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Future Perspectives of Aviation for Urban and Regional Mobility

Dr. Jochen Kaiser

Future Prospects of Aviation in Urban Mobility

Multiple aspects are still being discussed:

- Vehicle characteristics regarding take-off and landing capabilities, travel speed, capacity,...
- Operational concepts as on-demand vs. scheduled, commercial vehicles vs. personal vehicles, inter- vs. intra-city,...
- Possible market structures, ownership models and business models
- Level of system costs
- Infrastructure set-up
- Air traffic management, routing and scheduling, UTM/ATM integration
- Regulatory framework

What we know today…

- High level of activities on research and industry side with focus on vehicle demonstrator and ATM/UTM concepts
- Commercial, piloted operations targeted in 2023 onwards
- Full-scale, autonomous operations decades away
- Operation from (heli)pad type area
- Various studies show an UAM market share of <10%, more around 4-6%

Conclusion from DLRK 2018

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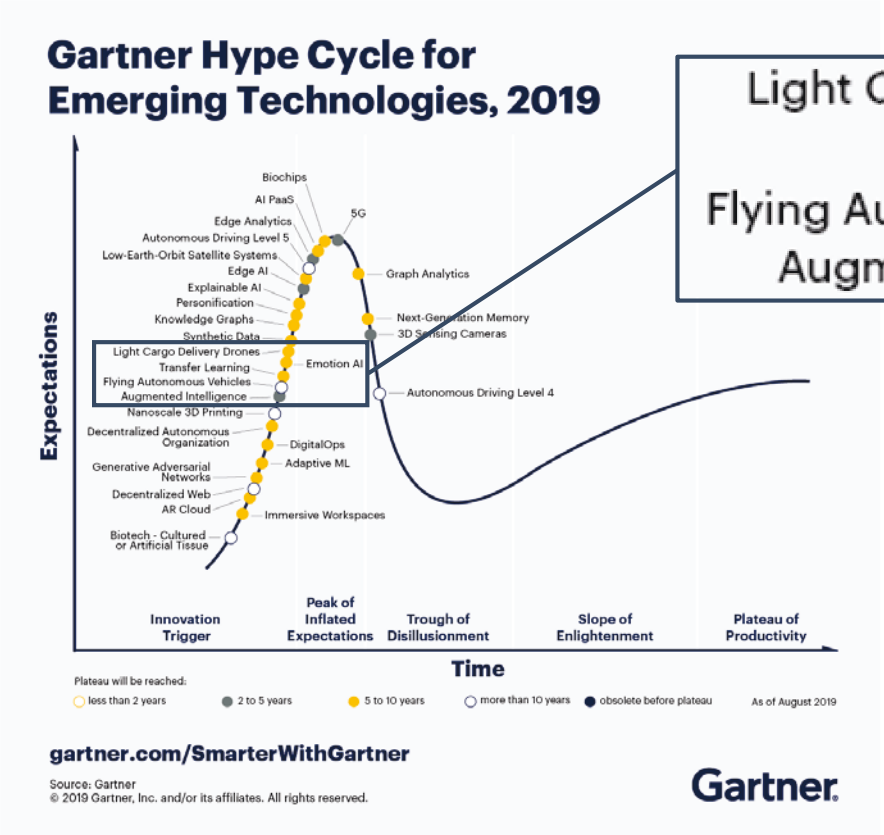
Where is Urban Air Mobility today?



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UAM Projects

114 Projects
25 Countries

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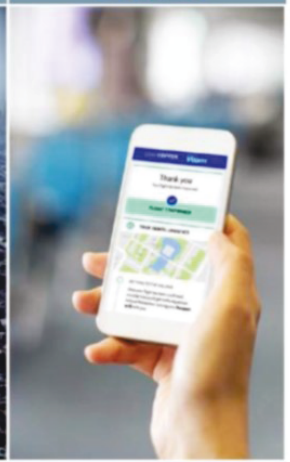
UAM is just more than only the vehicle

Urban Aircraft	Support & Service	Flight Operations	Air Traffic Management	Ground Infrastructure	Passenger Solution
					
Design, Development and Production	Maintenance, Repair, Overhaul Spare parts	Operation of the Urban VTOL Acquisition or leasing of VTOL	Develop and operate ATM solution for Urban VTOL	Installation and maintenance of VTOL pads	Booking application for flight trips

Airbus, Toulouse, France, 2018

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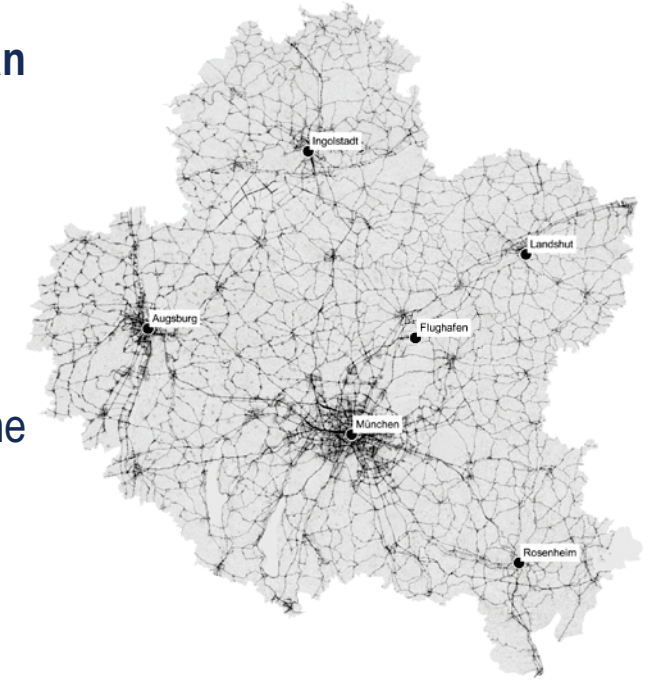
OBUAM Project

- **Research into the long-term application potential of Urban Air Mobility as a supplement to local public transport, using Upper Bavaria as an example**
  - Definition and simulation of promising Urban Air Mobility mission profiles and transport networks for the Upper Bavarian region
  - Quantification of transport performance and feedback on the traffic situation
  - Derivation of technology requirements at vehicle, infrastructure and airspace level as well as promising business and operator models



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Impact of UAM on Traffic Situation

- **Example for Munich Metropolitan Area / Upper Bavaria**
  - 4.5 million inhabitants→8.7 million trips
- **UAM@1%modal share: 87.000 trips per day**
- **UAM@10% modal share: 870.000 trips day**
- **Public Transport: 24%|11%**
  [City of Munich|Munich suburbs]

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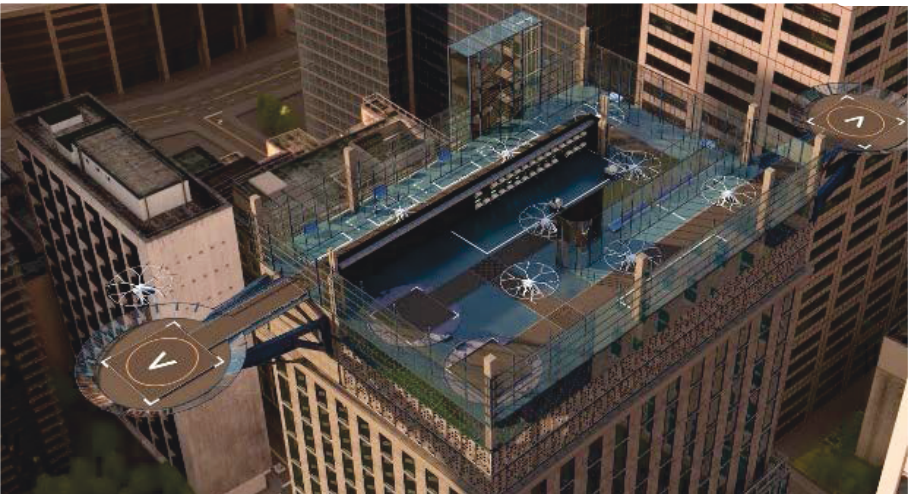
marc bourbon aerophoto


UBER HUMPHREYS & PARTN




UBER
UBER PICKARD CHILTON / ARUP

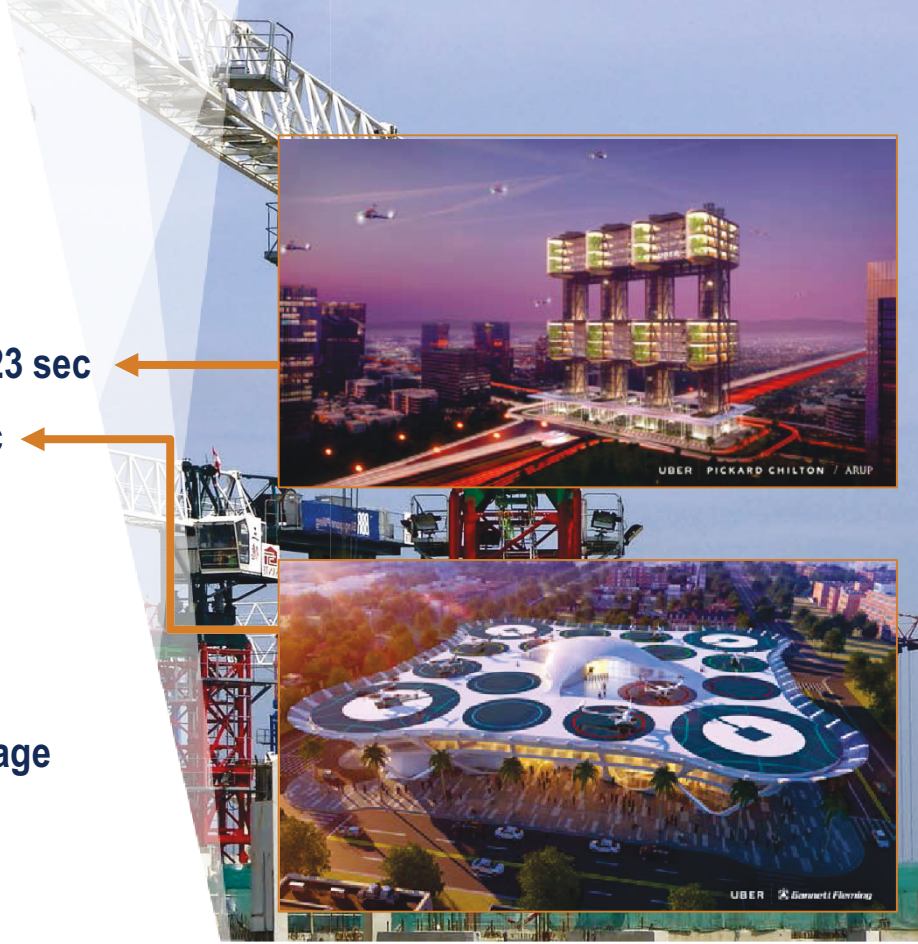
Role of UAM Infrastructure

Capacity:

- 1000 landings/h (UBER) enabled by 6/12 pads → ~23 sec
- 150 landings/h (UBER) enabled by 4 pads → 96 sec
- 24 landings/h (MIT) per pad (@60sec arr./dep.)

Example for Munich:

- Operating hours: 6:00-23:00, 2 PAX p. UAM as average load factor



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Role of UAM Infrastructure

Example for Munich:

- **UAM@1%modal share = 87.000 trips per day**
  - 3 large vertiports, 18 medium vertiports, 112 small vertiports
- **UAM@10% modal share = 870.000 trips day**
  - 26 large, 171 medium, 1066 small vertiports
- **Public transport in Munich**
  - 100 underground stations
  - 150 suburban stations
  - 173 tram stations
  - 1006 bus stops
  - Modal share: 24%|11% [City of Munich|Munich suburbs]

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UAM Air Space & Air Traffic Management

- Today's airspace and the organization of air traffic control need to be adapted to a larger number of air vehicles at low altitudes
- Automated air traffic management with reliable communication and data connections as well as up-to-date databases with obstacles and installations relevant to flight operations are a prerequisite
- Highly automated flight control and guidance


NASA / Lillian Gipson

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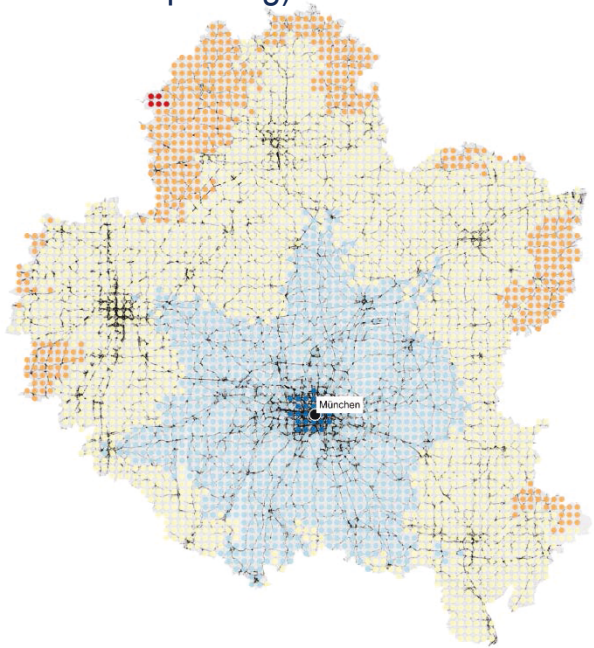
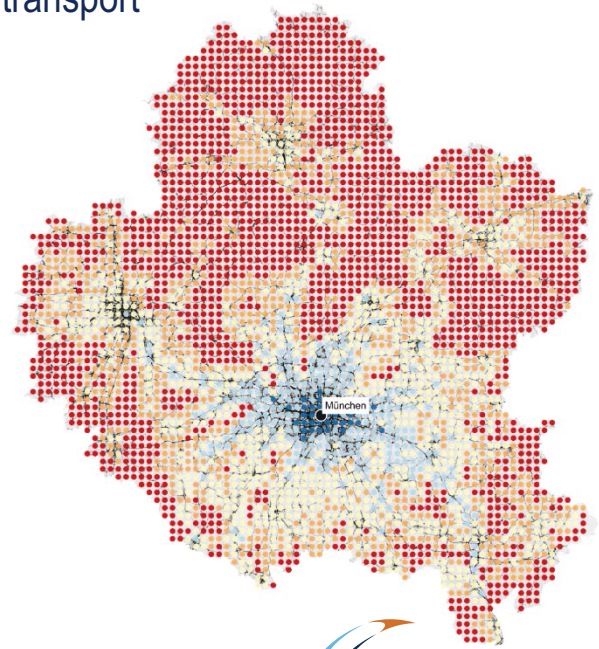
Where is the advantage of UAM?

Accessibility of Munich City Centre

- Car (incl. 15 mins parking)



- Public transport



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Urban or Rural Air Mobility?

- UAM utilizes its speed advantage on long distances
- Advantages due to natural obstacles (terrain, water, etc.) compared to today's ground based traffic
- Less competition with existing transport infrastructure

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Future Perspectives of Aviation for Urban and Regional Mobility

- Infrastructure will be a key factor for the introduction of Urban Air Mobility
- Integration of the necessary infrastructure into cities might be challenging
- Integration into existing air space
- Advantage of UAM could be more valuable for rural areas of cities

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