'Navigating the opportunities and Obstacles in UAM:

First Findings from Hands–On Practical Experience with Use Cases'

FF2020

AiRMOUR

AURORA

European Commission
European Climate Infrastructure and Environment Executive Agency
(CINEA)

Introduction

Urban Air Mobility (UAM) is gaining momentum in the world of aviation, technology, and mobility. Within the two years that the Flying Forward 2020 project is active, the topic has received great interest and there are many questions to explore, ranging from regulatory challenges to dealing with the practicalities. The number of European projects & initiatives that are working on emergent aviation technologies are also increasing and with that, the knowledge, experience, and lessons learned.

While it remains an upcoming market without a mature market demand, UAM deserves and keeps on getting more attention from the European legislators, public officials, and citizens. Millions of euros are invested in EU-funded projects to investigate the business opportunities and obstacles and to find answers on how the regulate, innovate, and design the drone market in order for the EU to become the frontrunner.

The EU-funded Flying Forward 2020 project, along with AiRMOUR and AURORA are working every day on the development of Urban Air Mobility. Within the two years that these projects have been active, a lot of knowledge and insights have been gathered, while at the same time new questions and problems arose. In this phase, where a new market is being developed, both the expansion and exchange of knowledge are two of the most important elements to ensure success.

In December 2022, these three projects launched a joint workshop "Navigating the Opportunities and Obstacles in UAM". The aim was to explore answers to current obstacles in UAM and, in doing so, contribute to solving some of the challenges. This will also help other EU projects who will conduct demonstrations and carry out drone operations. And finally, this workshop will contribute to the knowledge development on how to incorporate Urban Air Mobility in future cities.

Workshop Report 'Navigating the opportunities and obstacles in UAM'

Objectives

With this workshop we aimed to achieve three objectives focused on knowledge development and community building:

1. Identify and explore the key challenges in the world of Urban Air Mobility as recognized by the sibling projects.
2. Gather input from selected target audiences on how to solve these challenges.
3. Bring together the selected target audiences in order to exchange knowledge and ideas for future explorations and to expand the network.

What are the opportunities and obstacles in UAM based on the first findings from experience with use cases?

Methodology

The methodology chosen to achieve these objectives was an online workshop. The workshop was organized virtually because the network is focused on Europe and beyond. The three involved projects have partners across Europe and therefore an international character. To address this international character an online workshop was best suited.

The workshop consisted of two main parts, including introductory keynote presentations and an interactive discussion with the help of breakout sessions:

A. A strategic keynote by CINEA about the importance of use cases and living labs, followed by the lessons learned so far. Three further keynote presentations focused on the practical hands-on experience with use cases of the projects Flying Forward 2020, AiRMOUR and AURORA.
B. An interactive discussion with the help of thematic breakout sessions, for which participants could sign up indicating their topic of interest.

The interactive discussion had a duration of 35 minutes. After the breakout sessions, the participants came back to the plenary session to give a short recap of the insights and to help in providing answers to the questions raised in the breakout session.

Main Topics for Discussion

The Flying Forward 2020, AURORA and AiRMOUR projects identified three main topics in which opportunities and obstacles arose for Urban Air Mobility. The three areas were:

- The regulatory framework
- Public acceptance
- Technology maturity

Regulatory Framework

- ▶ How to include the role of AI in the current UAM operations?

- ▶ How to anticipate changes in the regulations while fostering innovation for the certified category?

Public acceptance

- ▶ What would increase the acceptability of civil society for this new technology?

- ▶ Which use cases would be helpful to display UAM's added value to society?

Technology Maturity

- ▶ What does the technology need to do to be matured enough to be part of daily operations?

- ▶ How can we create a technological ecosystem in which all related UAM IT hard- and software is integrated and vendor agnostic?

Workshop Report 'Navigating the opportunities and obstacles in UAM'

Target Audience

With this workshop, we aimed to explore and navigate through the opportunities and obstacles in Urban Air Mobility and to discuss first findings from Hands-On practical experience with use cases. With the development of the breakout sessions, we identified three main target groups that would be able to help navigating through these identified opportunities and obstacles.

1. Policy-makers and (inter)national authorities
2. UAM/UAS industry, operators, service providers and urban planners
3. Public representatives and citizens interested in how drone technology can support public services

Each target group was informed prior to the workshop about the best fitting breakout session based on their background and expertise to ensure a fit between the participant and the breakout session. This enabled the projects to gather the most relevant input for each individual breakout session. This resulted in the following classification:

1. The role of the regulatory framework in automatic and autonomous flights (AiRMOUR), of specific interest to policymakers and (inter)national authorities
2. The hiccups of technology maturity in the UAM/UAS industry (FF2020), of specific interest to UAM/UAS industry, operators, service providers, urban planners
3. Accepting a new vision for our cities (AURORA), of specific interest to public representatives and citizens interested in how drone technology can support public services

In total, there were 44 participants engaged in the workshop. All participants already knew about the concept of Urban Air Mobility, but the depth of the knowledge differed among the participants. Not all the participants joined the breakout session due to overlapping meetings and other priorities. For the next workshop we will double check shortly before the event who will attend the plenary sessions and who will attend the breakout session to facilitate the process and remind registrants of the upcoming event.

Main findings

In the below table, the main findings for each of the breakout sessions is provided.

Breakout session	Findings
The Role of the Regulatory Framework How to include the role of AI in the current UAM operations? How to anticipate changes in the regulations while fostering innovation for the certified category?	The main issue identified in this breakout session is 'How to integrate the highly regulated and rule-based ecosystem of manned aviation and the untransparent and unpredictable Artificial Intelligence (AI) ecosystem?'
	One of the main questions raised was 'Who can we hold responsible and who do we trust?'
	A risk- based approach is necessary, boxing in the use cases. The AI Liability Act also helps by making clear who carries what risk.
	Statistics could be used to decide when the use of AI is considered safe enough.
	For the integration of AI in UAM, it could be interesting to look at the cross-over from AI in manned aviation and how this became certified.
	When the airspace becomes more crowded in the future, a lot of data needs to be processed as required by the U-Space Regulation. AI and Machine Learning (ML), when proven reliable, might lead to useful ways to handle all this information.
	The research field of AI in UAM is primarily a technological approach, but this should be done in parallel with the regulatory developments.
	Currently the research into UAM is very broad, it would help to create focus and to scale capacity and effort of larger research institutes to cover all perspectives.
	To help move the entire industry, it is important to work towards a framework for deciding and prioritizing what's important and what research is most beneficial.
	Regulatory certainty is essential for investments by the market, especially when it comes to criteria and requirements for certification. This should be a core focus.
	Without knowing what will be required for the certified category, technical developments will be slowed down because it will be too big a risk to invest time and money, particularly towards actual implementation of service operations.
	Funding programs for research and development are important to help bridge the gap between the regulation and the market, until the regulation has developed further.

Breakout session	Findings
Public acceptance What would increase the acceptability of civil society for this new technology?	Demonstrations / living labs: demonstrate use cases that benefit society, showcase what is happening with the technological advancements so people can see for themselves and form their own opinion on this.
	Local municipalities will know the needs of their citizens and should encourage use cases that address these.
	Drone industry / stakeholders should directly address fears of society of this new technology. Therefore, a responsibility lies with them.
	Be careful of social washing – EMS applications are being promoted whilst we know that drones will also be used for transporting food to those who can afford it. The potential for social inequality in drone operations should be addressed.
	In Brussels the local police used drones for crowd surveillance of masks and social distancing and had a speaker to tell people to comply, also people have seen drones being used for defence in the current political crisis in Europe. This creates negative public perception of drones. Therefore, positive application of uses of drones and their dissemination by the media to the public is important.
	Follow up on citizen participation – start by telling people how the results will be used from their surveys, workshops etc. Drone industry / stakeholders need to take on board the comments and suggestions made by the public.
	Ensure that people are confident that the new technology is safe and supervised by competent bodies.
	The first step could be to help them make UAM fully transparent for citizens. Trust starts with transparency.
	An idea would be to have public discussions with the local society to plan landing spots for civil service drones.
Which use cases would be helpful to display UAM's added value to society?	Customer facing application of drones so citizens can experience the results. For example light shows are becoming more popular as they are less noisy than fireworks and therefore less disturbing for people's pets. This creates a positive attitude by the general public for the application of drones.
	Providing safe landing sites of drones, making use of existing infrastructure. For example, first have a helicopter land on a helipad and then have a passenger eVTOL land on a helipad so people can see a direct comparative benefit, such as reduced noise.

Use cases that require less physical infrastructure would be a benefit to society. Current infrastructure is costly and sometimes difficult to maintain.

Deliveries to remote areas (significant time savings, on-demand service, back-up solutions), patrols of objects (saving of human resources, frequent operations, short response time or first-response-operations).

The example of the port of Antwerp using drones for good, e.g. identifying fuel leakages in the harbour and for security surveillance, is a positive case for society.

Breakout session	Findings
Technology maturity What does the technology need to do to be matured enough to be part of daily operations? How can we create a technological ecosystem in which all related UAM IT hard- and software is integrated and vendor agnostic?	Maturity should be demonstrated via real-life tests to show the drones in operation and to show that obstacles can be detected for example. It is important that software systems advance as well. If you want to have a lot of drones flying in the same airspace, they need an integrated software system. AI is needed to learn from different missions to optimize the whole system. The technology is in place, but we are lacking the interface to a kind of u-space structure that allows a regulatory overview of everything that can be produced with AI. One of the main questions is 'How to integrate the drone and its goal with the systems in place of individual organisations?' A common joint approach is needed that answers the question of which technology is needed. The technology of manned aviation is prevailing, but is this the right angle? How to decide which technology fits best? Technology is mature enough, but it needs to be more human-centric so that the technology isn't leading. It is a challenge to balance technology with the regulation since the regulations often move slower than the technology. Standards are necessary! Project activities should lead to insights for creating these standards.

Conclusion

This workshop contributed to the three identified objectives. With the help of the breakout sessions a lot of input has been gathered around the key questions. This input helps the knowledge development for UAM.

This workshop contributed to the role of the regulatory framework by discussing in depth the importance of Artificial Intelligence (AI) and Machine Learning (ML). An important question for future events and debates is how to integrate the AI ecosystem into the complex unmanned aviation system? Both worlds are complex individually, but even more complex is how to intertwine them in such a way that they reinforce each other. Second, because of the complexity inherent in UAM, a research portfolio and roadmap would be beneficial to steer time, money, and effort. That way, research institutions can make more strategic choices on which areas and challenges to explore, and in which order. This enables independent researchers and research institutions to work coherently on addressing the technological, legal and societal aspects related to UAM. Finally, delay in regulations will have direct negative consequences for the industry. Especially prolonged lack of clarity on anticipated criteria for certification, will hamper investments in innovations. Funding to enable industry partners to bridge this gap is fruitful, but should always be in close cooperation with the legislators and public officials who in their turn can benefit from their experience.

This workshop contributed to the debate of public acceptance by providing new UAM use cases that could be beneficial to society. 'New' in the sense that these examples are not yet highlighted extensively during events and public debates. Examples are use cases that require less physical infrastructure in the already busy cities, or that enable services that are more difficult to provide using existing infrastructures, for example in remote areas. Second, use cases that directly show the benefit of UAM by making a comparison between existing forms of mobility and future possibilities. The discussion also underlined the importance of transparency towards the public, as well as the importance of displaying directly noticeable benefits to citizens.

To increase the social acceptance of drones, it is vital for local authorities/municipalities to take their role in knowing and understanding their citizens. It is important to encourage public debate and demonstrate what drone operations look like in practice. But only showing the operations is not enough. It would help to experience the entire UAM-customer journey from beginning to end, including what decisions are made and why.

This workshop also contributed to the exploration of 'technology maturity', resulting in the observation that technology might in areas already be considered mature enough to become market ready. But the coordination and integration of the technologies into one coherent system is where the real challenge lies. What type of technology do we need to integrate all the IT hard- and software? Furthermore, the technology of a single drone itself is not complex, but the integration of the device into the business systems of all related organizations meets many challenge. For example, in practice a lot is involved when integrating drones into current surveillance and monitoring systems. An important aspect to this discussion is to prevent the aviation-technology push to be too dominant. Rather, we need to take relevant societal use cases as a point of departure, in order to determine what is desirable and how UAM can contribute to this.

In summary, these and many more important questions were raised during this workshop. New connections were made and new opportunities for future collaborations were explored. We look forward to seeing them come to fruition in the future.
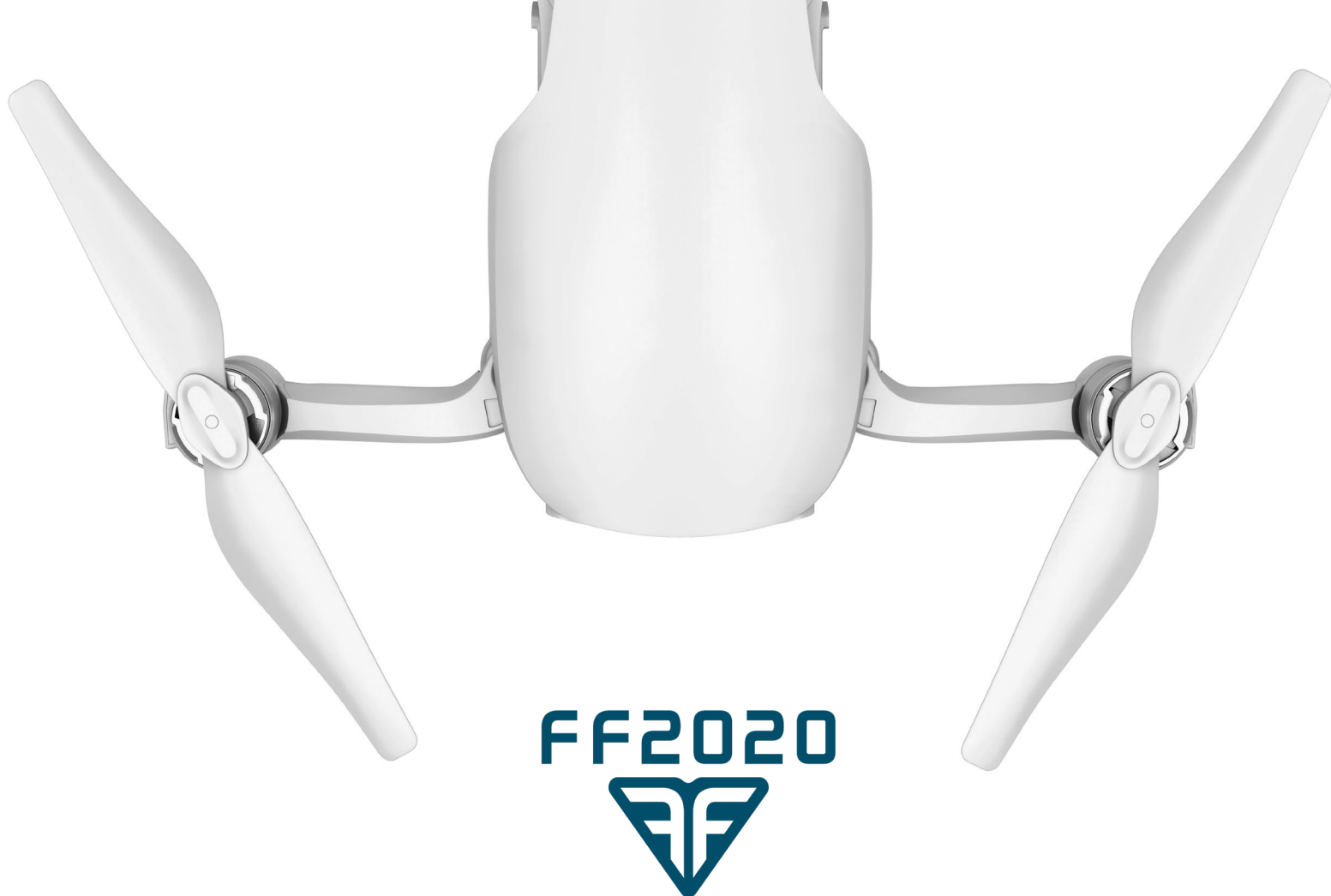
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