

Passagierdrohnen Erfolgsfaktoren für die Mobilitäts – revolution des 21. Jahrhunderts

Vortrag – Alexander Dyskin



Wuppertal, January 30, 2020

Here for you today



Alexander Dyskin

Principal,
Office Düsseldorf

Alexander.Dyskin@rolandberger.com
+49 160 7442981



Kim Kohmann

Senior Consultant,
Office Munich

Kim.Kohmann@rolandberger.com
+49 160 7448213

Roland Berger combines a unique set of profound expertise and experience with smart mobility solutions

Our mobility value proposition

1 Extensive experience with piloting innovative mobility solutions

- > We are **globally recognized as leading advisor** on **mobility services** among OEMs, suppliers, service providers and governments
- > We **developed** the cutting-edge **integrated mobility platform in Dubai**: from concept definition till successful implementation



- > We are an **interdisciplinary team** with in-depth expertise in **transportation, automotive and infrastructure**
- > We distinguish ourselves through an **entrepreneurial spirit** and apply a **business-focused approach** while being technologically top-notch

4 Entrepreneurial spirit with a business-focused approach

2 Long track record of defining operation models for disruptive services

- > We **defined** the **operation and business models** for several mobility providers worldwide
- > We **regularly support** established players and start-ups to **translate disruptive ideas** into successful and sustainable **business operations**



- > We profit from a **broad network of future mobility pioneers** and **regularly publish** on **smart cities and disruptive technologies**
- > We work closely with the scientific community to **test and assess the impact of innovations** and apply scientific tools where they are useful

3 Strong presence in global hotspots and access to inspiring mobility pioneers



We work closely with the scientific community to assess the impact of innovations and apply scientific tools where they are useful

Our additional cooperations with the scientific community

Scientific network – Selection



Scientific topics – Selection

- > Global AI footprint
- > Predictive maintenance
- > Network business models
- > Smart organizations ("Simple Smarts")
- > Commercial analytics
- > Network organizations
- > AI and blockchain in travel
- > Future-proof mobility
- > ML for Financial Services

Think:Act HUB
"Bringing Science to Business"

Many UAM projects are announced worldwide – Roland Berger has launched an Urban Air Mobility Radar to track progress worldwide

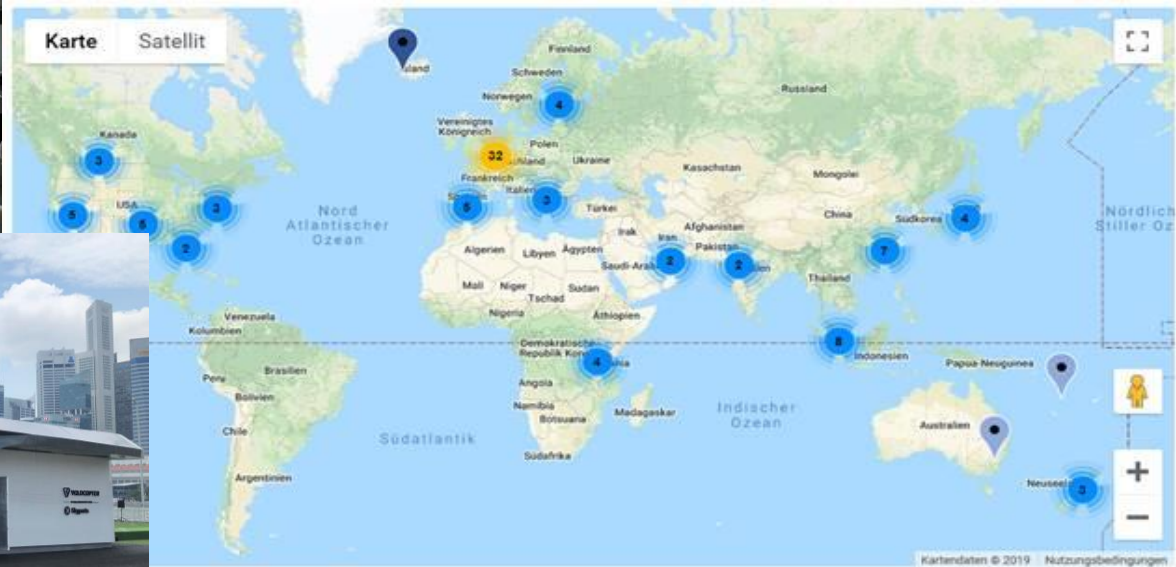
Progress monitoring

UAM pilot projects on the way



Impressions of Volocopter Skyports prototype showcase in Singapore (Oct 2019)

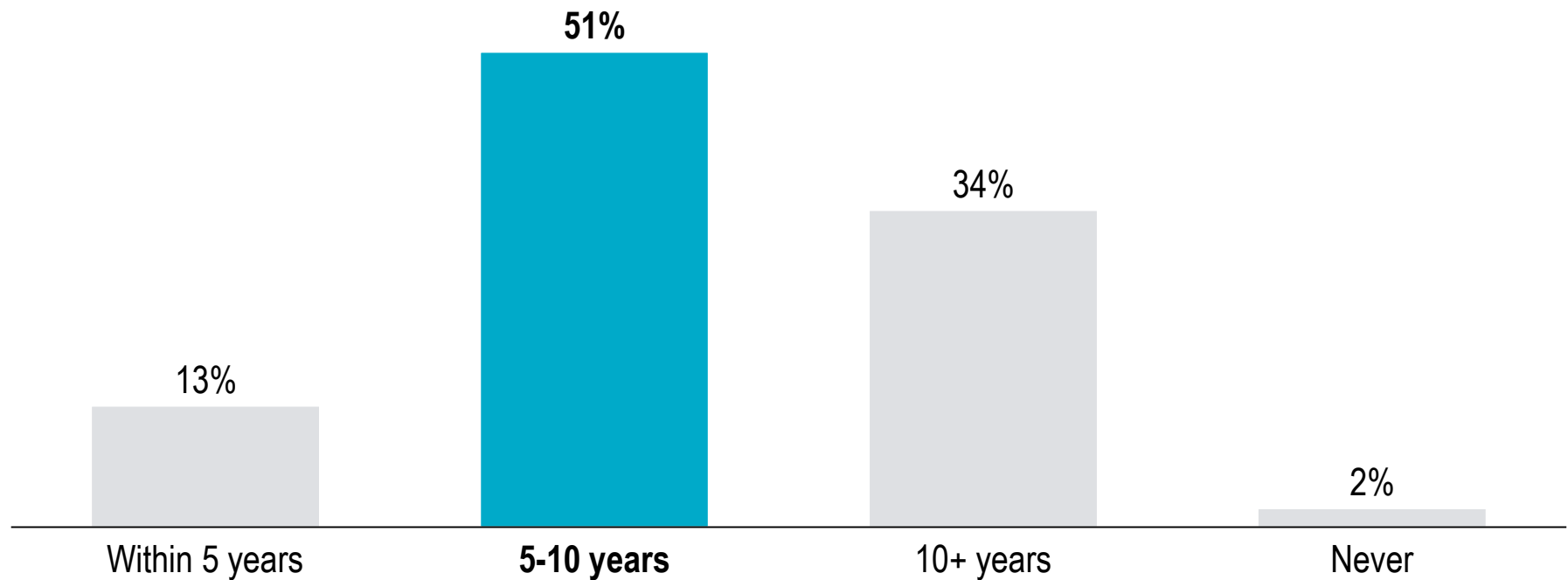
RB Urban Air Mobility Radar



<https://www.rolandberger.com/en/Point-of-View/Mapping-autonomous-urban-air-mobility's-progress.html>

Increasing number of top executives in aerospace expect success of Urban Air Mobility in 5-10 years from now on

Urban Air Mobility to become revenue-earning [% of answers]



Three key topics to make UAM successful in the near future



- 1 **Adopt technology to market needs**
UAM business models are ready to take off and disrupt mobility markets and public transportation
- 2 **Focus on winning over the public**
Public acceptance remains the key challenge for UAM to succeed
- 3 **Master multidisciplinary challenge**
Setting up UAM operations requires technology and infrastructure development

Three key topics to make UAM successful in the near future



- 1 **Adopt technology to market needs**
UAM business models are ready to take off and disrupt mobility markets and public transportation
- 2 **Focus on winning over the public**
Public acceptance remains the key challenge for UAM to succeed
- 3 **Master multidisciplinary challenge**
Setting up UAM operations requires technology and infrastructure development

The application opportunities for UAM are broad – Today we would like to discuss drones as part of public transport in more depth

UAM use cases



Public transport

- > Variety of public transport applications, e.g. air taxi, commute to airport and medium to long intercity flights



Emergency & Security

- > Air ambulance and rescue support
- > Delivery of medication/supply
- > Transport of organs



Inspection & Maintenance

- > Inspection and maintenance of large infrastructure facilities such as port bridges, wind turbines and train tracks



Delivery & E-commerce

- > Rapid delivery of packages
- > Unscheduled deliveries that are routed as order is placed



Cargo transport

- > Delivery of heavier cargo on a regular basis

Increasing urbanization brings traditional transportation networks to their limits – UAM adds a new dimension



By 2050, 67% of the world's population will reside in urban areas, up from 54% as of today



Population growth in urban areas out-paces up to 3-fold the capacity growth of public transport networks and infrastructure



Global transport infrastructure investment would need to increase by ~10 trillion USD to meet infrastructure needs in 2040



Heavy congestion increases traffic fatalities and long commute times decrease job productivity by up to 10%



Empty airspace over larger urban areas remain unoccupied as it is not used yet

Increasing urbanization demands transport networks to increase their efficiency, affordability and safety



Urban Air Mobility adds a new mobility dimension and complements existing systems



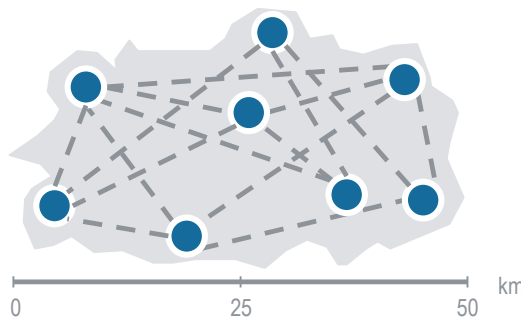
Three main use cases will emerge for passenger drone services – Each with its own technological and operational requirements

Passenger UAM use cases

I Air taxis

On-demand point-to-point operations

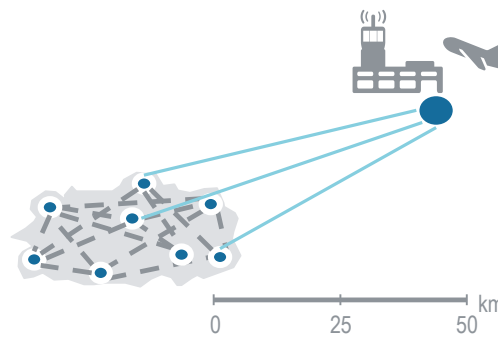
- > Non-stop service from any available landing pads within a defined area
- > For one or two passengers and their light hand luggage (up to 20 kg) over distances of between 15 and 50 kilometers



II Airport shuttles

Scheduled short-range operations

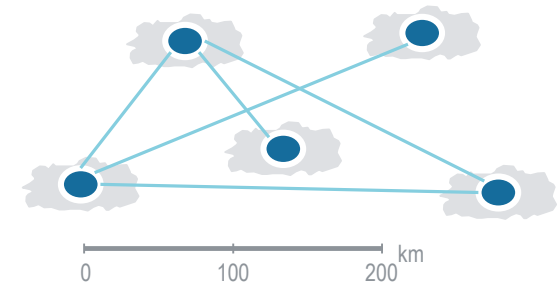
- > Fixed flight operations between various landing pads and the airport
- > For up to four passengers and between 50 and 80 kg of luggage on defined routes and timings
- > Over distances of between 15 and 50 kilometres



III Intercity flights

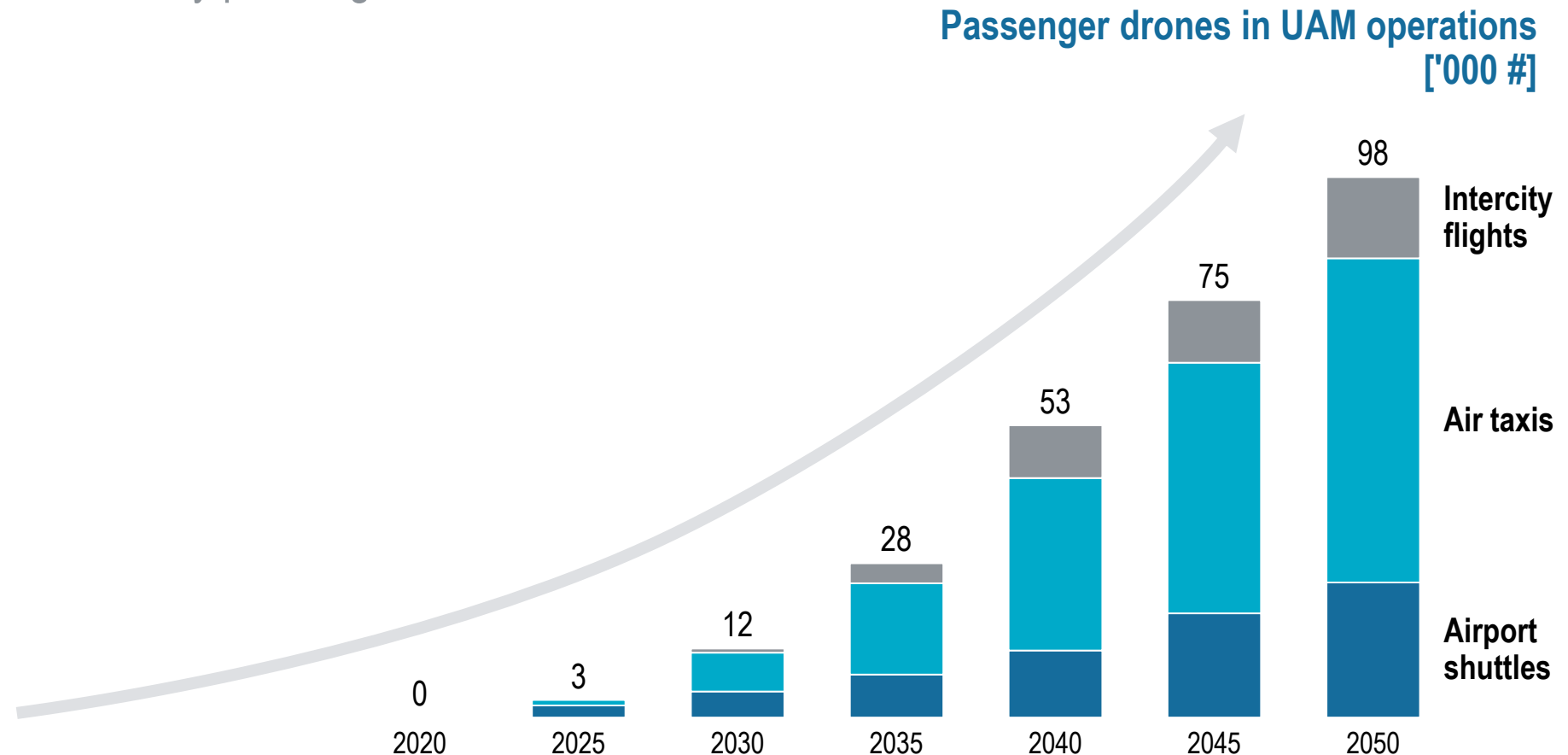
Scheduled medium- to long-range operations

- > Fixed flight operations between cities that are too close to be viable for regular aviation links
- > For up to four passengers over distances of between 50 and 250 kilometers



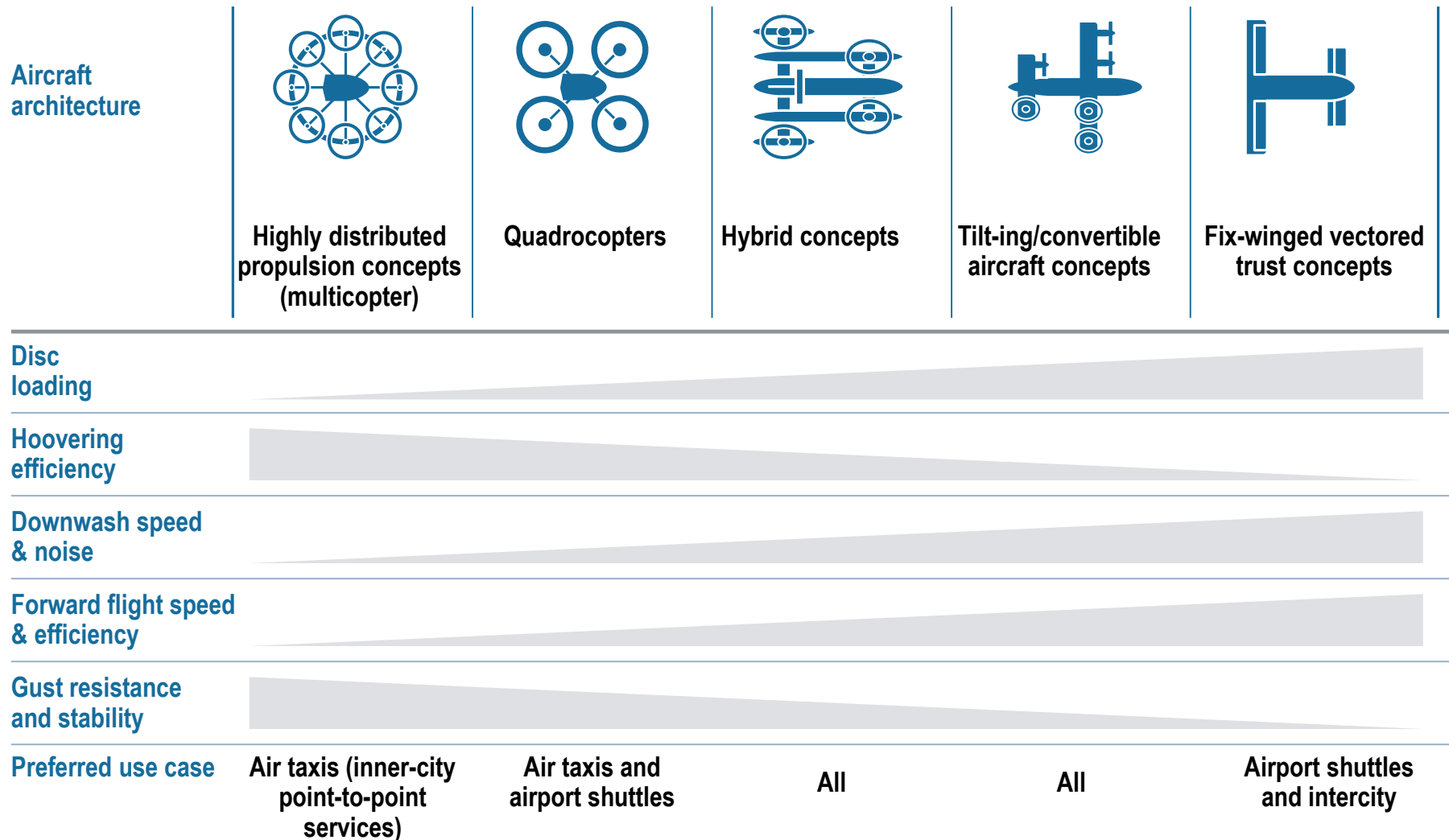
Numbers of passenger drones in UAM operations is forecasted to grow rapidly – Almost 100,000 Passenger drones to fly by 2050

Forecast by passenger use cases



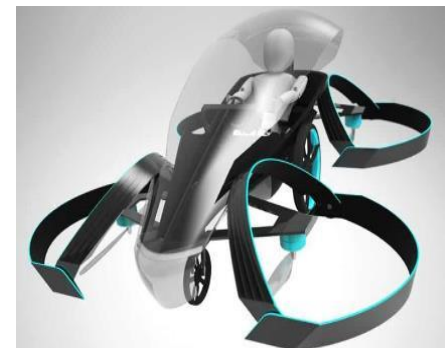
Note: Estimated that ~100 cities will have UAM operation in 2050

Five basic electric aircraft architectures are on the rise with varying strengths making them better suited to different use cases



Aerospace companies and startups alike have joined the race to translate the vision of flying taxis from science fiction into reality

Impressions of eVTOL architectures being researched



Three key topics to make UAM successful in the near future



- 1 **Adopt technology to market needs**
UAM business models are ready to take off and disrupt mobility markets and public transportation
- 2 **Focus on winning over the public**
Public acceptance remains the key challenge for UAM to succeed
- 3 **Master multidisciplinary challenge**
Setting up UAM operations requires technology and infrastructure development

Public acceptance is based on four major pillars: Safety, noise as well as convenience of the services offered at affordable prices

Public acceptance

1. Safety



Redundant systems and multiple safety layers are required to ensure safe operations in dense urban areas at all times for both passengers and pedestrians even in the case of malfunctioning systems

2. Noise



Noise levels per passenger drone need **to be kept to a minimum** considering a future scenario of hundreds of drones flying at the same time

3. Convenience



Taking an UAM flight has to be **as simple and convenient as booking a cab** ride and the service needs to be seamlessly integrated into the existing mobility ecosystem

4. Price



UAM services need to be perceived by the broader public as a **general means of transportation** and not as exclusive offer for the very rich

Regulatory challenge

Commercial challenge

UAM offers a number of solutions to today's traffic problems which may foster acceptance rates among customers and authorities

Benefits of Urban Air Mobility – Selected examples

Addressed challenges



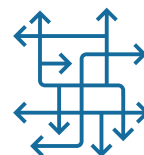
Emissions
(in cities)



Congestions



Complex
mobility
chains



Difficult
connection to
airport hubs

UAM/ eVTOL advantages



Low emissions
(in cities) due to
electrical propulsion



Use third
dimension for short
distance transport



Optimize
existing
mobility chains



Fast
transportation
>20 km

eVTOL vs. helicopters

4x
quieter

2x
safer



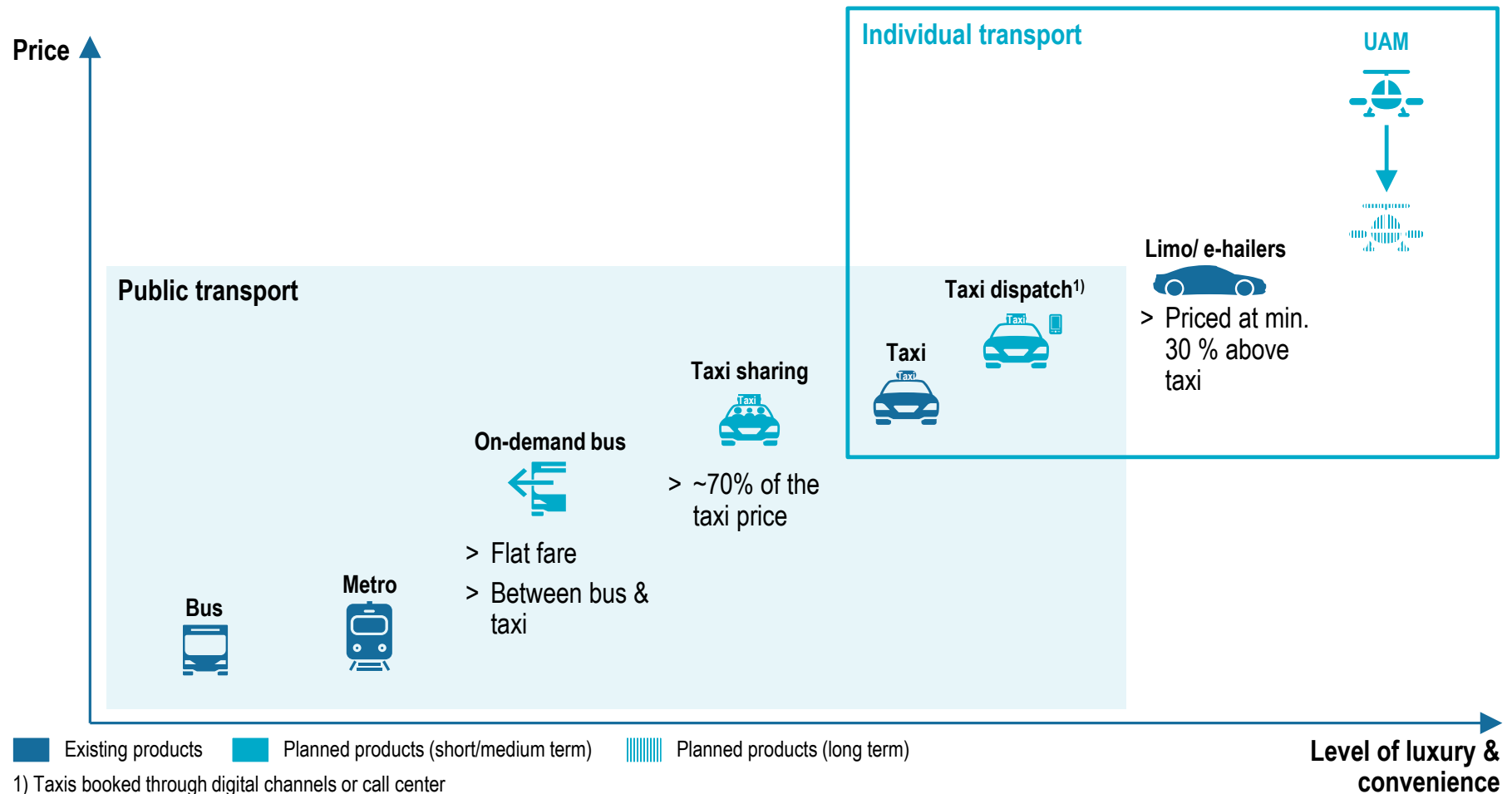
15x
Higher
reliability

10x
Less
expensive



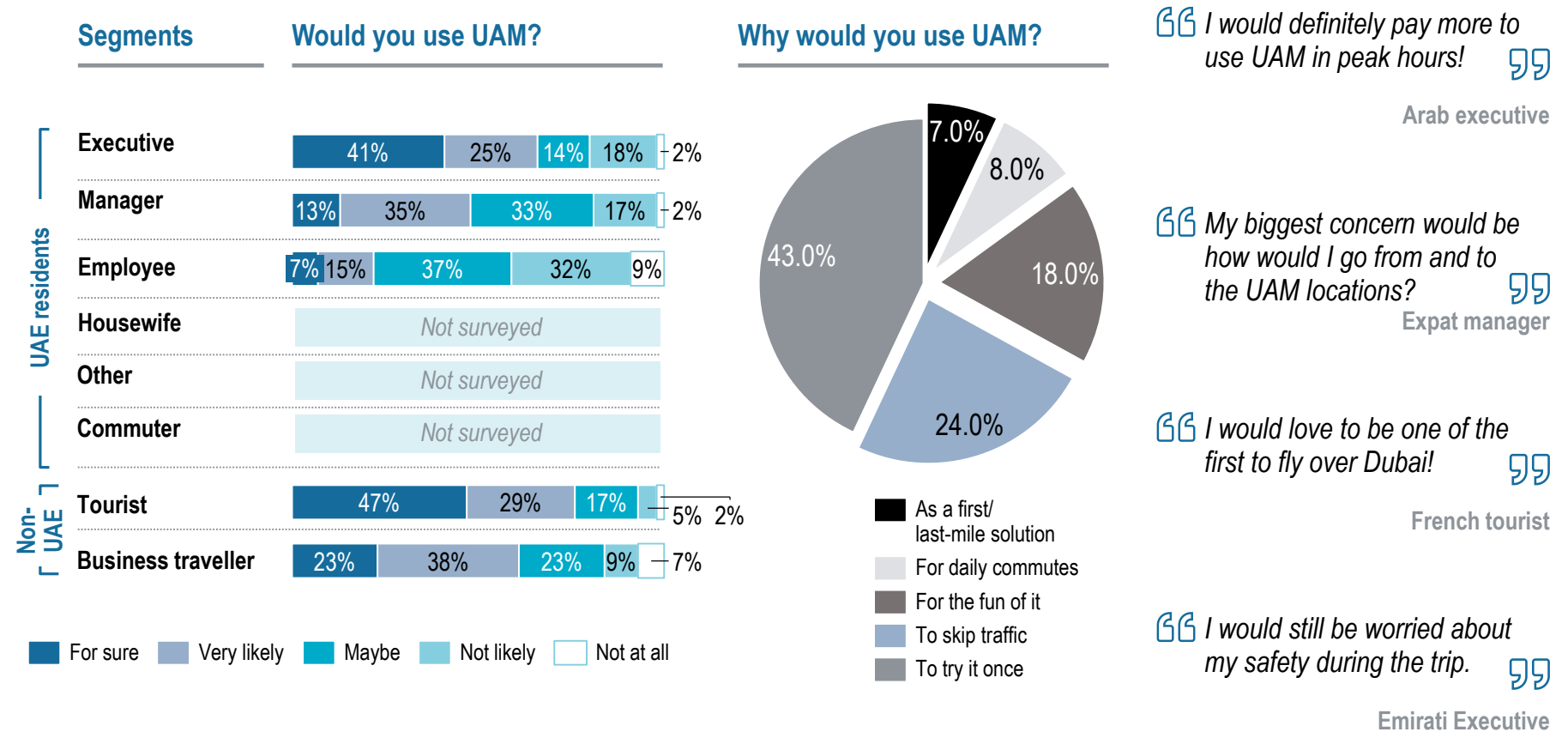
Initially, UAM services will be positioned as high-end products transforming into an integrated public transportation offering over time

Urban transportation landscape



UAM is considered as a premium mode of transport – Yet our survey unveiled clear demand among relevant customer segments

Passenger acceptance: Example based our survey in Dubai

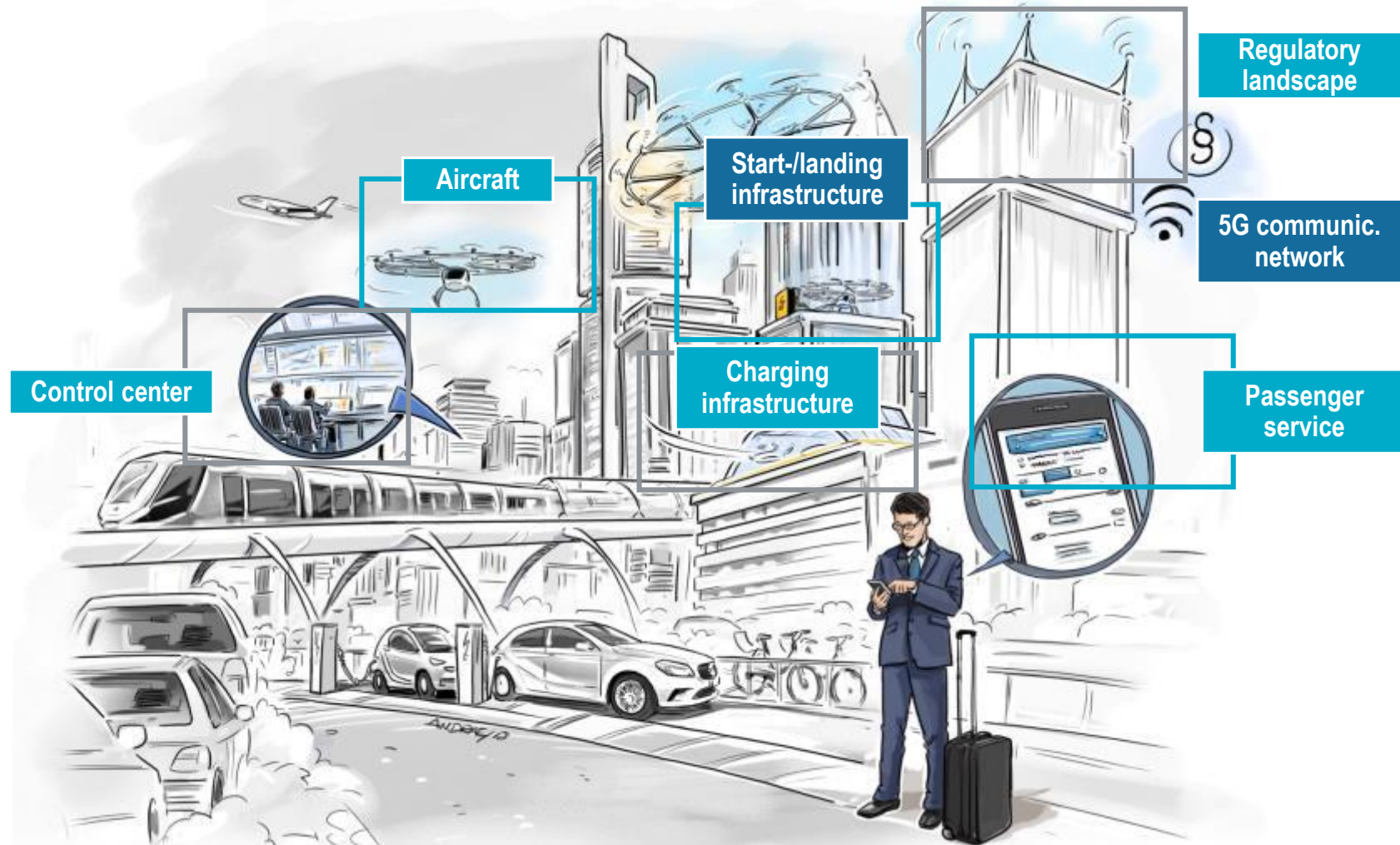


Three key topics to make UAM successful in the near future



- 1 **Adopt technology to market needs**
UAM business models are ready to take off and disrupt mobility markets and public transportation
- 2 **Focus on winning over the public**
Public acceptance remains the key challenge for UAM to succeed
- 3 **Master multidisciplinary challenge**
Setting up UAM operations requires technology and infrastructure development

It's not just about drones - Urban eVTOL operations are a system of systems that needs to be put in place greenfield



The available take-off & landing infrastructure of a city has to be investigated in-depth in order to enable suitable eVTOL services

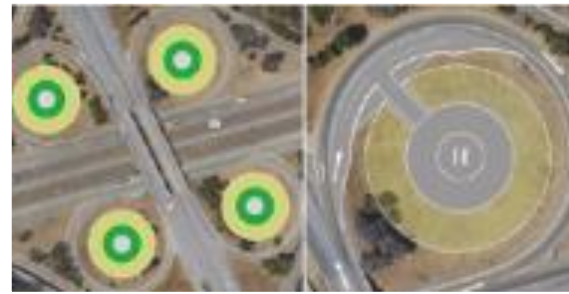
Take-off & landing infrastructure

Illustrative

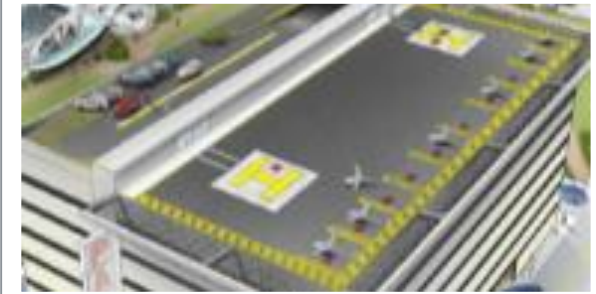
1 Vertical take-offs vs. short runways



2 Ground spots vs. rooftops

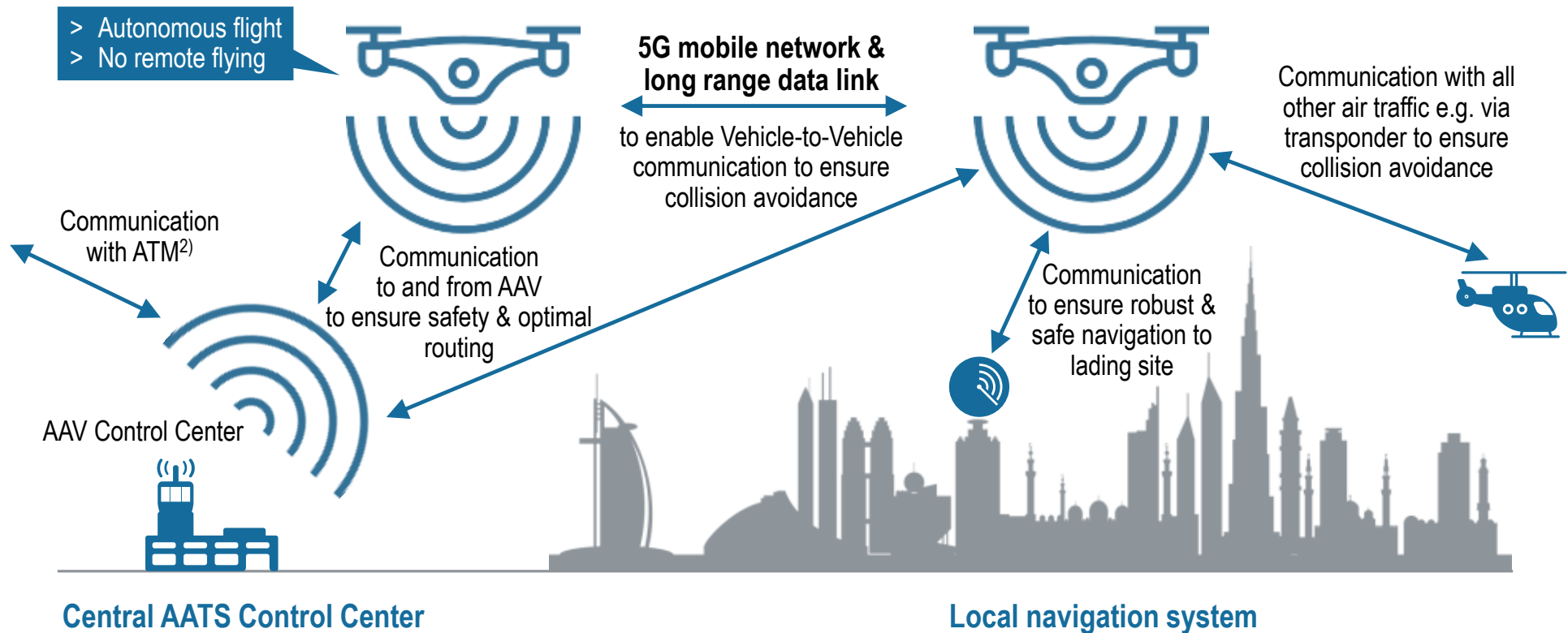


3 Vertiports vs. vertistops



The communication network shall provide redundancies and can be based on existing or newly created networks

Communication network based on 5G mobile network & dedicated AAV¹⁾ data link



1) Autonomous aerial vehicle
2) Air traffic management

In addition to infrastructure and communication, several further key aspects have to be addressed to realize the vision of UAM

Success factors of Urban Air Mobility operations

Commercialization €

- > Time-saving, upper-priced, yet still affordable alternative to road taxis
- > VTOL operations with helicopters first and eventual transition to drones

Compliance with Transport & Air Traffic Regulations §

- > Early involvement of transport authorities for air taxi approvals
- > Automated interaction with air traffic control

Predictive IT-Backend

- > Smart VTOL routing and dispatching
- > Predictive reservation of landing areas and charging times

Flight Experience

- > Jaw-dropping but always safe flight experience
- > Intuitive side functions such as booking and billing



Integrated Mobility Service

- > Collaboration with airports, public transport and other private mobility services
- > If available, integration in automotive joint mobility offerings

Customer Service

- > Appreciated customer services for both private users and B2B clients

VTOL & Charging Infrastructure

- > Identification and licensing of suitable landing areas on roofs and open spaces
- > Installation of charging hubs

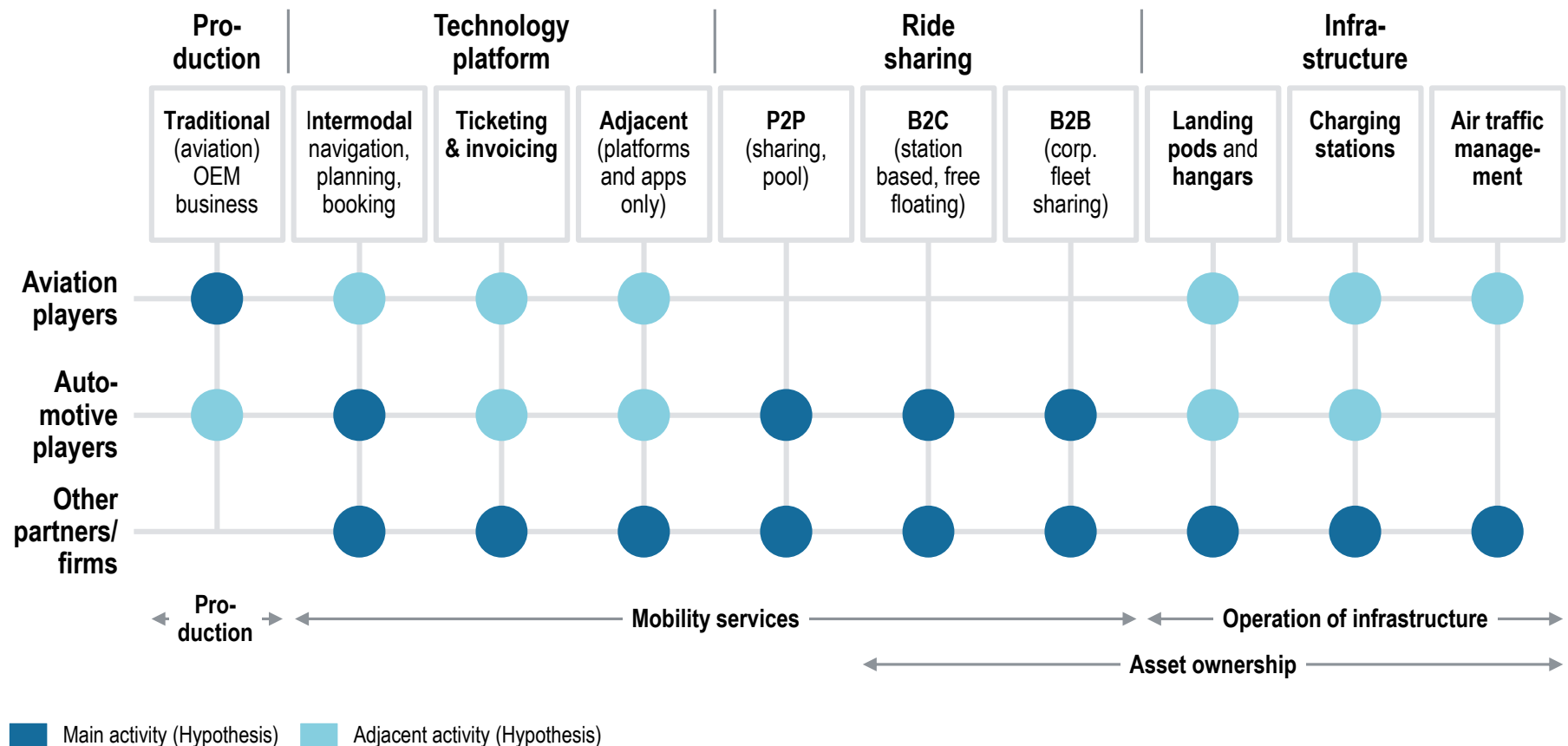
Maintenance

- > Off-site hangars for cleaning and repair services
- > Allocation of downtime periods during times of low air taxi demand

■ Stand-alone ownership possible ■ Alignments / partnerships required

Players from various industries need to define where they would like to position themselves within the overall UAM/ eVTOL ecosystem

UAM ecosystem and potential positioning of aviation and automotive players



The vision of UAM can only be realized in close collaboration between manufacturers, operators, infrastructure, cities and authorities

Key stakeholders



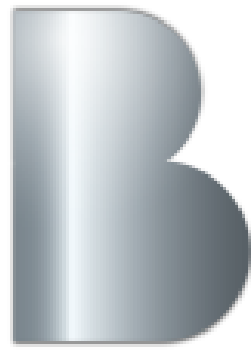
Established and new players are racing to pave the way for Urban Air Mobility

Summary

- 1 Translating UAM into reality requires **high investments** while **market development** is still **unclear** – **only some** projects **will survive** and lead the way for UAM
- 2 The **most promising companies** have a **clear view** of their **targeted use case** and develop a **perfectly suited concept**, which might quickly become a **dominant design**
- 3 **Winning over the public** is crucial and will be achieved by offering a **premium yet affordable service** seamlessly **integrated into** a city's **existing mobility ecosystem**
- 4 **The earlier** manufacturers, service and infrastructure providers **join forces** and **offer holistic solutions** to cities, the **higher their chances** to become the **defining players**

Time for your questions

Roland
Berger



**Alexander
Dyskin**
Transportation



**Kim
Kohmann**
Transportation

