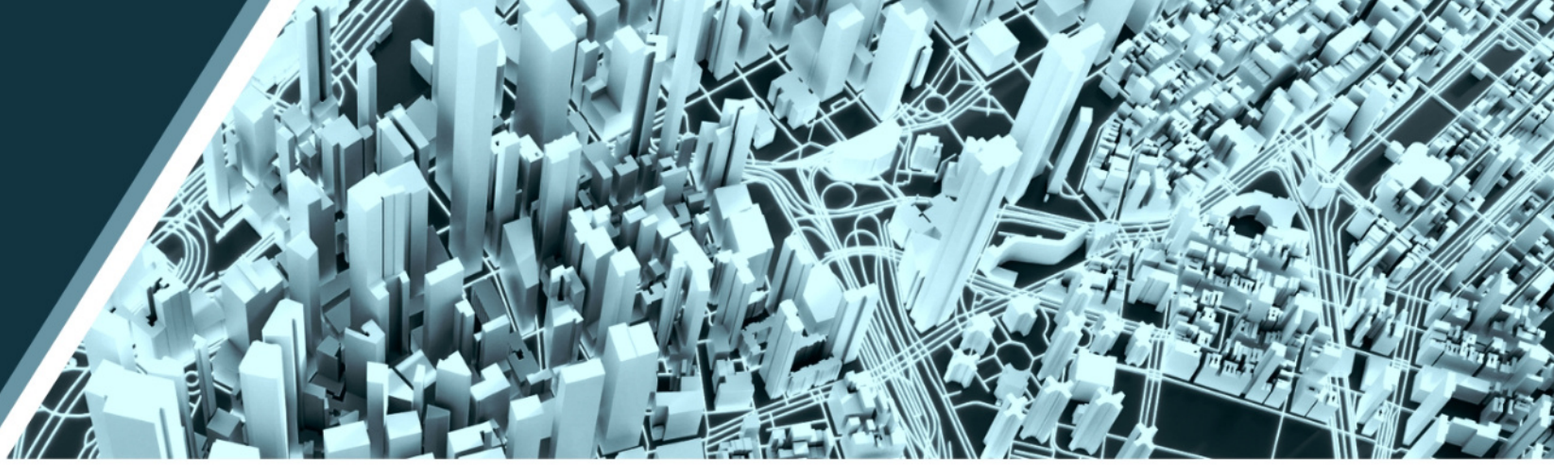


AURORA

Safe Urban Air Mobility For European Citizens





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"Welcome to the exciting world of Urban Air Mobility! We are thrilled to introduce you to our AURORA project, where the sky is not the limit but a new realm of possibilities. In this booklet, you'll discover how we're revolutionizing urban transportation, making it a more autonomous, sustainable, and efficient contributor to the emergency services ecosystem. From vertical take-off and landing aircraft to autonomous flight technologies, we're shaping the future of urban travel. As Project Manager, I invite you to embark on this journey with us, exploring the innovations, challenges, and immense potential of UAM. Together, we're reimagining the way we move in cities, opening doors to a new era of mobility. Thank you for joining us on this remarkable adventure!"

Silvio Semanjski
Aurora Project Coordinator


AURORA
Safe Urban Air Mobility For European Citizens

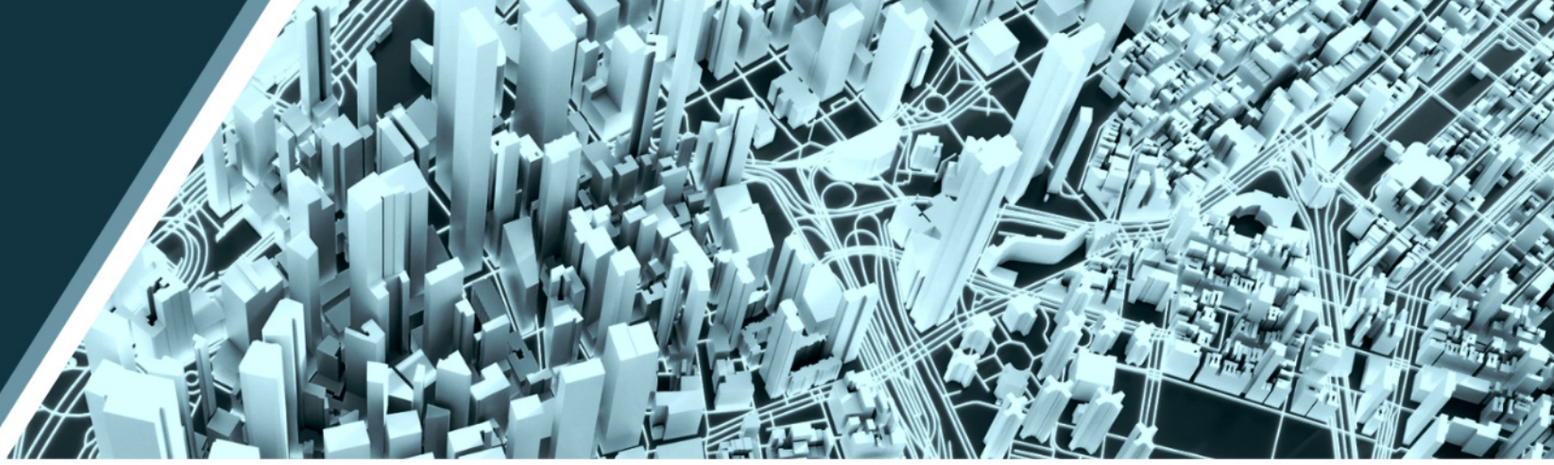


about

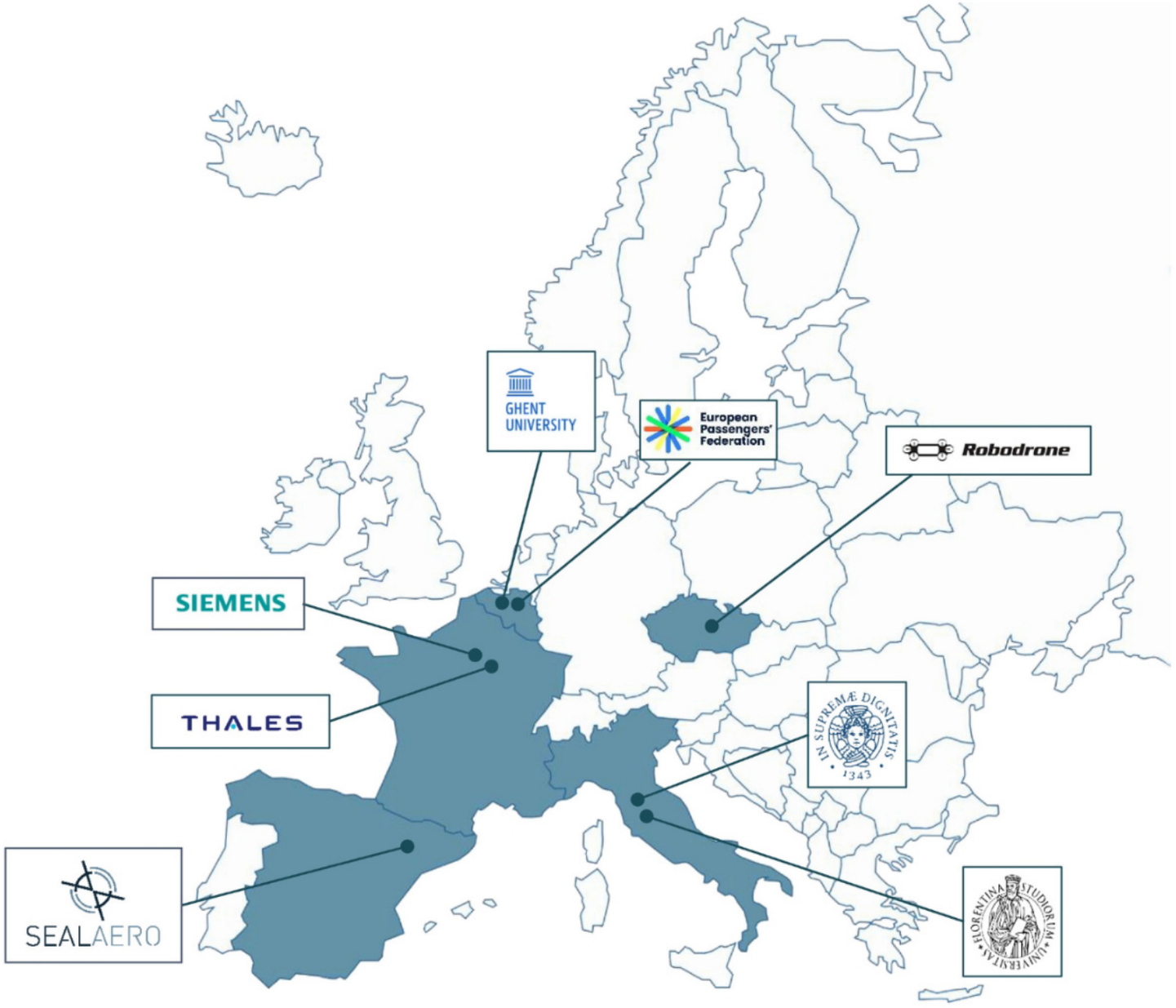
AURORA

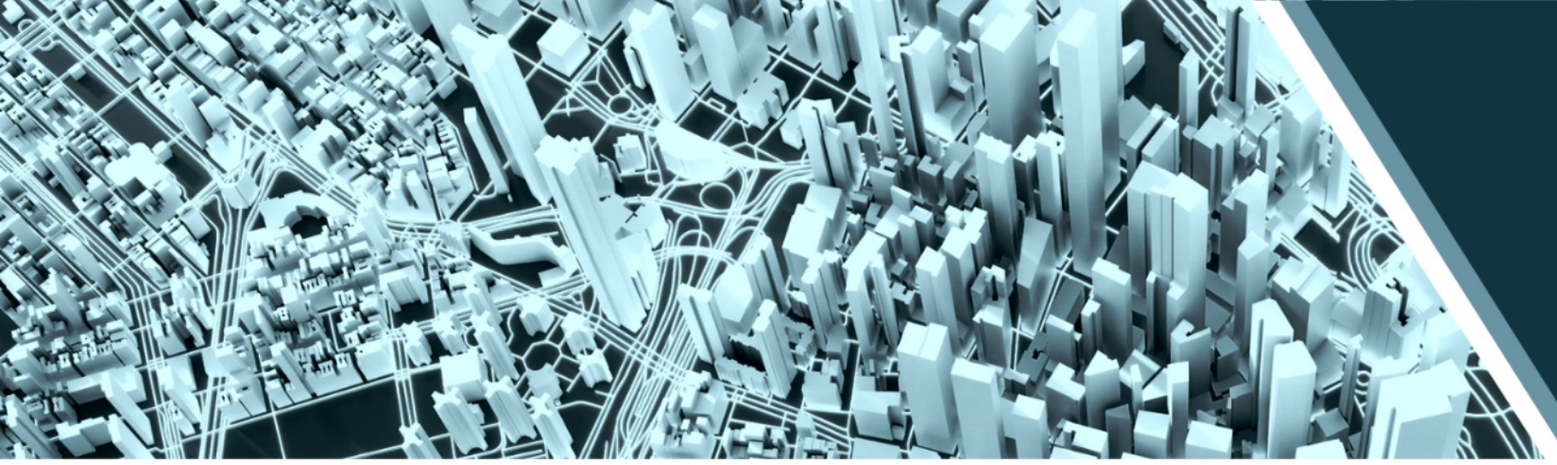
AURORA embarked on an approach to embrace Urban Air Mobility by effectively addressing the challenges and mitigating risks associated with urban flight operations. We did it through the introduction of key enabling technologies, promoting public acceptance of UAM through co-creation with stakeholders and citizens.

In AURORA we believed and pursued the idea of enabling Urban Air Mobility by developing key technologies to vertically integrate unmanned aircraft into the existing surface-based service ecosystems. We believe that autonomous flight integrated with higher automation U-Space services is one of the key enablers in managing the risks associated with UAM operations and that if the intrinsic robustness of the overall UAM underlying technology is enhanced and demonstrated, then the safety of the citizens is increased, and consequently citizens' acceptance of UAM. In AURORA we called it pro-active public acceptance through the co-creation of technologies and their subsequent real-world applications. The technological solutions showcased in real-world applications for first responders, urgent logistics, and smart cities extend far beyond AURORA, serving as adaptable and progressive models for the growing field of Urban Air Mobility.

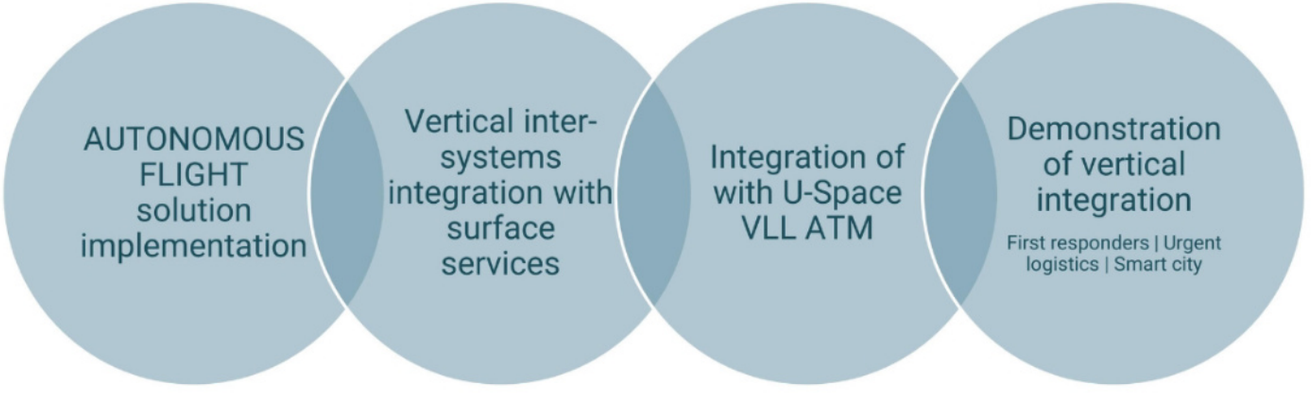


AURORA Consortium



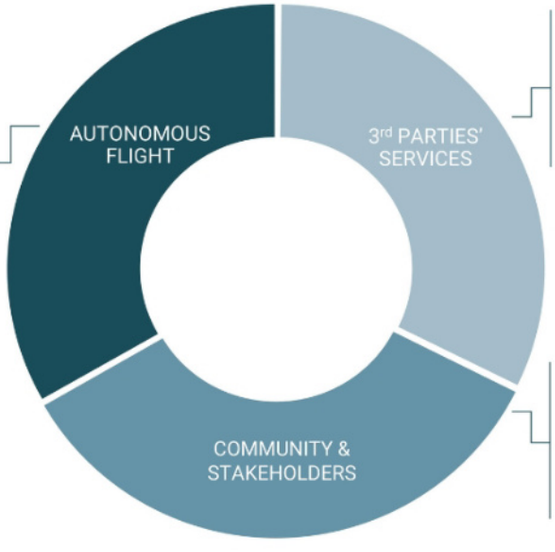


AURORA Objectives



AURORA Key Areas

- Managing mission - not flying it
- Conform to mission objectives
- Path planning & following
- Integrated Detect-and-avoid
- Emergency landing capability
- Flight Performance aware electric operations



- Smart-City | Urgent logistics | First responders
- Ground-Air elements connectivity
- Mission management interfacing

- Use-cases built with community & stakeholders
- UAM autonomous flight OPS proof-of-concept
- UAM safety OPS through autonomy & automation

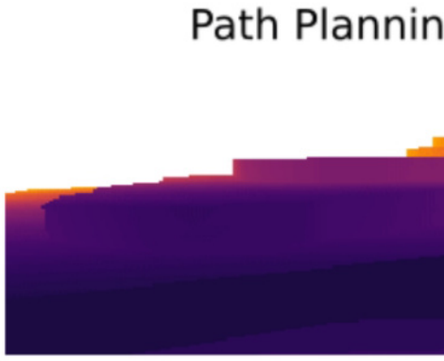
Autonomous Flight

Lead: SEALA
Contributors: UGent, Robodrone, Thales

Autonomous flight is considered one of the key enablers of UAM. Autonomous behaviour, that is being able to autonomously react to unforeseen events, is rather a human virtue. In AURORA we pursued autonomous functionality in the global and local path planning & following solutions, with automated airspace and mission management.

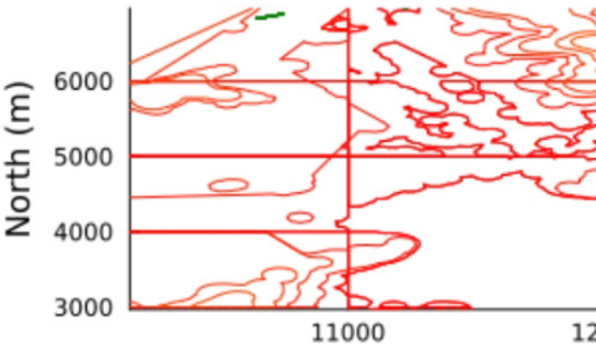
Global path planning solution (GPP) Start TRL 1 - End TRL 4

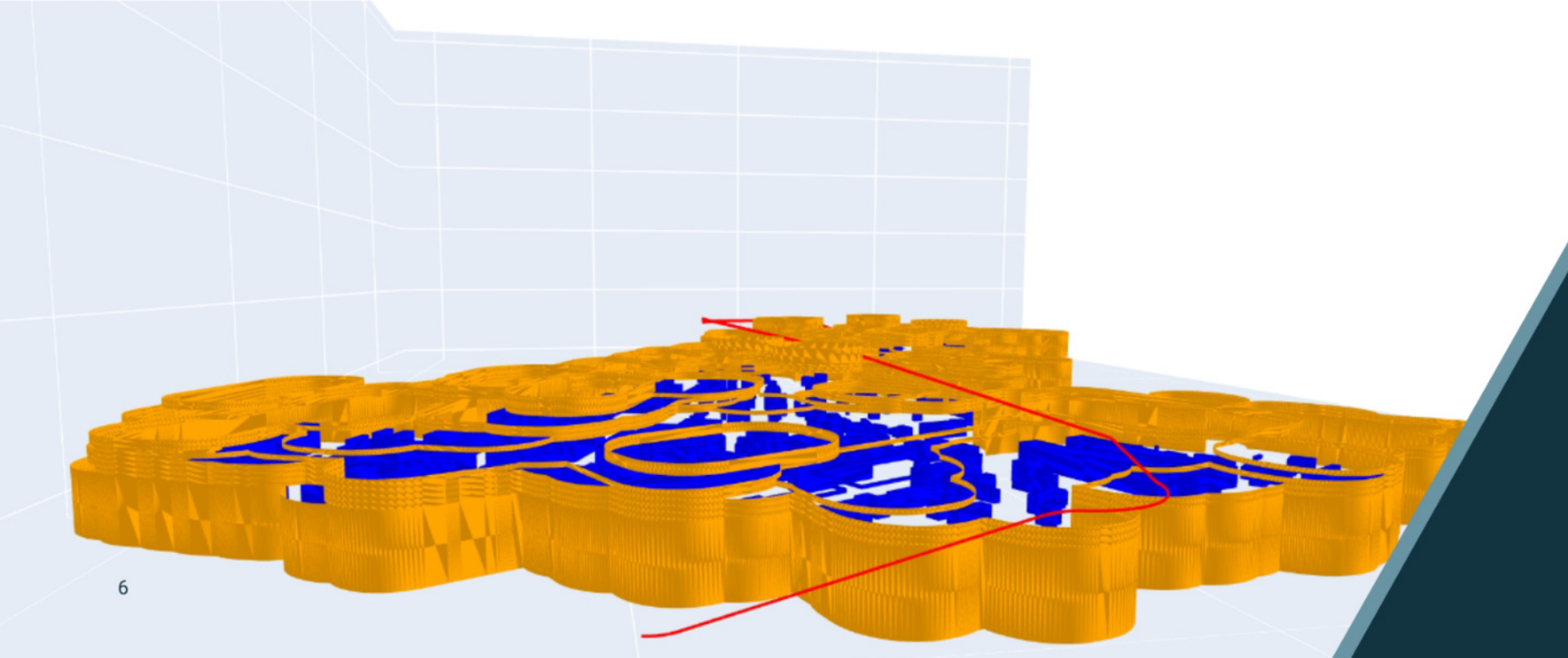
Global path planning solution (GPP):
The foundation of any autonomous flight solution is the ability to find an optimized flight path in a given and known obstacle space. In AURORA we developed a 3D flight path planning solution based on a state-of-the-art hybridized A*/Visibility graph method that uses obstacles, terrain, and aircraft performance as constraints. Aircraft performance constraints are factored in as dynamic (flight dynamics wrt density altitude) vertical and horizontal holonomic constraints.



Local path planning solution (LPP) Start TRL 2 - End TRL 4

Next to the ability to find a path in a known environment, is the ability to find a path in an unknown obstacle environment, that is sensed by environment perception sensors. In AURORA we developed a local path planning solution, also known as detect-and-avoid, based on a state-of-the-art partially observable Markov decision process method. The AURORA solution has effectively adopted an algorithm on which minimum operational performance standards for the Airborne Collision Avoidance System Xu (ACAS Xu) equipment for unmanned aircraft are defined, by integrating ground obstacles in addition to the un-cooperative aerial threats (intruders).

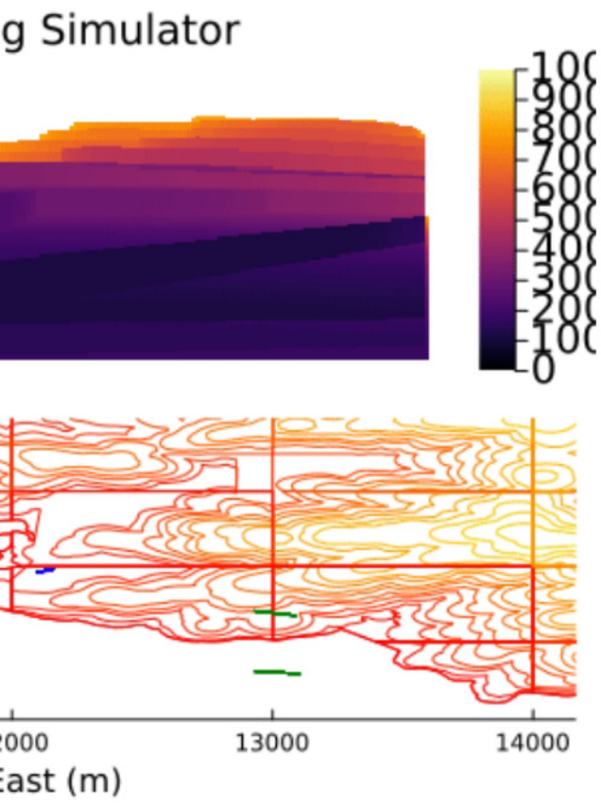




Mission management solution (MMS)

Start TRL 1 - End TRL 5

In order to automate the whole process of mission and flight preparation phase of autonomous flight navigation and guidance of an unmanned aircraft, in AURORA we have developed a mission management system based on the robotic operating system (ROS) allowing not only intra-systems on board the aircraft to be interlinked but also geographically distant processes and applications via Internet.



In this way, we are able to relieve humans from flight control responsibility and through the use of MMS put them in an oversight role, with ultimate decision authority over the mission and flight objectives. Through MMS, on one side we have been able to interlink with 3rd party ground-based management systems, such as first responders' and urgent logistics' ones, and on the other side to the sources of airspace information (i.e. geo-zones) and meteorological information. This AURORA solution has been developed to be robust enough and scalable for adopting a number of future applications, such as U-Space services: strategic conflict management, tactical geo-fencing, tactical conflict management, and dynamic geofencing.

Flight performance management (FPM)

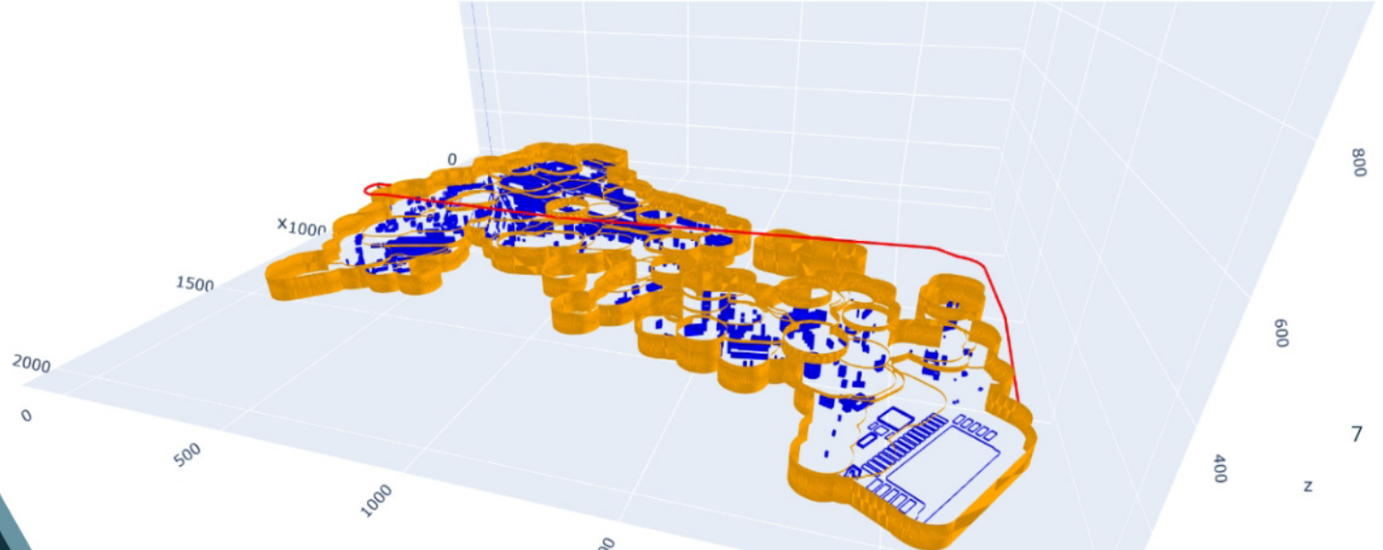
Start TRL 1 - End TRL 4

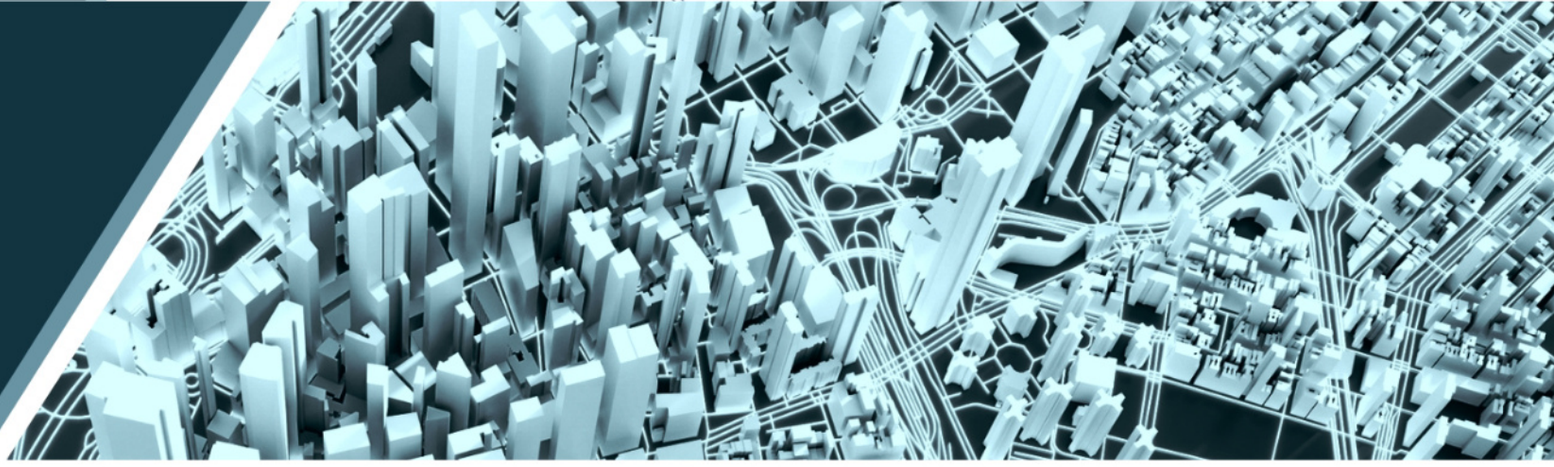
For an autonomous flight-capable aircraft, awareness of its endurance and range is a prerequisite. In AURORA we have developed a flight performance solution continuous estimation of endurance and range with respect to meteorological conditions (wind speed/direction), density altitude, and energy-storing capacity onboard the UA. We have demonstrated a solution in a use-case with electric powered UA (drone) being aware of its energy consumption with respect to path, wind, and energy consumption, to autonomously fly to the nearest recharging station (assumed to be available in the future) and complete the mission.

Emergency landing solution (ELS)

Start TRL 1 - End TRL 4

For any VTOL unmanned aircraft to be considered safe in an urban environment where UAM operations take place, the ability to perform an emergency landing is one of the critical autonomous functions. In AURORA we have developed a state-of-the-art solution for emergency landing of VTOL aircraft based on continuous safe landing site detection by environment perception sensor, allowing not only spatial suitability to be determined but also occupancy of the site (i.e. human). GPP solution together with SLS detection is allowing to find instantaneous path in an obstacle environment of the city allowing automated safe landing in emergency situations.





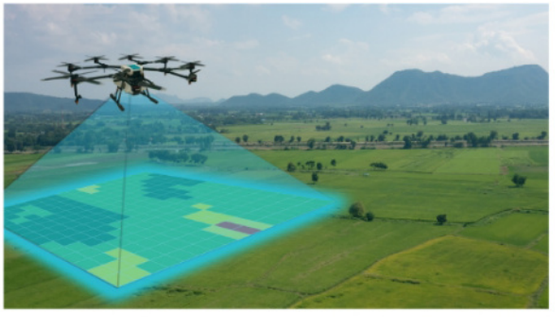
Navigating the Environment

Lead: SEALA (GNSS), UniFlo (Radar), Thales (Camera)
Contributors: Siemens, UGent

AURORA believes that the robust and resilient awareness of a UAV regarding its position and environment is a fundamental aspect of achieving autonomous flight capabilities. This becomes especially crucial in urban settings, which are intricate and characterised by factors like urban landscapes, a mix of services, and high safety requirements. As a response to these challenges, we have explored the employment of GNSS, radar, and optical perception capabilities to bolster UAM operations.

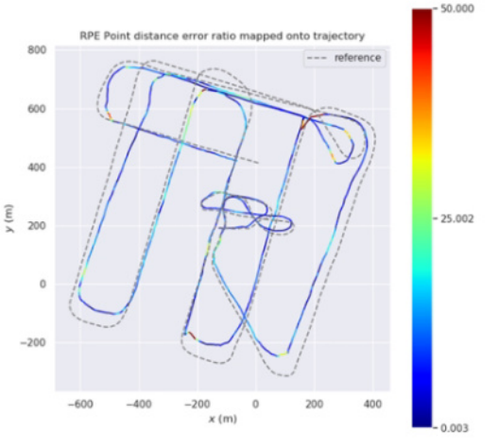
GNSS

In AURORA we have pioneered the use of GALILEO High Accuracy Service. In an urban environment, where conventional positioning-navigation-timing based on open GPS and GALILEO services are degraded or even denied due to multipath interference and lack of satellite line-of-sight, the latest European GNSS precise point positioning service is believed to be the air traffic management supporting navigation infrastructure for UAM and AAM. In AURORA we have tested the robustness and performance of GALILEO HAS using the experimental GNSS receiver and algorithm in an urban environment.



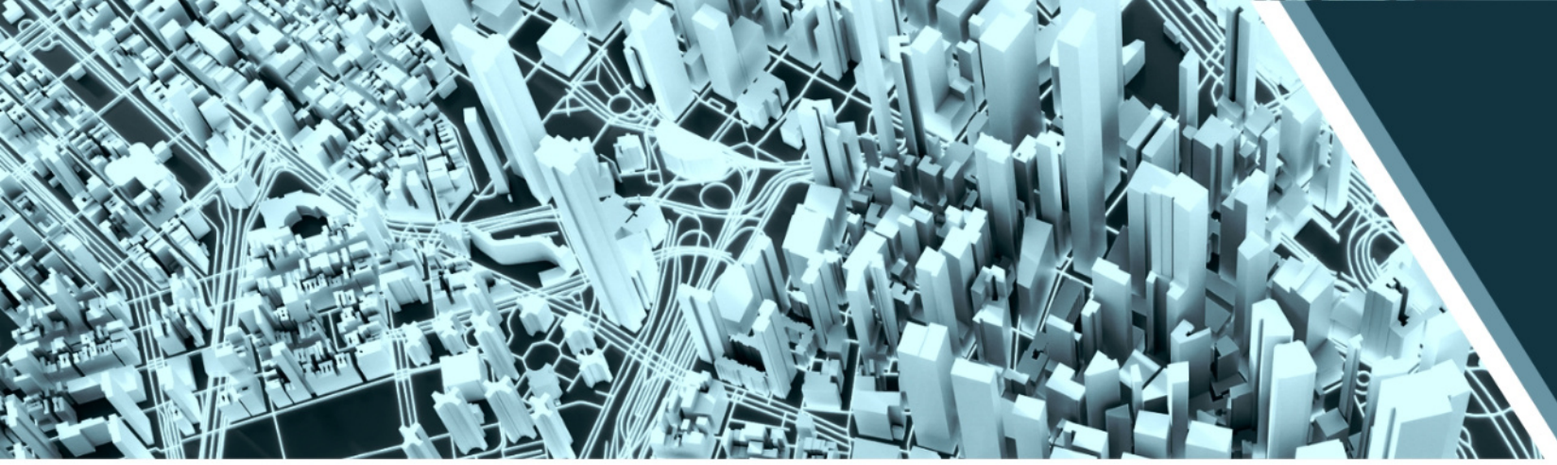
RADAR

During AURORA, we proposed a radar-based mapping system both for obstacle detection and path planning. The radar equipment used is a single-chip device originally developed for automotive applications that has good resolution in azimuth, but poor resolution in elevation. This limitation can be critical for UAS applications, and it must be considered for obstacle-avoidance manoeuvres and for autonomous path-planning selection. The developed radar-based solution was successfully tested in an operative scenario and it was able to map the environment and detect and avoid obstacles along the UAM path. Moreover, the radar can be also used for detecting electric wire along the desired trajectory.



Camera

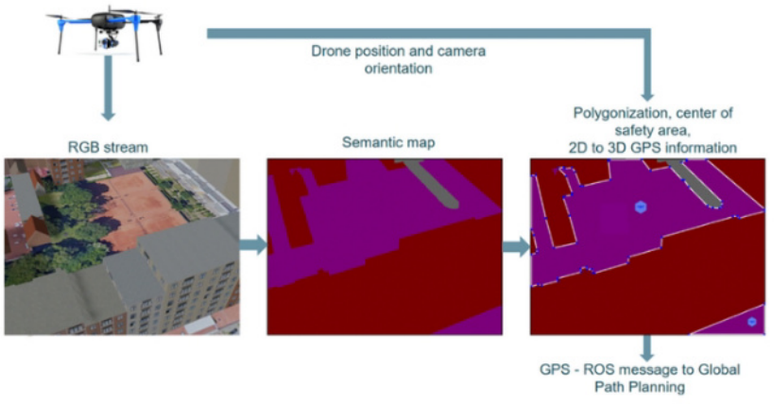
In AURORA we have explored a computer vision-based solution that enables analysis of images captured by UAV in real-time, which has recently become a very active and challenging research topic. In this context, we have developed different video analytics components including the development of a vision-based localisation system / Infrastructureless localisation system and the development of a safe emergency landing site detection using vision to determine possible landing place(s).



Safe Landing Site (SLS) Detection

Lead: Thales
Contributors: SEALA, UGent, Siemens

While contemporary systems in aviation allow automated responses to known or expected conditions, a key feature of autonomous flight is the ability to autonomously react to unforeseen events. One of the key safety-critical features of AURORA UAM operations is the continuous selection of safe emergency landing sites and autonomous flight guidance for UAM vehicles. In our context of detecting safe landing sites (SLS), we propose a video analytics-based solution able to analyse the scene in real-time, providing such information to the path planning module. Our solution takes advantage of modern computer vision approaches in order to detect safe landing sites without dangerous or moving objects. The main output is a multiclass semantic segmentation mask representing a map of pixel-wise class probabilities based on the images of an RGB camera deployed on the UAV.



The solution is conceived by merging the following technologies:

- Object detection and scene segmentation (landing area building blocks)
- Polygonization of the detected areas and transmission of safe landing site locations candidates
- Conversion of safe landing site locations detected on camera image coordinates to geodetic coordinates to be sent to the Global Path Planning (GPP).

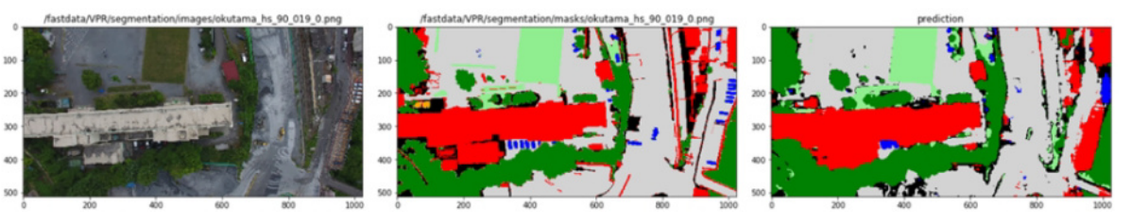
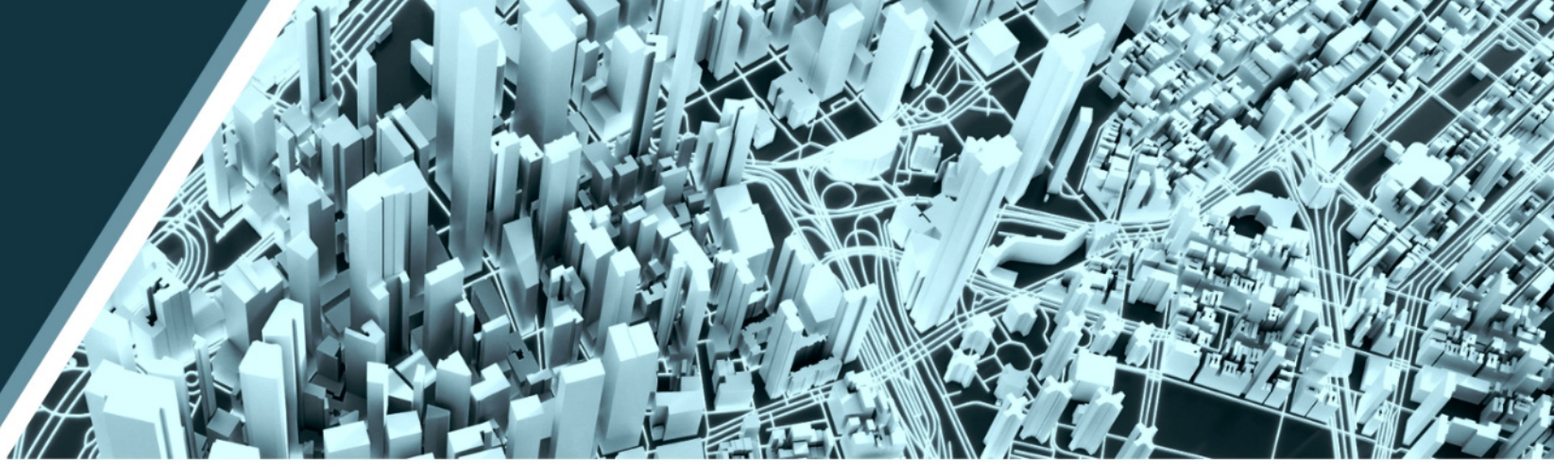


Image seen by UAV **Ground truth** **The segmented results**



Sustainable Mobility Indicators

Responsible partner: UGent
Contributors: All partners

Urban Air Mobility's value is seen in its potential to contribute to more sustainable mobility systems by overcoming challenges in the current mobility system. However, public acceptance struggles with worries about safety, privacy and environmental impacts (noise hindrance, visual impact, …). The Mobility Indicators therefore aim to provide a handhold to evaluate the impact of UAM on the sustainability of the mobility system. Given the multi-faceted content of sustainable mobility, the challenge is in finding a set of Mobility Indicators that are specific (measuring the aspects that actually matter), measurable (possible to evaluate in a quantitative and objective way), attainable (based on readily available data), relevant (covering all affected aspects, but no more than required) and time-based (repeatable in time, for example, to compare situations before and after implementation of UAM).
For developing the indicator set, we started from the Sustainable Urban Mobility Indicators (SUMI), proposed by the European Commission for the evaluation of cities' urban transport systems. Based on the literature, we evaluated which of the SUMI indicators are affected by the implementation of UAM. This reduced the initial set of 21 indicators to a set of 8 UAM indicators, complemented by two specific indicators for the AURORA project.

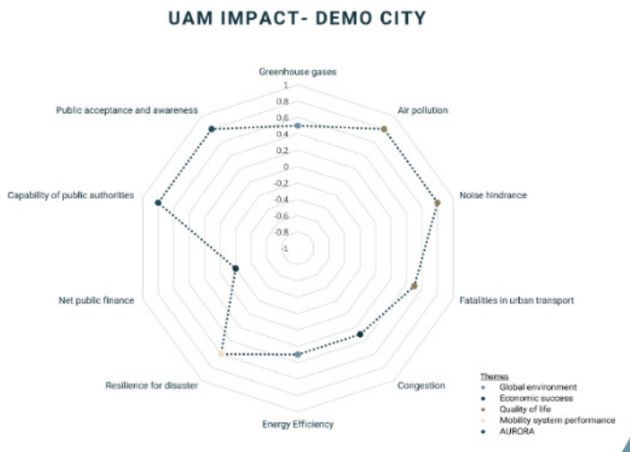
The added value of Sustainable mobility indicators for UAM

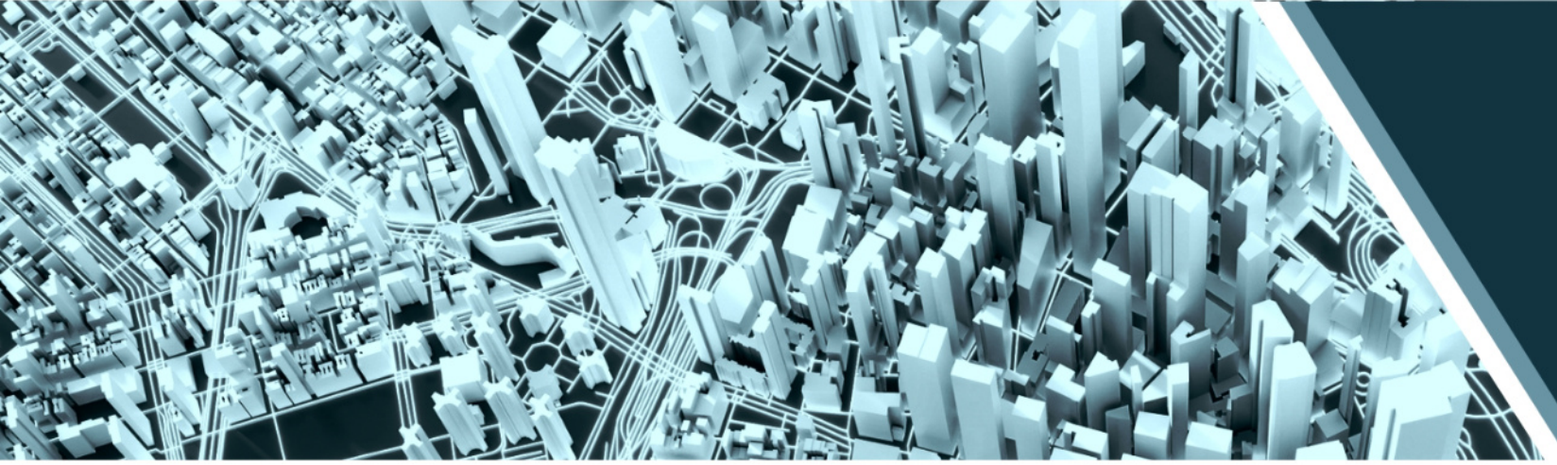
The Sustainable Mobility Indicators firstly offer a handhold for other demonstrations to evaluate UAM's contribution to sustainable mobility. This way, they also give a direction for data collection during demo set-up. Further research however shows that, while UAM has a positive impact on certain indicators, the impact on other indicators is still uncertain, because of the role of, for example, lifecycle evaluation or rebound effects mitigating the intended impact. Vehicle technology (capacity, battery performance), operational set-up (trip length, charging infrastructure) and regulations (speed, height, flight planning) highly affect the UAM performance on certain indicators. These insights are important focus points to be further clarified by research and technological partners.

We defined a set of indicators for sustainable UAM. An overview of the literature showed the expected impact of UAM on each indicator. For some indicators, the impact is unclear (e.g. need for lifecycle evaluation of UAM vehicles) or depends on the system design (infrastructure, flight scheme, regulation, …). As a proof of concept, the selected indicators were applied to the AURORA use cases.

The added value of Sustainable mobility indicators for AURORA

The Sustainable Mobility Indicators were developed with a double aim. On the one hand, public acceptance is an important obstacle for UAM, hence a specific work package being contributed to the topic. The Mobility Indicators offer a structure to inventory the impact of UAM, so that negative effects are acknowledged but at the same time balanced with its positive effects. On the other hand, the indicators were used to evaluate the AURORA demonstration activities and demonstrate the added value of the use cases towards a sustainable mobility system.

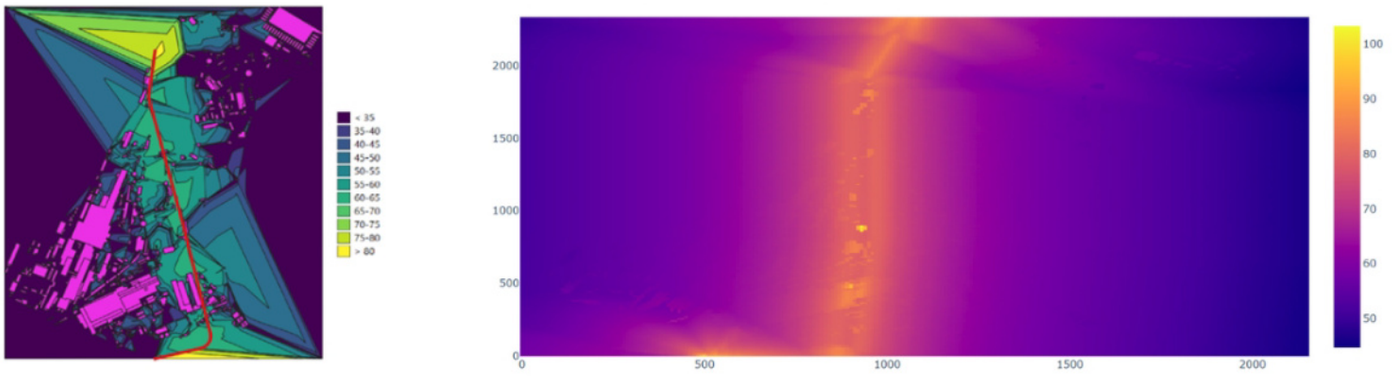




Overflight Noise Modelling in Urban Areas

Responsible partner: SEALA
Contributors: UGent

AURORA provides the solution to estimate a noise footprint in a 3D city environment for any given path UAM vehicle is flying or intended to fly over. The solution consists of implementing a noise source hemisphere model for a particular unmanned aircraft (UA), whose data is provided by EASA from their NOise of Rotorcraft Assessed by a Hemisphere-approach (NORAH) database[1]. Noise propagation physics and noise level estimation at the receiving 3D object level (including ground level) is being implemented using methodology laid down in the open-source noise modelling framework[2] with path propagation numerical model referenced in the Common Noise Assessment Methods in Europe (CNOSSOS-EU).
The solution is foreseen to be used in at least two major applications; establishing permanent UAM corridors in urban areas with the minimum noise exposure to the city inhabitants, and ad-hoc finding of the flight path with the minimum noise exposure.



The solution for overflight noise modelling in urban areas is adding value to the green and clean sky agenda of the EU, contributing to the active mitigation of the noise pollution effects in the cities. The solution contributes to the adaptability of the UAM operations and services in a proactive operational manner, allowing cities to minimize the exposure of their inhabitants to the overflight by optimizing the placement of the UAM corridors in the airspaces under their jurisdiction. In such a way, cities are becoming part of collaborative decision-makers, natively being limited to the aviation authorities and airspace users.

1 This project (Rotorcraft noise modelling method) has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No MOVE/B3/SUB/2020-243/SI2.826742.

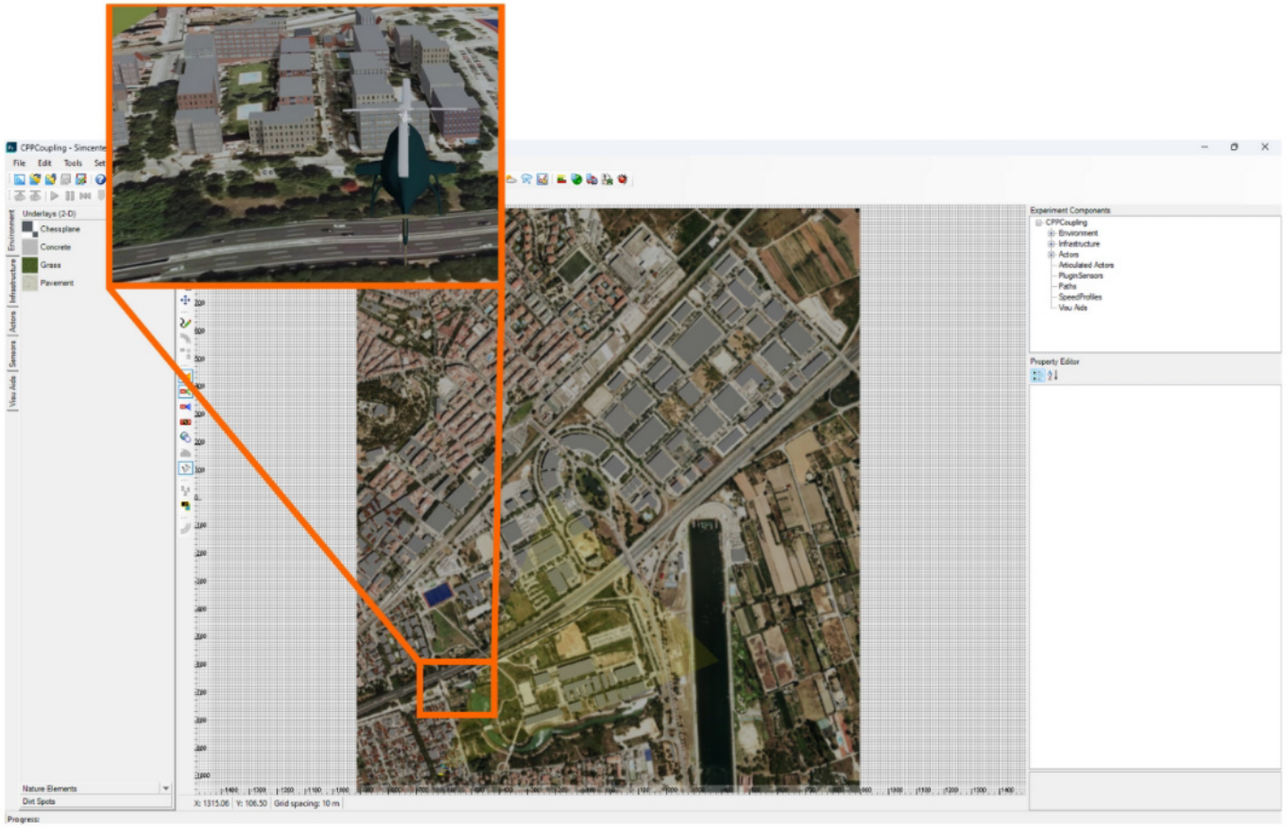
2 In this sub-task SEALA has established collaboration with the Acoustics, Vibration, Lighting and Electromagnetism Division of the CSTB, Unité Mixte de Recherche en Acoustique Environnementale (UMRAE) of the Université Gustave Eiffel, and Aerodynamics, Aeroelasticity, Acoustics Department of the ONERA.

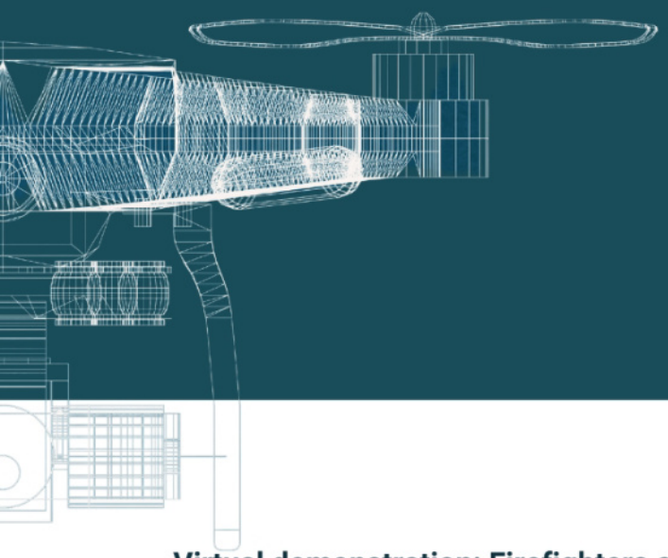
Virtual World Demonstrations

Lead: UniPi
Contributors: All partners

To test AURORA solutions and advances, we have foreseen three validation and demonstration levels:

- **zero-level**, lab environment validations for software and hardware integrations,
- **first-level**, the digital twin testbed validation, allowing us to simulate several virtual reality scenarios at once and test multiple phenomena, some of which simply do not exist yet, in an inexpensive manner and in a risk-free environment
- **second-level**, technology demonstrations in a relevant world environment with the inclusion of key stakeholders to ensure maximised impact and exploitation of AURORA's findings and advances.





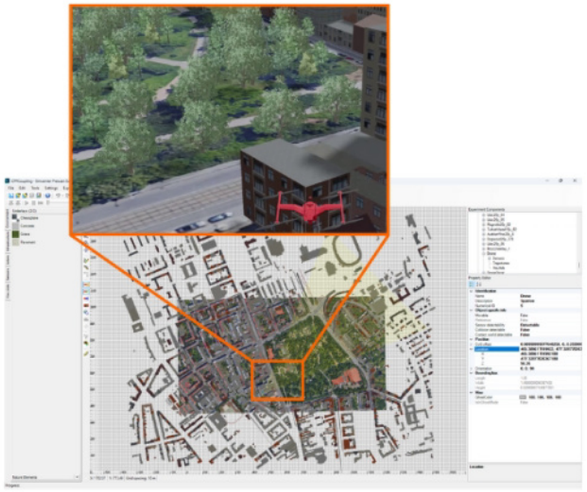
Virtual demonstration: Firefighters and search and rescue missions

The aim of the demonstration was to validate technological building blocks developed within AURORA on scenarios involving a search and rescue mission (searching for a lost person in a park area) and hazardous fire situations (in support of evacuation missions from a burning building and an areal fire surveillance missions). The virtual test area was a Brno, Czech Republic, supporting the preparation of AURORA real-world demonstrations foreseen in the area.

Virtual demonstration: Medical emergency logistics

The medical emergency logistics virtual demonstration focused on validating technological building blocks developed within AURORA in relation to emergency logistics applications. The explored mission included pickup and delivery of certified containers containing hazardous goods, such as blood samples or medications, between distant locations. In our case, this meant that the mission needed to be executed partially over the sea as, among the selected locations, the Piombino and Portoferraio hospitals were included, connecting the medical facility situated on the Italian coast to an island-based medical location.





Virtual demonstration: Smart city

Virtual demonstration situated in the area of Castelldefels, Spain, aimed at validating AURORA's technological building blocks on smart city scenarios where a smart city system initiates a UAV mission request. The UAM service provider's Mission Management System (MMS) integrates a minimum mission point of interest (POI), action at the POI, and flight altitude constraint together with meteo-source feed inputs in an automated manner, providing input for an electrical UAV's flight path plan. During the mission execution, several options were explored including a low energy level and autonomous routing towards the nearest charging station, power failure and emergency landing solution as well as the appearance of an intruder drone and autonomous conflict resolution solution.



Real World Demonstration

Lead: SEALA (Barcelona, Spain), UniPisa (Piombino, Italy), Robodrone (Brno, Czech Republic)
Contributors: All partners

AURORA believes that services that reflect the direct benefit of humans, human life and properties, are likely to be among early adopted UAM services as their value proposition will be imminently visible and incremental to the existing services in this domain. For this reason, we have focused our co-creation and real-world demonstration activities around potential first responders' services, such as emergency medical, civil protection (fire and rescue) and smart city applications, exploring how fully autonomous, self-piloting or pilot-augmented UAM platforms' applications can make a significant societal difference by extending the current capabilities of the first responders.



BRNO
CZECH REPUBLIC

The primary challenge in search and rescue operations has always been the speed of response from first responders and the sheer number of personnel required for the mission. However, the introduction of UAVs has been a game-changer in addressing these issues. UAVs play a crucial role in reducing the manpower needed for search and rescue missions. AURORA explored how UAVs equipped with advanced sensors and cameras, can swiftly scan vast areas, increasing the chances of finding survivors or identifying hazards. Moreover, UAVs excelled at speeding up the detection and localization of fires, mitigating the risk of rapid spread. In summary, the integration of UAV technology into search and rescue operations not only lessened the personnel burden but also significantly enhanced the efficiency and effectiveness of these critical missions, ultimately supporting life savings and minimizing damage.



PIOMBINO
ITALY

Our real-world demonstration in Italy focused on emergency medical logistics. In more detail, a use case of blood sample delivery between Portoferraio (Elba island) and Piombino (mainland) locations was explored. A particular focus during this real-world use case exploration was also put on emergency services provision in the network degraded conditions (as Internet network failure) and provision of resilient and reliable emergency service in the considered area.



BARCELONA
SPAIN

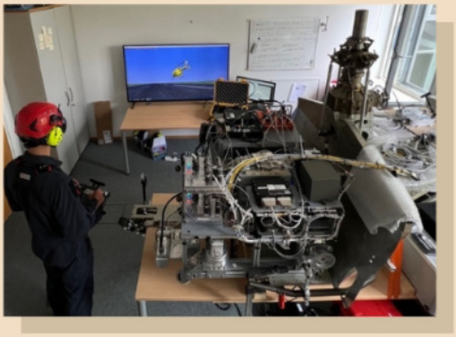
In AURORA we have demonstrated several functions of the autonomous flight solution in the real-world environment. Automated mission planning with global path generation for obstacles environment represented as buildings, with consecutive path following has been demonstrated using multicopter drone. Path control critical features of the autonomous flight solution have been demonstrated in the real-world environment using AURORA developed state-of-the-art autonomous flight laboratory, based on robotic light rotorcraft.















Decision Support Tool

Responsible partner: UGENT
Contributors: SEALA, ROBODRONE

AURORA's Decision Support Tool has been developed to support stakeholders in UAM ecosystem in selecting the appropriate UAS (Unmanned Aircraft Systems) operational category according to UAS's Concept of Operations (ConOps).

It is designed in accordance with the September 2022 revision of the Easy Access Rules for Unmanned Aircraft Systems, Regulations (EU) 2019/947 and 2019/945. Its primary aim is to serve as a valuable resource for researchers and enthusiasts of UAM and to empower users with a deeper comprehension of the requisite authorizations and certification processes, thereby enhancing their overall understanding of UAS regulatory compliance.

This step-by-step decision support guide is available on the AURORA webpage (https://aurora-uam.eu/decision-support-guide) and can simply be accessed by scanning the QR code.



Stakeholders Engagement

Lead partner: EPF
Contributors: All partners

AURORA Workshops:

5
workshops

95
engaged stakeholders

4
locations

1. **First stakeholder workshop, online**
   Location: online
   Date: September 28th, 2021.

2. **Stakeholder and citizen workshop (“Urban Air Mobility for All”)**
   Location: Brussels, Belgium
   Date: May 17th, 2022.

3. **Brno citizen workshop**
   Location: Brno, Czech Republic
   Date: June 17th, 2022.

4. **Pisa citizen workshop**
   Location: Pisa, Italy
   Date: June 30th, 2023.

5. **Barcelona citizen workshop**
   Location: Barcelona, Spain
   Date: October 30th, 2023.

Lessons Learned

During AURORA, project partners found numerous challenges and solutions to tackle them. These experiences resulted in several recommendations to be shared with other stakeholders in the world of UAM.

AUTONOMOUS FLIGHT

One of the most essential lessons is the importance of autonomous flight as a key enabler for UAM. However, the existing regulations currently exclude fully autonomous flights, mandating the presence of a remote pilot for control and monitoring. Consequently, these constraints pose substantial hindrances to the development and testing of autonomous flight systems in real-world scenarios. Urgent action is therefore imperative to establish a regulatory framework that embraces the requisite flexibility for advancing innovative Unmanned Aircraft Systems (UAS).

REGULATORY FRAMEWORK

Other challenges in the field of regulations are the lack of access and standardization between the various regulations, which could be helped by a centralized access point for all UAM-related (national, European) regulations. The European Union drones' legal framework has been recently subjected to uniform regulation by the European Union Aviation Safety Agency (EASA). Similar standardization or integration should also be strived for in terms of technical solutions, interfaces or instruments.

SOCIETAL IMPACTS

Furthermore, the success of UAM does not only depend on technological development but also on societal impacts. The public acceptance of UAM is still challenging, requiring the mitigation of negative effects on the one hand, and the integration of UAM within the existing urban mobility system on the other hand. Demonstration activities provide a valuable platform to create involvement from citizens, and awareness about the potential of mobility services by UAM, as well as the possible weaknesses or threats. Indicators form a tool to monitor these various impacts of UAM in a structured way.

STAKEHOLDERS INVOLVEMENT

During the process of conceptualizing, implementing and operating the UAM system, it is important to be aware of the large variety of stakeholders involved. This refers to their level of knowledge, the area of expertise, their interest in UAM, etc. Activities need to be specifically targeted, distinguishing between broad dissemination activities and technical discussions, between technological and more societal topics, and between a public of industrial partners, policymakers and the general public (and even further diversified according to age, gender, disability, educational level, economic status, etc).

Recommendations to Stakeholders Involved in UAM

1. Autonomous flight is the key enabler of the AAM, and its sub-category, UAM. AURORA recommends that EASA engages the aviation industry, standardization entities and other regulatory bodies, to adopt the autonomous flight in the current regulatory framework, instead of a complex step-by-step approach, currently remote piloting-oriented one.

2. AURORA recommends that city planners investigate the aspects of Sustainable Mobility Indicators in relation to regulations and operational design as for several Sustainable Mobility Indicators, the impact of UAM is still unclear or highly dependent on regulations and operational design. In this context, the strengths of UAM may be restricted by regulatory limitations. Parameters of the UAM system can heavily influence the performance of the UAM as a whole and in combination with aspects of safety, privacy, environmental impacts, … might negatively affect public perception of UAM.

3. AURORA recommends EASA to define a dedicated regulatory framework for research and innovation activities in the domain of AI and autonomous flight (AF) systems so that they do not need to fall under commercial level requirements for operations, but support lower TRLs testing and experimentation. Currently, it is not possible to test AF-capable unmanned aircraft in realistic environments because national aviation authorities apply commercial operations' certification basis in the process of their development. Such analogy does not exist in manned aviation and seriously hampers wider innovation and the introduction of the main enabler of UAM and AAM, the AF.

4. AURORA recommends that city planners and use case developers create awareness, prepare cities and share practices in order to help broaden the support for UAM and avoid concentration of interest in and knowledge of UAM in specific sectors with strong ties to UAM. Real tests and practical demonstrations of UAM concepts were found to be highly effective in helping people understand and engage with the technology.

5. AURORA recommends that policymakers involve a diverse group (in terms of age, gender, disability, economic status, education, etc.) of citizens to provide valuable insights into different communities' perspectives in all phases of UAM development and to address societal concerns and gain public acceptance. Be aware that the world of UAM is quite unknown, and that it's important to communicate and disseminate about UAM before developing solutions.

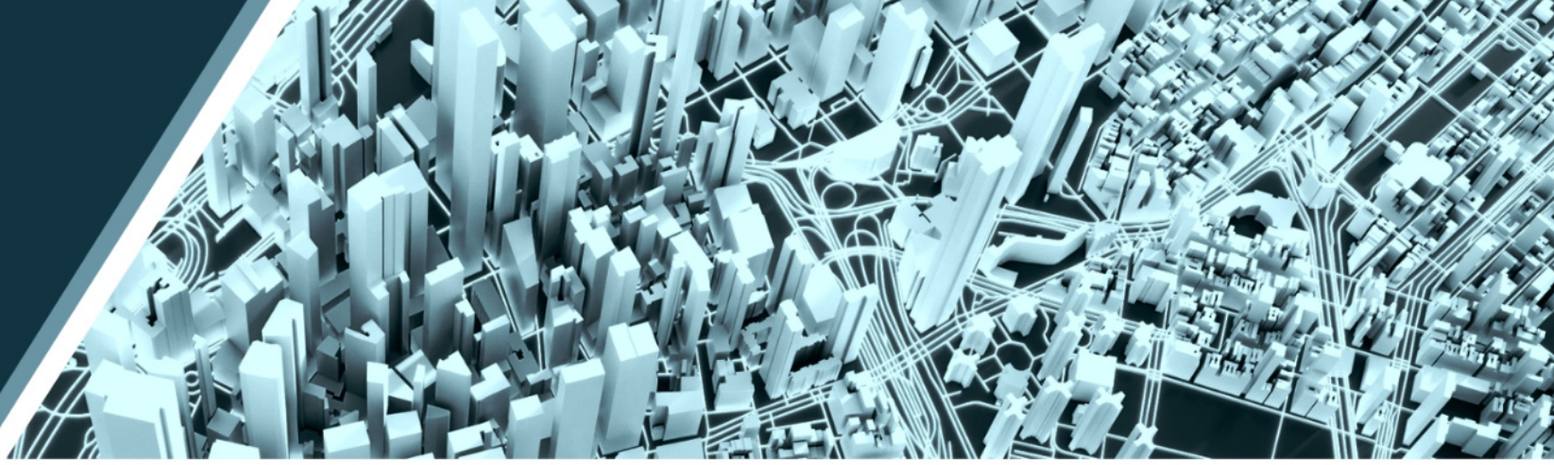
6. AURORA recommends that use-case designers, for the development and innovation of autonomous flight UAM applications, engage national aviation authorities early in the process.

7. AURORA recommends that UAM service providers build system-agnostic interfaces with consumers and providers of UAM services that allow seamless vertical integration of existing ground-based services with aerial-counterpart. AURORA has shown that using available standards and norms, interfaces can be implemented for automation purposes and thus vertical integration

8. AURORA recommends that the UAM industry, for the scope of technical development, sets up a system architecture as an essential framework to attribute and align contributions from versatile groups of stakeholders and define a Minimum Viable Product (MVP) for each development. In line with this, it is recommended to take into account (possible) future technical evolutions

9. AURORA recommends that the UAM industry and use-case developers continuously monitor the emerging UAV market, as it is highly dependable on the existing socio-economic situation and market fluctuation in the domain of electronics, avionics and aviation. When engaging in UAV related research it is good to take this into account as we have seen prices splurging over the past years.

10. AURORA recommends that the European Commission creates a user-friendly UAM regulation compliance tool.



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SEAL Aeronautica S.L. (Coordinator)

SEAL Aeronautica is an Aerospace company located in the ESA business incubation centre in Castelldefels, Barcelona. It is focused on research and development of solutions for autonomous flight integrated into ATM and U-Space environments. Transversal disciplines such as big data and AI are extensively researched and employed in aerospace solutions being developed by SEAL Aeronautica.

At SEAL Aeronautica, our primary focus is to offer expertise and guidance in the complex field of air traffic management. With a dedicated team of highly skilled professionals, we bring substantial knowledge and a proven track record to the industry.

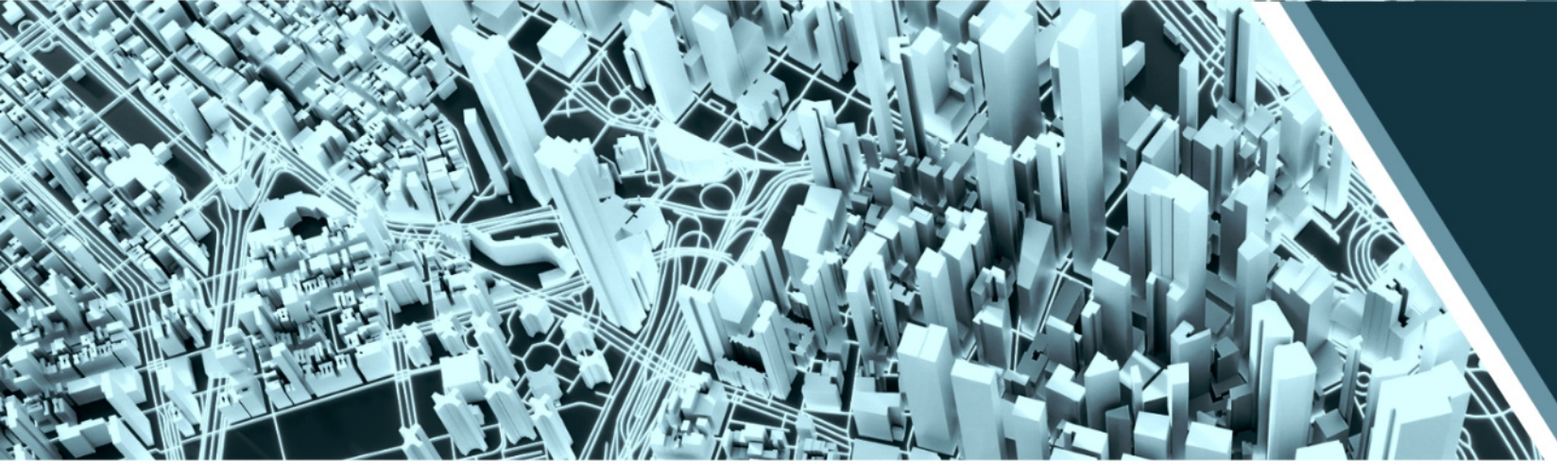
Our participation and leading role in projects under the European Commission's Framework Programs demonstrates our commitment to advancing air traffic management technologies. These involvements have allowed us to collaborate with leading organizations, researchers, and innovators in the aviation sector, fostering the development of innovative solutions aimed at enhancing the efficiency, safety, and sustainability of air traffic operations.

SEAL Aeronautica is dedicated to remaining at the forefront of research and technological development, continually seeking to address the evolving challenges and opportunities within air traffic management. Our commitment to staying current with industry trends, regulations, and cutting-edge technologies ensures that we provide clients and partners with the latest and most effective consulting services available. In summary, SEAL Aeronautica is a trusted partner in air traffic management research and technological development, offering extensive experience and a steadfast dedication to driving progress in this vital sector.

Ghent University

Ghent University is a top 100 university, founded in 1817, and one of the major universities in Belgium with 50,000 students and 9,000 employees. Our 11 faculties offer more than 200 courses and conduct in-depth research within a wide range of scientific domains. Our credo is ‘Dare to Think’, challenging everyone to question conventional views and to dare to take a nuanced stand. The University hosts 78 ERC grant holders, has 1153 patents and 76 spin-off companies stemming from its research activities.

In the AURORA project, Ghent University participates with its Intelligent Systems Engineering team from the Faculty of Engineering and Architecture (EA18). The team drives innovation in Intelligent Systems Engineering in diverse markets, particularly focusing on smart cities, smart mobility and smart industry domains. It applies an integrated, multi-disciplinary approach and provides a user-centric research methodology for prototyping, validating and refining complex solutions in multiple and evolving real-life contexts. The research expertise ranges from hardware over software up to thematic applications such as big data analytics, sustainability, mobility, health and environment. The team already has several patents relevant to UAM applications and has produced several relevant spin-off companies. We actively participate in the Institute for Sustainable Mobility (UGent IDM) with expertise in sustainable mobility, intelligent systems, mobility management and urban planning decision support. We are also a part of the EIT Urban Mobility and Flanders Make research center.



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Thales SIX GTS France SAS

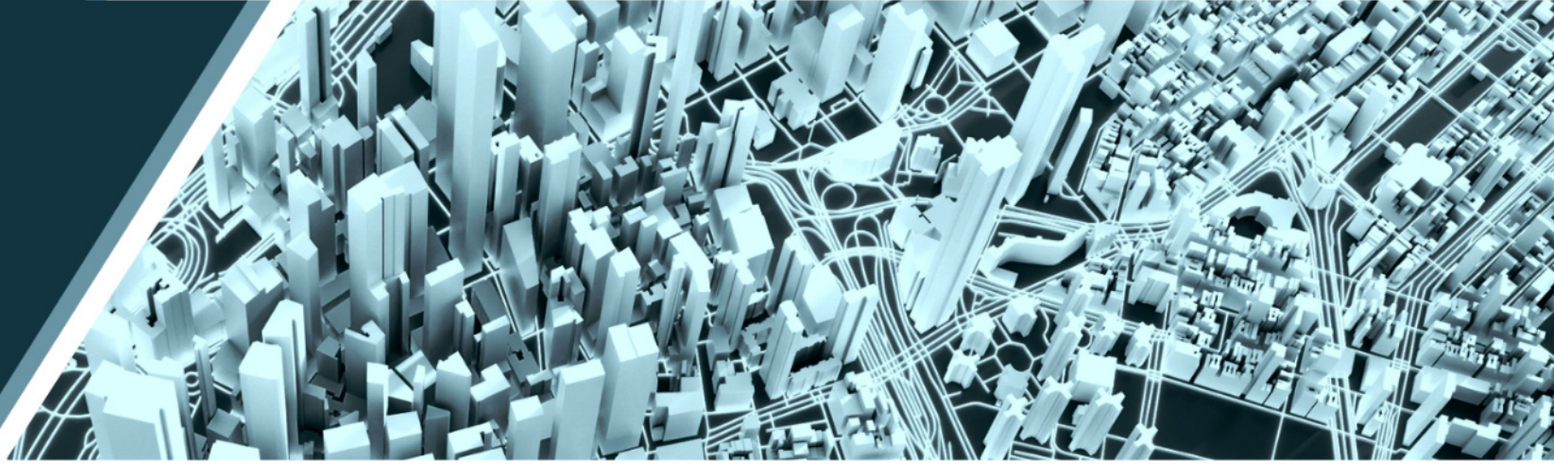
Thales Group is one of the world's leading providers of mission-critical systems for security, defense, land transport and aerospace. Thales is a global technology leader with more than 77,000 employees on five continents, in 68 countries. The Group is investing in digital and "deep tech" innovations – Big Data, artificial intelligence, connectivity, cybersecurity and quantum technology – to build a future we can all trust.

In the markets of defence and security, aerospace and space, digital identity and security, and transport, Thales provides solutions, services and products to help its customers – companies, organisations and governments – to carry out their critical missions. Leveraging a global presence and spanning the entire value chain, from prime contracting to equipment, Thales plays a pivotal role in making the world a safer place.

Thales SIX GTS is a subsidiary of the Thales Groups. As part of Thales SIX GTS research facility at the École Polytechnique campus in Palaiseau, near Paris, the Secure Communications and Information Systems Global Business Unit has created ThereSIS, a research laboratory dedicated to developing security technologies to protect people, property and critical information systems. ThereSIS aims to consolidate and expand this capacity to manage complex electronic systems used by millions of citizens. ThereSIS – VAR (Vision Autonomy and Robotic learning) innovation lab focuses on vision and sensing, network security and cyber protection, adaptive systems and bio-inspired simulation. The vision and sensing domain develops technologies dealing with video analytics, perception and robotics and specialises in critical infrastructure monitoring and transportation.

European Passengers' Federation ivzw

The European Passengers' Federation (EPF) brings together all major passenger organisations in Europe. EPF is an international non-profit organisation under Belgian law and has 39 member associations covering 21 European countries. EPF's mission is to achieve comprehensive passenger rights throughout Europe, a better passenger experience and effective multi-modal travel by conducting research, holding conferences and working constructively with the transport industry and decision-makers. EPF has a multi-modal focus and sees passenger travel as an end-to-end journey. One of the main strengths of EPF is its broad network. As a civil society organisation that represents the interests of European travellers, including vulnerable to exclusion groups, EPF has the capability to address an extensive network of passengers, passenger experts, policy makers and other stakeholders both at EU and national level.



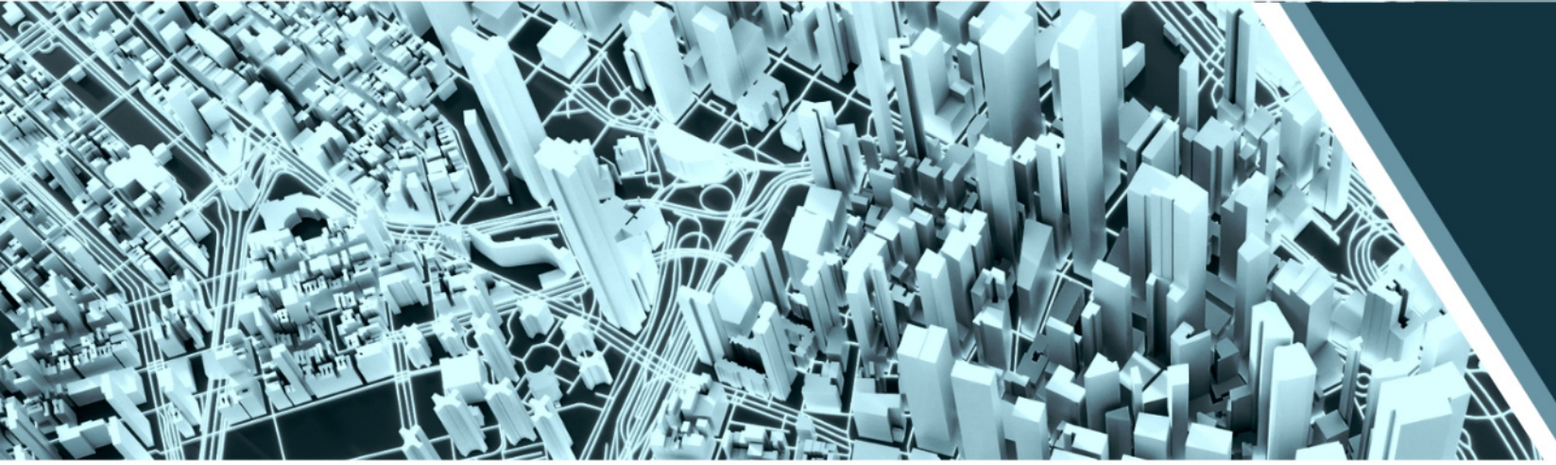
AURORA Consortium

University of Pisa

The Centre for Logistic Systems is the Logistic branch of the University of Pisa. The Centre for Logistic Systems was founded aiming to promote and implement university-level training, as well as scientific research and innovation in the supply chain and logistics sector. The Centre is located in Livorno whose local economy is strongly characterized by the logistics, due to the presence of one of the most important ports in Italy, which is crucial for import and export of relevant volumes of goods as well as for cruise tourism. The center has been created with the joint contribution of several departments, since the integration of skills and competences of multiple kind is essential for logistic specialists. Among others, the departments participating to the activities of the Center are the following: Economics and Management, Industrial and Civil Engineering, Information Engineering, Political Sciences, Law. The developments of the center has been supported and funded by the Municipality of Livorno, the Livorno Port Authority and the Livorno Foundation, which belongs to the biggest local bank. The presence of the Center for Logistics Systems in Livorno may represents a source for competitive advantage both for the University of Pisa and for the development of local economy.

Siemens Industry Software SAS

Siemens Industry Software SAS (SIEMENS) develops in France and in Netherlans for over 20 years the Simcenter System Simulation solutions (Amesim, Prescan). The Simcenter System Simulation solutions allow to model and simulate the dynamic behavior of complex multi- domains systems and their environmental perception, mainly addressing the automotive, aerospace, industry and energy engineering domains. More specifically SIEMENS develops the Simcenter Amesim simulation platform, its large range of generic physical libraries, its processing and analyses capabilities, develops the Simcenter Prescan environement simulation and simulators couplings for SiL to HiL applications. In the Aerospace domain, Simcenter Amesim is widely used to cover a range of studies from early concept assessment up to life cycle operations, from component to full aircraft integrating all ATAs while Simcenter Prescan, originating from autonomous driving simulation, sees it use growing in the field of UAV perception simulation.



AURORA Consortium

University of Florence

The Department of Information Engineering (DINFO), one of the 24 departments of the University of Florence, is the reference Department for ICT (Information and Communications Technology), where it carries out advanced research in control systems, computer science and engineering, electronics systems, electromagnetism, telecommunications, operation research, bioengineering, and electrical engineering.
Traditional and advanced research, designs and implementations are digital signal processing, fixed and wireless telecommunications systems, radar, sensors and electronic devices, advanced software, ultrasound systems, satellite telecommunication/localization/sensing, media content processing and interpretation, decision support, security and protection of information and telematics, ICT for eHealth systems and electrical networks efficiency.
DINFO employs a workforce of more than 210 units (including professors, researchers, technical and administrative people, post-doc fellows and PhD students) with success in the acquisition of important public and private research funding. DINFO is in charge of two first-level three-year degree courses (Electronic Engineering and Telecommunications, Computer Engineering), five Master-of-Science two-year courses (Biomedical Engineering, Computer Engineering, Electronics Engineering, Electrical and Automation Engineering, Telecommunications Engineering) and a PhD course in Information Engineering for a total of about 1,400 students.
The main public research funding comes from European Community, the European Space Agency, the Ministry of University and Research, national research programs and the Tuscany Region. More than a quarter of the research budget of the DINFO comes from contracts with private companies that generate a fruitful technological transfer to industry.

Robodrone Industries SRO

Robodrone Industries is designing, developing and manufacturing Unmanned Aerial Vehicles (UAV) since 2013. The company focuses on multiple size UAV platforms, including user- friendly communication and control systems to store, process and stream large volumes of data coming from the various payload, sensors and cameras. In 2014 the company has been authorized by the Civil Aviation Authority to conduct commercial flight services with its own UAVs. Over the course of the numerous commercial and public projects the company has extended the expertise in production of customized battery packs, gimbals, and integration of various types of payload, communication and control units. Robodrone has the engineering capacity to integrate envisaged payload and communication systems on its own UAVs and conduct flight, functional and interoperability testing. As needed, the company will provide its various drone types & sensors.

AURORA

Communication & dissemination

AURORA's Communication and Dissemination activities included managing AURORA's communication channels and content, such as the project webpage, social media channels and identification of key messages and target audiences for the project across the full spectrum of AURORA lifetime. The infographics below summarise some of the key aspects of our communication and dissemination activities.

PRESENTATIONS

19 PRESENTATIONS AT EVENTS

CITIZENS

46 ENGAGED CITIZENS

BLOGPOSTS

47 PUBLISHED BLOGPOSTS

STAKEHOLDERS

93 ENGAGED STAKEHOLDERS

PRESS

3 PRESS REALISES

PUBLICATIONS

XX PUBLISHED PAPERS

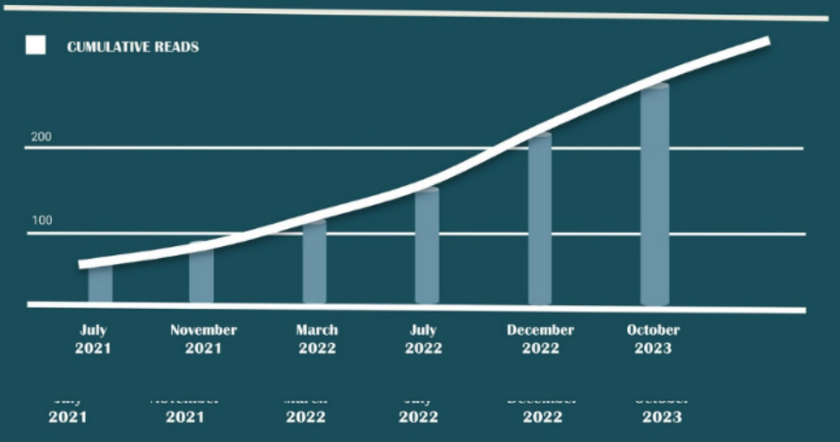
SOCIAL MEDIA

OVER **350** ACCUMULATED FOLLOWERS ON SOCIAL MEDIA

AURORA-UAM.COM

+7000 WEBSITE VIEWS

NEWSLETTER



WORKSHOPS

5 WORKSHOPS

INTERVIEWS

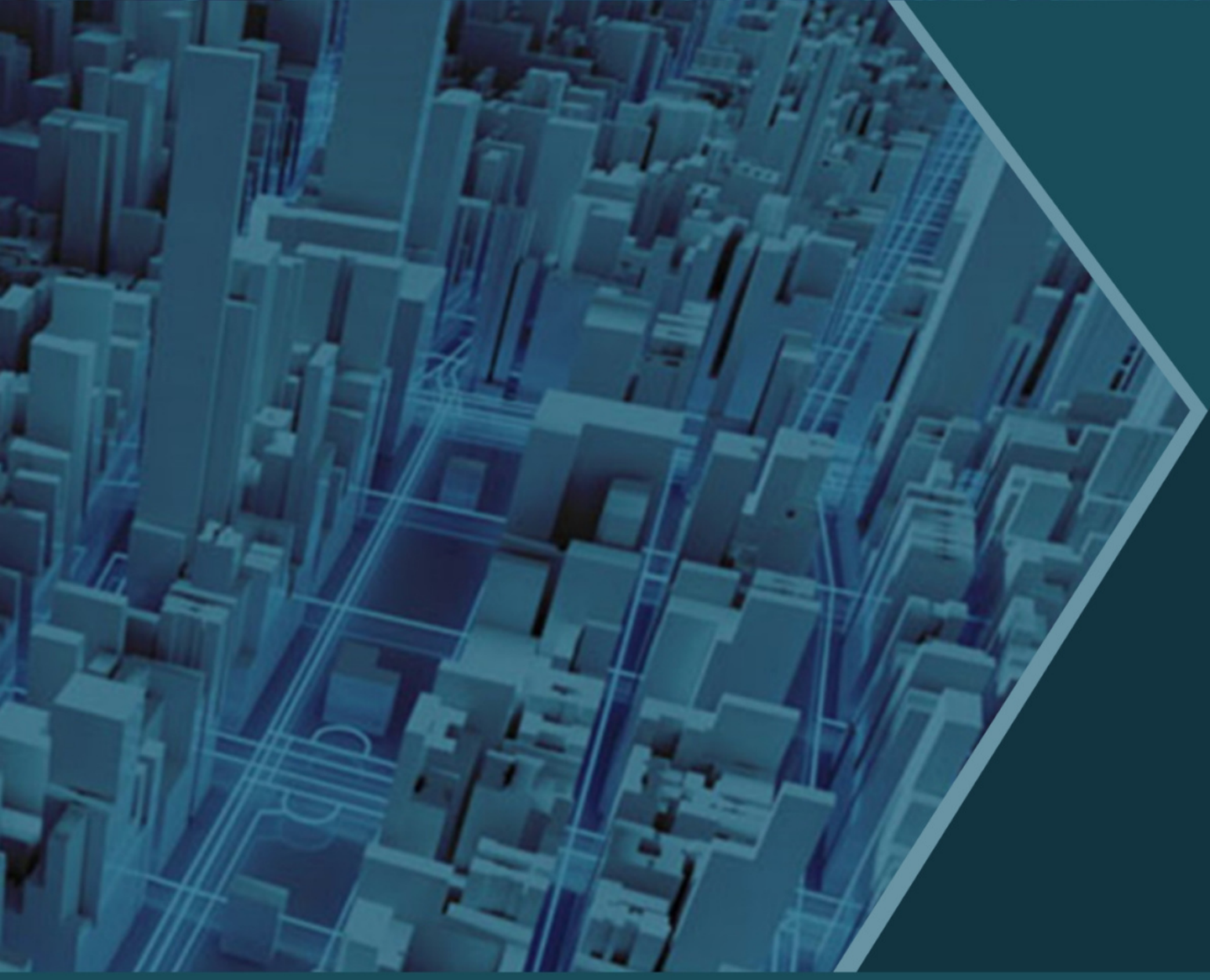
8 STAKEHOLDERS INTERVIEWS

DEMONSTRATIONS

3 REAL WORLD DEMONSTRATIONS



We invite all parties interested in further evolution and implementation of AURORA solutions to establish a link to AURORA project partners. Let us jointly promote the AAM and UAM thought technological breaktrous in present and future!



AURORA

Safe Urban Air Mobility For European Citizens



info@sealaeronautica.com

aurora-uam

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www.aurora-uam.eu

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