



**3DEXPERIENCE®**

# New Mobility

June 10th, 2021

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Vice President, Aerospace & Defense Industry

# Challenges of 21<sup>st</sup> Century Mobility

## SHARE PUBLIC SPACE

*Managing Complexity across ecosystem*



## RENEW AS

## AN AUTHENTIC PLAYER

*of the 21st Century*

*Traditional OEMs have a long history with Internal Combustion Engine / Jet Fuel*

## DEVELOP VEHICLES MORE RESPECTFUL

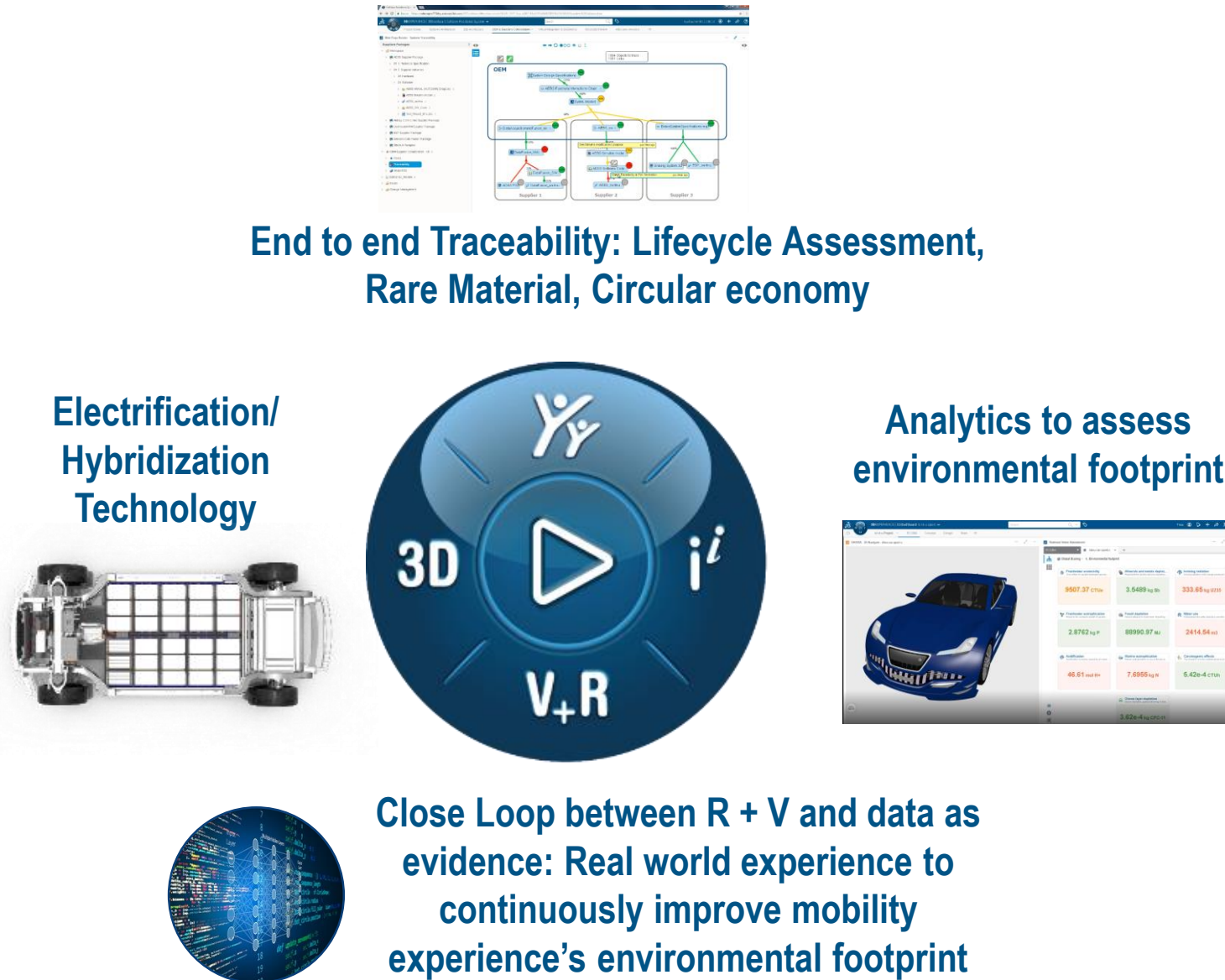
*of the quality of the air and of the resources of the planet*

*Environmental Pollution is the 2<sup>nd</sup> major concern on a list of 21 tracked.*

# Develop Vehicles More Respectful of the Environment

The 3DEXperience Platform connects the dots between all sustainability domains

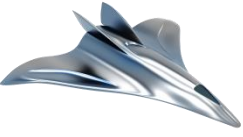
The global market share of **Full EV** and **Plug in EV** vehicles is expected to grow from **6% in 2020** to **30% by 2030**.



## 9 out of 10 EV Startups are using CATIA / 3DEXPERIENCE

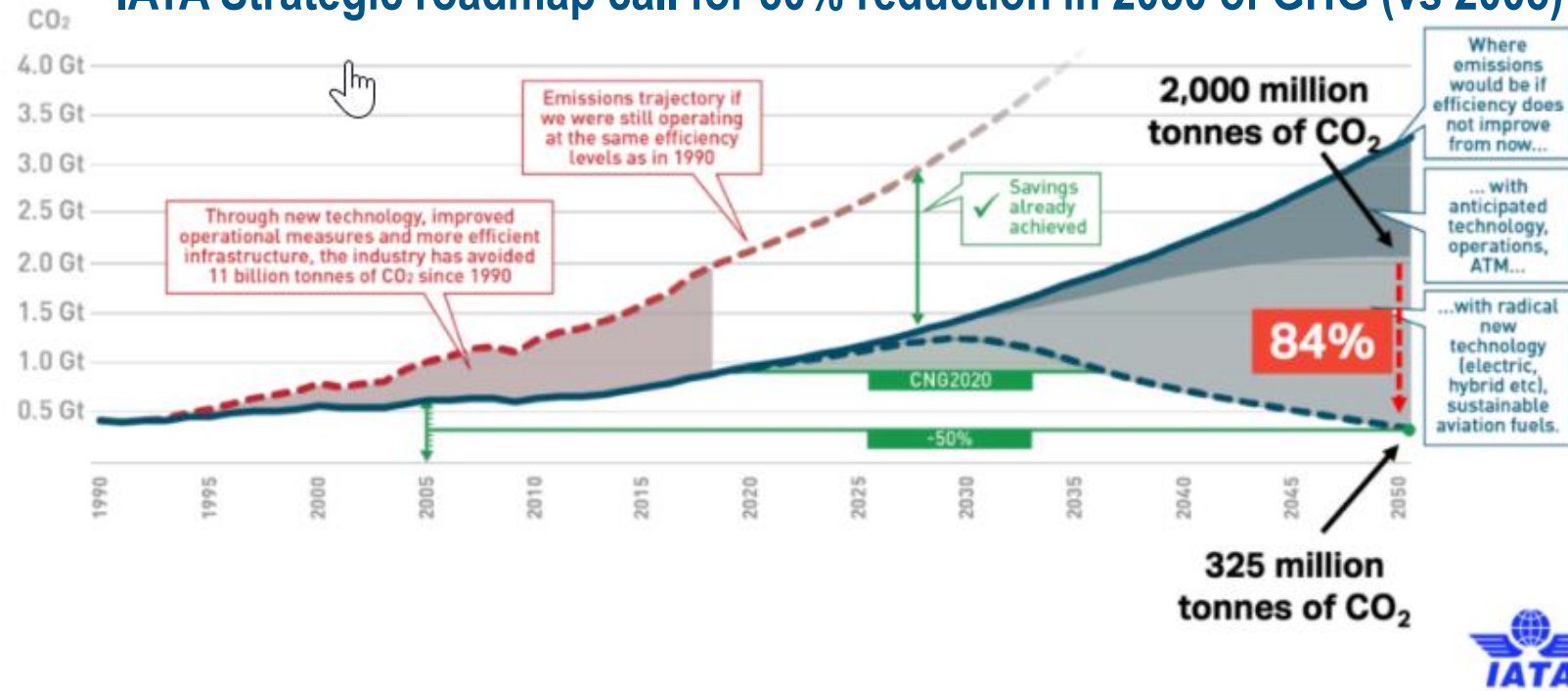
#	Name	Geo	Solutions
1	TESLA	USA	3D V.R
2	RIVIAN AUTOMOTIVE	USA	3D V.R
3	NIO	China, USA	3D V.R
4	WELTMEISTER WM Motor	China	NP
5	NIKOLA MOTOR COMPANY	USA	3D V.R
6	X P E N G Xiaopeng Motors	China	NP
7	Faraday Future	China, USA	3D V.R
8	LUCID	USA	3D V.R
9	-chargepoint-	USA	NP
10	PROTERRA	USA	3D V.R





# Decarbonating Aviation

## IATA Strategic roadmap call for 50% reduction in 2050 of GHG (vs 2005)

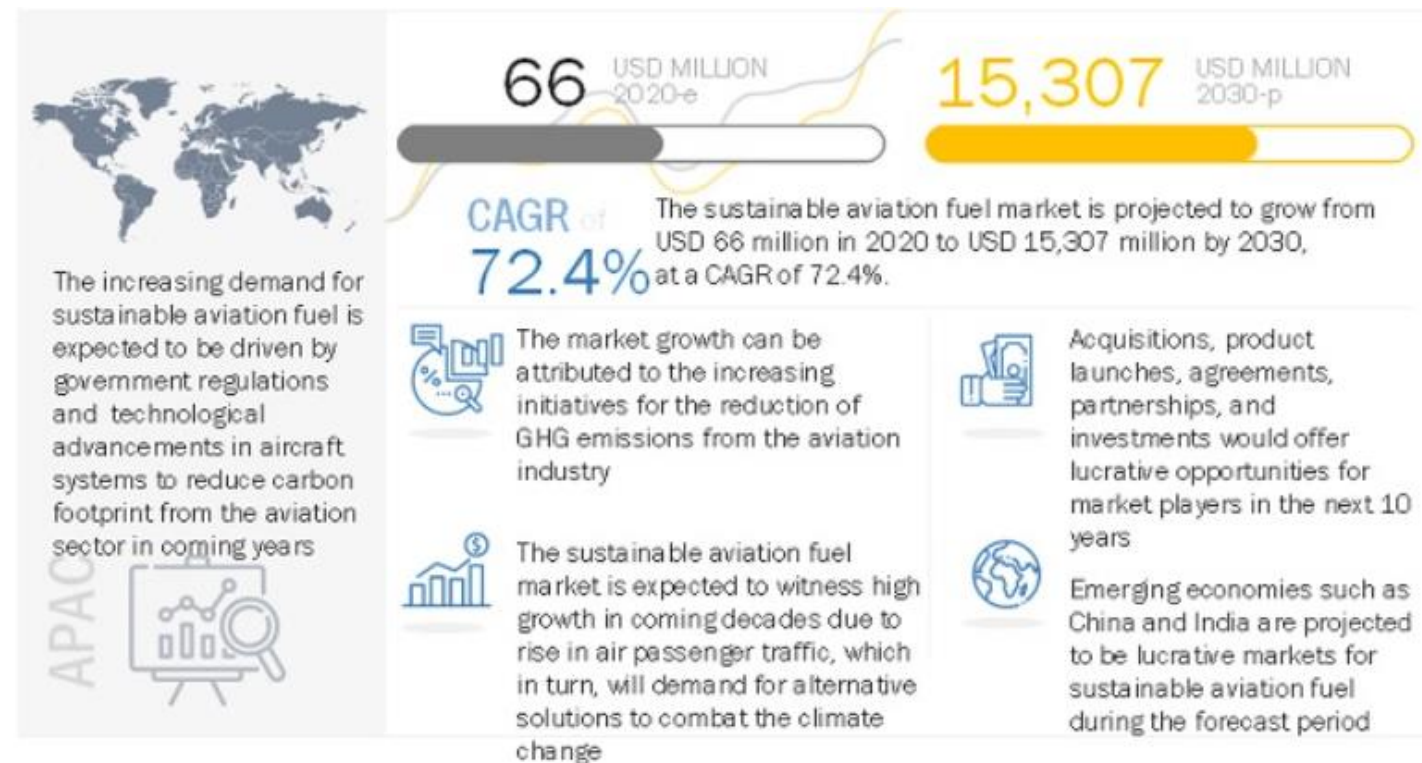


## New Generation urges for Carbon Neutral Aviation and willing to pay more

	Really worried about climate change	Aviation plays a major role in carbon footprint	Have a bad conscience when flying	Aviation should definitely become carbon neutral	Plan to reduce own air travel	Willing to pay ≥\$20 for carbon-neutral flight <sup>1</sup>
18-24 years	52	41	34	59	40	55
25-34 years	62	46	40	62	38	56
35-44 years	56	42	34	56	34	47
45-54 years	49	34	21	44	24	37
55-64 years	46	33	14	39	20	35
≥65 years	44	30	13	42	18	34
Total	54	40	30	53	31	46

<sup>1</sup>For a \$1,000 flight. Source: McKinsey CleanSky Survey, July 2019

## 72% CAGR for Sustainable Aviation Fuel



## From Synthetic Fuels to Hydrogen Turbine to Fuel Cell – a radical change is required

### Comparison of climate impact from H<sub>2</sub> propulsion and synfuel

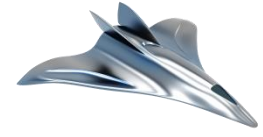
Compared to kerosene-powered aircraft, timeframe until 2100

	Change of in-flight emissions and emission related effects <sup>1</sup>				Climate impact reduction potential <sup>4</sup>
	Direct CO <sub>2</sub>	NO <sub>x</sub>	Water vapor <sup>2</sup>	Contrails, cirrus	
Synfuel	-0% -100% (Net) <sup>3</sup>	-0%	-0%	-10-40%	-30-60% <sup>3</sup>
Hydrogen turbine	-100%	-50-80%	+150%	-30-50%	-50-75%
Hydrogen fuel cell	-100%	-100%	+150%	-60-80%	-75-90%

**Ongoing scientific debate about full climate impact, in particular:**

- Contrail/cirrus formation
- Aggregate measure

**Total climate impact could be 2 to 4 times compared to CO<sub>2</sub> emissions alone**



# Achieving Sustainable Innovation



# Challenges of 21<sup>st</sup> Century Mobility

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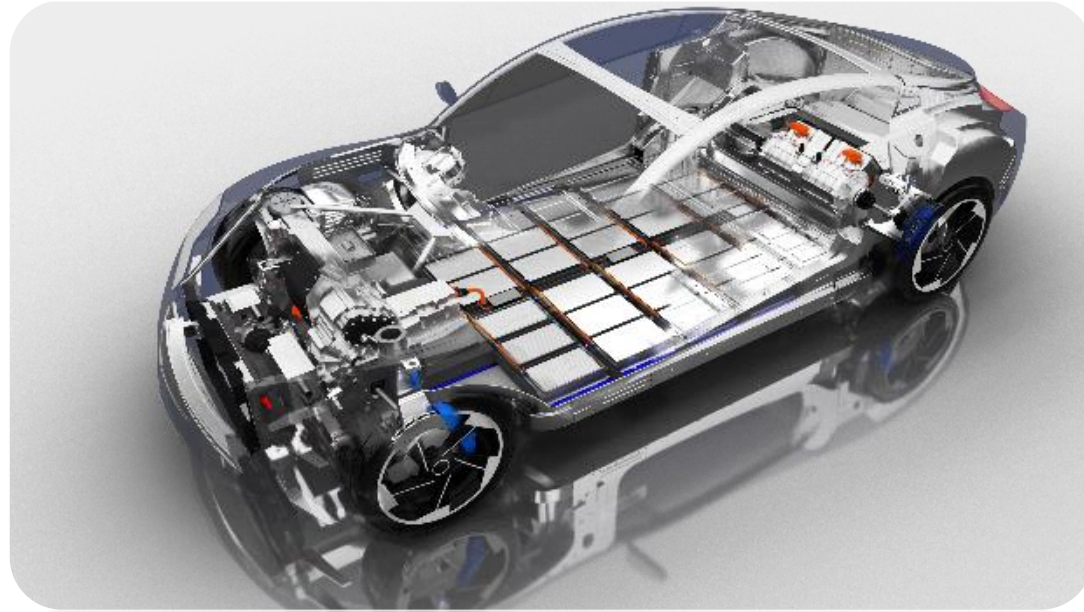
*Environmental Pollution is the 2<sup>nd</sup> major concern on a list of 21 tracked.*



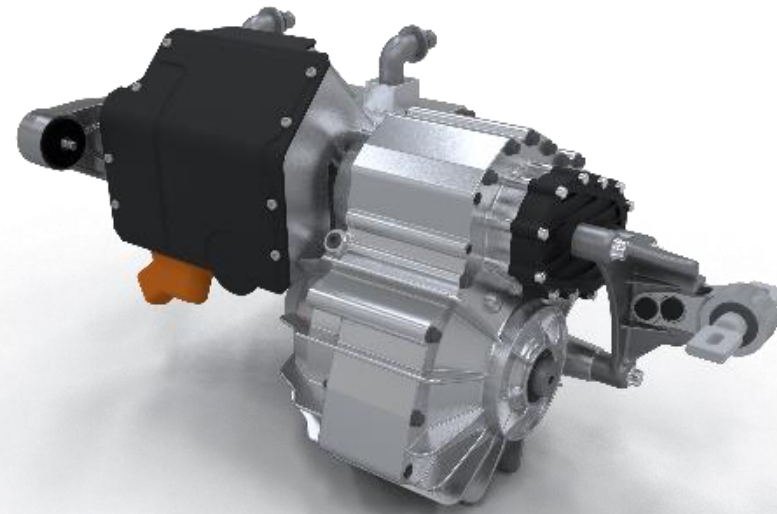
# Dassault Systèmes solutions are supporting EV Challenges

## Engineering

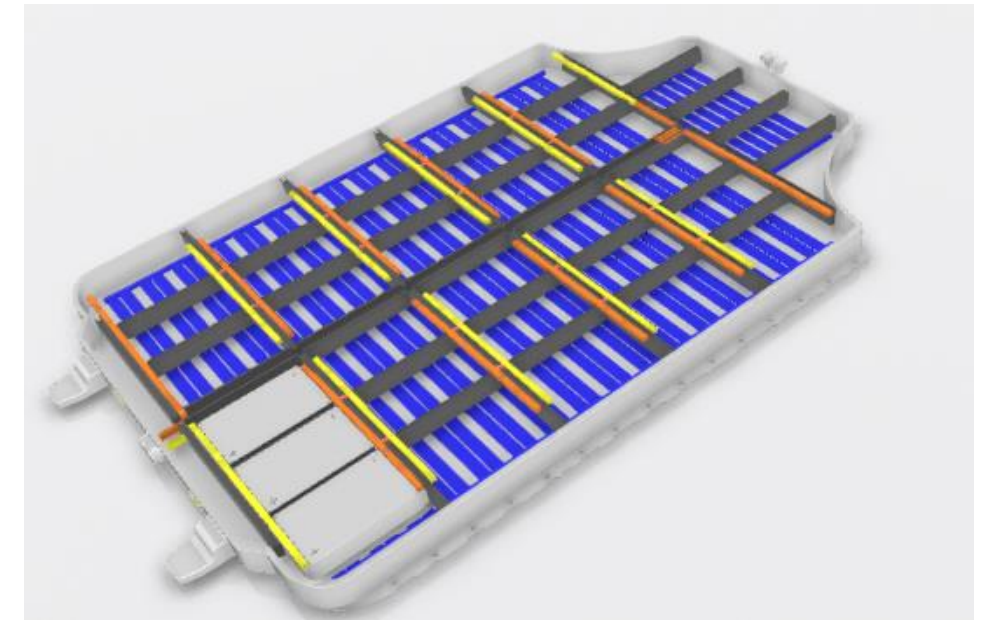
### Vehicle Architecture



### e-Powertrain Engineering



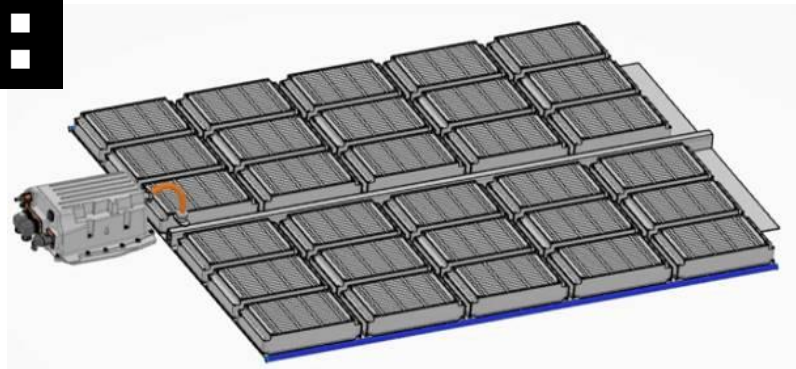
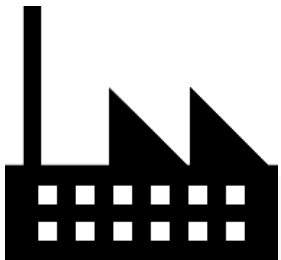
### Cell Pack Optimization



## Manufacturing

### Manufacturing Optimization

### Waste Management



## Ownership

### Range Optimization



### Battery Aging and Recycling



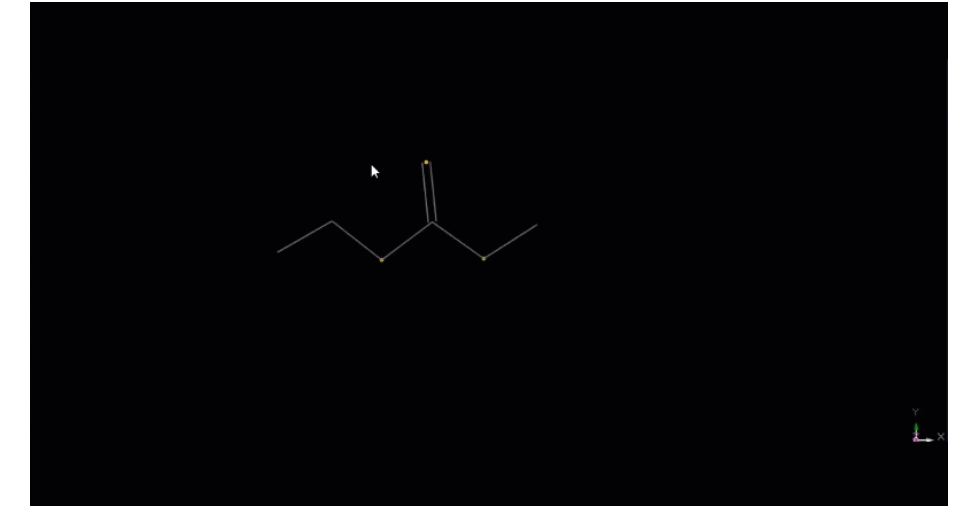


# Lead the EV race with the 3DEXPERIENCE Platform

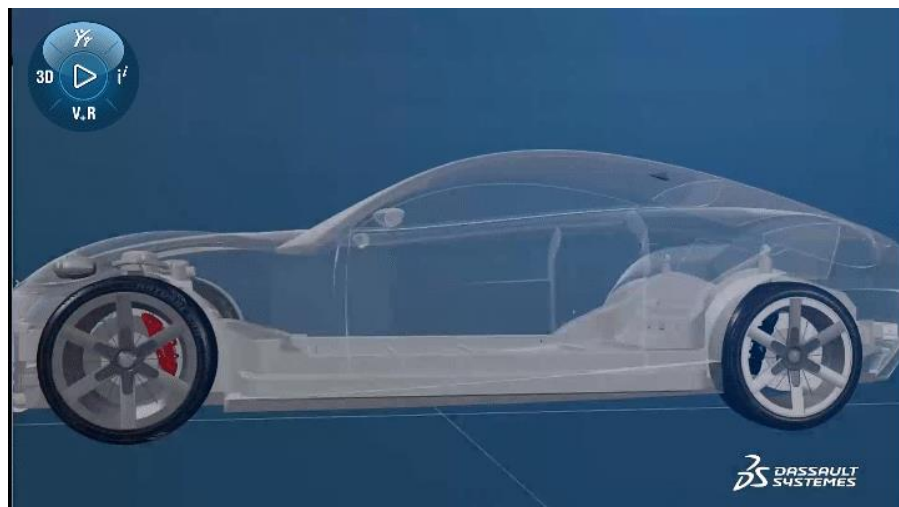
## Vehicle Integration



## Cell chemistry



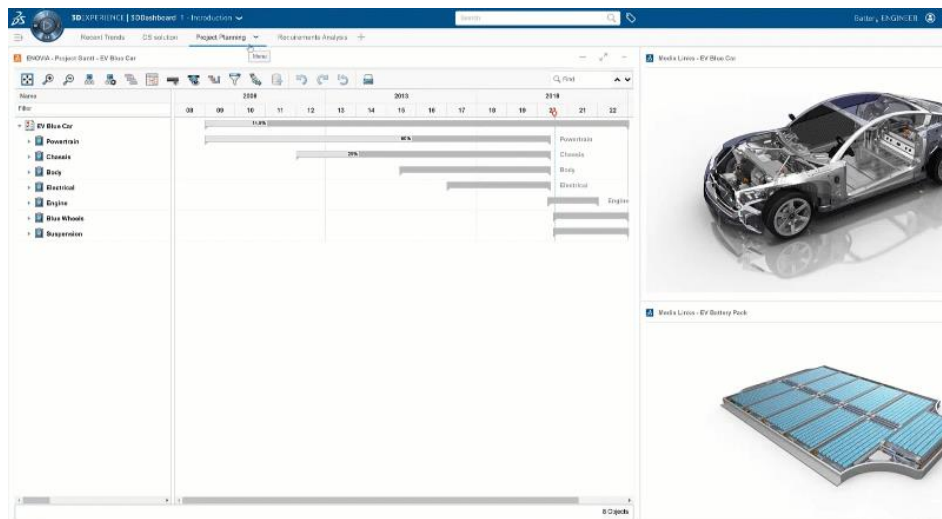
## Motor Efficiency



## Battery Cells



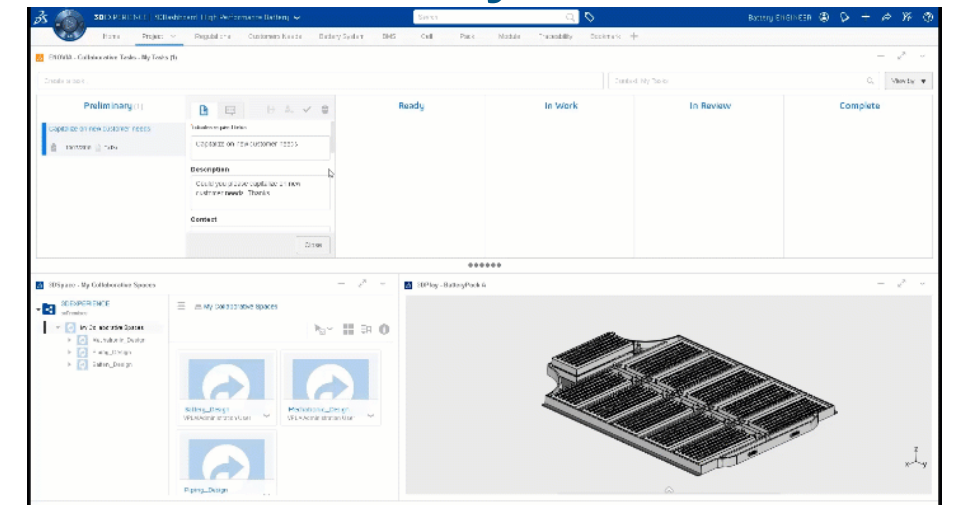
## Validation Plan



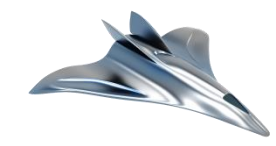
## Pack Manufacturing



## Battery Pack



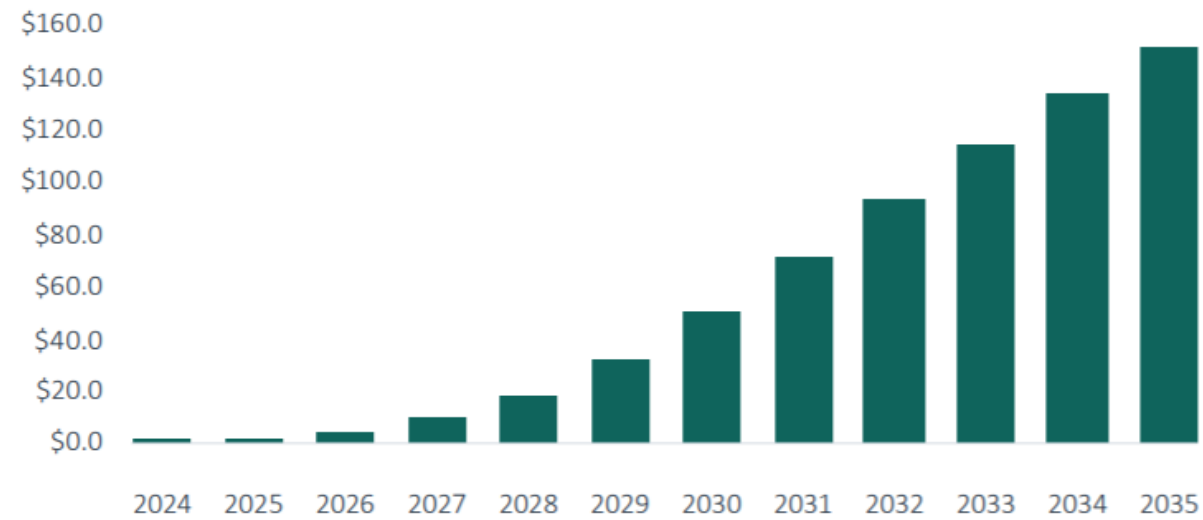




# Urban Mobility Maturity

A Market size estimated by some analysts as bigger than Commercial Aerospace

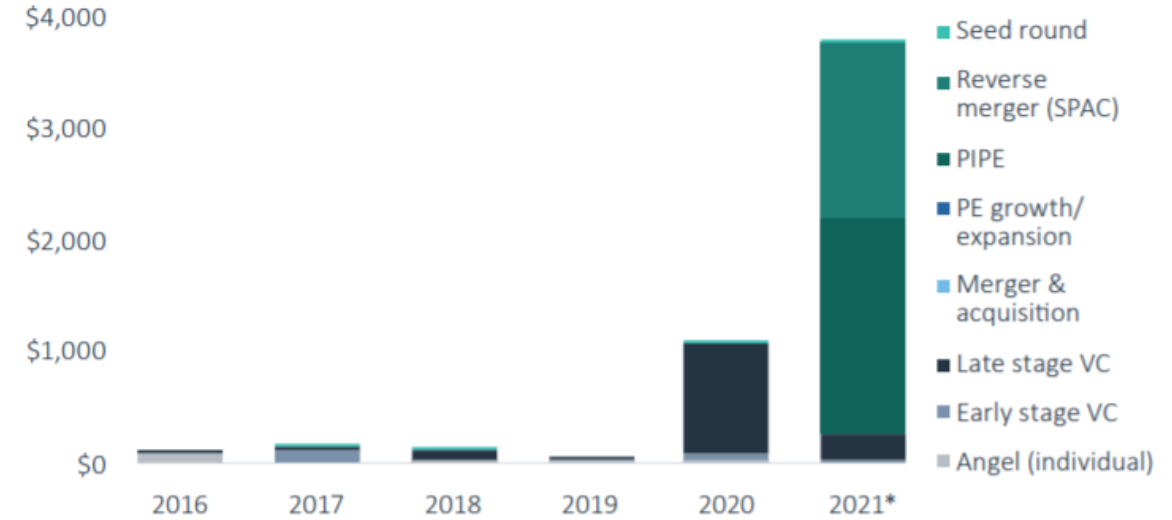
Air taxi passenger mobility market size (\$B)



Source: PitchBook | Geography: Global

\$4bn invested in 2021 through SPACs and PIPE

Investment in eVTOL passenger air taxis (\$M)



Source: PitchBook | Geography: Global  
\*As of March 31, 2021

## Drawing attention to T&M Main Players

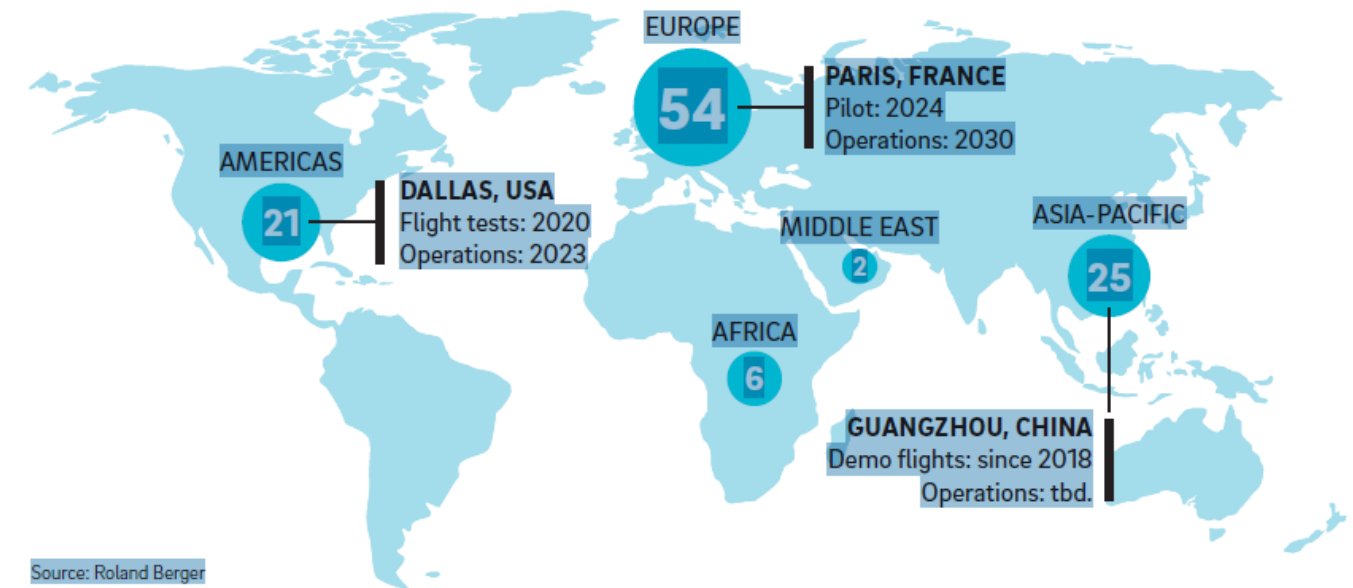
Company name	Total raised (\$M)	Country
Joby Aviation	\$2,328.30	US
Lilium**	\$1,221.50	Germany
Archer Aviation	\$1,155.70	US
Volocopter	\$376.56	Germany
EHang (NAS: EH)	\$132.00	China
Kitty Hawk	\$75.00	US
Aurora Flight Sciences	\$51.88	US

Source: PitchBook | Geography: Global  
\*As of March 22, 2021  
\*\*As of March 31, 2021



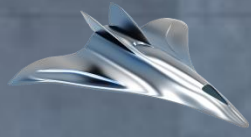
## Infrastructure is gearing up (More than 100 Airports Demonstrators)

A: The Global Urban Air Mobility Radar  
Distribution of the more than 100 projects, with example cities



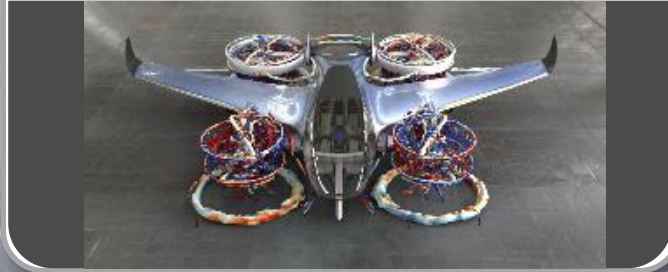
Source: Roland Berger



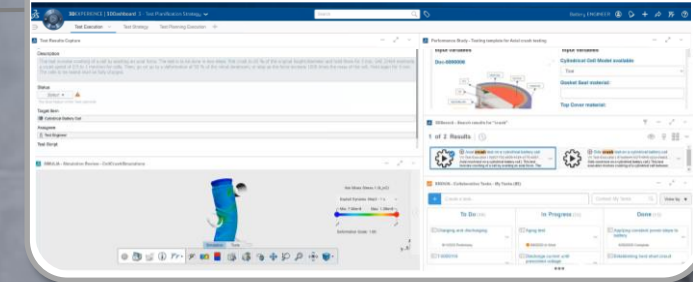


# Leading Urban Air Mobility Revolution with 3DExperience

## Noise Analyses



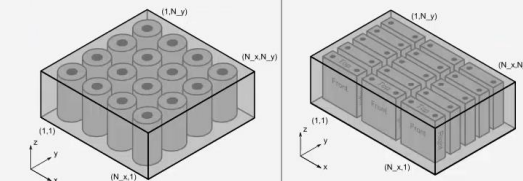
## Certification



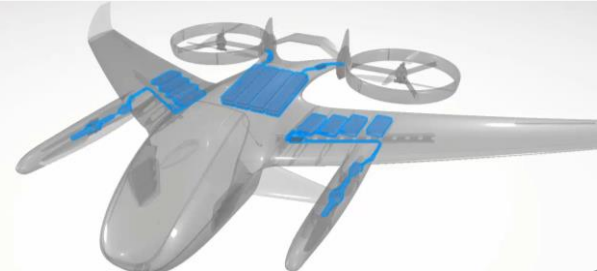
## Electrical Wire Harness Engineering



## Battery Design & Simulation



## Battery Integration



3DEXPERIENCE®



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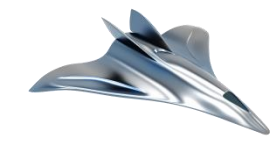
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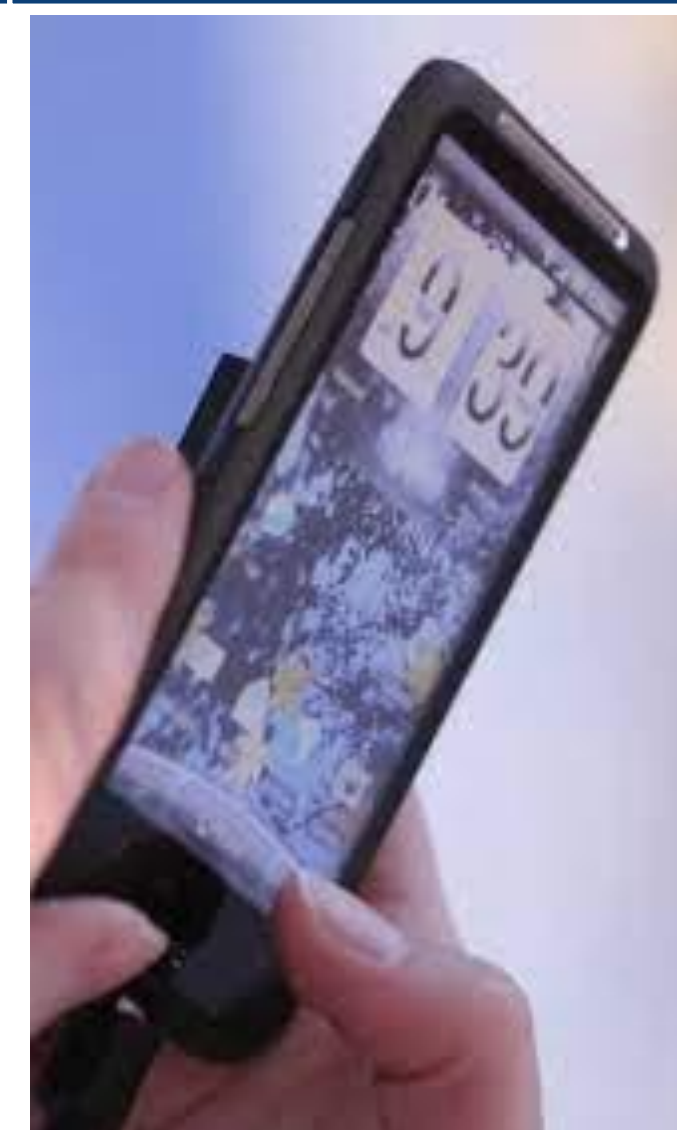
# Share Public Space

Aircraft  
OEM

Air Operations  
OEM, Operators, Regulatory authorities

City Integration  
Operators, Regulatory Authorities, Cities

Passenger  
Solutions



Design

Production

Certification

Flights  
Operation

Airport  
Operation

MRO

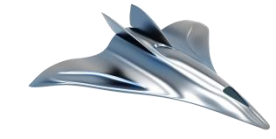
Airspace  
Mgmt.

Vertiport

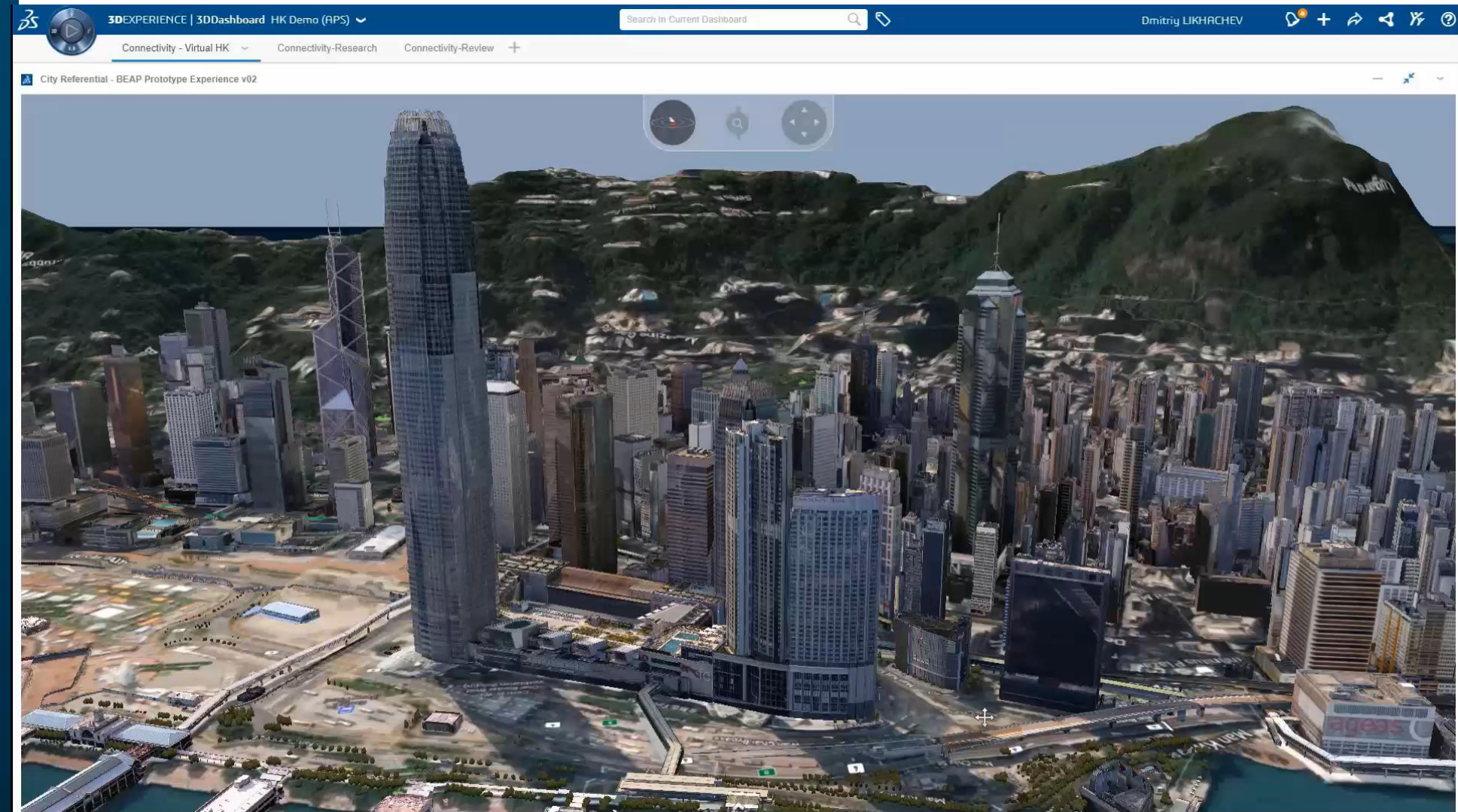
Airworthiness

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# Share Public Space





# Share Public Space

A multi-players' collaborative platform to integrate data, model future scenarii & operate



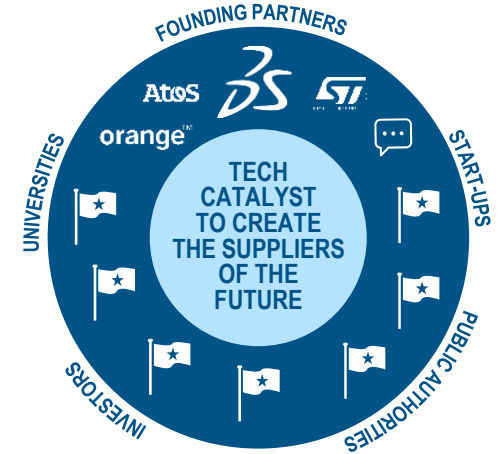




► **3DEXPERIENCE** platform with  
**Smart, Safe and Connected**

# 3DS Platform Partner for SOFTWARE REPUBLIQUE

Sovereignty for New Mobilities' Software Development



*"The Renaultion is about moving the whole company from volumes to value. We will feed our brands' strength, each with their own clear, differentiated territories. We'll move from a car company working with tech to a tech company working with cars."*

**LUCA DE MEO**  
CEO of Groupe Renault



'Renaultion': ambitious transformative program  
Moving away from volumes and on to value.

## Business Value:

- NEW Mobility Experiences**
- NEW Value Networks**
- NEW Ways of Working**



**3DEXPERIENCE®**



