McKinsey & Company

Disruption in Aerospace –

a few observations on current trends surrounding flying cars, drones and hypersonic aircraft

August 2022

~$15 B

In disclosed funding

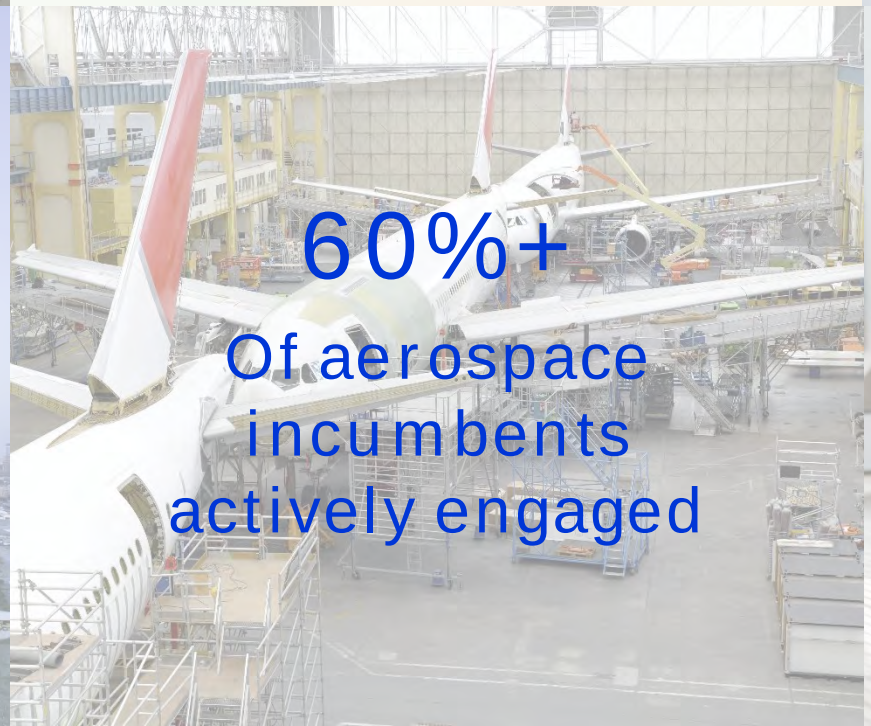
2024-2026

Target entry into service for leading players

11,700 aircraft on **“order” worth $63** +

30+ cities

Actively planning and partnering



60%+

Of aerospace incumbents actively engaged

~.5 M

Revenue drone deliveries in 2021


VOLOCITY

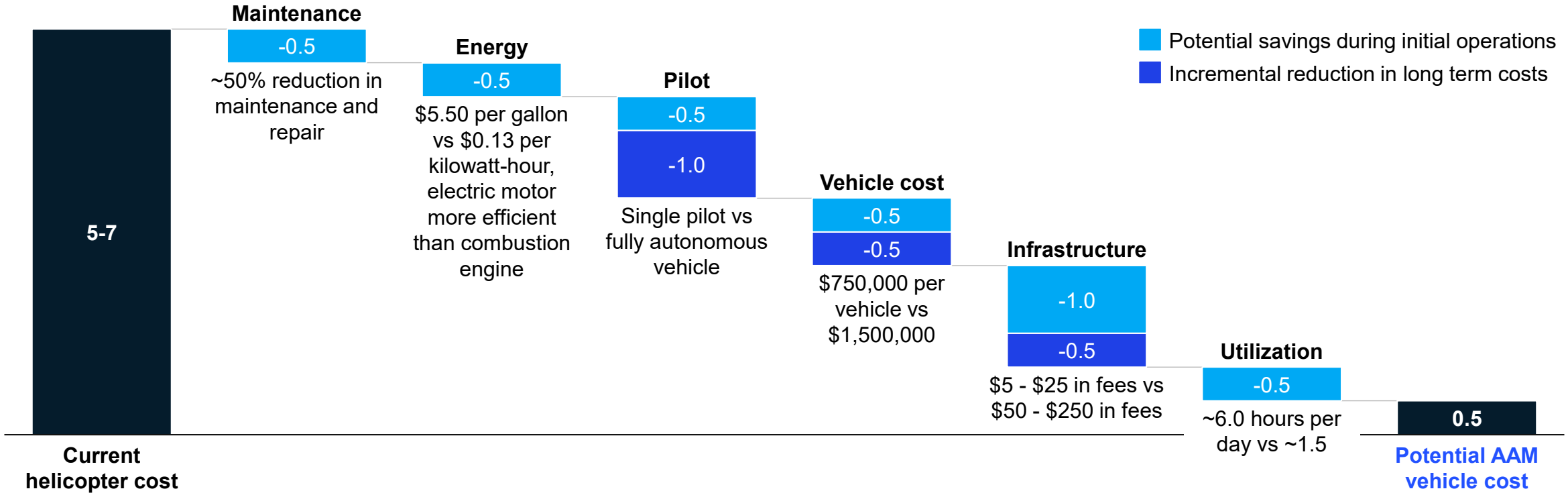

DUFOUR
DUFOUR AEROSPACE


VERTICAL

eVTOL Transportation cost *could* be revolutionary

ILLUSTRATIVE

Potential evolution for AAM vehicle, operating cost per seat-mile, $



1. Less conservative target which is more likely to materialize once the AAM services will be operating at scale
2. Reasonable target likely to be achieved during the scaling-up phase of the industry

Source: Online research (https://www.quora.com/How-much-do-helicopter-rides-cost; http://ti.org/antiplanner/?p=88); McKinsey analysis

Why is Future Air Mobility “taking off” now?

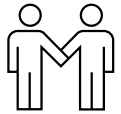
3 mega trends …

Technological convergence

Advancement in electric propulsion, control systems (AI), broadband (5G), materials (composite), etc. enable new designs & use cases

Sustainability

23% of global CO2 emissions are triggered by transportation: increased consciousness of public and decision-makers. And lots of ESG funding

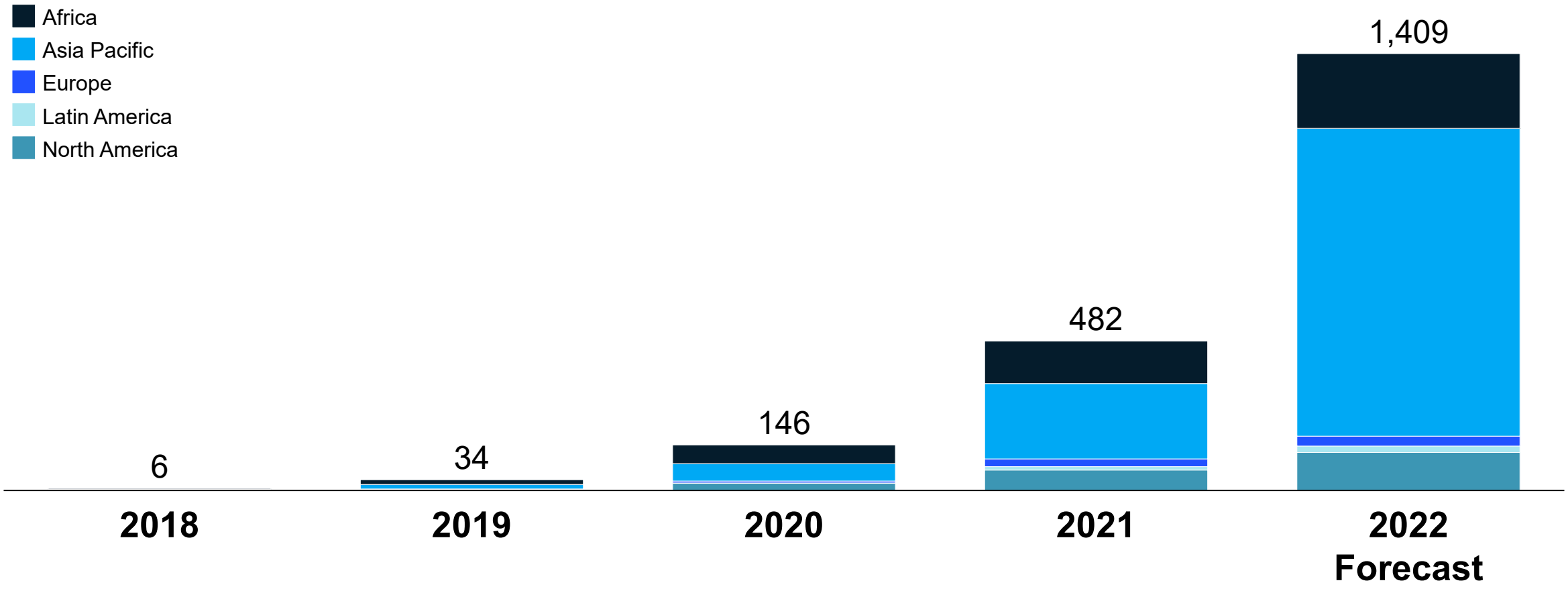


Shared mobility

Sharing mobility and travel assets (vehicles, infrastructure) have become widely accepted (e.g,. Uber, AirBnB)

Drone deliveries are ramping up quickly

Commercial drone deliveries, thousands

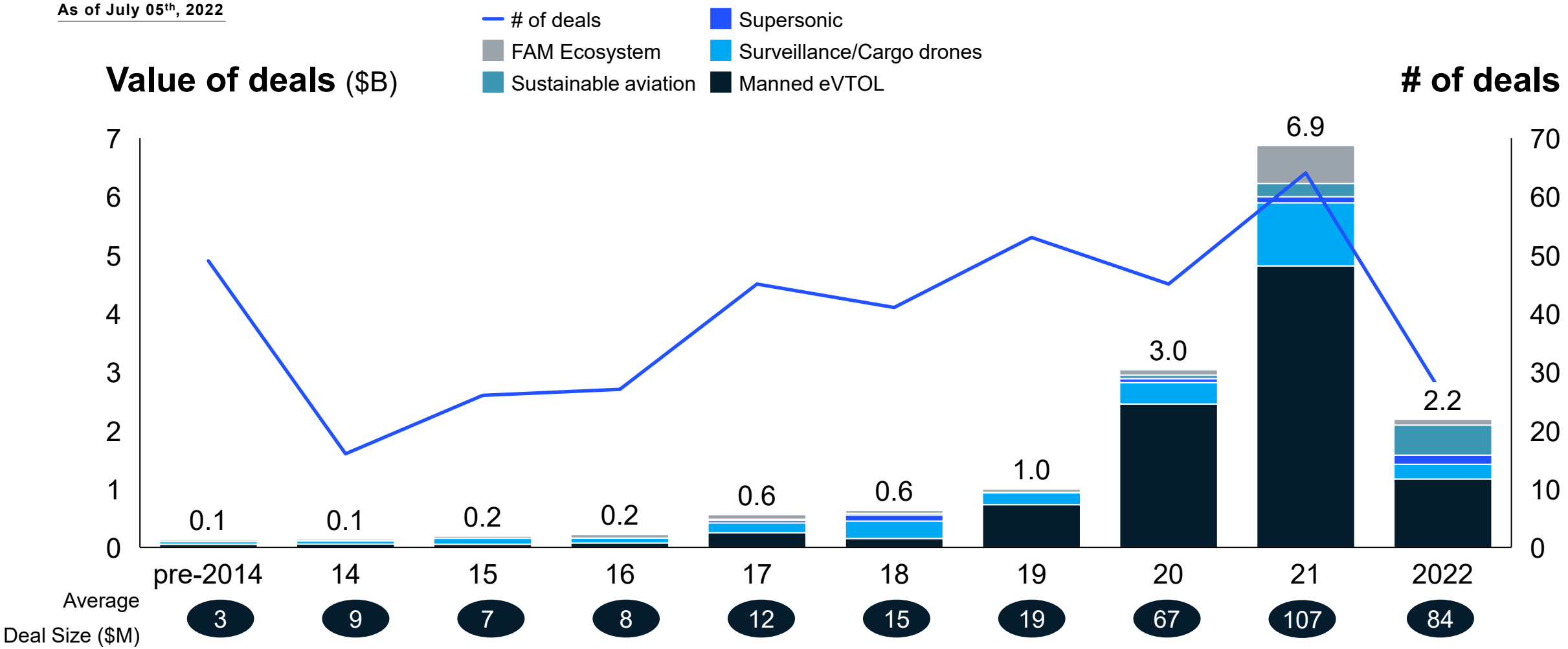


Source: McKinsey Drone Delivery Tracker and Forecast

Funding for Future Air Mobility Funding has taken off

Total disclosed funding[1]

As of July 05th, 2022



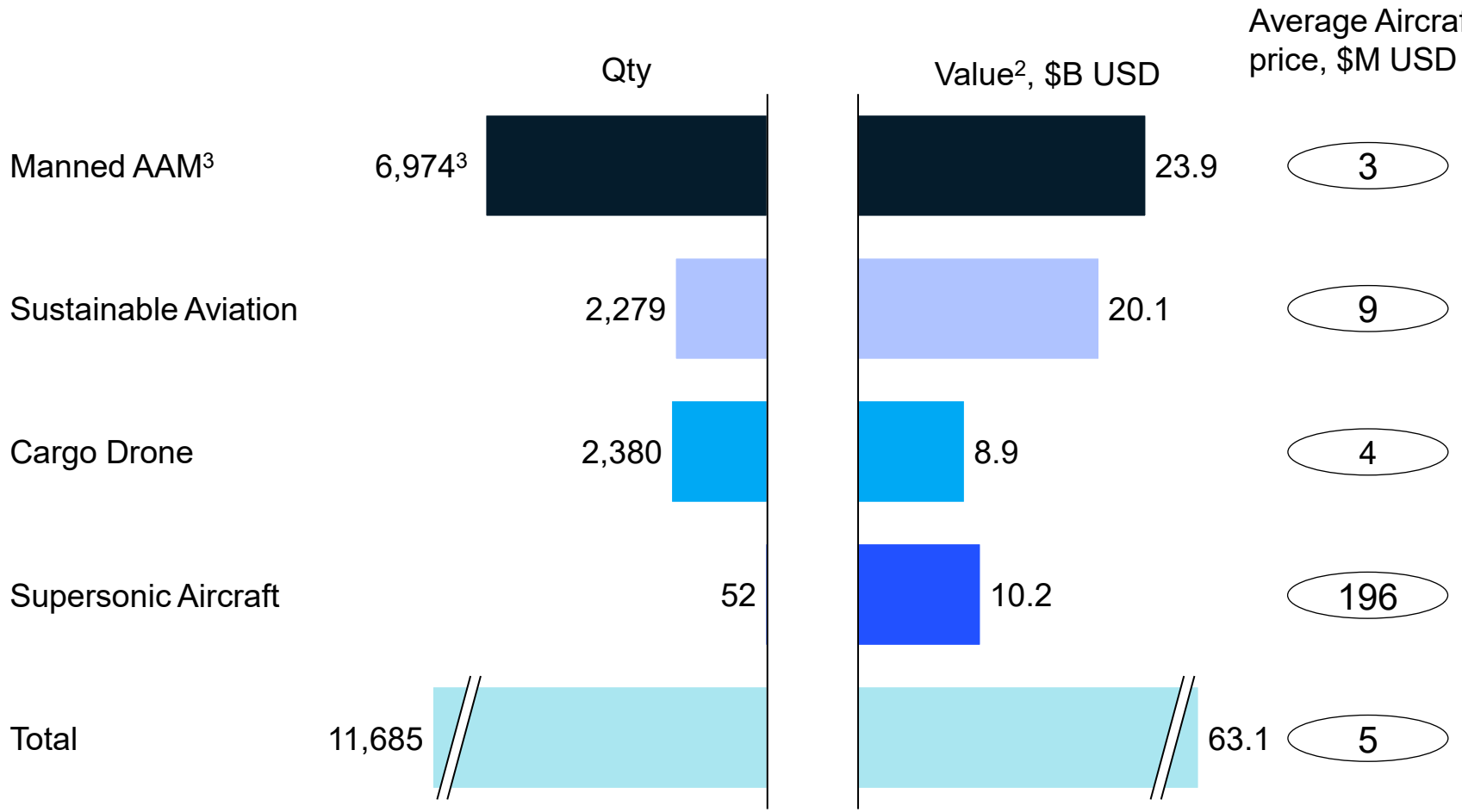
1. Includes venture capital, disclosed R&D ($1.5B from Hyundai in 2020), PIPE and SPAC funding. Year based on transaction announcement date

Source: McKinsey Analysis, Capital IQ, CB insights, Pitchbook

Over 11,500 orders worth $63B have been placed for future air mobility aircraft

Future Air Mobility Orders by Industry Segment

Current as of June 03, 2022



1. Includes all AAM projects, sustainable aviation and supersonic. Not including Aerion as operations have ceased
2. Value based on public information. Where values not disclosed, an average price per seat for the aircraft configuration (e.g. Lift+Cruise) was used
3. Includes commitments to yearly flight hours

Source: Company websites, press

Insights

Manned AAM has ~60% of the total order quantity

Though the order quantity for supersonic jets is only 52, they total a value of $10.2B, representing 16% of total order value

Disclaimer: order contract details cannot be validated to be firm due to lack of information available. We assume there is moderate order cancellation risk due to nascency of the industry

A few observations

1. Sharing a bold and engaging vision and creating excitement is key

2. “Sustainability” storyline opened a lot of doors (and purses)

3. Assumptions on figures of merit (and physics) vary widely

4. “Industry portfolio” allows for bolder innovation

5. Early players “sponsor” the foundation of the industry

6. Hard problems attract top talent

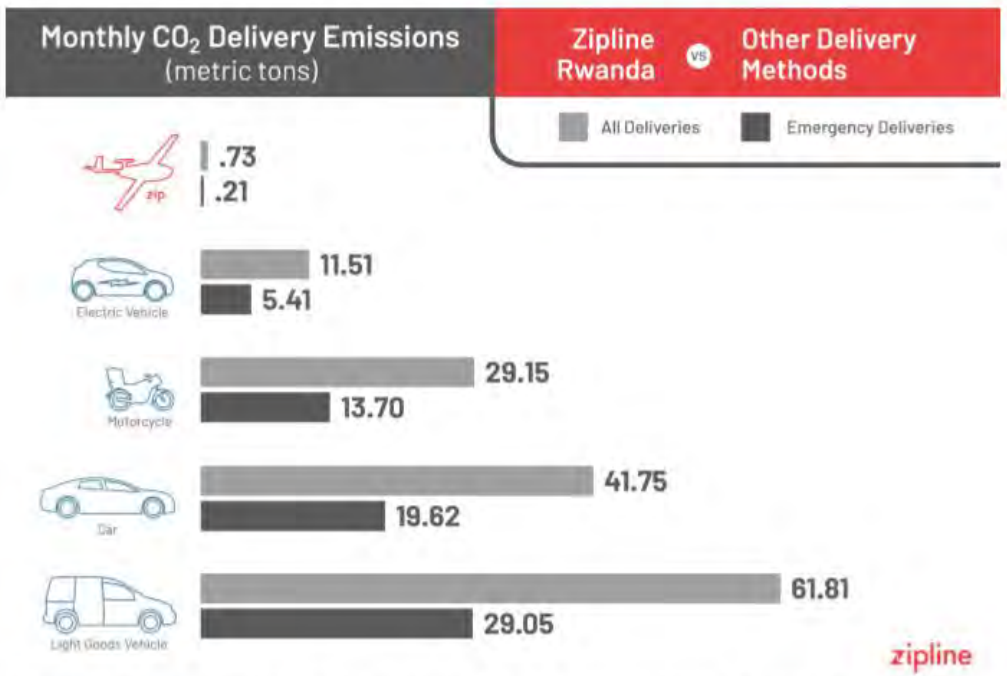
1. big brand put it on the map

White papers, partnerships ecosystem, summit conferences

1. Noble missions drives excitement and **engagement: Zipline's operations save lives**

- delivers 25 percent of Rwanda's blood supply
- delivered 1 million COVID-19 vaccines in Ghana

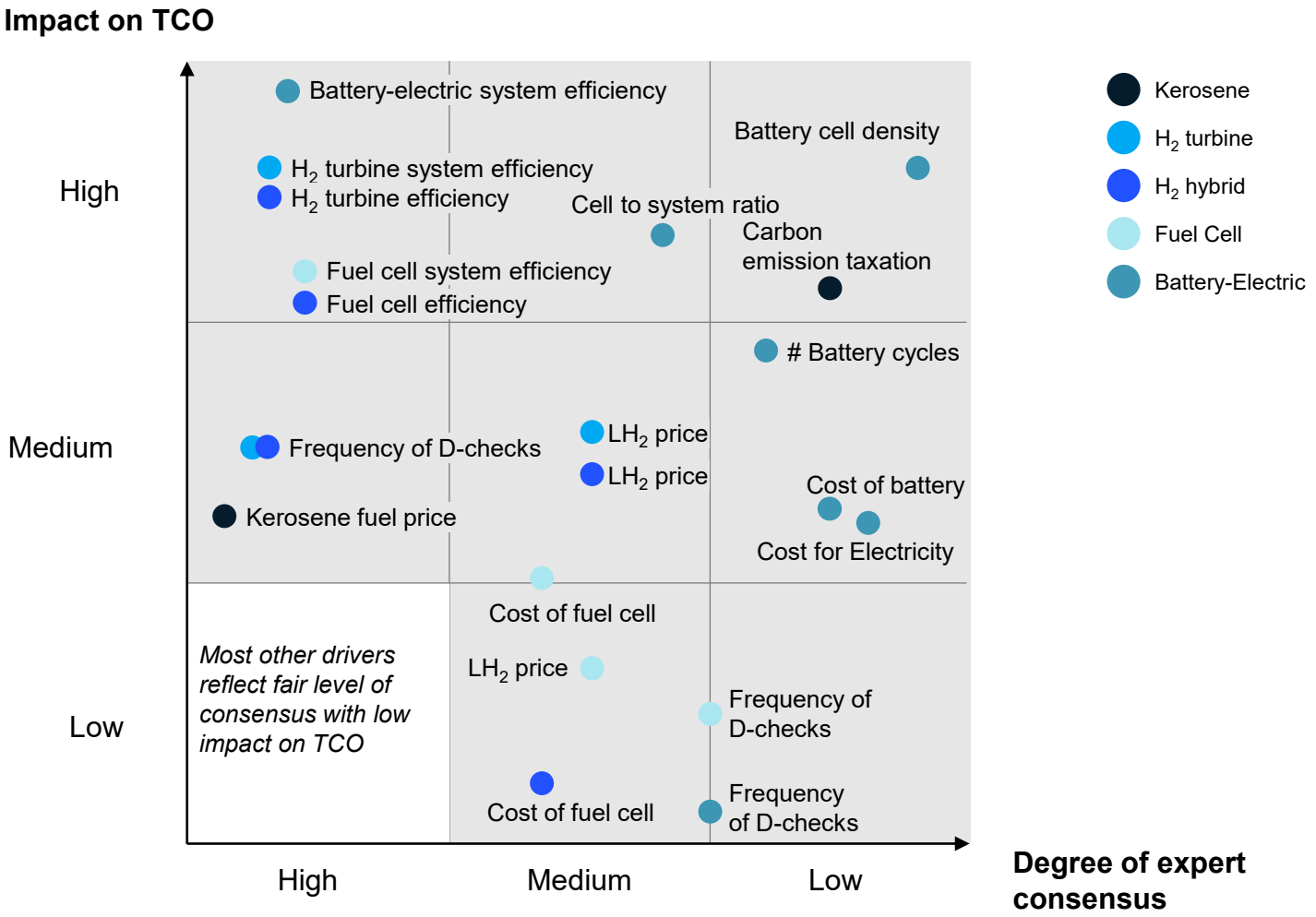
2. Sustainability story creates engagement

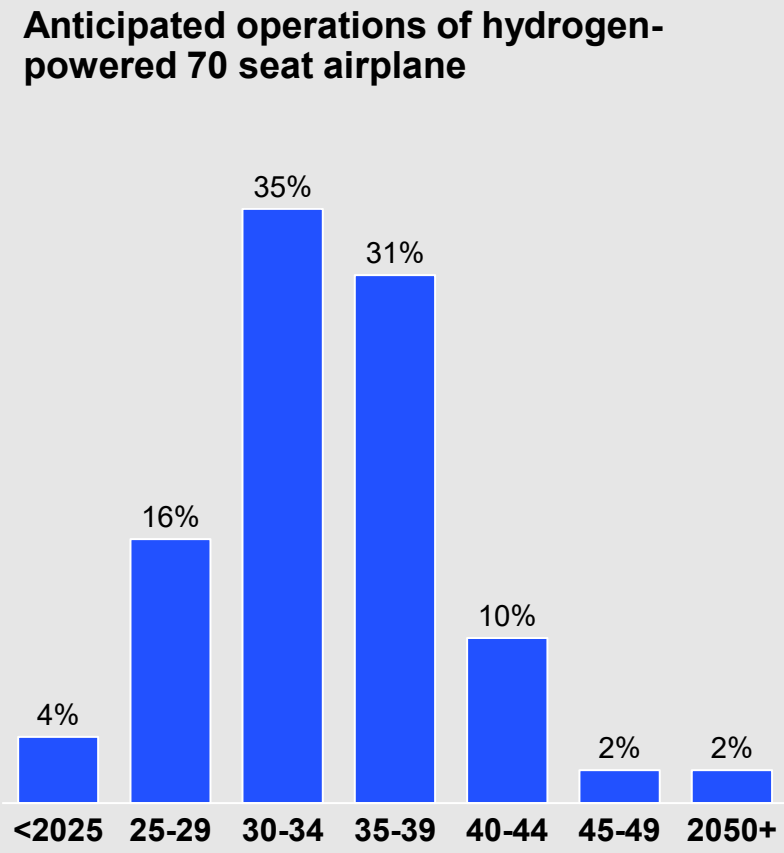


Sep 2021 delivery emissions for Zipline Rwanda (n=10,887) vs tailpipe emissions if delivered by ground transportation.
Sources: 2020 UK Government Greenhouse Gas Conversion Factors; EV Database; Our World in Data.

"BETA Technologies continues to take steps forward in electrifying the aviation industry and reducing its impact on our environment"
Sarah Rhoads, VP Amazon Global Air

3. Assumptions vary widely





Source: McKinsey Sustainable Aviation Executive Survey of 50 aviation executives, July 2022

4. Historically, aerospace innovates incrementally

Reusability

Advanced flight controls

First supersonic airliner

Fly-by-wire

Advanced composites

More electric systems

Modular approach

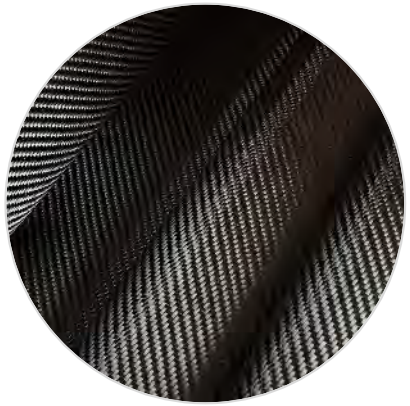
4. “Industry portfolio” allows for bolder innovation across many dimensions… though we should expect lots of failure as we learn

Distributed electric propulsion

Augmentation & Autonomy

Aircraft configuration

Power sources



Advanced lightweight materials

5. Early players fund the foundation, but often don't have the early mover advantage as talent moves on… with many of the learnings

6. Hard problems attract top talent

Some take-aways for the wind world

- To allow rapid innovation you need to allow for failure…. and not kill seemingly crazy ideas too early (unless they defy science)
- Storytelling is as important as engineering for investors, customers, talent
- Talent will move around – and with it insights and knowledge

More perspectives on Future Air Mobility available on our website

Air-mobility solutions: What they'll need to take off

Parcel delivery: The future of last mile

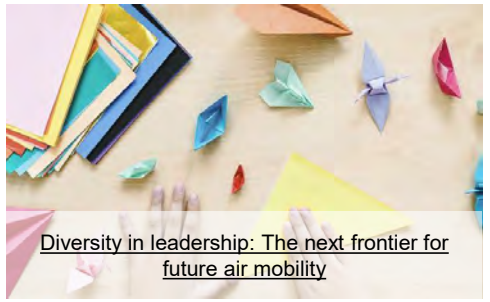
Flying-cab drivers wanted

To take off, flying vehicles first need places to land

Up in the air: How do consumers view advanced air mobility?

Final approach: How airports can prepare for advanced air mobility

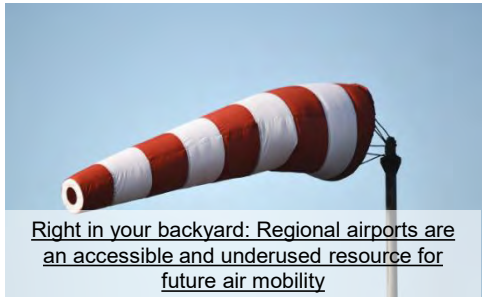
Future Air Mobility Blog



Diversity in leadership: The next frontier for future air mobility

Reducing aviation emissions over the long and short haul

Looking to the skies: Funding for future air mobility takes off



Right in your backyard: Regional airports are an accessible and underused resource for future air mobility


Thank you!