Study on the Societal Acceptance of Urban Air Mobility (UAM) Operations

Press briefing

19th May 2021
Europe is at the forefront in the newly emerging UAM industry

Cities announcing UAM services within the EU

- Passenger transport announcement
- Cargo transport announcement

- Helsinki 2020
- Dusseldorf, Cologne 2025
- Paris 2024 (Olympics)
- Ingolstadt 2022
- Linz 2021 (initial tests operations)
- Munich (no date)
- Nuremberg (no date)
- Seville and Llíria (no date)

...and many more indicated to follow

- Geneva
- Hamburg
- Ghent
- Plovdiv
- Euregio
- Cross-border (Enschede, Munster), Antwerp
- Toulouse Metropole
- Region Aquitaine & Bordeaux MAHHL region
- Northern Hesse reg.

Many European OEMs leading developments

Passenger UAM Vehicles
- VOLOCOPTER
- LILiUM
- AIRBUS

Cargo Drones
- VOLOCOPTER
- PIPISTREL
- AIRBUS
- WINGCOPTER

Ascendancy Rights Managed
UAM has the potential to create major benefits for European Citizens and EASA will enable the success of this industry

Focus on the EU or Europe

~90,000
jobs created in the Europe in 2030

~4.2 bn €
market size in Europe in 2030

~31%
of global UAM market to be located in Europe in 2030

1,500 times
less likely to be involved in a fatal accident compared to road transport on a passenger kilometre basis

2x - 4x
faster travel time by UAM for a city to airport transfer

~73%
faster delivery of organs between city hospitals possible

1. Based on McKinsey VTOL market model
2. Assuming same safety level as commercial air transport in the EU
3. Based on direct, indirect and induced jobs created by CAPEX and OPEX spend of UAM industry in Europe in 2030
4. Compared to a car drive on a Thursday at 5pm

Source: VTOL team, Eurostat, Google Maps
To study the societal acceptance for UAM solutions in Europe six European focus cities/regions were selected.

Prioritisation of 6 most relevant use cases:
1. Airport shuttle
2. Sightseeing
3. Fixed metropolitan network (<120km)
4. First aid
5. Last mile delivery
6. Medical supplies

6 use cases x 15 cities = short list of 90 cities

Selection of most suitable cities based on identified metrics

Ranking of cities based on KPIs

Infrastructure feasibility assessment

Timeline feasibility assessment

KPI based ranking and application of guiding principles:

<table>
<thead>
<tr>
<th>City</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Paris</td>
<td>West Europe</td>
</tr>
<tr>
<td>2 Barcelona</td>
<td>South Europe</td>
</tr>
<tr>
<td>3 Hamburg</td>
<td>Central Europe</td>
</tr>
<tr>
<td>4 Budapest</td>
<td>East Europe</td>
</tr>
<tr>
<td>5 Milan</td>
<td>South Europe</td>
</tr>
<tr>
<td>6 Oresund region</td>
<td>North Europe</td>
</tr>
</tbody>
</table>

(Copenhagen, Hillerod, Helsingor, Malmo, Lund)
Survey methodology

1. Quantitative survey

3690 usable responses out of 4000 contacted respondents representing the cross-section of the European population

36 questions 30-45 min survey

2. Qualitative survey

>40 in-depth interviews with prioritized stakeholders from local to European level

3. Noise perception assessment

Detailed noise perception study with

20 European residents
We derived 10 key results from the survey

1. A positive initial attitude to UAM throughout the EU
2. Strong support for use cases in the public interest
3. Top 3 expected benefits: faster, cleaner, extended connectivity
4. Top 3 concerns: safety, environment/noise and security
5. Safety: existing aviation safety levels are the benchmark
6. Environment: priority is protection of wildlife
7. Noise: acceptable at level of familiar city sounds
8. Security: need to build confidence and trust in citizens
9. Ground infrastructure: must be integrated well
10. Regulatory authorities: must work together at all levels
1: A positive initial attitude to UAM throughout the EU

General attitude towards UAM

<table>
<thead>
<tr>
<th>的态度</th>
<th>Sum</th>
<th>Very Negative</th>
<th>Rather Negative</th>
<th>Rather Positive</th>
<th>Very Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>17%</td>
<td>3%</td>
<td>14%</td>
<td>54%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Vast majority of 83% feel positive (very positive or rather positive) about introduction of UAM overall

Only 17% with negative perception and minority share of 3% are very negative and probably hard to persuade of introduction of UAM

Interest in using UAM services

- 71% Potential UAM users
- 29% unlikely to use UAM services

In sum, 71% of total interested in using UAM services (either drones or air taxis or both)

Large supporters group of 43% with interest to try out both use cases

Conversely, 29% of respondents lack willingness to try out at least one UAM service

Source: EASA UAM social acceptance survey question S5. What would be your overall perception if urban air mobility solutions (such as those shown in the video) were to be introduced in your city? Please select one answer.

Homogeneous results across Europe

Only small deviations between regions, i.e. all deviations below 10% from average

- Southern cities Barcelona and Milan more positive
- Northern regions more reserved
2. Use cases: public interest should come first
Perceived usefulness of UAM use cases

Emergency use cases are considered most useful by respondents

In overall ranking (1) emergency use cases are perceived as most useful (most beneficial for society) followed by (2) drone delivery use cases and (3) passenger transport use cases.

- In (1), drone delivery of medical supplies and transport of injured persons are leading; only use case that falls back is delivery of medical supplies to home (comparable to other delivery to end consumer use cases).
- Within (2), the top three use cases rank almost the same – drone delivery of meals considered the least useful.
- Within category (3) airport shuttle and regional air mobility rank highest.

Source: EASA UAM social acceptance survey question A3. Which of the below use cases (that were previously selected as the most useful in their categories, see A2.a, A2.b and A2.c) are the most useful overall? Please sort the following applications from 'most useful' to 'least useful'.

1. None stands for respondents who answered questions A2.a to A2.c with “None of these are useful”
3. Top 3 expected benefits: faster, cleaner, extended connectivity

Improved response time is clearly perceived as top benefit with all cities ranking it first

- Improved emergency response time
- Reduction of traffic jams
- Reduction of local emissions
- Development of remote areas
- Creation of new jobs
- Market-leading position for Europe
- None

Share of respondents that selected benefit out of 3 possible

(absolute %, +/- difference to avg % in total)

Similar perception in all cities as suggested by low spread and steepness of trend curve

Hamburg and Öresund with similar opinions

Reduction of local emissions with highest spread between Paris (37%, -11%) on lower and Budapest (56%, +8%) and Milan (55%, +7%) on upper end

Creation of new jobs more important in Barcelona (41%, +9%)

Source: EASA UAM social acceptance survey questions A4. What benefits and opportunities can the development of urban air mobility bring for the EU and EU citizens? Please select up to 3 answers.
4. Top 3 concerns: safety, environment/noise and security

Concerns regarding delivery drones and air taxis

<table>
<thead>
<tr>
<th>Concerns ranked by % of respondents under top 3</th>
<th>Delivery drones</th>
<th>Air taxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>44%</td>
<td>37%</td>
</tr>
<tr>
<td>Security</td>
<td>39%</td>
<td>29%</td>
</tr>
<tr>
<td>Local &amp; global environmental concerns</td>
<td>36%</td>
<td>38%</td>
</tr>
<tr>
<td>Privacy</td>
<td>30%</td>
<td>19%</td>
</tr>
<tr>
<td>Noise related concerns</td>
<td>28%</td>
<td>38%</td>
</tr>
<tr>
<td>Job loss</td>
<td>30%</td>
<td>16%</td>
</tr>
<tr>
<td>Affordability</td>
<td>21%</td>
<td>16%</td>
</tr>
<tr>
<td>Visual pollution</td>
<td>19%</td>
<td>16%</td>
</tr>
<tr>
<td>None</td>
<td>4%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Part of trade-off analysis (conjoint)

Local and global environmental concerns taken together highly important in both use cases

Noise related concerns (simply noise pollution for delivery drones; noise related to flying aircraft & noise related to vertiports for air taxis) emerge as much more important with regard to air taxis

Safety top ranked concern in both use

Security more important in drone delivery than in air taxi use case

Notes:
1. Incident due to technical or human failure
2. Local environmental impact includes air pollution, negative impact on bird life and insects, decreasing biodiversity
3. Global environmental impact covers climate change
4. Covers noise pollution for delivery drones, and noise related to flying aircraft & noise related to vertiports for air taxis
5. Incident due to deliberate harmful action, e.g. by criminal organization or terrorists

Source: EASA UAM social acceptance survey questions B4. What are you most concerned about regarding drone delivery, both for the delivery of day-to-day goods as well as medical supplies? Please consider your own usage of such a service as well as other people using it (e.g. your family or neighbours), which may affect you as well. Please select up to 6 answers. B5. Please sort your main concerns (selected in B4) from ‘most concerning’ to ‘least concerning’. C5. What are you most concerned about with respect to air taxis? Please consider your own usage of such a service as well as other people using it (e.g. your family or neighbours), which may affect you as well. Please select up to 6 answers. C6. Please sort your main concerns from ‘most concerning’ to ‘least concerning’.
5. Safety: existing aviation safety levels are the benchmark

Respondents unanimously agree that no trade-off should be allowed for safety as safety is paramount. Interviews have shown that importance of safety tends to be under-represented in survey as people 'take it for granted', and are thus less concerned about it – especially for Air Taxis as people associated them with current aviation vehicles.

Respondents unanimously agree that no trade-off should be allowed for safety as safety is paramount.
### 6. Environment: priority is protection of wildlife

#### Environmental concerns

<table>
<thead>
<tr>
<th>Ranking of environmental concerns (% ranked among top 3)</th>
<th>Delivery drones</th>
<th>Air taxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative impact on animals</td>
<td>62%</td>
<td>56%</td>
</tr>
<tr>
<td>Noise pollution</td>
<td>52%</td>
<td>53%</td>
</tr>
<tr>
<td>Environmental and climate impact from production (incl. battery production)</td>
<td>43%</td>
<td>42%</td>
</tr>
<tr>
<td>Climate impact from operation (incl. energy expenditure)</td>
<td>33%</td>
<td>40%</td>
</tr>
<tr>
<td>Environmental impact from disposal</td>
<td>29%</td>
<td>30%</td>
</tr>
<tr>
<td>Sealed surfaces</td>
<td>28%</td>
<td>33%</td>
</tr>
<tr>
<td>Emissions</td>
<td>28%</td>
<td>31%</td>
</tr>
<tr>
<td>None</td>
<td>8%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: EASA UAM social acceptance survey questions B9. What are your greatest concerns when it comes to the possible environmental consequences of drone delivery? Please sort the following answers from 1 being ‘most concerning’ to 7 being ‘least concerning’ or select ‘none of these’. C9. What are your greatest concerns when it comes to the possible environmental consequences of air taxis? Please sort the following answers from 1 being ‘most concerning’ to 7 being ‘least concerning’ or select ‘none of these’.

#### In both use cases, top 3 concerns are

1. **Negative impact on animals** (62%, 56%)
   - Even more important for old age group 65-75 (+7%, +5%);
   - ”Technology in the air that disturbs birds and makes noise.”
   - ”The more of them flying around, the more disturbing it becomes... for animals, insects and humans.”
   - ”Leads to reduction of birds in cities”

2. **Noise pollution** (52%, 53%)
   - Less concerning for young age group 18-24 (-8%, -10%)

3. **Environmental & climate impact from production (incl. batteries)** (43%, 42%)
   - Significantly higher than climate impact from operation (33%) in drone delivery use case, but almost equal (40%) in air taxi use case
   - Especially young age group more concerned about environmental impact from production (+1%, +7%), disposal (+1%, +7%) and emissions (+12%, +11%)
7. Noise: acceptable at level of familiar city sounds

1. UAM noise is more annoying at same noise level…

<table>
<thead>
<tr>
<th>Sound type</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helicopter</td>
<td>80 dBa</td>
</tr>
<tr>
<td>Aircraft</td>
<td>80 dBa</td>
</tr>
<tr>
<td>Motorbike</td>
<td>80 dBa</td>
</tr>
<tr>
<td>Bus</td>
<td>80 dBa</td>
</tr>
<tr>
<td>Light Drone</td>
<td>80 dBa</td>
</tr>
<tr>
<td>Large Drone</td>
<td>80 dBa</td>
</tr>
<tr>
<td>Air Taxi 1</td>
<td>80 dBa</td>
</tr>
<tr>
<td>Air Taxi 2</td>
<td>80 dBa</td>
</tr>
</tbody>
</table>

How annoying sound was perceived

<table>
<thead>
<tr>
<th>Volume</th>
<th>80 dBa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Taxi 2, Position 1</td>
<td>80 dBa</td>
</tr>
<tr>
<td>Air Taxi 2, Position 2</td>
<td>70 dBa</td>
</tr>
<tr>
<td>Air Taxi 2, Position 3</td>
<td>60 dBa</td>
</tr>
</tbody>
</table>

Variance ● Average

There could be three possible interpretations for this:

- People perceive familiar sounds as less annoying (this was frequently stated in comments)
- The noise characteristics could have an impact on annoyance
- The integrated noise level over time could have an impact (i.e. speed of pass over)

When looking at different distances, realized through different noise pressure levels from 80dBa to 60dBa.

It can be observed that the perceived annoyance from the UAM vehicle at ~65dBa reaches a similar level as a bus at 80dBa.
8. Security: need to build confidence and trust in citizens

Trust levels in UAM aircraft systems incl. security and cybersecurity

Security & cybersecurity of UAM vehicles are trusted by only ~53% of respondents

<table>
<thead>
<tr>
<th></th>
<th>Delivery drones</th>
<th>Air taxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully mistrust</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Mistrust</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Somewhat mistrust</td>
<td>23%</td>
<td>25%</td>
</tr>
<tr>
<td>Somewhat trust</td>
<td>31%</td>
<td>32%</td>
</tr>
<tr>
<td>Trust</td>
<td>19%</td>
<td>17%</td>
</tr>
<tr>
<td>Fully trust</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Sum</td>
<td>46%</td>
<td>47%</td>
</tr>
</tbody>
</table>

Source: EASA UAM social acceptance survey question D2. To what extent do you trust that advanced aircraft flying in an urban environment will be technologically secure and armed against threats from hackers (such as criminal organisations, hacktivists or terrorists) in the following cases? Please select one answer per row.

Only slightly more than half of respondents with trust in UAM aircraft systems

Very similar results for drones and air taxis (~53%)

Trust levels are higher for men than for women and decrease with age
- More trusted by men (~+7%)
- Less trusted by age group 65-75 (~−8%) and women (~−7%)

Defined subgroups against introduction of UAM with very low trust levels
- Delivery drone usage rejecters, air taxi usage rejecters, UAM usage rejecters, digital laggards with -14% to -28% less trust
9. Ground infrastructure: must be integrated well

Interviews have shown that integration into local transport ecosystem is of key importance to citizens. Many are concerned about space availability for vertiports and integration into cityscape. The cultural heritage and cityscape should not be harmed or impacted.

**Drone delivery**

- Level of comfort highest for options
- **Garden / private area**
- **Delivery station** in neighborhood similar to nowadays delivery locations (mailbox, post office)

**Air Taxis**

Related to Vertiports citizens are most concerned about noise (48%) and safety (41%).
10. Regulatory authorities: must work together at all levels

Source: EASA UAM social acceptance survey question D1. To what extent do you trust the following authorities to handle the risks and adopt regulations needed to manage urban air mobility (including safety, noise control, environmental protection, security, cybersecurity, etc.)? Please select one answer per row.

Small differentiation in trust levels for European regulation authority between cities
- Higher trust levels: Budapest (+10%)
- Lower trust levels: Hamburg (-9%), Paris (-9%)

Trust levels for national and regional / local authorities almost always with similar results
- Øresund significantly higher for national (+14%) and regional / local authorities (+11%)
- Barcelona lower trust level in national authority (-7%), slightly lower for regional / local authority
- Paris lower trust levels for both national and regional / local authorities (~5%)
Conclusion

Safety should be addressed primarily, with a safety level equivalent to that of current aviation operations.

Environmental risks should be mitigated, including impact on animals and environmental footprint from production and operation of UAM vehicles.

Noise should be limited to a level equivalent to that of current familiar noises in a city.

Security risks should be prevented, mostly for drones in a first stage.

European, national and local authorities should work together.

Local authorities need detailed information and guidance, as well as involvement in the decision-making.

Public acceptance should be secured by different levers, e.g. by:

- ensuring UAM is affordable to all and used in the public interest
- well integrated in the local mobility system
- supported by timely, sufficient and transparent information to citizens and local stakeholder groups
- pilot projects demonstrating that UAM is functioning and safe

Use cases with highest benefit for general public to be introduced first (transport of medical goods with manned eVTOLs (e.g. with a pilot onboard)), use cases by cargo like last mile delivery could follow.

Aviation safety needs to be taken care by competent authorities through appropriate regulations and design assessment of vehicles, systems and infrastructure. The UAM traffic should be safely integrated in the airspace with conventional aircraft.
Thank you for your attention!