

ISO 21384-2:2021-12 (E)

Unmanned aircraft systems - Part 2: UAS components

Contents		Page
	Foreword	vii
	Introduction	viii
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Abbreviated terms	2
5	General design requirements for UAS	4
5.1	General.....	4
5.2	Function and reliability.....	4
5.2.1	Design.....	4
5.2.2	Components.....	5
5.3	Maintainability and supportability.....	5
5.3.1	Design.....	5
5.3.2	Documentation.....	5
5.3.3	Support.....	6
5.4	Fatigue durability.....	6
5.5	Aircraft identification features.....	6
5.6	Transportation, storage and packaging.....	6
6	Aircraft structures	7
6.1	Overview.....	7
6.2	Damage tolerance assessment.....	7
6.3	UA construction.....	7
6.4	Moving parts.....	8
6.5	Attached parts.....	8
7	Propulsion	8
7.1	Propulsion risk management.....	8
7.2	Engines and motors.....	8
7.2.1	General requirements.....	8
7.2.2	Mounting and installation.....	8
7.2.3	Combustion engines.....	9
7.2.4	Electric motors.....	9
7.2.5	Electronic speed controller (ESC) requirements.....	9
7.3	Thrust mechanisms.....	9
7.3.1	Propellers and rotors.....	9
7.3.2	Turbine and fans.....	10
8	Electrical systems	10
8.1	General.....	10
8.2	Electrical safety.....	10
8.3	Airborne electrical systems.....	10
8.4	Ground electrical systems.....	10
8.4.1	UAS electrical components on the ground.....	10
8.4.2	RPS power system.....	11
8.4.3	Labelling.....	11
9	Energy sources	11
9.1	Batteries.....	11

9.1.1	General	11
9.1.2	Protective measures	11
9.1.3	Precautions	11
9.2	Combustible fuels	11
9.3	Fuel cells	12
9.3.1	General requirements	12
9.3.2	General safety requirements	12
9.3.3	Protective measures	12
10	Equipment	12
10.1	Avionic equipment (general)	12
10.2	Flight control system (FCS)	13
10.2.1	General requirement	13
10.2.2	Flight control hardware	13
10.2.3	Flight control software	14
10.2.4	Course accuracy	14
10.2.5	Airspeed	14
10.3	Flight control actuators	15
10.4	Diagnostics	15
10.5	Navigation systems	15
10.5.1	General	15
10.5.2	Global Navigation Satellite System (GNSS) receiver	15
10.5.3	Real time kinematic (RTK) augmentation	15
10.5.4	Inertial measurement unit (IMU)	16
10.5.5	Magnetic compass	16
10.6	Attitude sensors	16
10.6.1	Altimeter	16
10.6.2	Airspeed sensor	16
10.6.3	Optical sensor	17
10.7	Hardware and software redundancy	17
10.8	Failure modes	17
11	C2 Link	18
11.1	Performance and design	18
11.2	Antenna module design	18
11.3	Operations	18
11.4	Monitoring	19
11.5	Protocol	19
11.6	Data features	19
11.6.1	General	19
11.6.2	UA status data	19
11.6.3	Delay requirements	19
11.7	Reliability requirements	19
11.8	Security requirements	20
12	Remote pilot station	20
12.1	General	20
12.2	Features	20
12.2.1	General	20
12.2.2	Data monitoring systems requirements	20
12.3	Design requirements	20
12.3.1	System	20
12.3.2	Structure	21
12.3.3	Human factors engineering and ergonomics design	21
12.4	Functional requirements	21
12.4.1	Mission planning	21
12.4.2	Data link control	21
12.4.3	Flight Control Commands	21
12.5	Displays	22
12.5.1	Instrumentation	22
12.5.2	Readability	22
12.5.3	Accuracy	22
12.5.4	Warnings, cautions, and advisories	22
12.5.5	Display/interface failures	22
12.5.6	Track and parameter display	23
12.5.7	C2 Link status display	23

12.5.8	Telemetry parameter record.....	23
12.6	Performance requirements.....	23
12.6.1	Environmental adaptability.....	23
12.6.2	Reliability.....	24
12.7	Safety.....	24
12.8	Collision avoidance (CA) systems.....	24
13	Payload.....	24
13.1	General requirements.....	24
13.2	Safety marking.....	25
13.3	Wiring design.....	25
13.4	Payload power supply.....	25
13.5	Storage requirement.....	25
14	Airworthiness.....	25
14.1	Documentation.....	25
14.1.1	Instructions.....	25
14.1.2	Manuals and handbooks.....	25
14.1.3	Procedural changes.....	26
14.2	Composition of an operator’s manual.....	26
14.2.1	Technical specifications.....	26
14.2.2	Flight performance.....	26
14.2.3	Aircraft weights.....	26
14.2.4	Flight control accuracy.....	26
14.2.5	Dimensions.....	27
14.2.6	Atmospheric and other environments adaptability.....	27
14.3	Electromagnetic compatibility considerations.....	27
14.4	Noise.....	27
14.5	Built-in test and monitoring.....	27
14.6	System safety program.....	28
14.6.1	Selection of design materials.....	28
14.6.2	Properties and processes.....	28
14.6.3	Mass properties.....	28
14.6.4	Corrosion.....	29
14.6.5	Material limitations.....	29
14.6.6	Fire hazards.....	29
14.6.7	Equipment separation.....	29
15	UAS software.....	29
15.1	Software architecture and design.....	29
15.2	Safety.....	30
15.3	Security.....	30
15.4	Software compliance.....	30
15.5	Software development life cycle.....	30
16	Other considerations.....	30
16.1	Ground equipment.....	30
16.2	Multi vehicle control.....	31
16.3	Jamming and spoofing.....	31
17	Automation.....	31
17.1	General.....	31
17.2	Software development lifecycle.....	31
17.3	Remote pilot intervention.....	32
17.4	System data collection.....	32
17.5	Automation risk assessment.....	32
17.6	Automation system architecture.....	32
	Annex A (informative) Software risk management.....	33
	Annex B (informative) Electromagnetic environmental effects (E3).....	36
	Bibliography.....	38