Nuovi paradigmi di mobilità aerea: scenari di impiego e implicazioni tecnologiche e normative

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Summary

- Overview of new scenarios for air mobility
- National and European regulation schedule
- The technical and design challenges
- NATO Applied Vehicle Technology (AVT) group 233

New aerial mobility

From *Study on the societal acceptance of Urban Air Mobility in Europe*, EASA 2022

- Goods transportation and delivery
- Medical emergency services (blood, organs, life-saving drugs…)
- Human mobility (aerotaxis, flying buses)
- Environmental monitoring
- Monitoring of infrastructures
- Surveillance

New aerial mobility

UBER Elevate

Fast-Forwarding to a Future of On-Demand Urban Air Transportation

October 27, 2016

Amazon Prime Air seeks FCC to authorise 60-64 GHz ban collision avoidance system bandwidth operations

- High interest from private and public operators
- Major implications on business plans and commercial system evolution

High pressure on regulation authorities

High impact on urban communities

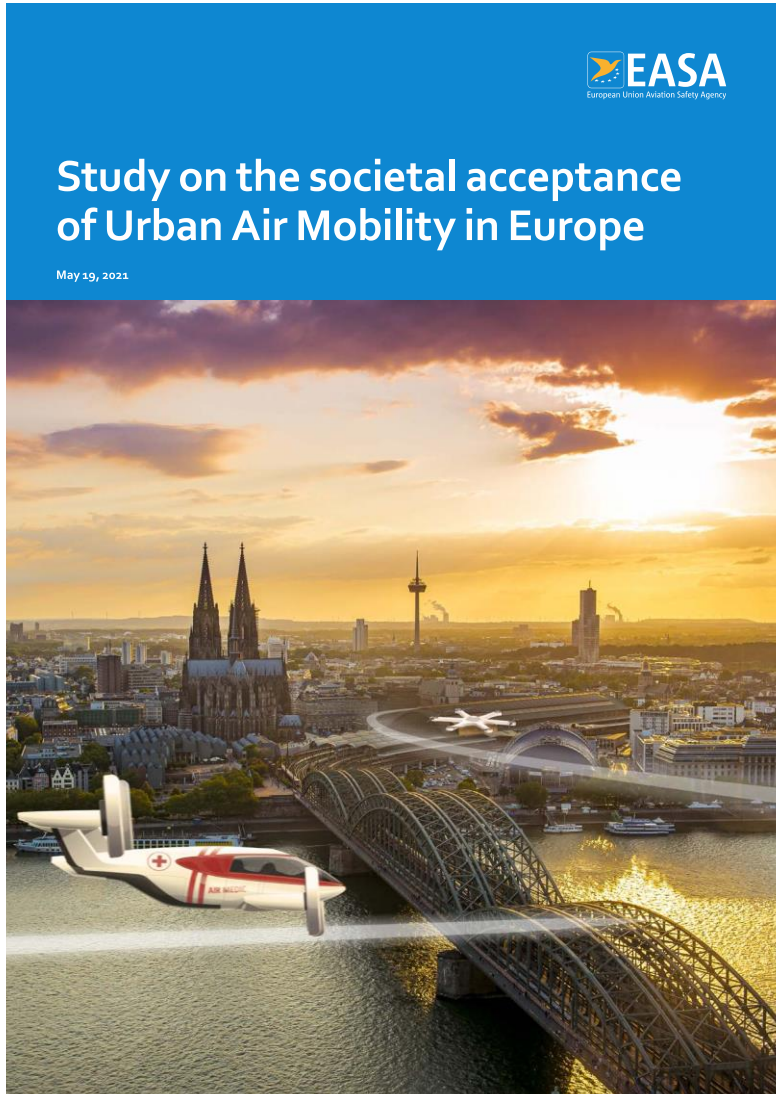
New aerial mobility

From www.nasa.gov

A revolution for urban and sub-urban communities !

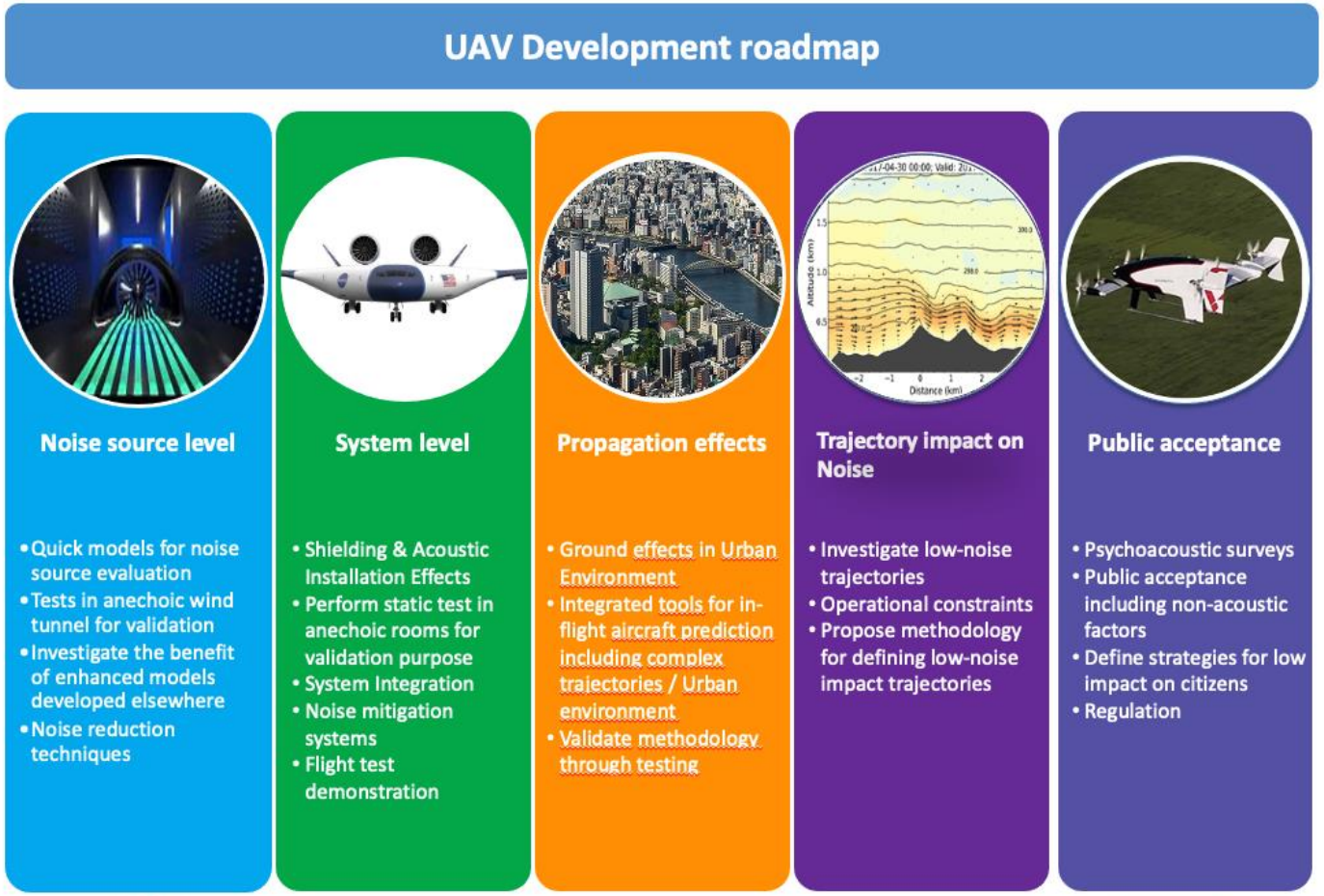
- Personal Mobility
- Real estate value and development
- Urban planning
- Completely different *soundscape*

New aerial mobility



In this context, societal acceptance is a concern of regulation authorities.

New aerial mobility



In this context, societal acceptance is a concern of regulation authorities.

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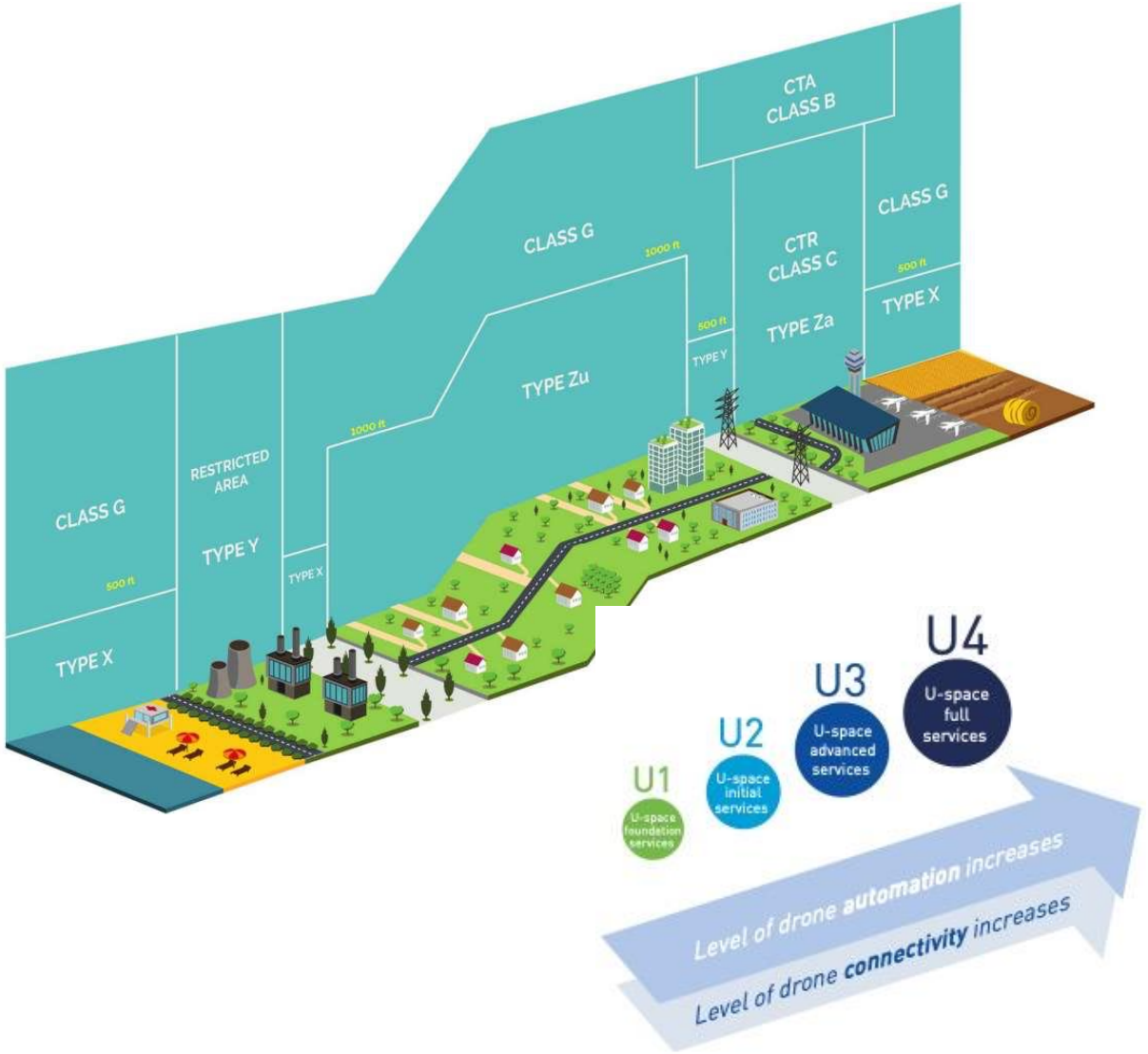
The U-space concept



U-space is a set of services to guarantee the safe integration of traditional air traffic with that of UAS.

UTM zones:

- **X** - No conflict resolution service is offered
- **Y** - Pre-flight ("strategic") conflict resolution is offered only
- **Z** - Pre-flight ("strategic") conflict resolution and in-flight ("tactical") conflict resolution are offered

Progressive entry into service.
Connettivity and automation are key words

Drones typologies (aero-design viewpoint)

multicopters

Fixed wing

Hybrid

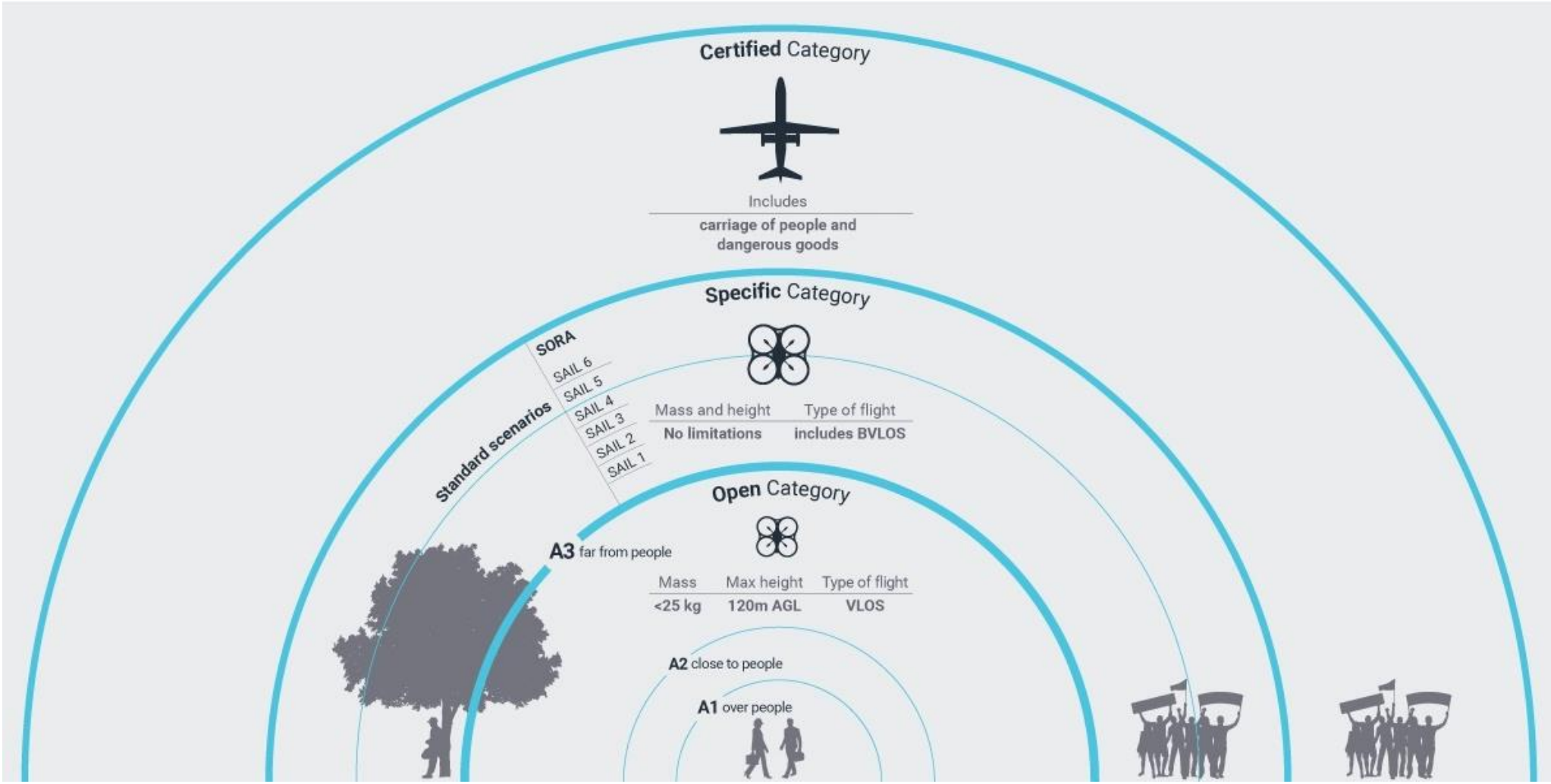
Drones typologies (aero-design viewpoint)

- Drugs delivery

- Organs delivery

- Air Ambulance

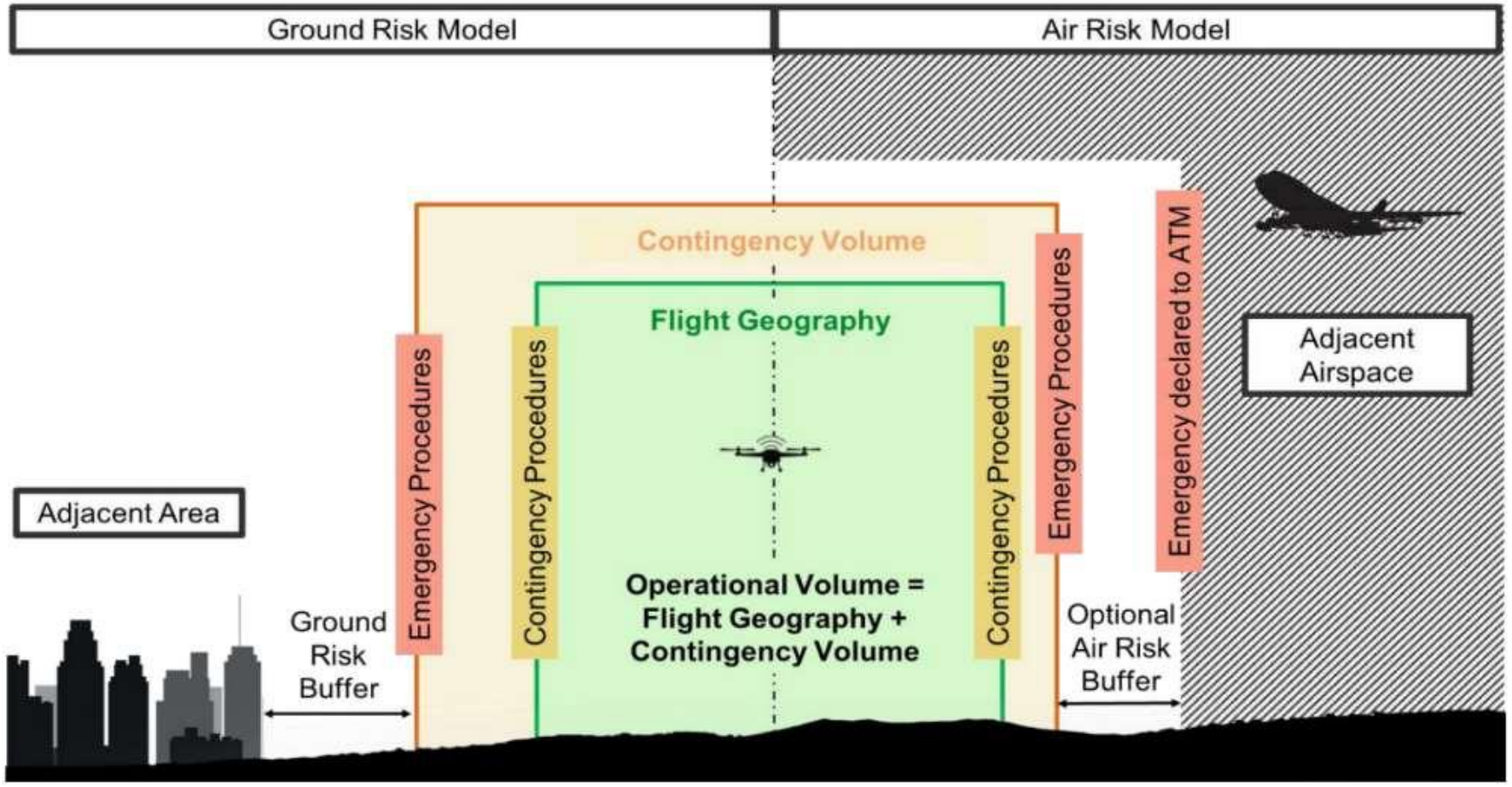
Operations categories



Operations categories (open limited)

UAS	Operation		Drone Operator/pilot		
Max weight	**Subcategory**	**Operational restrictions**	**Drone Operator registration**	**Remote pilot competence**	**Remote pilot minimum age**
< 250 g	A1 (can also fly in subcategory A3)	- No flying expected over uninvolved people (if it happens, should be minimised) - no flying over assemblies of people	No, unless camera / sensor on board **and** a drone is not a toy	- no training needed	No minimum age
< 500 g			Yes	- read user manual - complete the training and pass the exam defined by your national competent authority	16*
< 2 kg	A2 (can also fly in subcategory A3)	- no flying over uninvolved people - keep horizontal distance of 50 m from uninvolved people	Yes	- read user manual - complete the training and pass the exam defined by your national competent authority	16*
< 25 kg	A3	- do not fly near or over people - fly at least 15m from residential, commercial or industrial area	Yes	- read user manual - complete the training and pass the exam defined by your national competent authority	16*

SORA (Specific Operations Risk Assessment)



SAIL (Specific Assurance and Integrity Level)

The SAIL represents the level of confidence that the UAS operation will remain under control.

Depends on

- GRC Ground Risk Class
- ARE Aerialim Risk Class

SAIL Determination				
	Residual ARC			
Final GRC	a	b	c	d
≤2	I	II	IV	VI
3	II	II	IV	VI
4	III	III	IV	VI
5	IV	IV	IV	VI
6	V	V	V	VI
7	VI	VI	VI	VI
>7	Category C operation			

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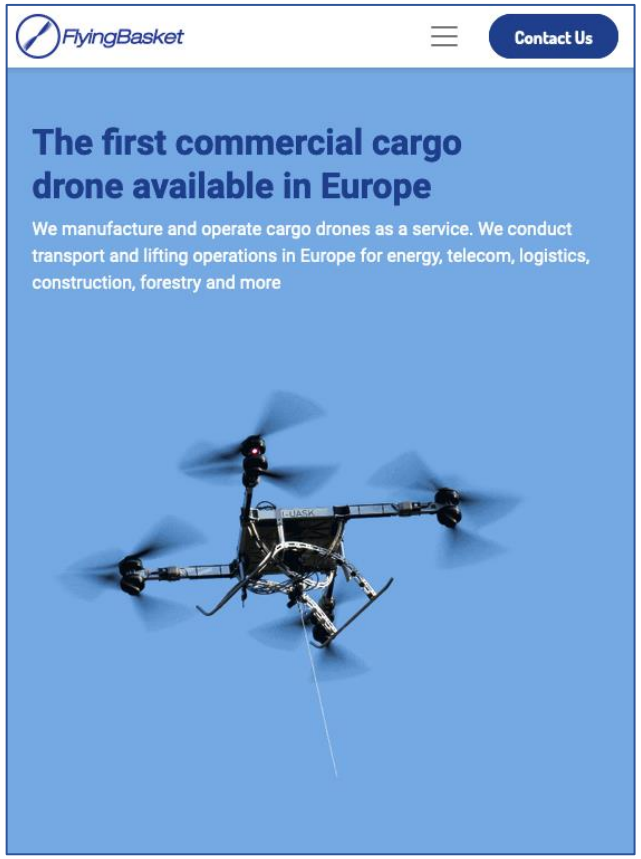
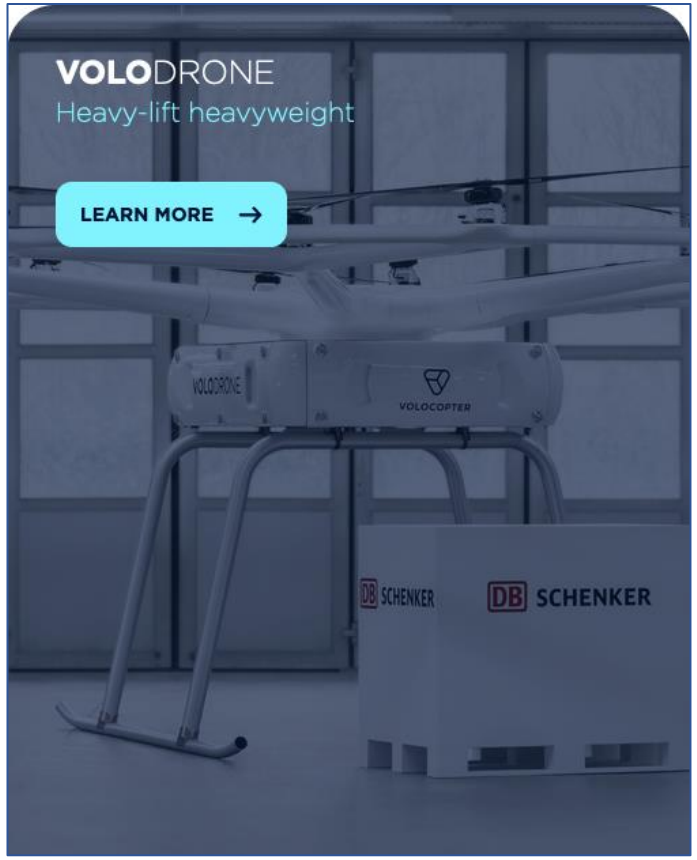
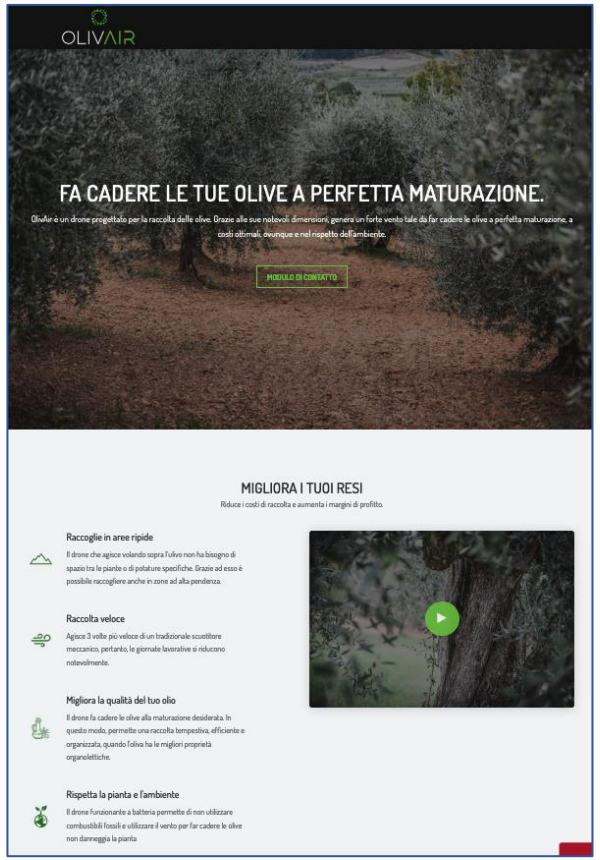
Technical and design challenges (some of the…)

- Gravimetric and volumetric energy storage density for electric propulsion;
- Noise emissions (intensity and directivity!!)
- Automation and connectivity
  - UAS-to-UAS, UAS-to-GRD, UAS-to-A/C
  - Large swarms
- Aeronautical-standards-certified design and manufacturing for robustness and reliability of heavy duty drones (also in presence of uncertainties)
- …

Technical and design challenges (some of the…)







Heavy multicopters for civil applications

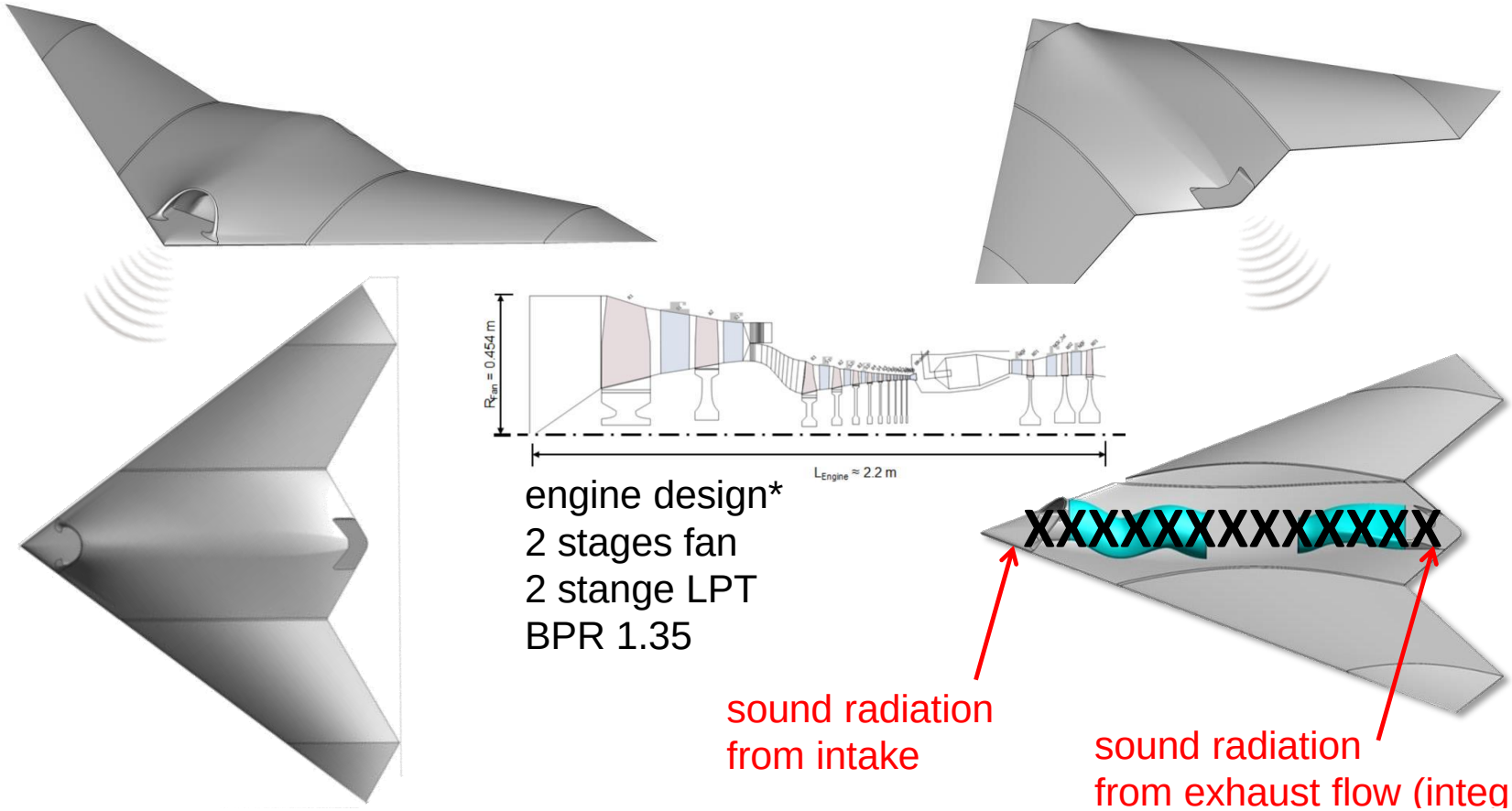
Technical and design challenges (some of the…)

Volocity operation in Rome ready by 2024

Technical and design challenges (some of the…)

Dronus Nest® concept for surveillance

The NATO AVT 251/318 panel



Design (251) and aeroacoustic assessment (318) of an attack drone.

A commitment for educators

Next generation of engineers must be prepared and trained for this challenge.

2022 Students' Projects Masters in Aeronautical Engineering – Roma Tre	
Air Bombero	Wildfire detection of large wild areas
DM Rush	Medical delivery (drugs, organs)
Moltres	Agridrone for olives harvesting
WildFireUAV	Wildfire suppression STOL UAV
Poseidon	Ocean temperature monitoring
Fair-Prandtl	Unconventional medium range AC

Almost all students' projects focused on drones for civil services

A commitment for educators

New program in Roma Tre University to cope with this challenge…

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Thank you for your attention

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