

## **ITALDESIGN AND AIRBUS UNVEIL THE EVOLUTION OF POP.UP, A MODULAR SYSTEM FOR FUTURE MOBILITY**

- **In 2017, Italdesign continued to develop the Pop.Up concept for future mobility in the areas of HMI, UX, E-traction and docking system**
- **Airbus further developed the flight systems and docking system**
- **Audi supports in technology for Autonomous Drive and Battery Electric Propulsion, system architecture and charging system**

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Italdesign unveils Pop.Up Next, the first fully electric and zero-emission modular system, designed to help resolve traffic congestion in large urban areas. Pop.Up Next consists of a modular, multi-modal system that enables transportation to enter into the third dimension by exploiting both urban ground and airspace.

Italdesign is unveiling Pop.Up Next exactly one year after its Geneva world premiere in 2017.

Pop.Up Next reflects the philosophy driving Italdesign's 50<sup>th</sup> anniversary celebrations, anticipating the challenges that the next fifty years will bring. It represents a vision of the potential offered by future technologies, the new concept of transportation and the new solutions for resolving the problems linked to city planning and traffic in large urban centres that are increasingly becoming one of the priority aspects for safeguarding our planet. Next is evidence of the success achieved by Pop.Up over the past year amongst the main players in the transportation world, the municipalities and institutions worldwide.

As the 2017 original project, the Pop.Up Next system aims to give time back to commuters, freeing them from the need to drive, through a flexible, shared and adaptable new way of moving within cities introducing a new user-focused transportation system concept.

Pop.Up combines the flexibility of a small two seater ground vehicle with the freedom and speed of a vertical take-off and landing (VTOL) air vehicle, thus bridging the automotive and aerospace domains. The core of the product is therefore the Intermodality and making it modular.

“Last year Pop.Up marked a new — and as we believe highly significant — chapter in the transportation sector by bringing together two worlds, road mobility and air transport, which had never previously met,” commented Jörg Astalosch, CEO of Italdesign. “The close cooperation with the premium brand Audi confirms that the project could become the standard bearer for future mobility, based on new technologies, sustainability, digitalisation and urbanization; all sectors in which Audi is a leading company. These are also the pillars that underpin Audi’s strategy and are fully embodied in Pop.Up Next. So we are proud having been asked to show this idea as Audi – engineered by Italdesign, following our Human Centred Design and Engineering approach.”

During 2017, Italdesign continued to work on developing the Pop.Up project on several fronts.

From the corporate/relational standpoint, Italdesign is investing in increasingly becoming a key player in the global development of future mobility, consolidating its own function as a development hub for new and innovative ideas and as a meeting point for the various sectors and stakeholders involved. Future mobility will be an all-round challenge that will increasingly involve not only vehicle manufacturers — whether these be cars, aircraft, trains to name but a few — but entities that to date have primarily played a statutory and regulatory role: from now on, they will increasingly become an integral part of the development process. Municipalities, institutions, urban planners, sociologists and developing countries will take on an ever-increasing active role in defining future mobility in the large urban areas. With this in mind, in 2017 Italdesign created, a network of contacts with municipalities, universities and other stakeholders on various continents, starting to identify typical and unique issues of each entity and defining a wealth of knowledge that will be essential for the next stages of the Pop.Up Next project’s development.

Over the course of the year, Airbus teams worked on refining the aerodynamic design of the air module and rotor ducts to improve performance and reduce power consumption in cruise flight. They also introduced a concept for a functional coupling system with locking and latching functionality. Airbus also worked on the interior design of Pop.Up Next to harmonise the Audi design language with the Airbus Airspace cabin design language from commercial aircraft.

The continuation of the research partnership with Airbus is also proof that the aerospace industry’s major players is very interested in pursuing the common aim of full integration of the various transportation sectors. Pop.Up Next is “Vorsprung durch Technik”; in this sense Pop.Up Next represents the progress of technology... and that’s not all.

From a technical standpoint, Airbus and Italdesign engineers have worked on several fronts to optimise the system's efficiency, working on weight reduction, aerodynamics, the system for coupling the various modules and optimisation of the onboard electronic systems.

Italdesign's engineers have developed an electric modular platform — currently remote steering & breaking by wire — designed to integrate ADASs for fully autonomous driving in the next prototyping step. Italdesign's electronics departments have worked on the set up of the electric driving platform and performed necessary tests to improve the system's capability. The next step is the integration of the autonomous drive system where Italdesign is closely working with the engineers of Audi and can count on its "state of the art" technologies in autonomous driving systems.

On board the capsule, work focused on the HMI system based on face recognition, eye tracking technology for activating and operating on-board services, as well as feedback systems for activating controls so as to achieve instinctive and natural human-machine interaction with the vehicle. A demonstration of this sophisticated HMI system will be available onboard the Pop.Up Next exhibited at the Geneva International Motor Show.

The greatest weight reduction was sought throughout the vehicle to ensure maximum efficiency both in flight and on the road. The seats have been completely redesigned using an approach that combines the aerospace world with the automotive universe. An extremely light aluminium structure is accompanied by an ultra-light mesh structure that combines excellent grip and passenger comfort, all weighing far less than the 2017 Pop.Up.

Airbus and Italdesign have worked jointly to develop the system for coupling the capsule and ground and air modules. This system validation is particularly complex due to the alignment and coupling requirements. The objective being pursued is for the system to be the same for connecting the passenger capsule to both the air and the ground modules, even though responding to completely different operating and safety dynamics. Based on an extremely light-weighted but ultra-strong titanium structure, with three coupling points and a central safety module, the system will have to respect the technical dynamics linked to the capsule's coupling to the air module; lift resistance, central safety fixing with extendible pins, air module's automatic alignment with the capsule in all directions (vertically in z with correct centering in x and y, whilst ensuring a correct approach angle between the two modules).

This coupling system is integrated with the onboard sensors used for the first approach and alignment of the air and ground modules with the capsule to allow safe and precise automatic connection of the modules. The

system will also have to satisfy all the technical and safety specifications for coupling the capsule to the ground module. In this way, the self-rotating locking hooks will have to satisfy operating specs. other than aerospace ones and guarantee the specific locking and safety features found in automotive use.

In both automotive and aerospace operating modes, the coupling system is optimised to ensure maximum efficiency and safety both in normal and extreme and/or emergency conditions. It is within this context that both companies have started to work with their respective certification bodies to identify the basic principles of future regulation.

## **Next is best**

Under this motto, which is partly included in the name of the new concept and is also the standard bearer for Italdesign's first 50<sup>th</sup> anniversary celebrations, the team is working on the future medium/long-term development of the Pop.Up Next project.

Audi's four rings bestow an element of prestige on future mobility, witnessed by Pop.Up Next, whilst maintaining its own democratic approach through shared usage extended to all those living in the megacities involved.

Airbus is strongly committed to the future development of Urban Air Mobility, and believes that it can only be achieved by collaboration among various transportation sectors. Italdesign will drive this project further in the future, thus confirming more and more its new function as a hub and an incubator for ideas and innovative services for mobility.

A special thanks to our technical partners: Sound to Sight, Seeing Machines.

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## POP.UP NEXT TECHNICAL SPECIFICATION

### AIR MODULE

DIMENSIONS			
	Length	mm.	4403
	Height	mm.	847
	Width	mm.	5000
	Rotors	n.	4+4
	Propeller diameter	mm.	1780

POWERTRAIN		
	Power train	Electric
	Motors	8
	Total power	160 kW
	Motor power (each motor) (MCP)	20 kW
	Range (without payload)	50 km
	Charging time	15 minutes
	Empty weight ratio (EW/GW)	43.90 %
	Total battery(ies) energy / capacity	70.0 kWh
	Disc Loading	30.4 kg/m <sup>2</sup>
	Tip Speed	150 m/s
Air Mode		
	Number of passengers	2

PERFORMANCE	Top Speed (stand-alone module)	120 km/h
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## GROUND MODULE

DIMENSIONS			
	Length	Mm	3115
	Height	Mm	681
	Width (front/rear)	Mm	1848/1900
	Front overhang	Mm	581
	Rear overhang	Mm	534
	Kerb weight	Kg	200

PERFORMANCE	Top speed	km/h	100
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POWERTRAIN			
	Powertrain	Electric	
	Motorwheels	2 (Rear)	
	Total Power	60 kW	
	Range	130 km	
	Charging time	15 Minutes	
	Total battery(ies) energy / capacity	15 kWh	

## CAPSULE

DIMENSIONS			
	Length	mm	2647
	Height	mm	1415
	Width	mm	1540
	Number of Passenger		2
	Kerb weight	kg	200