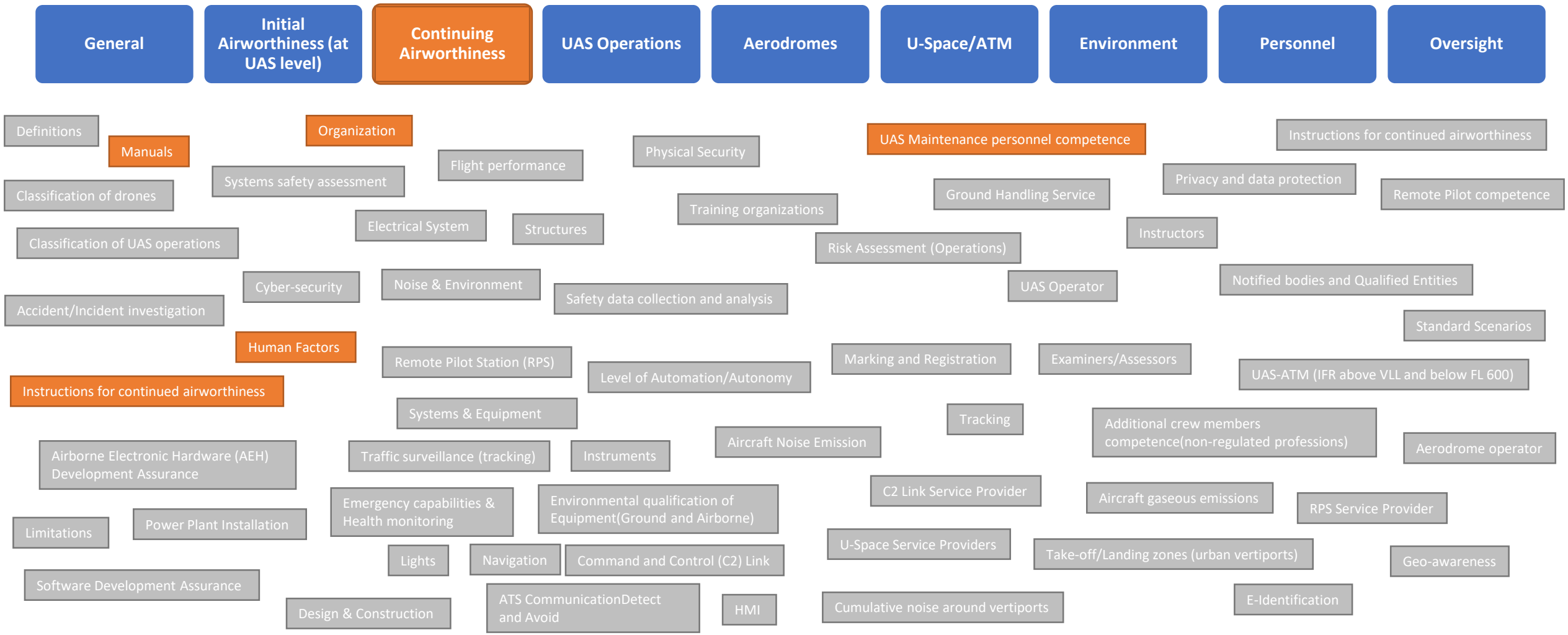
Categorization to Domains - Revised



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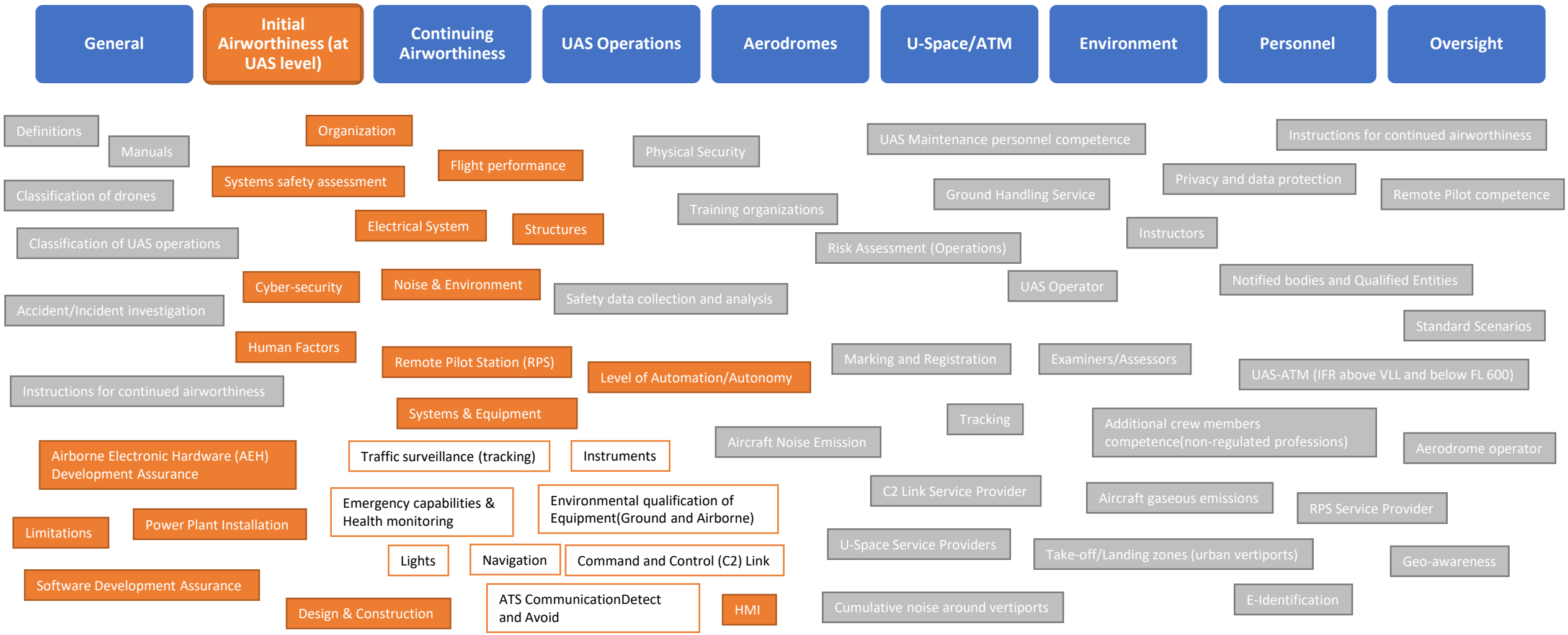
Categorization to Domains - Revised



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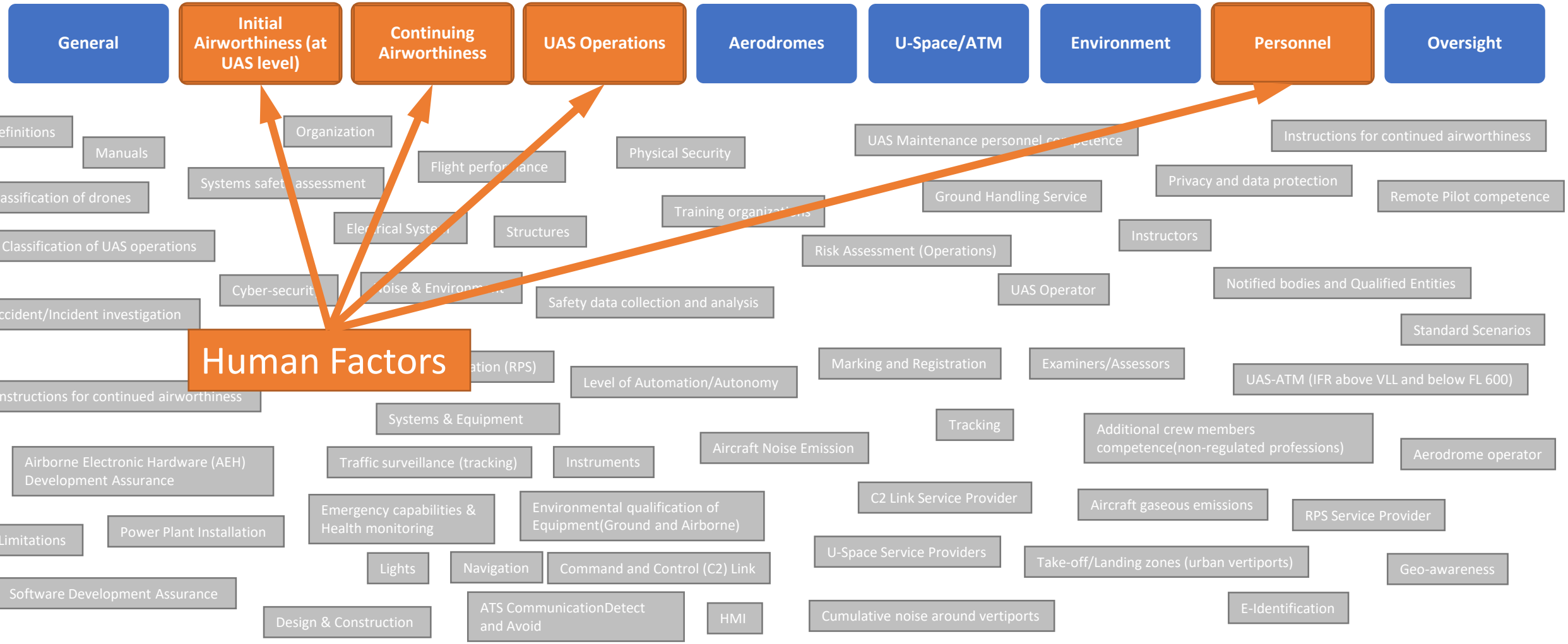
Categorization to Domains - Revised



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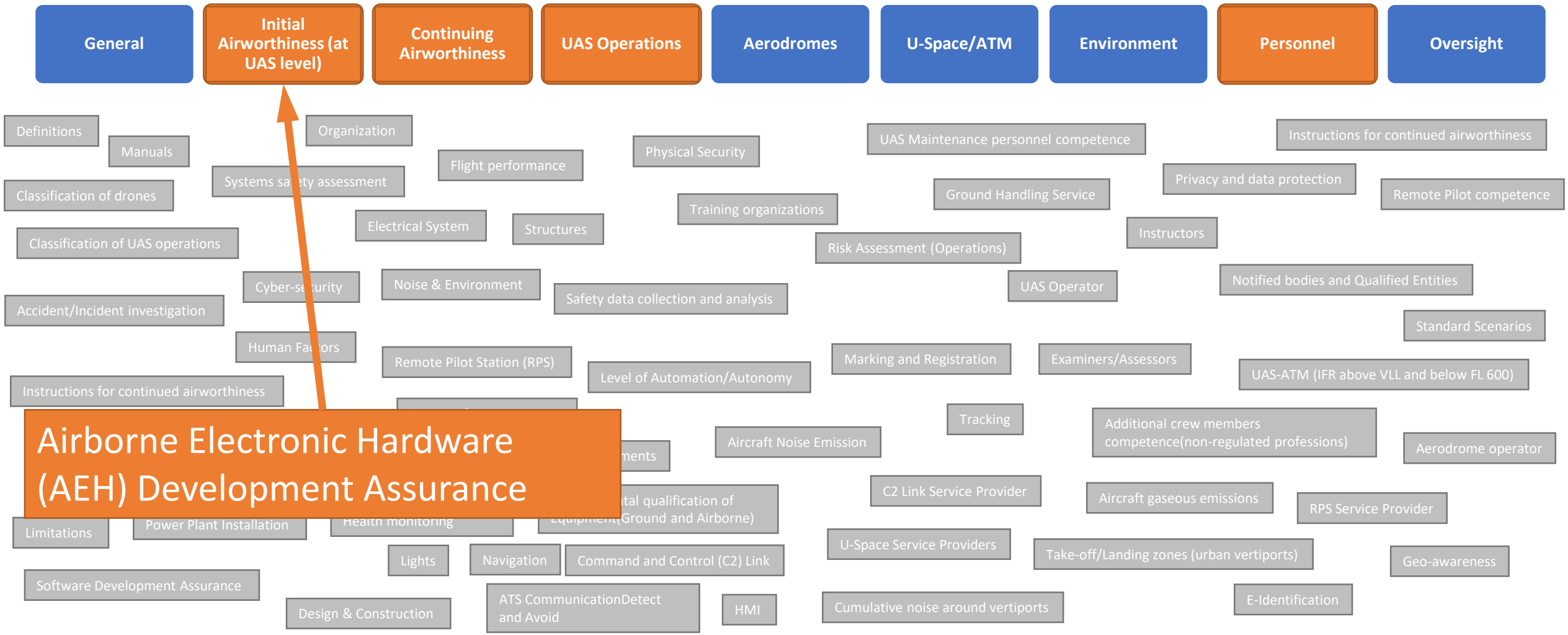
Categorization to Domains - Revised



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Structuring of Data

Data collection of drone (-related) standards

General Data

Domain
Topic | Subtopic

Document Data
Type | N° | Title | …

Drone Category
Open | Spec | Cert

Mapping to SORA requirements

Standards Data

- EUSCG Rolling development plan
- ANSI Standardization Roadmap for Unmanned Aircraft Systems
- ASTM UAS Roadmap
- Collection of other applicable standards (ASTM, ISO, DIN, RTCA, SAE, …)

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Structuring of Data

Data collection of drone (-related) standards

General Data		Drone Category	Categorization			
Domain Topic | Subtopic	**Document Data** Type | N° | Title | …	Open | Spec | Cert	**Affected OSOs** #01 … #24	**Affected GRM** M1 [1…2]| M2 | ERP	**Affected ARM** Strat | Tact	**SORA STEP #9**
Standards Data			X X X X	X X X X X X X X X	X X X X	X	

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AW DRONES

Data Collection Document

69 / 612	Domain		Type			Document					UAS Category		
N°	Domain	Subtopic	Standard/Specification	Best Practices	Information/Guidance	Document N°	Title	Organization	Status	Description	open	specific	certified
5	General	Classification of drones	X			ISO 21895	Requirements for the categorization and classification of civil UAS	ISO TC20 / SC16 / WG1	ongoing	Requirements for the categorization and classification of civil UAS. The standard	X	X	X
6	General	Definitions	X			ISO 21384-1	General requirements for UAS for civil and commercial applications, UAS terminology and classification	ISO TC20 / SC16 / WG1	ongoing	Provides the foundation and common terms, definitions and references relevant to the	X	X	X
7	General	Manuals	X			ASTM WK62744	New Practice for General Operations Manual for Professional Operator of Light Unmanned Aircraft Systems (UAS)	ASTM F38 Unmanned Aircraft Systems	onging	This standard defines the requirements for General Operations Manual for	X	X	X
20	Avionics & Equipment	Command and Control (C2) Link	X				MOPS (Terrestrial LOS)	EUROCAE WG-105	ongoing	Minimum Operational Performance Standard for the terrestrial Line of Sight	X	X	X
21	Avionics & Equipment	Command and Control (C2) Link	X				MOPS (SATCOM)	EUROCAE WG-105	ongoing	Minimum Operational Performance Standard for the satellite Command and Control	X	X	X
22	Avionics & Equipment	Command and Control (C2) Link	X				Minimum Aviation System Performance Standard for the Command and Control Link	EUROCAE WG-105	ongoing		X	X	X
51	Avionics & Equipment	Detect & Avoid	X				Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for DAA of IFR Flights in class A-C airspace.	EUROCAE WG-105	ongoing		X	X	X
52	Avionics & Equipment	Detect & Avoid	X				Minimum Operational Performance Standard (Requirements at equipment level) for DAA of IFR Flights in class A-C airspace.	EUROCAE WG-105	ongoing			X	X
53	Avionics & Equipment	Detect & Avoid	X				Operational Services and Environment Description for DAA for DAA in Class D-G airspaces under VFR/IFR	EUROCAE WG-105	ongoing		X	X	X
54	Avionics & Equipment	Detect & Avoid	X				Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for DAA against conflicting traffic for RPAS operating	EUROCAE WG-105	ongoing			X	X
55	Avionics & Equipment	Detect & Avoid	X				Minimum Operational Performance Standard (Requirements at equipment level) for DAA against conflicting traffic for RPAS operating	EUROCAE WG-105	planned			X	X
56	Avionics & Equipment	Detect & Avoid	X				OperationalServices and Environmental Description for DAA in very Low Level Operations	EUROCAE WG-105	ongoing		X	X	X
57	Avionics & Equipment	Detect & Avoid	X				Minimum Operational Performance Standard (Requirements at equipment level) for DAA at Very Low Level (VLL)	EUROCAE WG-105	planned		X	X	X
58	Avionics & Equipment	Detect & Avoid			X	STANREC 4811 Ed. 1/ AEP-. 101 Ed. A Ver.1	UAS sense and avoid	NATO FINAS	published	To detail comprehensive guidance and recommended practice for the development of	X	X	X
63	Design & Airworthiness	Level of Automation/Autonomy	X			ED-252 OSED		EUROCAE WG-105	published	Operational Services and Enironment Description for Automatic Take-Off and Landing.	X	X	X
64	Design & Airworthiness	Level of Automation/Autonomy	X			MASPS	Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for Automatic Take-Off and Landing	EUROCAE WG-105	planned		X	X	X
65	Design & Airworthiness	Level of Automation/Autonomy	X			ED-251 OSED		EUROCAE WG-105	published	Operational Services and Enironment Description for Automatic Taxiing	X	X	X
66	Design & Airworthiness	Level of Automation/Autonomy	X			MASPS	Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for Automatic Taxiing	EUROCAE WG-105	planned		X	X	X
67	Design & Airworthiness	Emergency capabilities	X			OSED		EUROCAE WG-105	ongoing	Operational Services and Enironment Description for Automation and Emergency	X	X	X
68	Design & Airworthiness	Emergency capabilities	X			MASPS	Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for automation and Emergency Recovery	EUROCAE WG-105	planned		X	X	X
97	Design & Airworthiness	Emergency capabilities	X			ASTM WK59171	New Specification for SUAS parachutes	ASTM F38 Unmanned Aircraft Systems	ongoing	Develop a draft standard that defines the requirements for a parachute system that would	X	X	X
98	Design & Airworthiness	Emergency capabilities	X			F3322-18	Standard Specification for Small Unmanned Aircraft System (sUAS) Parachutes	ASTM F38 Unmanned Aircraft Systems	Published	This specification covers the design and manufacture requirements for deployable	X	X	X
99	Design & Airworthiness	Electrical System	X			F2490-05(2013)	Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis	ASTM F39 Aircraft Systems	published	This guide covers how to prepare an electrical load analysis (ELA) to meet Federal		X	X
100	Design & Airworthiness	Management of Continuos Airworthiness	X			F2799-14	Standard Practice for Maintenance of Aircraft Electrical Wiring Systems	ASTM F39 Aircraft Systems	published	Damaged wiring or equipment in an aircraft, regardless of how minor it may appear to be,		X	X

	Affected SORA OSO																							
	Technical							Operational				Remote crew training			Safe design		Deterioration of	Human Error					Adverse Operating Conditions	
N°	#01	#02	#03	#04	#05	#06	#07	#08	#11	#14	#21	#09	#15	#22	#10	#12	#13	#16	#17	#18	#19	#20	#23	#24
5																								
6																								
7	X						X	X	X	X	X							X	X		X		X	
20				X	X	X									X	X								
21				X	X	X									X	X								
22				X	X	X									X	X								
51				X	X																			
52				X	X																			
53				X	X																			
54				X	X																			
55				X	X																			
56				X	X			X			X												X	
57				X	X			X			X												X	
58	X		X	X	X	X		X		X	X	X										X		
63				X				X	X	X	X													
64				X				X	X	X	X													
65				X				X	X	X														
66				X				X	X	X														
67				X				X	X	X	X				X	X					X			
68				X				X	X	X	X				X	X					X			
97																								
98					x										x	x								
99				x											x	x								
100			x																					

	Ground Risk Mitigations								Collision Risk (Air Risk)											SORA Step #9
	M1 (Generic)				M2 (Effects of ground impact)			ERP	Strategic Mitigation					Tactical Mitigation						
	Strategic M.		Tethered operation						Operational Restrictions			Common Structures and Rules		VLOS	BVLOS					
N°	M1 S#1	M1 S#2	M1 T#1	M1 T#2	M2 #1	M2 #2	M2 #3	M3 #1	Boundary	Chronology	Time of Exposure	Common Flight Rules	Common Airspace Structure	VLOS	Detect	Decide	Command	Execute	Feedback loop	Containment
5																				
6																				
7																				
20																	X		X	
21																	X		X	
22																	X		X	X
51															X	X	X		X	
52															X	X	X		X	
53															X	X	X		X	
54															X	X	X		X	
55															X	X	X		X	
56															X	X	X		X	
57															X	X	X		X	
58												X			X	X			X	
63													X							
64													X							
65																				
66																				
67																				X
68																				X
97																				x
98					x															x
99																				
100																				

N°	Comments	Access	Responsible	Assessed
5	No clear mapping found		EuroUSC	X
6	No clear mapping found		EuroUSC	X
7	A draft is not available. A preliminary mapping is performed.		EuroUSC	X
20	OSO #4 "This should be a standard similar to the MOPS for SATCOM with		EuroUSC	X
21	OSO #4 "Since the C2 Link is part of the UAS, then this standard provides a		EuroUSC	X
22	MASPS define requirements at system (sub-system) and not at		EuroUSC	X
51	Tactical Miitgation: Detect The DAA functionalities include		EuroUSC	X
52	TThe draft is still not available. Preliminary mapping is made taking		EuroUSC	X
53	he OSED only defines high level requirements and enviromental		EuroUSC	X
54	The draft is still not available. Preliminary mapping is made taking		EuroUSC	X
55	The draft is still not available. Preliminary mapping is made taking		EuroUSC	X
56	Tactical Mitigation:Detect : The DAA functionalities		EuroUSC	X
57	A draft is not availabe at the moment. Preliminary mapping is made		EuroUSC	X
58	Standard: “UAV emergency procedures should mirror those for		TUDelft	X
63	OSO #4:ATOL capability can be included as a core standard for certain UASs		EuroUSC	X
64	Draft not available yet. A preliminary mapping is made considering what is		EuroUSC	X
65	OSO #4: Automatic taxing capability can be included as a core		EuroUSC	X
66	No draft published. Preliminary mapping derived from the OSED.		EuroUSC	X
67	OSO #4 Emergency & Recovery functions can be included in the UAS		EuroUSC	X
68	A draft is not available yet. A preliminary mapping is made		EuroUSC	X
97	with current hypothesis, assumed to be identical to other ASTM parachute	controlled	DELAIR	x
98	OPEN: potentialy to meet 80J threshold, but not	controlled	DELAIR	x
99	OPEN: Electrical stds Not	controlled	DELAIR	x
100	OPEN: Electrical stds Not mentioned in ASD-STAN	controlled	DELAIR	x

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Data Collection Document

General Data | Category | Mapping to SORA | Editorial

69 / 612	Domain		Type			Document					UAS Category		
N°	Domain	Subtopic	Standard/Specification	Best Practices	Information/Guidance	Document N°	Title	Organization	Status	Description	open	specific	certified
5	General	Classification of drones	X			ISO 21895	Requirements for the categorization and classification of civil UAS	ISO TC20 / SC16 / WG1	ongoing	Requirements for the categorization and classification of civil UAS. The standard	X	X	X
6	General	Definitions	X			ISO 21384-1	General requirements for UAS for civil and commercial applications, UAS terminology and classification	ISO TC20 / SC16 / WG1	ongoing	Provides the foundation and common terms, definitions and references relevant to the	X	X	X
7	General	Manuals	X			ASTM WK62744	New Practice for General Operations Manual for Professional Operator of Light Unmanned Aircraft Systems (UAS)	ASTM F38 Unmanned Aircraft Systems	onging	This standard defines the requirements for General Operations Manual for	X	X	X
20	Avionics & Equipment	Command and Control (C2) Link	X				MOPS (Terrestrial LOS)	EUROCAE WG-105	ongoing	Minimum Operational Performance Standard for the terrestrial Line of Sight	X	X	X
21	Avionics & Equipment	Command and Control (C2) Link	X				MOPS (SATCOM)	EUROCAE WG-105	ongoing	Minimum Operational Performance Standard for the satellite Command and Control	X	X	X
22	Avionics & Equipment	Command and Control (C2) Link	X				Minimum Aviation System Performance Standard for the Command and Control Link	EUROCAE WG-105	ongoing		X	X	X
51	Avionics & Equipment	Detect & Avoid	X				Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for DAA of IFR Flights in class A-C airspace.	EUROCAE WG-105	ongoing		X	X	X
52	Avionics & Equipment	Detect & Avoid	X				Minimum Operational Performance Standard (Requirements at equipment level) for DAA of IFR Flights in class A-C airspace.	EUROCAE WG-105	ongoing			X	X
53	Avionics & Equipment	Detect & Avoid	X				Operational Services and Environment Description for DAA for DAA in Class D-G airspaces under VFR/IFR	EUROCAE WG-105	ongoing		X	X	X
54	Avionics & Equipment	Detect & Avoid	X				Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for DAA against conflicting traffic for RPAS operating	EUROCAE WG-105	ongoing			X	X
55	Avionics & Equipment	Detect & Avoid	X				Minimum Operational Performance Standard (Requirements at equipment level) for DAA against conflicting traffic for RPAS operating	EUROCAE WG-105	planned			X	X
56	Avionics & Equipment	Detect & Avoid	X				OperationalServices and Environmental Description for DAA in very Low Level Operations	EUROCAE WG-105	ongoing		X	X	X
57	Avionics & Equipment	Detect & Avoid	X				Minimum Operational Performance Standard (Requirements at equipment level) for DAA at Very Low Level (VLL)	EUROCAE WG-105	planned		X	X	X
58	Avionics & Equipment	Detect & Avoid			X	STANREC 4811 Ed. 1/ AEP-. 101 Ed. A Ver.1	UAS sense and avoid	NATO FINAS	published	To detail comprehensive guidance and recommended practice for the development of	X	X	X
63	Design & Airworthiness	Level of Automation/Autonomy	X			ED-252 OSED		EUROCAE WG-105	published	Operational Services and Enironment Description for Automatic Take-Off and Landing.	X	X	X
64	Design & Airworthiness	Level of Automation/Autonomy	X			MASPS	Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for Automatic Take-Off and Landing	EUROCAE WG-105	planned		X	X	X
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67	Design & Airworthiness	Emergency capabilities	X			OSED		EUROCAE WG-105	ongoing	Operational Services and Enironment Description for Automation and Emergency	X	X	X
68	Design & Airworthiness	Emergency capabilities	X			MASPS	Minimum Aviation System Performance Standard (End-to-end Requirements at system level) for automation and Emergency Recovery	EUROCAE WG-105	planned		X	X	X
97	Design & Airworthiness	Emergency capabilities	X			ASTM WK59171	New Specification for SUAS parachutes	ASTM F38 Unmanned Aircraft Systems	ongoing	Develop a draft standard that defines the requirements for a parachute system that would	X	X	X
98	Design & Airworthiness	Emergency capabilities	X			F3322-18	Standard Specification for Small Unmanned Aircraft System (sUAS) Parachutes	ASTM F38 Unmanned Aircraft Systems	Published	This specification covers the design and manufacture requirements for deployable	X	X	X
99	Design & Airworthiness	Electrical System	X			F2490-05(2013)	Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis	ASTM F39 Aircraft Systems	published	This guide covers how to prepare an electrical load analysis (ELA) to meet Federal		X	X
100	Design & Airworthiness	Management of Continuos Airworthiness	X			F2799-14	Standard Practice for Maintenance of Aircraft Electrical Wiring Systems	ASTM F39 Aircraft Systems	published	Damaged wiring or equipment in an aircraft, regardless of how minor it may appear to be		X	X

	Affected SORA OSO																							
	Technical							Operational				Remote crew training			Safe design		Deterioration of ...	Human Error					Adverse Operating Conditions	
N°	#01	#02	#03	#04	#05	#06	#07	#08	#11	#14	#21	#09	#15	#22	#10	#12	#13	#16	#17	#18	#19	#20	#23	#24
5																								
6																								
7	X						X	X	X	X	X							X	X		X		X	
20				X	X	X									X	X								
21				X	X	X									X	X								
22				X	X	X									X	X								
51				X	X																			
52				X	X																			
53				X	X																			
54				X	X																			
55				X	X																			
56				X	X			X			X												X	
57				X	X			X			X												X	
58	X		X	X	X	X		X		X	X	X										X		
63				X				X	X	X	X													
64				X				X	X	X	X													
65				X				X	X	X														
66				X				X	X	X														
67				X				X	X	X	X				X	X					X			
68				X				X	X	X	X				X	X					X			
97																								
98					x										x	x								
99				x											x	x								
100			x																					

	Ground Risk Mitigations								Collision Risk (Air Risk)											SORA Step #9
	M1 (Generic)				M2 (Effects of ground impact)			ERP	Strategic Mitigation					Tactical Mitigation						
	Strategic M.		Tethered operation						Operational Restrictions			Common Structures and Rules		VLOS	BVLOS					
N°	M1 S#1	M1 S#2	M1 T#1	M1 T#2	M2 #1	M2 #2	M2 #3	M3 #1	Boundary	Chronology	Time of Exposure	Common Flight Rules	Common Airspace Structure	VLOS	Detect	Decide	Command	Execute	Feedback loop	Containment
5																				
6																				
7																				
20																	X		X	
21																	X		X	
22																	X		X	X
51															X	X	X		X	
52															X	X	X		X	
53															X	X	X		X	
54															X	X	X		X	
55															X	X	X		X	
56															X	X	X		X	
57															X	X	X		X	
58												X			X	X			X	
63													X							
64													X							
65																				
66																				
67																				X
68																				X
97																				x
98					x															x
99																				
100																				

N°	Comments	Access	Responsible	Assessed
5	No clear mapping found		EuroUSC	X
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21	OSO #4 "Since the C2 Link is part of the UAS, then this standard provides a		EuroUSC	X
22	MASPS define requirements at system (sub-system) and not at		EuroUSC	X
51	Tactical Miitgation: Detect The DAA functionalities include		EuroUSC	X
52	TThe draft is still not available. Preliminary mapping is made taking		EuroUSC	X
53	he OSED only defines high level requirements and enviromental		EuroUSC	X
54	The draft is still not available. Preliminary mapping is made taking		EuroUSC	X
55	The draft is still not available. Preliminary mapping is made taking		EuroUSC	X
56	Tactical Mitigation:Detect : The DAA functionalities		EuroUSC	X
57	A draft is not availabe at the moment. Preliminary mapping is made		EuroUSC	X
58	Standard: "UAV emergency procedures should mirror those for		TUDelft	X
63	OSO #4:ATOL capability can be included as a core standard for certain UASs		EuroUSC	X
64	Draft not available yet. A preliminary mapping is made considering what is		EuroUSC	X
65	OSO #4: Automatic taxing capability can be included as a core		EuroUSC	X
66	No draft published. Preliminary mapping derived from the OSED.		EuroUSC	X
67	OSO #4 Emergency & Recovery functions can be included in the UAS		EuroUSC	X
68	A draft is not available yet. A preliminary mapping is made		EuroUSC	X
97	with current hypothesis, assumed to be identical to other ASTM parachute	controlled	DELAIR	x
98	OPEN: potentialy to meet 80J threshold, but not	controlled	DELAIR	x
99	OPEN: Electrical stds Not	controlled	DELAIR	x
100	OPEN: Electrical stds Not mentioned in ASD-STAN	controlled	DELAIR	x

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Data Collection Document – Example

General Data		Category	Mapping to SORA	Editorial
F3330 - 18	Standard Specification for Training and the Development of Training Manuals for the UAS Operator	ASTM	published	1.1 This specification defines the requirements for training and the development of training manuals for the unmanned aircraft systems (UAS) operator. …

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Data Collection Document – Example

General Data	Category	Mapping to SORA	Editorial

F3330 - 18	Standard Specification for Training and the Development of Training Manuals for the UAS Operator	ASTM

Domain	
Domain	Subtopic
Personnel	Remote Pilot competence

UAS Category		
open	specific	certified
	X	X

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Data Collection Document – Example

F3330 - 18	Standard Specification for Training and the Development of Training Manuals for the UAS Operator	ASTM

Affected SORA OSO																							
Technical							Operational				Remote crew training			Safe design		Deterioration of external systems supporting UAS operation	Human Error					Adverse Operating Conditions	
#01	#02	#03	#04	#05	#06	#07	#08	#11	#14	#21	#09	#15	#22	#10	#12	#13	#16	#17	#18	#19	#20	#23	#24
Ensure the operator is competent and/or proven	UAS manufactured by competent and/or proven entity	UAS maintained by competent and/or proven entity	UAS developed to authority recognized design standards	UAS is designed considering system safety and reliability	C3 link characteristics (e.g. performance, spectrum use) are appropriate for the operation	Inspection of the UAS (product inspection) to ensure consistency to the ConOps	Operational procedures are defined, validated and adhered to (to address technical issues with the UAS)	Procedures are in-place to handle the deterioration of external systems supporting UAS operation	Operational procedures are defined, validated and adhered to (to adress human errors)	Operational procedures are defined, validated and adhered to (to address Adverse Operating Conditions)	Remote crew trained and current and able to control the abnormal and emergency situations (i.e. Technical issue with the UAS)	Remote crew trained and current and able to control the abnormal and emergency situations (i.e. Human Error)	The remote crew is trained to identify critical environmental conditions and to avoid them	Safe recovery from technical issue	The UAS is designed to manage the deterioration of external systems supporting UAS operation	External services supporting UAS operations are adequate to the operation	Multi crew coordination	Remote crew is fit to operate	Automatic protection of the flight envelope from human errors	Safe recovery from Human Error A Human Factors evaluation has been performed and the Human-Machine Interface (HMI) found appropriate for the mission	Environmental conditions for safe operations defined, measurable and adhered to	UAS designed and qualified for adverse environmental conditions (e.g. adequate sensors, DO-160 qualification)
						X					X	X	X				X			X		X	

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F3330 - 18	Standard Specification for Training and the Development of Training Manuals for the UAS Operator	ASTM

a Collection Document – Example

Ground Risk Mitigations								Collision Risk (Air Risk)												SORA Step #9
M1 (Generic)				M2 (Effects of ground impact)			ERP	Strategic Mitigation					Tactical Mitigation							
Strategic M.		Tethered operation						Operational Restrictions			Common Structures and Rules		VLOS	BVLOS						
M1 S#1	M1 S#2	M1 T#1	M1 T#2	M2 #1	M2 #2	M2 #3	M3 #1	Boundary	Chronology	Time of Exposure	Common Flight Rules	Common Airspace Structure	VLOS	Detect	Decide	Command	Execute	Feedback loop	Containment
Definition of the ground risk buffer	Evaluation of people at risk	Technical Desgin of tether	Procedures for tether installation & control	Technical Design for ground impact	Procedures for equipment installation	Training for ground impact measures	Emergency Response Plan	Mitigations that bound the geographical volume in which the UAS operates	Mitigations that bound the operational time frame	Mitigations that bound the time of exposure	Mitigations by setting a common set of rules which [illegible]	Mitigations by [illegible] airspace through, physical characteristics, procedures, and techniques	Tactical mitigation with the remaining well clear and avoiding collisions [illegible]	precision for the avoidance manoeuvre (ARC-a to ARC-d)	Define Decide with adequate precision for the avoidance manoeuvre (ARC-a to ARC-d)	precision for the avoidance manoeuvre (ARC-a to ARC-d)	precision for the avoidance manoeuvre (ARC-a to ARC-d)	adequate precision for the avoidance manoeuvre (ARC-a to ARC-d)	requirements for adjacent airspace and area considered
						X														

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Data Collection Document – Example

		ry	Mapping to SORA	Editorial
F3330 - 18	Standard Specification for Training and the Development of Training Manuals for the UAS Operator	ASTM		

Comments	Access	Responsible	Assessed
This specification defines the requirements for training and the development of training manuals for the unmanned aircraft systems (UAS) operator. The standard includes requirements or best practices, or both, for documentation and organization of a professional operator (that is, for compensation and hire) for the purposes of internal training programs. The standard may cover the development of a training syllabus that includes Multi Crew coordination	controlled	DBL	**X**

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Current Status

Status

Currently >600 documents in the table

~50% of documents mapped

Feedback from partners & EASA experts

Progress

Data collection

Data mapping to SORA

Adaption to new proposed Domain system

Data assessment (first step)

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Thank you!

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