AW DRONES

AW-Drones: Project Outcomes

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

Introduction: 3 Iterations

- Year 1: Standards required to support effectively the Specific Operations Risk Assessment (**SORA**) methodology
- Year 2: Standards supporting the development of **U-Space** in Europe (+ 2nd iteration of SORA)
- Year 3: Standards needed to support **SC Light UAS** (+ 3rd iteration of SORA and 2nd iteration on U-Space)

Iterative approach throughout the project duration

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Methodology for the assessment of the standards

The methodology for the assessment of the standards comprises **different cases:**

- **CASE 1: Assessment of standards potentially suitable to comply with a given requirement (e.g. SORA OSO, U-space service, SC requirement)**
- **CASE 2: Assessment of the gaps (i.e. requirements not covered)**

- Multi Criteria Analysis to address each **CASE**

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CASE 1

➢ CASE 1: Assessment of standards **potentially** suitable to comply with a given requirement

Criterion	Weight
Effectiveness to fulfill requirement*	3
Maturity	1
Type of standard	1
Cost of compliance	2
Environmental impact	1
Impact on EU industry competitiveness	1

Scoring system **example**

Item	-2	-1	0	1	2
Maturity	Draft	INT Consult.	EXT Consult.	Pub.	Recommended

* Effectiveness to fulfill SORA req. removed in final iteration

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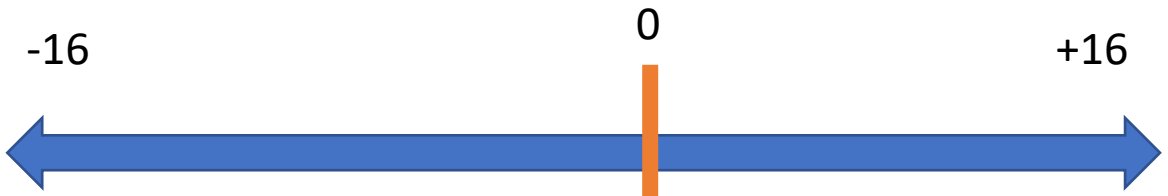
CASE 2

➢ CASE 2: assessment of **gaps** related to a given requirement

Criterion	Weight
Safety (or other reference KPA)	3
Cost of compliance (to the requirement)	2
Environment	1
Impact on EU competitiveness	1
Social acceptance	1

Same principle as CASE 1



i. Identify applicable standards from manned aviation regulations or other industry segments (e.g. automotive); or

ii. Recommend the development of a suitable standard

Impact of gap negligible = no action recommended

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Example: SORA

OSO #09, 15, 22: Remote Crew Training

REMOTE CREW COMPETENCIES		Level of integrity		
		Low	Medium	High
OSO #09, OSO #15 and OSO #22	Criteria	The competency-based, theoretical and practical training is adequate for the operation[1] and ensures knowledge of: (a) the UAS Regulation; (b) airspace operating principles; (c) airmanship and aviation safety; (d) human performance limitations; (e) meteorology; (f) navigation/charts; (g) the UAS; and (h) operating procedures.		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		

REMOTE CREW COMPETENCIES		Level of assurance		
		Low	Medium	High
OSO #09, OSO #15 and OSO #22	Criteria	Training is self-declared (with evidence available).	(a) Training syllabus is available. (b) The UAS operator provides competency-based, theoretical and practical training.	A competent third party: (a) validates the training syllabus; and (b) verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

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Example: SORA assessment

OSO #09, 15, 22: Remote Crew Training

Standard	Coverage	Gaps	Score
ISO 23665 - Unmanned aircraft systems -Training for personnel involved in UAS operations	Partial	• Lack of standards covering training requirements for personnel, other than remote pilot, in charge of duties essential to the management of the flight (semi-regulated professions; e.g. Visual Observer) • Lack of standards covering training requirements for non-regulated professions (e.g. supporting personnel, payload operator, flight dispatcher etc.) • ISO 23665 (current version) only covers VLOS.	**8**
JARUS Recommendations for RPC	Partial		**8**

OSO completely covered for the Remote Pilot.
The first identified gap has graver implications on safety, hence it is recommended to take action to cover it.

Requirement

Standards identified and assessed

Conclusions

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Highlights: SORA

- Most SORA requirements are at least partially covered by published standards, except:
  - OSO#13 - External services supporting UAS operations
  - OSO#18 - Automatic protection of the flight envelope from human errors
  - OSO #16 – Multi-crew Coordination
- Some requirements are fully covered, but with **limitations** (e.g. limited MTOM/configuration)
- Roughly 40 gaps identified
- Some gaps solved by AMCs in new EASA NPA of 09/2021, e.g.:
  - Emergency Response Plan
  - OSO #08, 11, 14, 21 – Operational Procedures
  - Assurance criteria on operational procedures of:
    - M1 – Strategic Mitigations for Ground Risk
    - M2 – Effects of Ground Impact are Reduced
    - OSO #16 – Multi-crew Coordination
    - OSO #19 – Safe Recovery from Human Error
    - OSO #23 – Adverse Operating Conditions

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U-space regulatory framework

- Assessment of standards related to the following U-space services:
  - Network ID
  - Geo-Awareness
  - Flight Authorisation
  - Traffic Information
  - Weather Info*
  - Conformance Monitoring*

U-space services in Commission Implementing Regulation 2021/664

Standards assessed vs. U-space services analogously to SORA objectives

*** services seen as optional services but may be obligatory if deemed necessary by a Member State**

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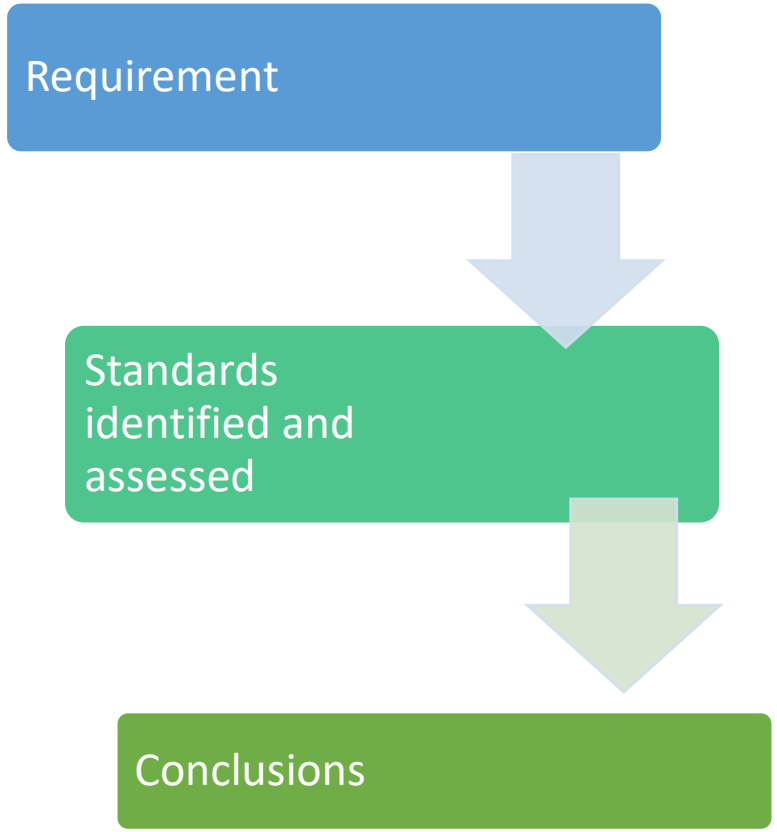
Example: U-space assessment

Network identification service

A network identification service shall allow the continuous processing of the remote identification of the UAS throughout the whole duration of the flight and shall provide the remote identification of the UAS to authorised users in an aggregated manner.

Standard	Coverage	Gaps	Score
ASTM F3411-19 UAS Remote ID and Tracking	Partial	• Compliant with draft U-space regulations: partially, but gaps are being addressed in ASTM's current revision.	**10**
ASD-STAN prEN 4709-002 Aerospace series - Unmanned Aircraft Systems - Direct Remote identification	Partial	• Direct Remote Identification covered, not Network Identification Service	**8**

While the requirement is not fully covered, ASTM is working with EUROCAE to address a global standard for NIS. This effort is coordinated by ISO TC 20 SC 16, which is developing a global standard on remote identification of unmanned aircraft (i.e. 23629-8).



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Highlights: U-space

- All services only partially covered.
  - Selected standards only fit very particular parts of a service e.g ED-269 as data format for geozones as part of the geo-awareness service
- Most standards have not been published yet
- EUROCAE, ISO, ASTM and ASD-STAN are actively working on the development of new standards covering U-space services.

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Example: SC Light-UAS assessment

Light-UAS.2625 Instructions for Continued Airworthiness (ICA)

Standard	SAIL	Coverage	Gaps	Score
F2909-19 Standard Practice for Maintenance and Continued Airworthiness of Small Unmanned Aircraft Systems (sUAS)	III and IV	Full	In principle it is only applicable to UAS with MTOM up to 25kg, but applicability can be extended if approved by NAA	**6**
F3366-19 Standard Specification for General Maintenance Manual (GMM) for a small Unmanned Aircraft System (sUAS)	III and IV	Supporting standard for the above covering Maintenace Manuals	In principle it is only applicable to UAS with MTOM up to 25kg, but applicability can be extended if approved by NAA	**6**

Requirement adequately covered. Applicability of identified standards to be further assessed from a technical point of view

Requirement

Standards identified and assessed

Conclusions

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Highlights: SC Light-UAS

- Availability of standards to cover the requirements is mostly aligned with the corresponding SORA OSOs and mitigations
- ASTM F3298 − 19 Standard Specification for Design, Construction, and Verification of Lightweight Unmanned Aircraft Systems can be the baseline complemented by specific standards to cover the individual requirements, e.g.
  - ED-280 Guidelines for UAS safety analysis for the Specific category for Light.UAS.2510
  - ASTM F3002 – 14 Standard Specification for Design of the Command and Control System for Small Unmanned Aircraft Systems (sUAS) for Light.UAS.2575
- Main gaps related to:
  - Subpart C – Structures: Test load and targets to be defined
  - Subpart E – Lift/Thrust/Power System: lack of standard for engines design
  - Subpart F – Equipment: lack of standards for environmental protection of the GCS

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Conclusions

- The final deliverable with conclusions will be submitted by mid-December
- Portal online at https://standards.aw-drones.eu/
- User interface to be further developed
- Some AW-Drones partners are committed to keep the portal running after the end of the project

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Thank you for your attention

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Back-up

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Example: OSO #09/15/22 Remote Crew Training

OSO #09, 15, 22: Standards' Assessment

SDO	#	Title	Maturity	Type of standard	Cost of Compliance	Environmental Impact	Impact on EU Industry competitiveness	Score
ISO	23665	Unmanned aircraft systems -Training for personnel involved in UAS operations	Published (+2)	Standard specification (+2)	Low (+2)	Positive (+2)	Neutral (0)	**8**
JARUS	GM to JARUS-RPC A/B	JARUS Recommendations for RPC	Published (+2)	Standard specification (+2)	Medium (0)	Positive (+2)	Very Positive (+2)	**8**

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Example: OSO #09/15/22 Remote Crew Training

OSO #09, 15, 22: Gaps' Assessment

Gap	Safety	Cost of compliance	Environmental Impact	Impact on EU Industry	Social Acceptance	Score
Lack of standards covering training requirements for personnel, other than remote pilot, in charge of duties essential to the management of the flight (semi-regulated professions; e.g. Visual Observer)	High (-3)	High (-2)	None (0)	Negative (-1)	Negative (-1)	**-7**
Lack of standards covering training requirements for non-regulated professions (e.g. supporting personnel, payload operator, flight dispatcher etc.)	Low (+3)	Very Low (+4)	None (0)	Negative (-1)	None (0)	**+6**

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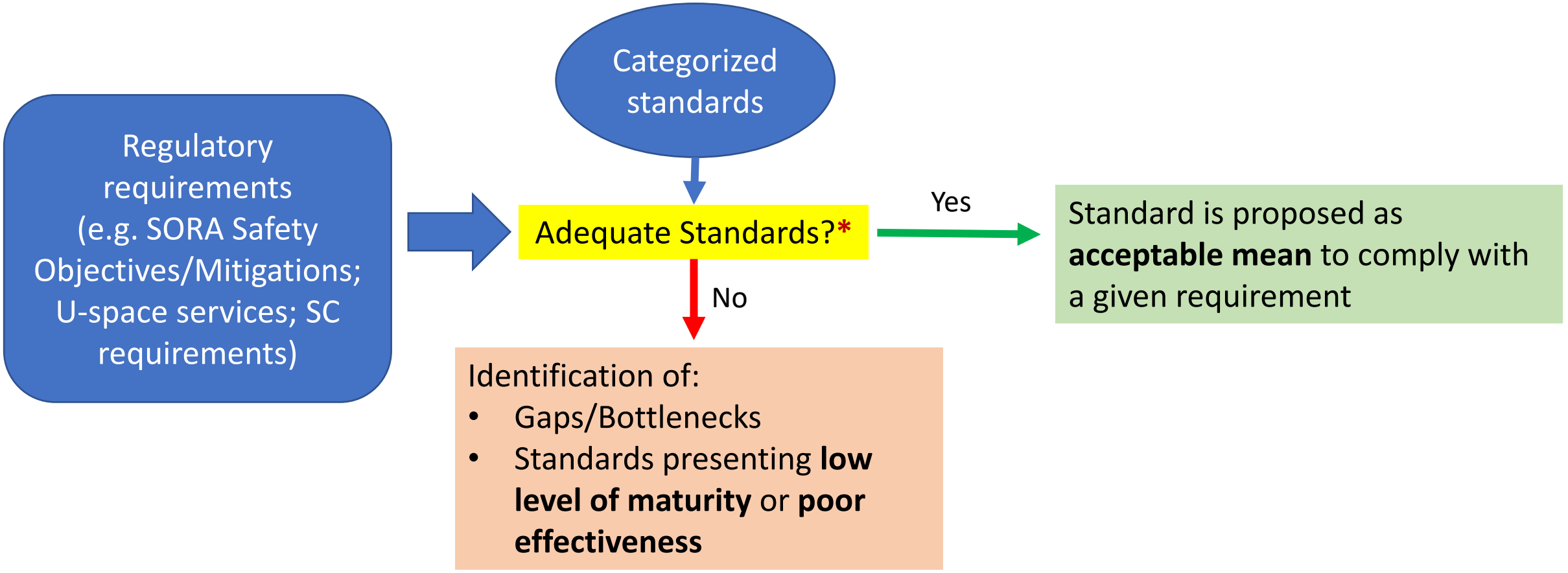
Methodology - Developing a “meta” standard



*** Results of Multi-Criteria Analysis**

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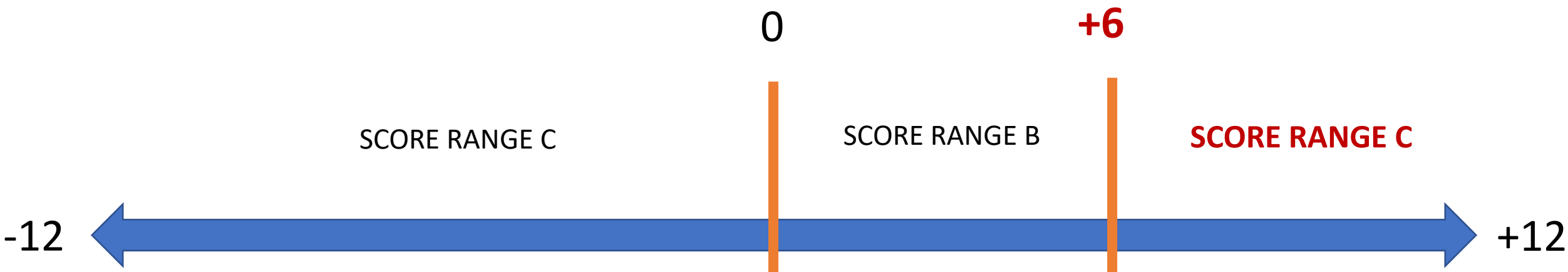
CONCLUSIONS FOR CASE 1



i. Identify possible applicable standards from other industry segments (e.g. automotive); or
ii. Recommend the amendment of the standard

standard listed as possibly **acceptable mean** to comply with the requirement **on a case-by-case basis**

Standard is proposed as **preferred acceptable means** to comply with the requirement

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