CORUS five

2nd WS – ConOps definition Societal & Economy

Cristina Barrado (UPC), CORUS five

1-3 October 2025, Cork, Ireland

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Innovative & Urban Air Mobility

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Benefits

€ Positive economic impact with creation of 90,000 jobs by 2030

EU as a market leader with 31% of the global market (€ 4.2 bn total market size €

Safer mobility: lower risk to be involved in a fatal accident in an air taxi vs. road transport

Faster mobility: 15 to 40 minutes saved on average on a standard city travel time and more than 70% time savings for emergency / medical delivery

Cleaner mobility: no local CO2 emissions for electric propulsion

safe fast clean

Challenges

- Safety and security
- Noise and environmental impact
- Integration into the city and local transport network
- Affordability
- Involvement of local authorities
- Public acceptance

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Objectives of CORUS five:

Obj3 - Public acceptance.

Describe an enhanced method for **evaluating public acceptance** related to U-space implementation.

Obj4 - Stakeholders acceptance: Economy !!

(...) ensure solutions and concept elements are acceptable for all stakeholders. I.e: economic aspects such as **fairness** issues, **charging** schemes, **funding** mechanisms, etc.

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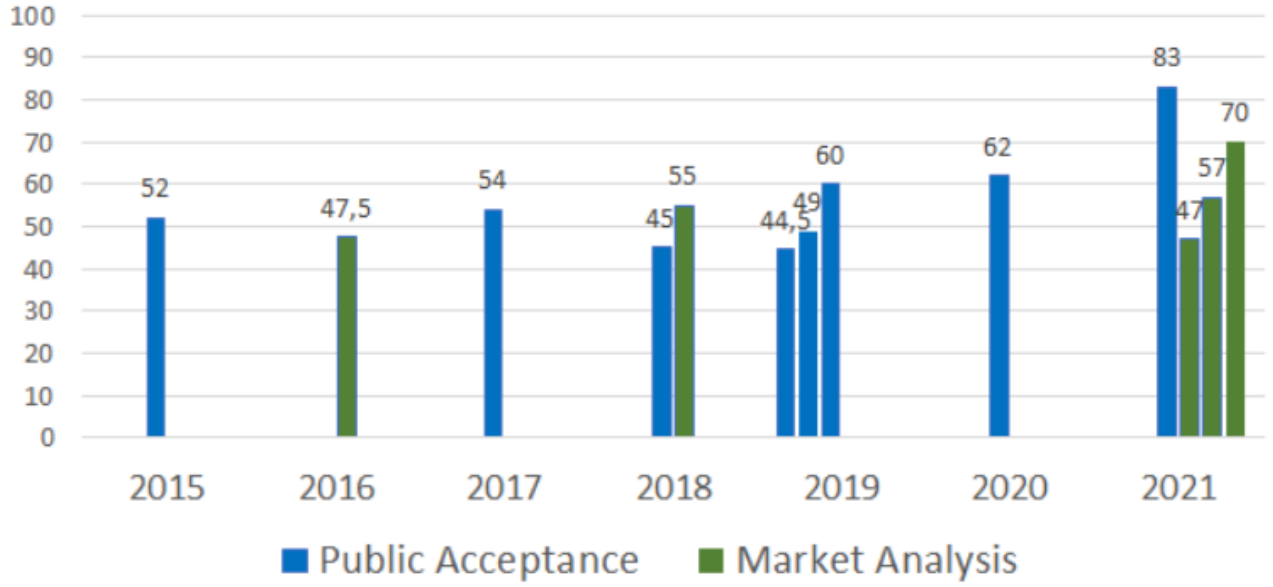
Surveys on acceptance

Address both: public & market



New surveys :

AiRMOUR'22,
TINDAIR'22,
Stolz-22,
Gohar'24,
Oksman'24,
ALG'25,
ÉALÚ-AER,
etc...

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- Common **conclusions** from surveys
  - Acceptance is good
    - Benefits : faster, cleaner, extended connectivity
  - Variables are :
    - Costs : affordable to all
    - Mission type : public, emergency
    - Demographics : young, male, tech
  - Concerns
    - Safety, Noise/Environment, Privacy/Security, Liability

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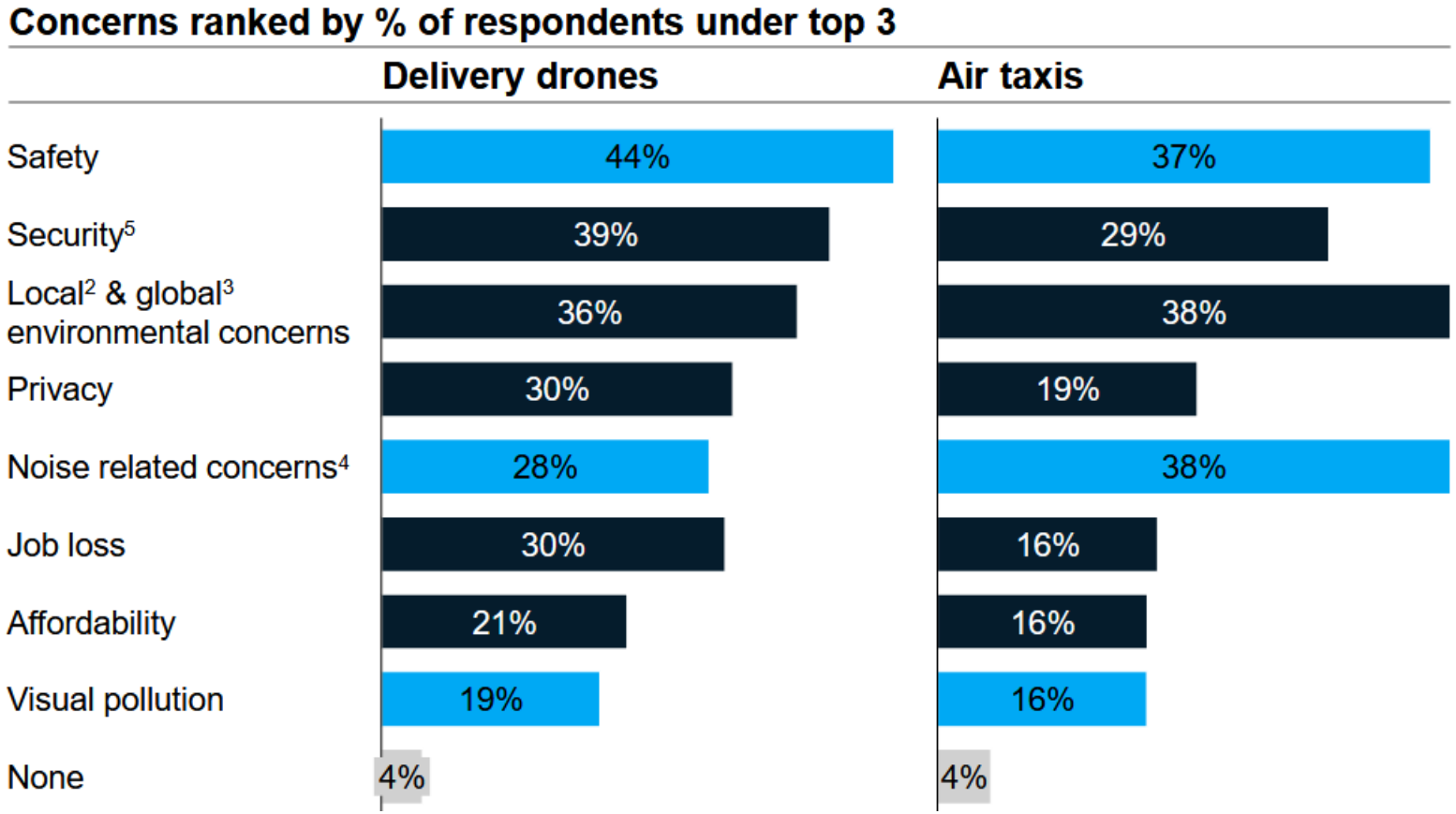
- Concerns on **EASA** survey



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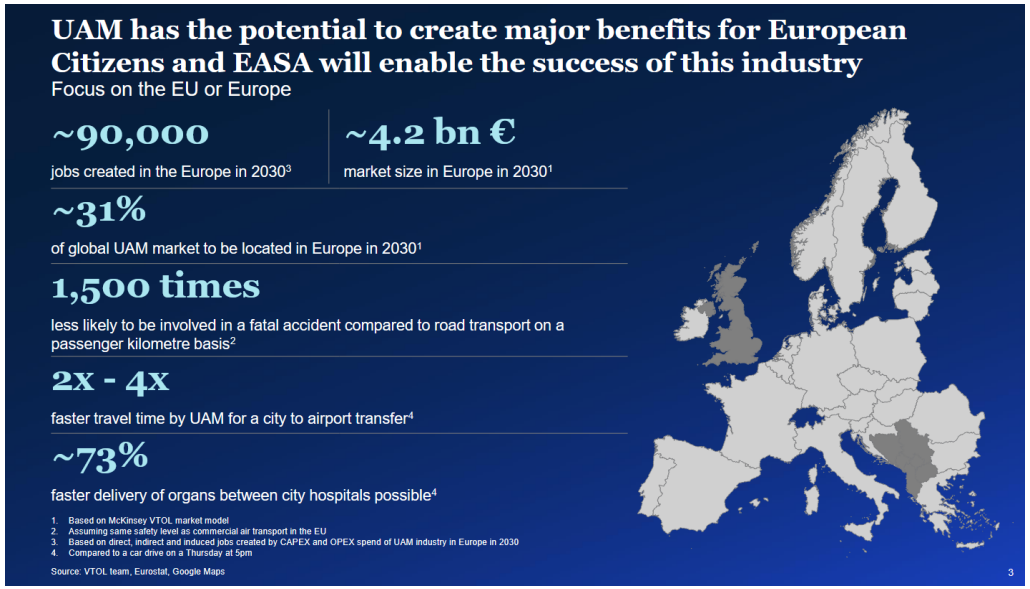
Economy: Who pays for the new services? The users!

Some big numbers

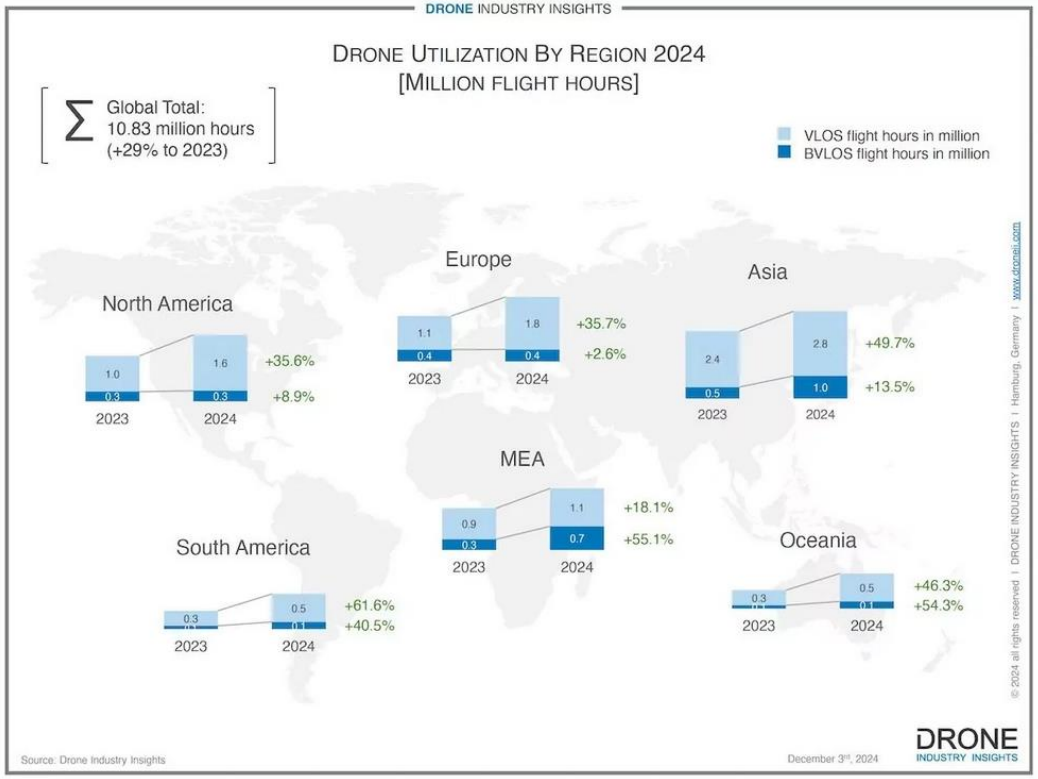
by EASA(2030)

https://www.easa.europa.eu/en/newsroom-and-events/press-releases/easa-publishes-results-first-eu-study-citizens-acceptance-urban#group-easa-downloads



by DRONEII(2024)

https://droneii.com/global-drone-industry-review



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Economy: Who pays for the new services? The users!

Some small numbers

by Manna (today)

DO cost (not fees!)**/flight**	
Current	< 4€
New	5.90€

by U-ELCOME (5y, not CISP)

Traffic	**cost/flight**
Low (20)	+10€
High (90)	0.93€

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In previous ConOps

- Study of SoA for new technologies acceptance

- **Principles** for social acceptance are:
  - **Transparency**
    - Accurate and timeliness information
    - Using understandable language
    - Verifiable by law enforcement agents
  - Inclusiveness / **governance**
    - Empowerment of individuals

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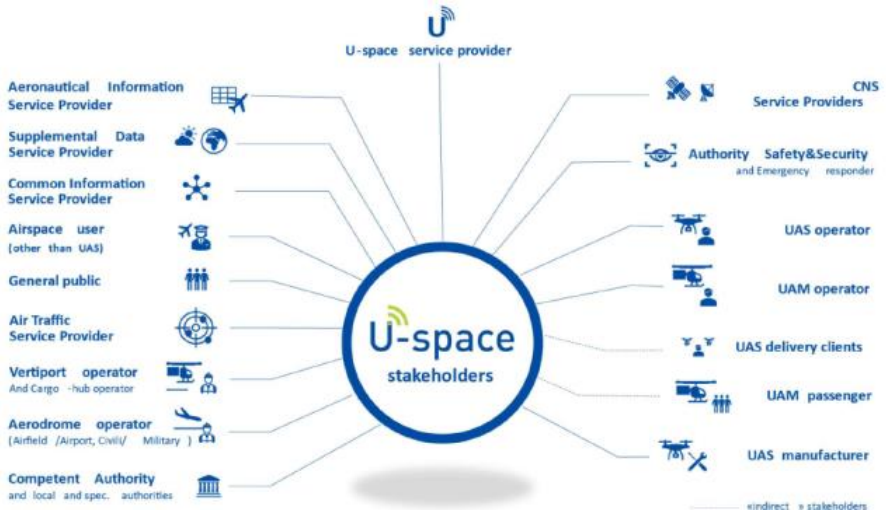
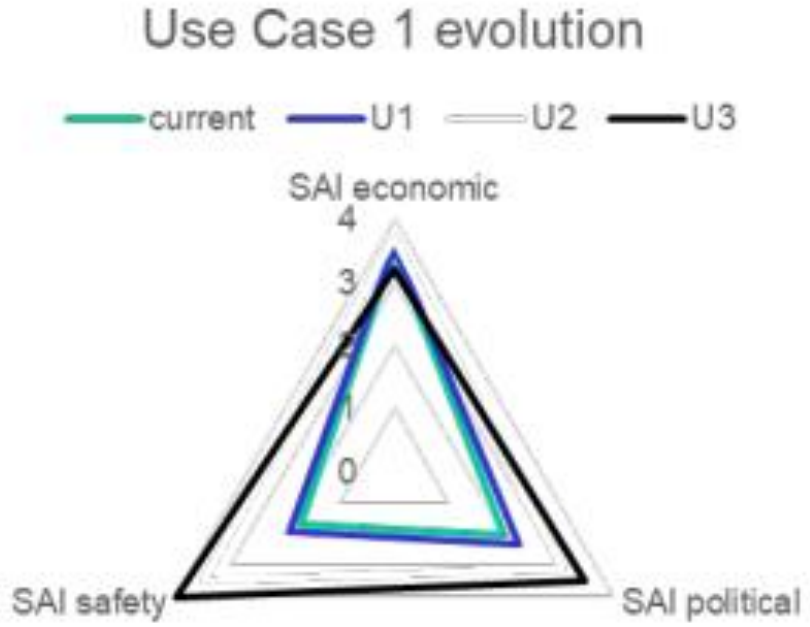
In previous ConOps

- **CORUS** proposed **SAI**s (Stakeholders Acceptance Indicators)
- SAIs tested by experts on Use Cases





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In previous ConOps

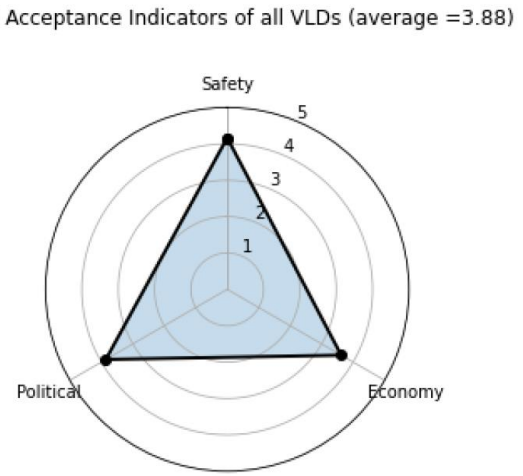
- **CORUS-XUAM** served to collect SAIs responses during demos

Access to SOCIAL ACCEPTANCE
Online QUESTIONNAIRES

https://forms.gle/byEJMCgU2wkLHXSg8

Thanks for your help !!

PROFILE / VLD	SPAIN	ITALY	FRANCE	SWEDEN	GE&UK	BELGIUM	TOTAL
			BEFORE				
USSP	1	6	2	1	2	0	12
AS Managers	1	4	10	2	1	1	19
Drone Industry	0	0	3	0	1	0	4
Drone Operator	0	6	1	0	1	1	9
Other AS users	0	1	6	0	0	0	7
			DURING				
Citizens	37	9	6	5	2	1	60
HEMS	10	0	1	0	0	1	12
Administration	5	3	1	2	0	0	11
			AFTER				
USSP	2	0	0	0	1	5	8
AS Managers	10	0	1	9	3	1	24
Drone Industry	3	0	1	3	4	1	12
Drone Operator	5	0	5	0	0	0	10
Other AS users	3	0	0	1	0	0	4
			TOTAL				192



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WS1 Results on **Societal** + Cross-cutting

CORUS five

21 ***RQ***

18 ***RQ***

PRIORITY RESULTS

7 RQ ***6 RQ*** ***8 RQ***

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WS1 Results on **Societal** + Cross-cutting

CORUS five

Standards

- C5 shall not try to amend

Emerging Topics

- Principles of **fairness**
- New **roles** for automated

18 ***RQ***

SESAR ER/IR

- Coordination is a must

Vision/Strategy

- Search worldwide

21 ***RQ***

PRIORITY RESULTS

7 RQ ***6 RQ*** ***8 RQ***

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WS1 Results on **Economy** + regulatory

CORUS five

37 ***RQ***

18 ***RQ***

PRIORITY RESULTS

11 RQ ***17 RQ*** ***8 RQ***

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WS1 Results on **Economy** + regulatory

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Economy: **charges**, **fairness** principles

Harmonisation

- Worldwide
- Community outreach, **best practices**

Performance: Low priority

FP (U-plan)

- Including uncertainty
- Lifecycle

Responsibilities

Standards

- Do not amend, adopt!

* Engage & community outreach

37 ***RQ***

18 ***RQ***

PRIORITY RESULTS

11 RQ ***17 RQ*** ***8 RQ***

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Process

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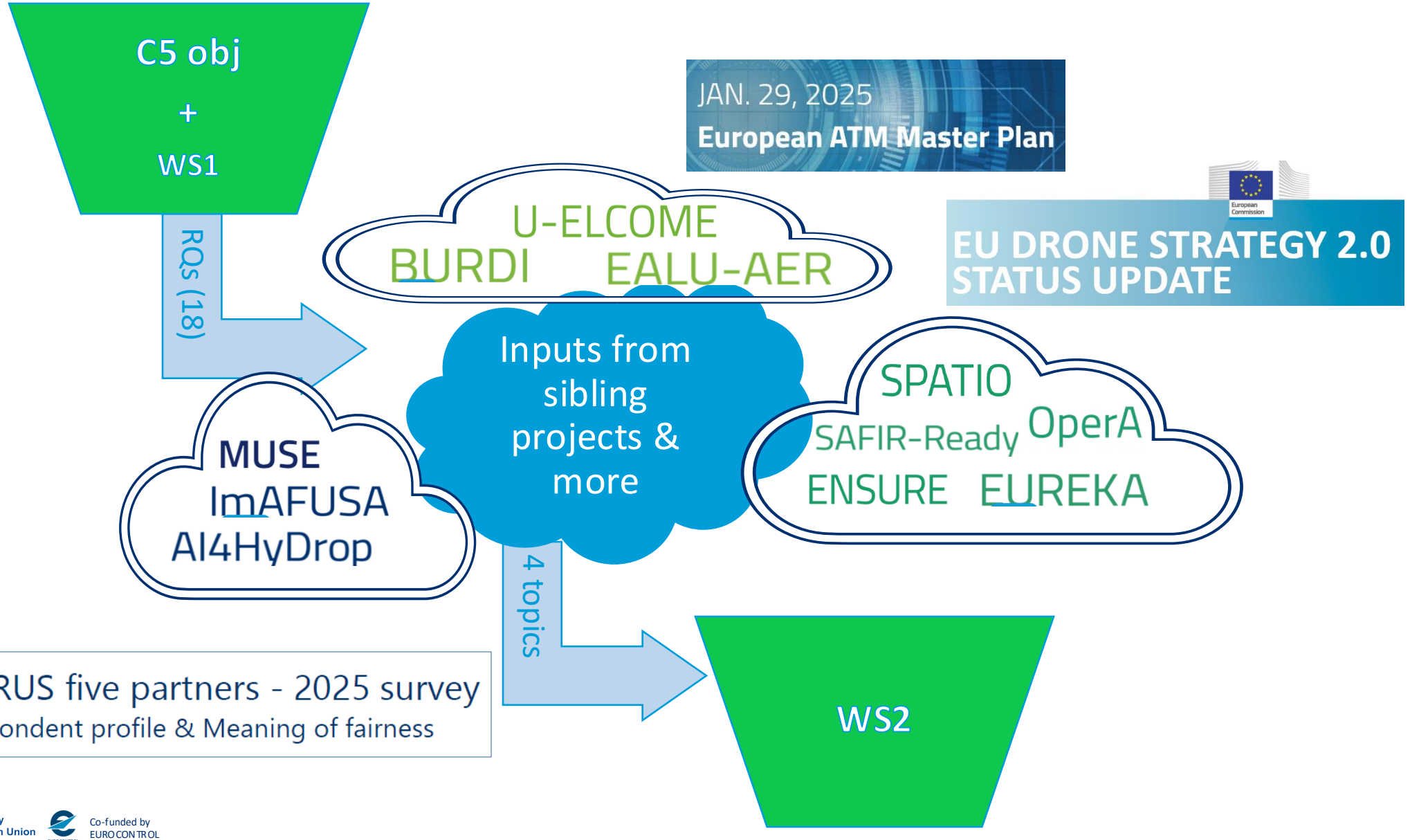

24
responses

CORUS five partners - 2025 survey
Respondent profile & Meaning of fairness

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WS2 Session on Societal + Economy

Topic 1 Social: measure U-space implementation acceptance

- How to update the method for evaluating public acceptance related to U-space implementation
  - Answers from **new surveys**, **PEARL**, **MUSE**, **ImAFUSA**, **AI4HYDROP**
  - Transition from SAIs (**CORUS, CORUS-XUAM)**

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WS2 Session on Societal + Economy

Topic 2 Economy: funding mechanisms

- Which are the economic principles of the U-space?
- RQ5.20 - How should U-space services and flight operations be charged?
  - Answers from **ICAO**, **EU DS2, ATM MP, SPATIO**

WS2 Session on Societal + Economy

Topic 3 Fairness

- RQ1.06 - Should CORUS five propose the principles and a way to address fairness, considering also a multi-USSP environment?
- RQ5.19 - How can U-space provide fair access to airspace?
  - Answers from **EU Drone Strategy 2.0**, **AI4HYDROP**, **SPATIO**, **MUSE, SoA (DLR), CORUS five**

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CORUS five

Topic 4 Roles, Responsibilities, Best Practices

- RQ1.12 - Which roles currently identified in U-space can be evolved from human centric to **automated** systems?
- RQ5.39 - Can CORUS outline responsibilities for all actors operating in U-space?
- RQ5.34 - How can industry best practices be included in ConOps?
  - Answers from **U-ELCOME**

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Social and Ecomonic topics

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Four topics

Three horizons	Social	Economy	Fairness	Roles
Short-term	➢ MUSE, ImAFUSA	➢ ICAO, ATM	➢ EASA, SoA, MUSE	➢ EASA, U-ELCOME
Medium-term	➢ PEARL	➢ CORUS five	➢ SPATIO, CORUS five	
Long-term	➢ Consolidation		➢ SAFIR-Ready	➢ AI4HYDRP

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Responses to Research Questions as draft of ConOps v5

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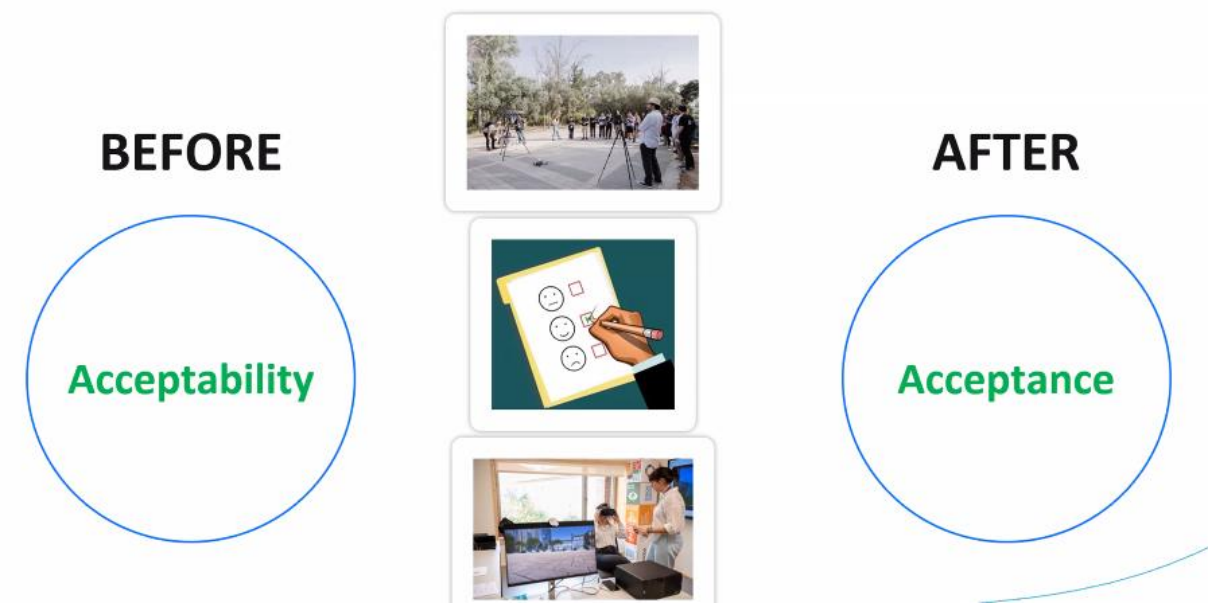
WS2 Session on Societal + Economy

Topic 1 Social: measure U-space implementation acceptance

- How to update the method for evaluating public acceptance related to U-space implementation

ImAFUSA



CORUS: theoretical SAI => CORUS-XUAM : real SAI but few citizens

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CORUS five

Topic 1 Social: measure U-space implementation acceptance

- How to update the method for evaluating public acceptance related to U-space implementation

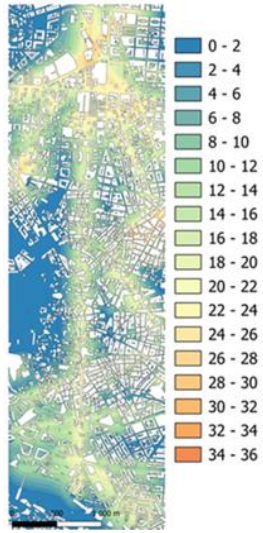
ImAFUSA

- Human-in-the-loop tests(*):
  - Psyco-acustics
  - Noticeability
  - Visual pollution limits

(*) Virtual reality
From subjective to OBJECTIVE by AI models to predict annoyance

MUSE

- Performance framework
  - Noise
  - Visual pollution
  - Privacy
  - Access&Equity
  - Plus 4 additional Focus areas



- Direct OBJECTIVE measures but missing real traffic & thresholds

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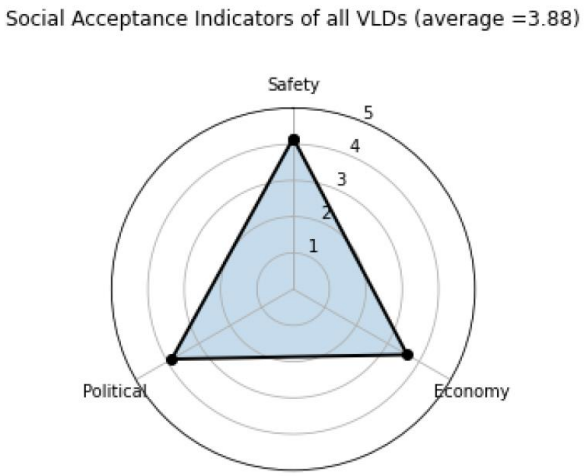
CORUS five

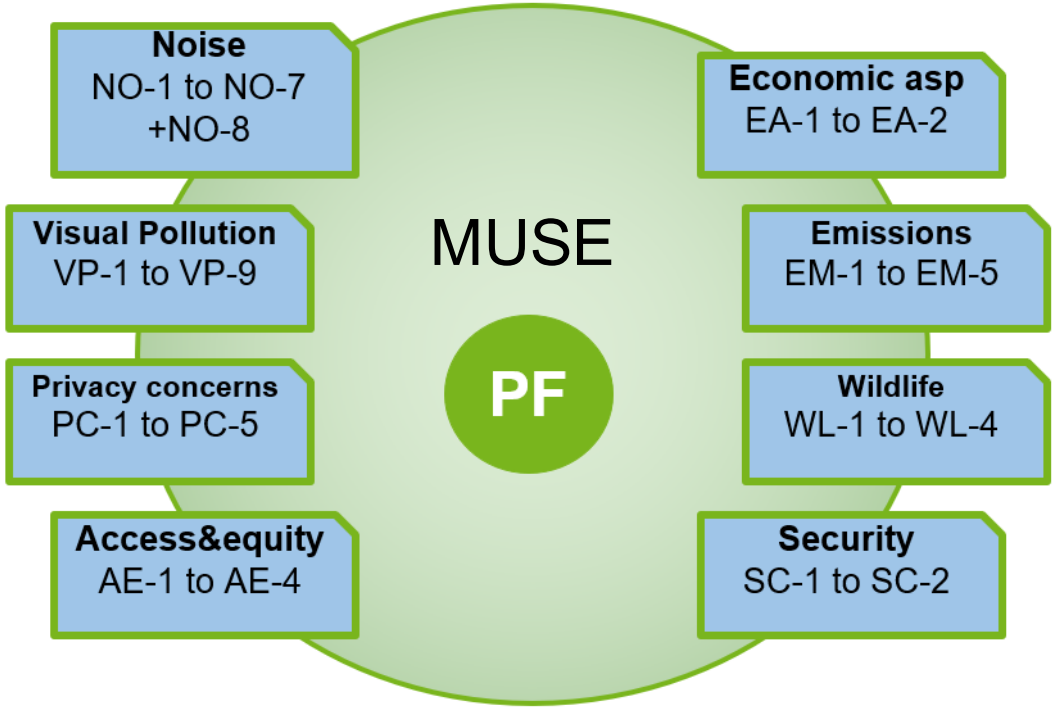
Topic 1 Social: measure U-space implementation acceptance

- **PROPOSAL:** Move from SAI to MUSE PF + Select a subset of 3? relevant KPIs + Set thresholds from ImAFUSA

?



CORUS



ImAFUSA

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Topic 2 Economy: funding mechanisms, Charging of U-space services

ICAO principles

- The users pays
- Fees shall be related with costs

Today ATM

- Fees = UR * 100Km * SR(MTOW/2)
- Excluded AC < 2 tons

Facts

- ATC / USSP do not work for free
- Who pays don’t want to bear all the cost
- Cost are different across EU countries
  - UR range in ECAC [28 € - 120 €]
- Service usage proxy: distance + size

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CORUS five

Topic 2 Economy: funding mechanisms, Charging of U-space services

Questions / Proposal

- Do we agree with exceptions ?? medical?
- Do we agree with proxy for IAM to use distance and size?? NO!?
  - What then? 4Dvol occupancy ??
- When to charge?? – link with U-plan states
  - Once U-plan accepted. Fee return: no if withdraw & yes if cancel. Adjust fee at termination
- Do we agree with flexible fees ?? see next slide

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Paying for priority??
- not an acceptable

Even at??
- Peak hours
- To lower other's charges
- To get fix schedule

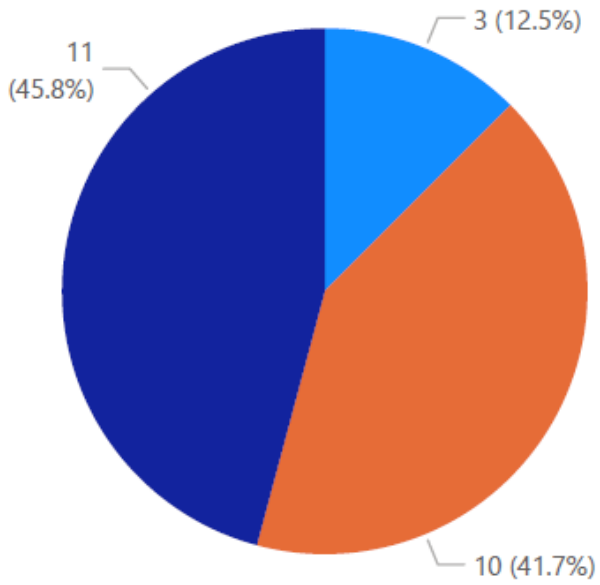
… or may be, depending on fee

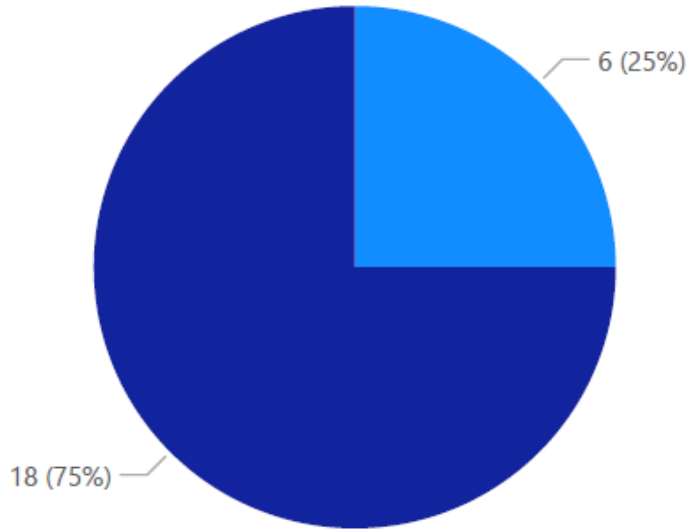
Q: Would you be willing to pay for increased priority?
(e.g., an auction system where operators bid for priority access)

Q: Do you think other people should be able to pay to get priority access – in doing so reducing your priority?

24
responses

CORUS five partners - 2025 survey
Respondent profile & Meaning of fairness





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Topic 3 Fairness

Synonyms: free from bias, dishonesty, or injustice; correctly or properly done according to the rules; pleasing in appearance;…

State of the Art

- **Verma et al.** 2018: Provide 20 definitions of 3 types of fairness: statistical, similarity-based, causal reasoning. Same decision can be fair and unfair under those definitions!
- **Saxena et al**. 2019: There are 3 types of fairness: calibrated fairness is better accepted by citizens. Request are granted as a function of the self merit vs. sum of everyone's merits

EASA GM 2021/664 GM7 Article 3(4)(b)

"to ensure efficiency as well as fairness (…) Member States may constrain (…) the maximum time a flight authorisation request may be sent in advance to ensure the effective implementation of the 'first in, first serve' principle (...)."

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Topic 3 Fairness

MUSE: Access&Equity focus area: KPI calculates as the deviation bias

SPATIO: Fairness manager service

Q1 accepted NxDP

Q2 waiting spare capacity

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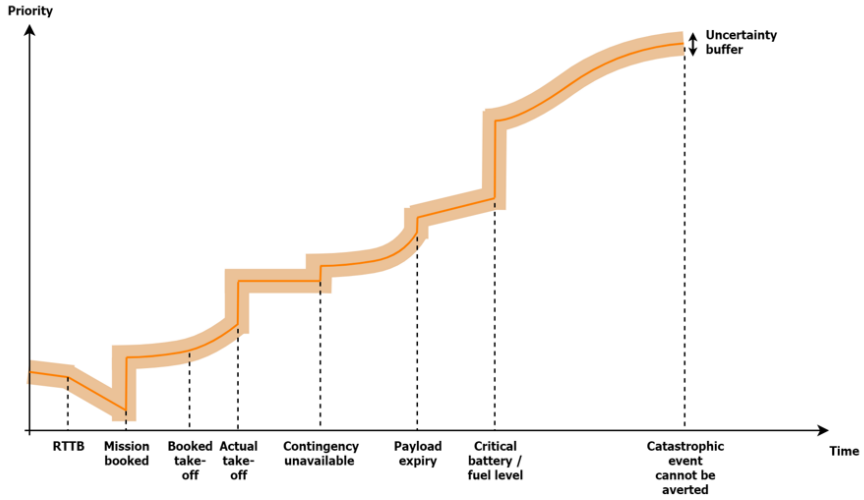
Topic 3 Fairness

SAFIR-Ready: Dynamic non-binary prio

Fictitious example



Dynamic Non-binary Prioritisation Scheme

Priority number calculation

All
- Mission type
- Mission status

Grounded
- Time to desired/booked take-off
- Booking status
- Time to latest possible take-off
- Fairness (ex. op rejections, RTTB)

Emergency
- People on board
- Ground/air risk levels
- Time to catastrophic event
- Time to reach safe landing spot

Airborne
- Remaining viable contingencies
- Time until payload expiry
- Time until predicted landing
- Time to critical battery/fuel level
- Ground/air risk levels
- Fairness (ex. delays, reroutes)

→ Standardised prioritisation function → Priority number

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Topic 3 Fairness

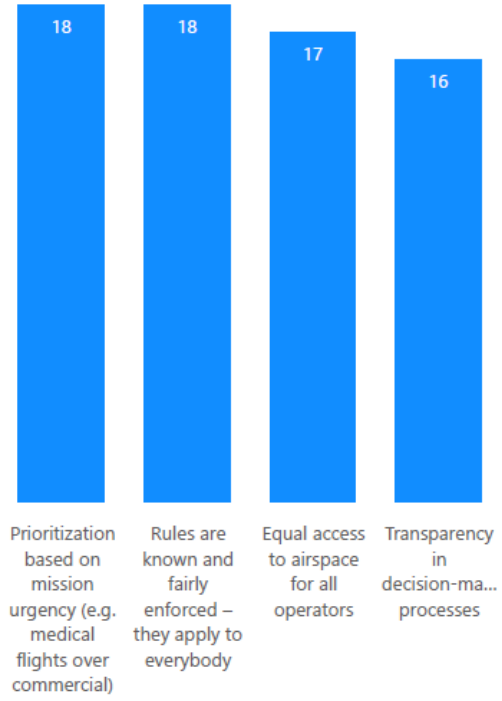
CORUS-5 questionnaire

24
responses

CORUS five partners - 2025 survey
Respondent profile & Meaning of fairness

Q: In the context of U-space, what does "fairness" mean to you?

- Prio to urgent/medical
- Rules known and enforced
- Equal access
- Transparent decisions



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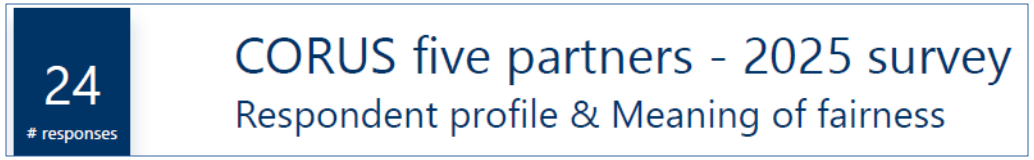
Topic 3 Fairness

CORUS-5 questionnaire



Q: Fairness challenges

- Ensuring the primacy of public interest
- Never prioritizing commercial over high-risk emergency flights

- Big players abuse little players
- Access to airspace for all users, including manned aviation
- The compatibility of different UAS mission with equal access
- Access rights during peak hours
- Early or excessive volumes reservation for "ghost flights"
- Receiving no slot if you cannot pay enough

- Defining and using a fairness score
- Avoiding overly complex, unenforceable and prone to cheating prioritizing system

- Including dialogue between players
- Differentiate operational fairness vs economic fairness

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Topic 3 Fairness

Questions / Proposal

- Fairness shall give priority always to state/emergency?? yes
- FCFS, now in place, is a good start ?? able to feed metrics?? yes
- Do we agree to extend to more queues ?? all FCFS?? yes
- Do we agree to reserve capacity per operator ?? NO!? Shall operators agree on the split?? ...
- Do you agree on separating queues per type of business? Yes? How to split capacity between them?? ...
- Do we agree establish deep hierarchy of priorities?? NO!?

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Topic 4 Roles, Responsibilities, Best Practices

- RQ1.12 - Which roles currently identified in U-space can be evolved from human centric to **automated** systems?
- RQ5.39 - Can CORUS outline responsibilities for all actors operating in U-space?
- RQ5.34 - How can industry best practices be included in ConOps?
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- **Roles:** from human centric to automated systems

What humans are involved? What they do? How many HMIs?

- **Drone Operator**
  - **Drone Pilot:** final accountable for the flight decision
  - **Flight planner:** provides the optimised route
- **USSP operator:**
  - Monitor status & emergency response personnel ??
  - human contact for DO?? for contingency??
  - Geofence manager
- **Vertiport manager**: ??
- **More**: AS Designers, Programmers…

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Topic 4 Responsibilities: USSP

- Provide the services certificated to their users not exceeding the latency requirements described in REG 2021/664
- Provide to their clients the necessary training in the use of their platform
- Provide to their clients the program (API) for the integration of their services in the UAS Operator GCS, or the list of tracker devices compatible with the USSP system
- Define and provide to their clients with recommendations to do during emergencies occurred in U-space during their operations, complementing their operations manual (the final decision and responsibilities related are from UAS Operators in this case)
- Record all U-space operations data necessary according REG 2021/664
- Report to the Spanish NSA the incidents occurred during their operations

* USSPs will not be responsible of any incident occurred in U-space although it happens due to a lack of U-space service provision → The NSA investigation will determine the detonator of the incident and the entity responsible

Topic 4 Roles, Responsibilities: CISP

- Provide the services certificated to the USSP not exceeding the latency requirements described in REG 2021/664
- Provide to the USSP the Interface Control Document necessary for the integration of both CISP/USSP systems
- Report to the Spanish NSA the incidents occurred during their operations
- Record all U-space operations data necessary according REG 2021/664

Topic 4 Roles, Responsibilities: Drone Operator

- Have the necessary training and courses completed related with the U-space operations (under definition)
- Ensure the transmission of Network Id to their USSP during all UAS operations in U-space
- Operate in U-space according to the training received and following the rules and regulations applicable (REG 664, 945, 947…) and their Operations Manual and Emergency Plan
- Have all the necessary airspace coordinations made related with each UAS operation
- Report to the Spanish NSA the incidents occurred during their operations

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Topic 4 Roles, Responsibilities: Communications Operator (IXM)

- Provide the service of communication exchange to the USSPs certified not exceeding the latency requirements described in REG 2021/664
- Provide to the USSP the Interface Control Document necessary for the integration of both IXM/USSP systems
- Not affect or modify in any aspect the data transmitted from one USSP to the others, the data integrity must be total
- Report to the Spanish NSA the incidents occurred during their operations
- Record all U-space operations data necessary according REG 2021/664

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- **Best practices** by U-ELCOME

Subsection	Lessons learnt	Recommendations	Best Practices

Best practice: "A working method or set of working methods that is officially accepted as being the best to use in a particular business or industry, usually described formally and in detail."

Lesson learnt: "Experience drawn from past activities that should be actively taken into account in future actions and behaviours."

Recommendation: "Advice about what is the best thing to have or do". Recommendations are those pieces of advice that are not solid or consensual enough to be considered a best practice.

- **Types**: Standardization / Regulation / Authorities / ARA / Certification / Systems/ Services / CNN

  => U-ELCOME experience detected **gaps**

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Consortium

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Collins Aerospace An RTX Business

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