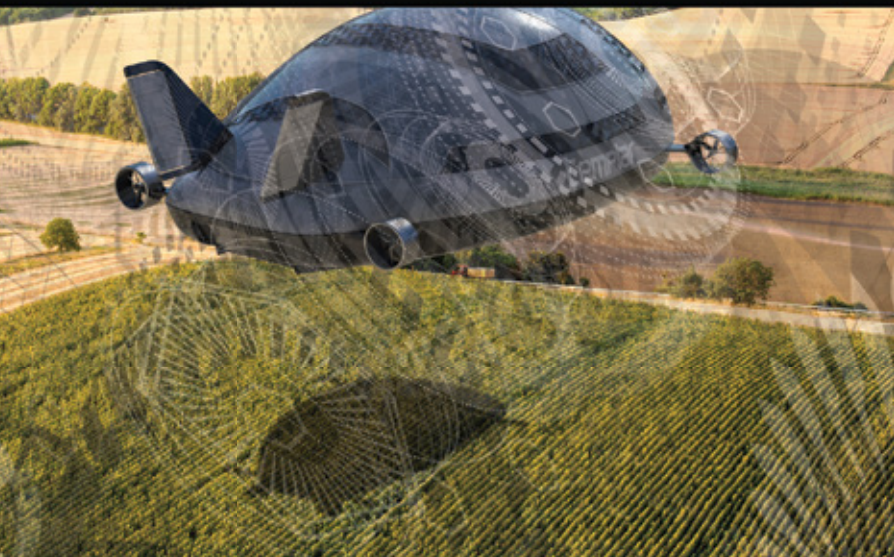




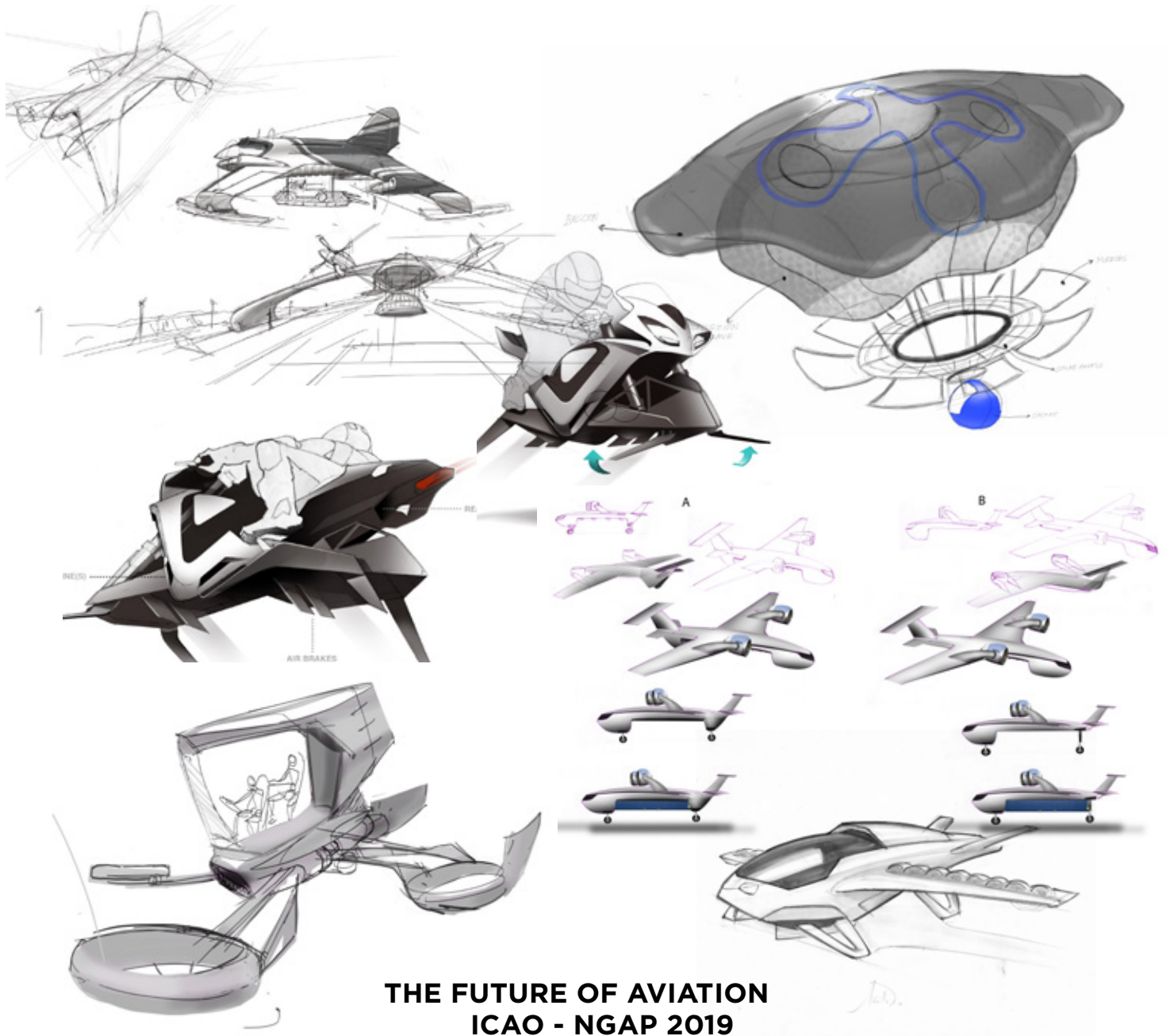
THE FUTURE OF AVIATION

BY CHARLES BOMBARDIER



ICAO

NGAP



**THE FUTURE OF AVIATION
ICAO - NGAP 2019**

START-UPS & COMPANIES

Aerofex, Aeromobil, Arca, Aurora, Cartivator, DeLorean Aerospace, EHANG,
FlytCycle, Hirobo, Hoversurf, Hybrid Air Vehicles, Kitty Hawk,
Leonardo, Lilium, Omniboard, Opener, Pale V, Parsifal, UBER, UDES,
Volocopter, XTI Aircraft, Zapata

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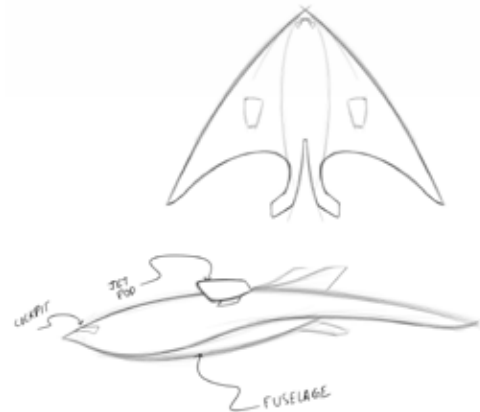
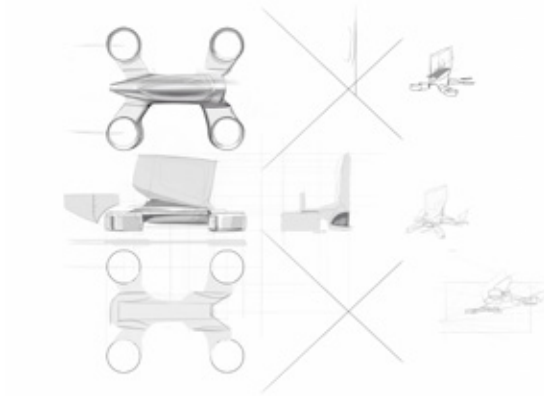
LEGAL DEPOSIT: DECEMBER 2018

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ABOUT THE AUTHOR

CHARLES BOMBARDIER
SENIOR ADVISOR, NGAP
ICAO

Charles Bombardier joined the family business, BRP, in 1989. Over the years, he was tasked with developing vehicles that included ATV's, snowmobiles and the notorious Spyder motorcycles. In 2006, he left BRP to develop electrical vehicle prototypes and invest in start-ups. He currently supports TandemLaunch startup foundry, BMU Labs, SportslogIQ, Hexoskin and Nawmal.

In 2011, Charles completed a certificate in governance from Laval University. In 2015, he obtained a master's degree in applied science (M.Sc.) from the École de Technologie Supérieure. He is now working on a Ph.D. project at the University of Sherbrooke. His research combines virtual reality, neuroscience and artificial intelligence applied to fuzzy front end (NPD).

In 2018, Charles was hired by the International Civil Aviation buenos días (ICAO) as a Senior Advisor for the NGAP initiative. His primary goal is to inspire the next generation to pursue a career in sectors related to aviation. Charles collaborates with inventors, industrial designers, students and scientists from around the world to create a vision for the future of aviation. His work with the NGAP team includes curating existing start-ups in aviation, brainstorming on new concept ideas, producing images, virtual objects, scale models, animations, speaking at ICAO conferences, and of course, working on this annual review of things to come in aviation!

Charles has been a pilot since 1992. He flies small aircraft, seaplanes and helicopters. He also sits on the board of l'Ordre des Ingénieurs du Québec and he's the proud father of three teenage boys.



FOREWORD

BY STEPHEN P. CREAMER
DIRECTOR, AIR NAVIGATION BUREAU
ICAO

Aviation has always been a driver for innovation. For hundreds, perhaps thousands of years before that December day on Kitty Hawk in 1903, humans were driven by the dream of flying. That urge fueled the creativity of thinkers across the globe and throughout time to try, and try again. While almost all early attempts ended in failure, the inventions that it took for each try often left behind an improvement that the rest of society could enjoy and use to improve the quality of life. These included: lighter materials, stronger structures, more efficient machines, and a much better understanding of science in general. In fact, every time you see a skyscraper, use a computer, drive a car or enjoy a cruise you are experiencing something that was made possible, in some critical way, by the knowledge gained by failing to fly.

While it has been more than a 100 years since the first powered flight, that impetus for innovation – the dream of flight – has not disappeared. Once we acquired an understanding of the basic physics of flight we learned to fly across the oceans, then around the world, then faster than the speed of sound, then to space, to the moon and beyond. Each achievement encountered failure before we successfully harnessed the complexity and risk inherent to each new milestone.

Today we build on the work of those who went before, and innovators are constantly creating new ideas and concepts that will serve or motivate the generations to come. This book represents a few of those new dreams. We hope that it will be a source of inspiration for innovators and also encouragement as they fail in their future attempts, to tell them not to give up; and, to reassure them that even their failures will represent progress, and be of social and economic benefit to the people of the world. Today that desire for progress is still with us.



ZAPATA



EHANG



OPENER



LILIUM

CORQ

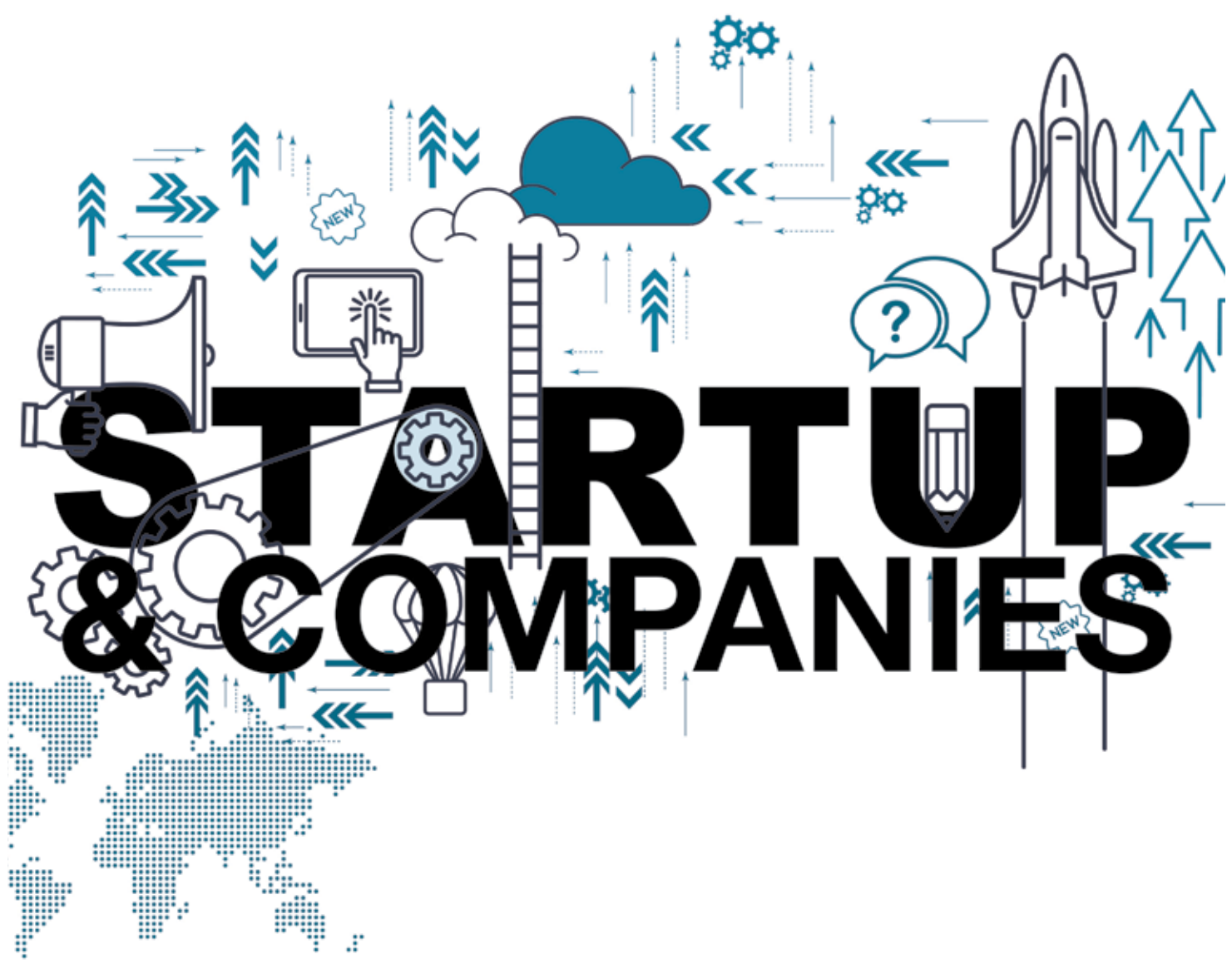


ARCA



CAR

FLYT

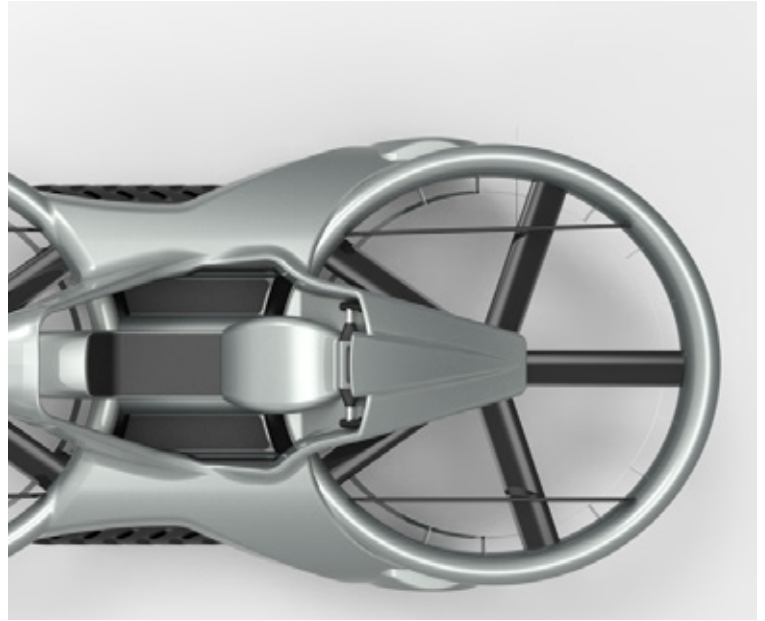


STARTUP & COMPANIES



AERO-X

AERO-X by AEROFEX



The Aero-X is tandem-duct platform that flies up to 10 feet off the ground at 45 miles per hour. It's a surface-effect craft that rides like a motorcycle—that's flying. The Aero-X can be adapted for a variety of uses including surveying, search and rescue, border patrol, disaster relief, agricultural, ranching, and rural transportation. Because it responds to the pilot's movements just as a motorcycle would, the Aero-X is intuitive to fly. Built with very few moving parts, its cost of ownership is a fraction of even the most basic airplane or helicopter.

Website: <https://aerofex.com/>

Location: Manhattan Beach, CA, USA

Design Features

- Intuitive pilot interface
- Fixed-pitch carbon fibre fans
- Four-wheel gear with castoring aft wheels
- Two-position control bars
- Carbon fibre composite primary structure
- Normally aspirated three-rotor rotary engine
- Direct drive composite drive shafts
- Oil-cooled gearboxes

Optional Features

- Whole vehicle airbags
- Floatation pontoons for water operations
- Mounting, USB, and power provisions for auxiliary equipment
- DOT-approved transport trailer
- Oil-cooled gearboxes

PERFORMANCE

Occupancy:
2 people

Useful Load:
140 kg

Altitude:
12 feet

Airspeed:
72 km/h

Autonomy:
1.25 hours



AIRLANDER 10

AIRLANDER 10 by HYBRID AIR VEHICLES



PERFORMANCE

Occupancy:
19 people

Useful Load:
10 000 kg

Altitude:
3000 feet

Airspeed:
148 km/h

Autonomy:
5 to 14 days

The Airlander 10 is a hybrid airship designed and built by British manufacturer Hybrid Air Vehicles (HAV). Comprising a helium airship with auxiliary wing and tail surfaces, it flies using both aerostatic and aerodynamic lift and is powered by four diesel engine-driven ducted propellers. The Airlander 10 is the largest aircraft flying today.

The prototype was first named HAV 304 and was originally built for the United States Army's Long Endurance Multi-intelligence Vehicle (LEMV) programme. In 2012, the HAV 304 conducted its maiden flight at Lakehurst, New Jersey, USA, but the programme was scrapped in 2013.

Hybrid Air Vehicles reacquired the airship and brought it back to England. It was reassembled and modified for civilian use, and in this form was redesignated as the Airlander 10. In 2016, the airship returned to the skies.

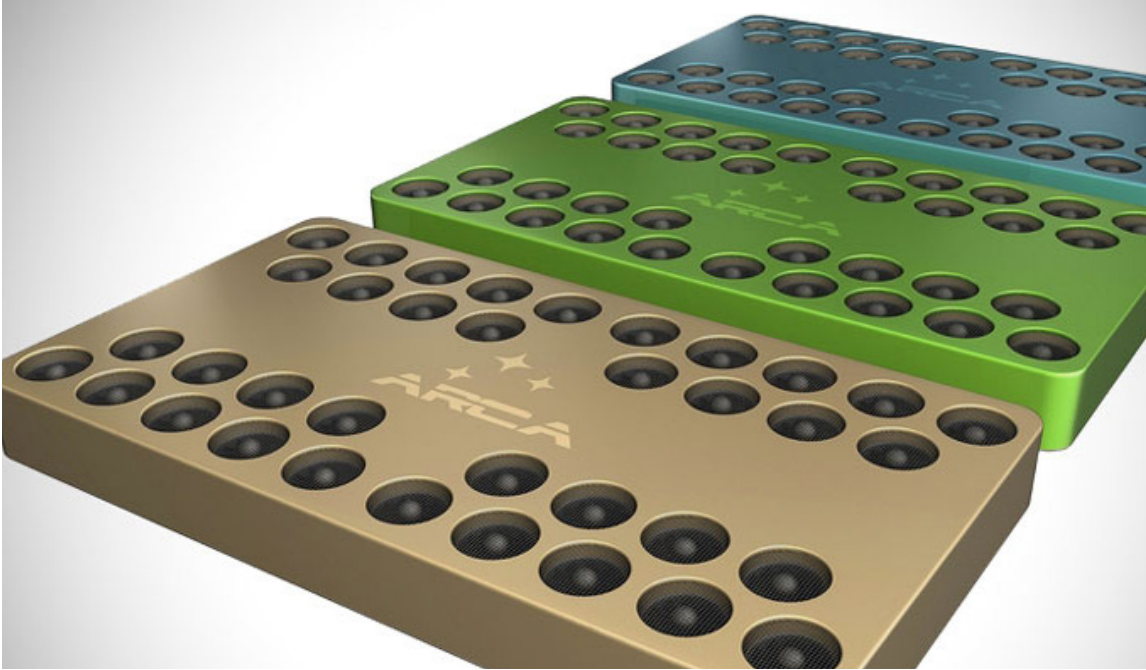
Location: Bedford, England

Website: <https://www.hybridairvehicles.com>



ARCABOARD

ARCABOARD by ARCA



PERFORMANCE

Occupancy:
1 person

Useful Load:
110 kg

Altitude:
10 feet

Airspeed:
20 km/h

Autonomy:
6 minutes

The ArcaBoard is powered by 36 electric ducted fans that produce a thrust of 200 kgf. It has a built-in stabilization unit so it is stable in any condition, and it's a safe platform to fly on. You'll be able to use your phone to control and navigate the vehicle. If you want to try something more intense, you can turn off the stabilization system and steer the ArcaBoard with your body.

After thousands of hours creating and testing different structures, Arca came to the conclusion that the simple shape of the Arcaboard is the answer to its quest to achieve a good balance between power, stability, durability and safety.

Location: Las Cruces, NM, USA

Website: www.arcaspace.com/en/arcaboard.htm





BLACKFLY

BLACKFLY BY OPENER



PERFORMANCE

Occupancy:
1 person

Useful Load:
113 kg

Altitude:
Not specified

Airspeed:
128 km/h

Range:
25 km

Autonomy:
12 minutes

Battery:
12kwh (intl)

BlackFly is the world's first ultralight, all-electric, fixed-wing, vertical take-off and landing (VTOL) aircraft. It's a single-seat Personal Aerial Vehicle (PAV) designed and built for a new world of three-dimensional transportation. It's also simple to master and requires no formal licensing (in the USA) or special skills to operate safely. Though BlackFly has full amphibious capabilities, it is primarily designed to operate from small grassy areas and travel distances of up to 25 miles at a speed of 62 mph (USA restriction).

It is a safe and affordable flying vehicle that can free its operators from the everyday restrictions of ground transportation.

OPENER's long-term vision is to integrate these highly-efficient vehicles into a rural/urban commuting network. These networks would be powered by renewable energy sources requiring only a fraction of the transportation energy used currently.

This vehicle already has years of continuous testing in 1,400+ flights and 12,000+ miles flown.

Location: Las Cruces, NM, USA

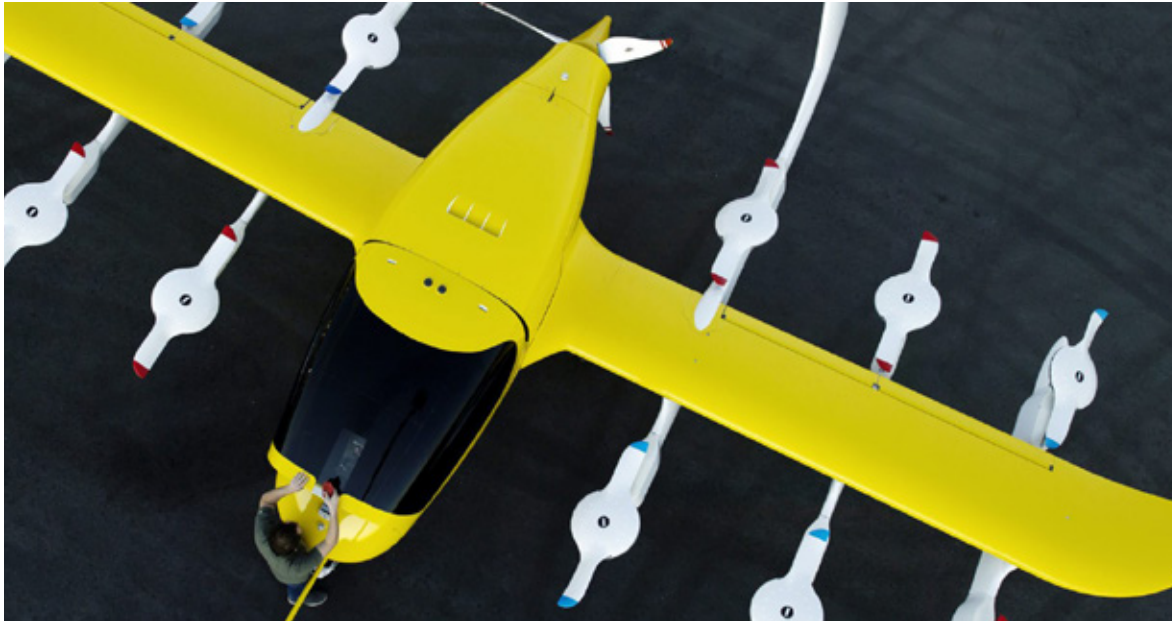
Website: <https://www.opener.aero/>

- 8 fixed propulsion units
- 4 redundant elevon pairs
- Ballistic parachute (optional)



CORA

CORA by KITTY HAWK



PERFORMANCE

Occupancy:
2 passengers

Range:
100 km

Altitude:
3 000 feet AGL

Crusing speed:
180 km/h

Autonomy:
33 minutes

Number of motors:
7

Cora began as a dream. An air taxi so personal and so simple it could take the trips you make every day, the ones that define our lives, and bring them to the sky. After eight years of tackling some of the biggest challenges in aviation, that dream is one step closer.

Cora isn't just about flying. Cora is about the time you could save soaring over traffic. The people you could visit. The moments that move you. Cora was designed with the planet in mind from day one. It's part of the electric revolution that's leading us to a sustainable future. And with the power to rise above the road, Cora will help ease the pressure traffic places on all our lives.

You have got enough happening in your life without having to learn how to fly. But what if flying across town was as easy as hopping in a rideshare? What if Cora could fly for you?

Cora will combine self-flying software with expert human supervision, so you can enjoy the ride.

After a global search for a partner, Cora has landed in New Zealand to start a new phase of evolution. With its commitment to innovation and forward thinking regulatory ecosystem, New Zealand is the perfect collaborator.

Zephyr Airworks, Kitty Hawk's operator in New Zealand, is working with the government, businesses and local communities to make the dream of every day flight a reality.

Location: Mountain View, California, USA

Website: <https://cora.aero/>



DR-7

DR-7 by DELOREAN AEROSPACE



PERFORMANCE

Occupancy:
1 person

Useful Load:
TBD

Altitude:
TBD

Airspeed:
TBD

Autonomy:
TBD

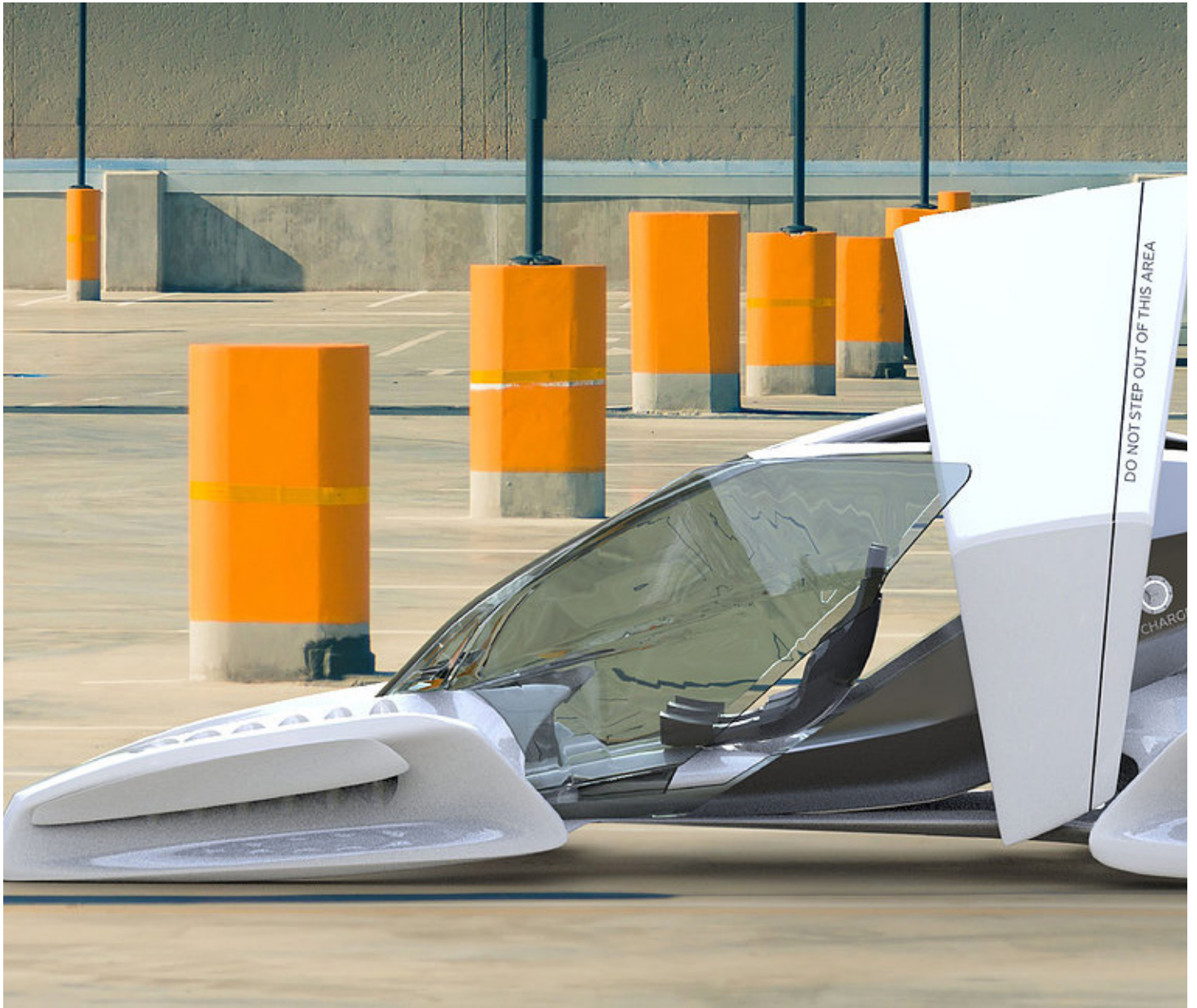
Engineered for maximum efficiency, the DR-7 is built like a Formula 1 race car—for the sky. With its monocoque composite construction, ultra-low drag body, and tandem seating configuration, weight is kept to a minimum for unrivaled performance and range.

The DR-7 has been designed with a number of unique technologies for improved safety and overall functionality. With an industry-first centerline twin vectoring propulsion system, stall-resistant canard design, and multiple patent-pending features, this aircraft is intrinsically safer. With an incredibly low drag coefficient, the DR-7 maximizes range under fully electric power. It has been issued a U.S. patent and has additional domestic and foreign patents pending.

Location: Orange County, California, US

Website: <http://www.deloreanaerospace.com/>





DRONE TAXI

DRONE TAXI BY HOVERSURF



PERFORMANCE

Occupancy:
1 person

Useful Load:
TBD

Altitude:
250 km/h

Airspeed:
TBD

Autonomy:
1.2 hours

Range:
300 km

Cost:
30 cents / km

Hoversurf created a new formula for the flying car that combines all the advantages in one concept: convenience, safety, and speed. This electric flying drone taxi has a unique system in which the vehicle can be both a copter and an aircraft. Unlike other S/VTOLs, these systems are independent. If the wing fails, the copter will land. If the copter fails, the plane will help you land. It also includes the most advanced ballistic parachute available for emergency situations.

The Drone Taxi is a lift-and-cruise or hybrid aircraft that is much more efficient than multi-rotor and much safer than tilt-x. It produces the lowest noise level due to the use of patented Venturi engines, which have a noise-canceling effect. The Drone taxi is the only concept that can take off and land in an ordinary parking space, allowing the project to enter the market faster.

Location: California, USA

Website: <https://www.hoversurf.com/formula>



EHANG 184

EHANG BY EHANG 184



PERFORMANCE

Occupancy:
1 person

Useful Load:
100 kg

Altitude:
500 meters

Airspeed:
100 km/h

Autonomy:
25 minutes

EHang is an intelligent aerial vehicle company with integrated capacities of R&D, manufacturing, sales and operation services, headquartering in Guangzhou, China. With the mission of “let humankind fly freely like a bird”, EHang provides customers from various industries with Autonomous Aerial Vehicles (AAV), command and control center for smart cities, connected drones, drone formation, delivery UAVs and solutions for UAV delivery. EHang is awarded by the global influential media Fast Company as one of the “Most Innovative Companies” and ranked into the top three companies across the world’s UAV industry.

At CES 2016, EHang officially launched the world’s very first electric AAV for low-airspace short-distance air transportation. With the core concepts of autopilot, full redundancy safety design and cluster management by intelligent command and control center, pilots are no longer necessary for a flight, while passengers only need to click the “take-off” button to fly to the selected destination. EHang will provide every passenger a truly enjoyable journey by the safe and intelligent autopilot system.

So far, EHang has finished over 1000 test flights under various conditions, including manned flight. EHang has also obtained the AS9100D certificate, a quality management systems standard for global aerospace & aviation industry. This “Created in China” technology innovation is leading the world to explore great potentials of urban air mobility, facilitating every aspect of human life, such as public transportation, logistics, emergency medical aid, tourism, etc., building up an aerial flight ecosystem for future smart cities.

Location: Guangzhou, Guangdong, China

Website: <http://www.ehang.com/ehang184/>



ELEVATE AND SKYPORT

ELEVATE AND SKYPORT by UBER



PERFORMANCE

Occupancy:
n/a

Useful Load:
n/a

Altitude:
n/a

Airspeed:
n/a

Autonomy:
n/a

Uber's Elevate team is developing an urban aviation ridesharing product called Uber Air: a network of small, electric aircraft that take off and land vertically. The Uber aircraft will enable rapid, reliable transportation between suburbs and cities, and ultimately, within cities.

Starting in 2023, Uber customers will be able to push a button and get a flight on-demand with Uber Air in Dallas, Los Angeles, and a third international city.

Location: San Francisco, California

Website: <https://www.uber.com/info/elevate/>





eVTOL

eVTOL by AURORA



Aurora's eVTOL aircraft will provide on-demand transportation to minimize long commutes due to heavy traffic and urbanization in populated areas. While initially operated with a safety pilot, the eVTOL aircraft is designed for fully autonomous operations. The flight capability for eVTOL aircraft is three times as efficient as a multi-copter aircraft.

The eVTOL aircraft includes eight lift rotors for vertical take-off along a cruise propeller and wing to transition to high-speed forward cruise. Once at the destination, the aircraft transitions back to rotor-borne flight for vertical landing. Its fully-electric operation decreases emissions and noise pollution.

The infrastructure plan includes urban vertiports for passenger boarding and vehicle servicing. The eVTOL would operate a hub-to-hub service between designated vertiports. The first test bed flights are scheduled to begin in 2020 in Dallas, Texas, USA, and Dubai, United Arab Emirates.

Website: <https://www.aurora.aero/evtol/>

Location: Manassas, Virginia, USA

PERFORMANCE

Occupancy:
2 people

Rotors:
8

Propeller:
1

Power Source
Electric



FLYBOARD AIR

FLYBOARD AIR by ZAPATA



The jet powered personal aerial vehicle, capable of VTOL and unprecedented individual mobility. The Zapata© technology platform is the safest, easiest, lightest, most maneuverable personal aviation system ever created.

Inventors have been chasing the dream of personal flight for decades, but no one else has achieved it in the way that Zapata has. Zapata's unique and innovative approach comes from its experience in hydroflight, its use of turbine engines over conventional electric propellers and the use of intuitive flight controls designed around the human body.

- Turbine engines have up to ten times the power to weight ratio of other power sources.
- You can install a lot more power into a confined space.
- More efficient in turning chemical energy into thrust.
- Greatly increases maneuverability and speed.
- Opens the possibility of engine redundancy and graceful degradation.

PERFORMANCE

Occupancy:
1 person

Useful Load:
200 kg

Altitude:
3 000 meters

Airspeed:
200 km/h

Autonomy:
30 minutes

- Very easy to learn.
- Designed to be flown without pilot training.
- Designed around the human body and our natural ability to balance.
- Safely train on the water Flyboard®

Website: <https://zapata.com/air-products/flyboardair>

Location: Rove, France



FLYER

FLYER by KITTY HAWK



PERFORMANCE

Occupancy:
1 pilot

Range:
8 km

Altitude:
10 feet

Crusing speed:
32 km/h

Autonomy:
12 to 20 minutes

Number of motors:
10

Is Flyer real? Very much so. Flyer is Kitty Hawk's first personal flying vehicle and the first step to make flying part of everyday life.

Is it easy to use? Flyer is designed to be easy to fly and flown for recreational purposes over water and uncongested areas. In just a couple of hours, you will experience the freedom and exhilaration of flight.

Will I be able to get on Flyer? Making Flyer accessible helps more people experience the freedom and possibilities of vehicles of the future. Partner with us here to help bring Flyer to your community and follow us here to learn how you can fly Flyer.

Is it available for purchase? Not at the moment. The opportunity to join the limited Founders Series pre-order is closed. We are now focused on making personal flight accessible and affordable. If you would like to help us bring Flyers

to your community, let us know here. We look forward to sharing our progress in the coming months: for updates, please follow us on Instagram and Twitter.

Is it going to be loud? Flyer creates thrust through all-electric motors that are significantly quieter than any fossil fuel based equivalent. When Flyer is in the air, depending on your distance, it will sound like a lawnmower (50ft) or a loud conversation (250ft).

We have not yet disclosed Flyer's sale price. Our mission is to give more people the freedom of flight so we will work with partners to make fleets of Flyer available to fly in recreational environments around the world.

Location: Mountain View, California, USA
Website: <https://flyer.aero/>



HAAS 2CA

HAAS 2CA by ARCA



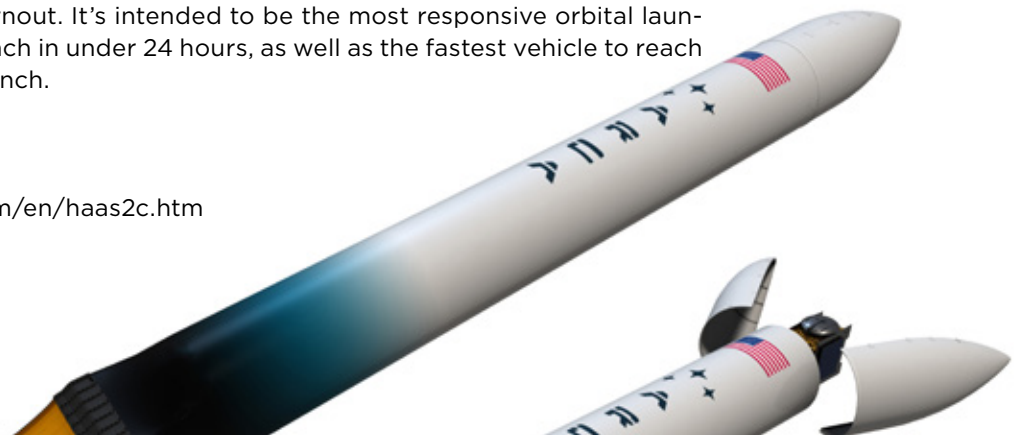
PERFORMANCE
Length: 16 meters
Diameter: 1,5 meters
Altitude: Over 160 km
Payload to LEO: 100 kg
Engine Type: Linear Aerospike
Cost/kg: 10 000\$ US
Total thrust ASL: 22,920 kgf

The Haas 2CA is a Single Stage to Orbit (SSTO) rocket that can launch 100 kg (220lbs) of payload to low-earth orbit. When this vehicle launches (projected for 2019), it will be the first rocket in history to go entirely into orbit. This opens new frontiers in Solar System exploration as the rocket can be refueled in-orbit and re-utilize its aerospike engine, thus eliminating the need for additional upper stages.

Extremely simple and therefore affordable to construct and operate, the rocket can be launched on a weekly or even daily basis. It could be operated from inland spaceports as there are no stages that fall to the ground at burnout. It's intended to be the most responsive orbital launcher ever created, being able to launch in under 24 hours, as well as the fastest vehicle to reach orbit at less than 5 minutes from launch.

Location: Las Cruces, NM, USA

Website: <http://www.arcaspace.com/en/haas2c.htm>





HORUS

HORUS HOVERBIKE at UDES



PERFORMANCE

Occupancy:
1 person

Useful Load:
115 kg

Altitude:
16 feet

Airspeed:
52 Knots

Autonomy:
**10 to 25 minutes
with pilot**

Battery capacity:
12.3 kWh

Total thrust:
364 kg

The Horus hoverbike is a student project from the University of Sherbrooke in Canada. It was designed to demonstrate the viability of a hybrid vehicle that mixes the pleasure of riding a motorcycle and the freedom of piloting an electric VTOL aircraft.

The Horus will be controlled by 4 main components: a combustion engine, two propellers, twelve deflectors, and an embedded controller. The 95 kW (130 hp) Apex engine will transmit its power to a shaft made of carbon fiber, which will be linked to two 1.6-meter diameter propellers. Those propellers will generate the lift-off thrust.

To control the roll, pitch, yaw, and altitude, six deflectors will be used per propeller. The six in the center will reduce the thrust efficiency of the propellers to control the altitude and the pitch, while the four at the extremities will be used to control the roll and yaw. The last component is the embedded controller, which can be adjusted based on the pilot's experience.

Location: Sherbrooke, Canada

Website: <https://www.hoversurf.com/orderyours>





HOVERBIKE

HOVERBIKE by HOVERSURF



PERFORMANCE

Occupancy:
1 person

Useful Load:
115 kg

Altitude:
5 meters

Airspeed:
96 km/h

Autonomy:
**10 to 25 min.
with pilot**

Total thrust:
364 kg

Hoversurf has designed a monocoque frame for its Hoverbike using different types of carbon fiber technology. The whole frame is made by a single element, which provides stiffness with half the weight.

The dimensions of the hoverbike allow it to be rolled through a standard doorway while also having ability to take off and land from an ordinary parking space. The safe flight altitude is 5 meters above the ground, although the pilot can adjust the limit to their comfort. Hoversurf has Auto-take-off (AT), auto-landing (AL), Alt Hold, Manual, and RC control available.

Hoverbike S3 2019 contains a hybrid-type battery that allows you to fly up to 40 minutes in the drone mode and between 10 to 25 minutes with a pilot depending on weight and weather conditions. A new portable home charging pack allows quick charging in as little as 2.5 hours without removing the batteries.

Location: California, USA

Website: <https://www.hoversurf.com/orderyours>



HX-1 by HIROBO



Hirobo recently developed a full-scale personal transportation and emergency relief vehicle called HX-1. This aircraft is a coaxial single-seat vertical take-off flying machine. It is capable of achieving close to 100 km/h for a duration of up to 30 minutes. The HX-1 is equipped with an electric motor, which means it will be pretty quiet, while you fly yourself from point A to point B.

Hirobo is planning a commercial rollout in 2021 for a price tag of US\$365,000.

Location: Hiroshima, Japan

Website: <https://www.hirobo.co.jp/group/hx-1/>

PERFORMANCE

Occupancy:
1 person

Useful Load:
TBD

Altitude:
TBD

Airspeed:
52 Knots

Autonomy:
30 minutes



LILIUM JET

LILIUM JET BY LILIUM



PERFORMANCE

Occupancy:
5 passengers

Range:
300 km

Altitude:
TBD

Crusing speed:
300 km/h

Autonomy:
TBD

Number of engines:
36

Lilium enables you to travel 5 times faster than a car by introducing the world's first all-electric vertical take-off and landing jet: an air taxi for up to 5 people. You won't have to own one, you will simply pay per ride and call it with a push of a button. It's our mission to make air taxis available to everyone and as affordable as riding a car.

In 1894, Otto Lilienthal began experimenting with the first gliders and imagined a future in which we could all fly wherever we want, whenever we want. Lilium is turning that dream into reality. We are bringing personalized, clean and affordable air travel to everyone

Quiet electric vertical take-off and landing (VTOL) is the technology that will change travel forever. It enables you to access city centres with an aircraft. A large network of small and inexpensive landing pads and central places in cities will allow you to quickly enter an aircraft anytime and fly anywhere you want. Leaving the city after a stressful day will soon be transformed into a thrilling ride. By travelling through the air you'll be able to avoid time-consuming traffic jams, while enjoying a magnificent view.

Location: Gilching, Bayern, Germany

Website: [ps://lilium.com/](https://lilium.com/)



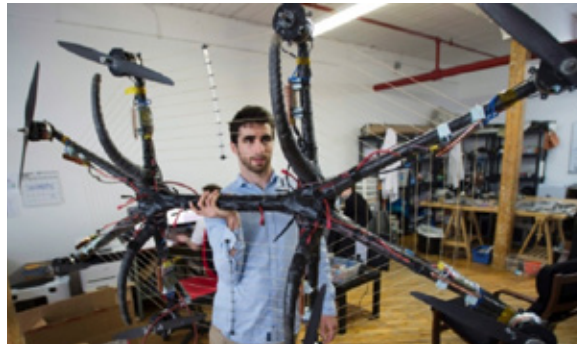
MARK 1

MARK 1 by OMNI HOVERBOARD



In 2015, Catalin Alexandru Duru broke the world record for the longest hoverboard flight. Duru flew up to five metres above a lake for a distance of 275.9 metres aboard his home-made, propeller-powered hoverboard in a trip that lasted more than 1½ minutes.

Duru has now created a company called Omni Hoverboards, and he is working on a next-generation version of his invention.



Location: Montreal, Québec, Canada
Website: <http://omnihoverboards.com/>

PERFORMANCE

Occupancy:
1 person

Useful Load:
80 kg

Altitude:
5 feet

Airspeed:
TBD

Range:
1 nautical mile



MODEL 4.0

MODEL 4.0 by AEROMOBIL



PERFORMANCE

Occupancy:
2

Useful Load:
240 kg

Range:
750 km

Cruising speed:
350 km/h

Transformation
time:
3 minutes

Power:
300 hp

The AeroMobil is a real flying car, with all that a car and an aeroplane have to offer. Because of its true flexibility, the owner can choose between driving on the road and flying in the air. The AeroMobil's structural design provides unprecedented levels of occupant safety, advanced automotive crash structure design and occupant restraint systems, as well as a ballistic recovery parachute for the entire vehicle.

The composite materials within the vehicle's structure make the AeroMobil light and strong whilst still allowing for a sizable payload. One of the main objectives of aerodynamic analysis is the creation of a vehicle which provides a pleasant and predictable flying experience. This optimisation ultimately has allowed AeroMobil to create a flying experience that will satisfy both newly qualified and experienced pilots who require excellent stall characteristics and short take-off and landing distances.

Location: Bratislava, Slovakia

Website: <https://www.aeromobil.com/>



PAL V ONE

PAL V ONE by PAL V



PERFORMANCE

Occupancy:
2 passengers

Useful Load:
246 kg

Altitude:
11 500 feet

Airspeed:
180 km/h

Autonomy:
4.3 hours

Maximum range:
500 km

The PAL-V ONE in flight is an autogyro or gyrocopter, with a foldable pusher propeller providing forward thrust and a free-spinning rotor providing lift. Directional stability is provided by twin boom-mounted tailfins. It has a tricycle undercarriage with relatively large wheels. On the ground, the propeller and rotor are stopped and power is diverted to the wheels, allowing it to travel as a three-wheeled car that leans into turns like a motorcycle.

Location: Raamsdonksveer, The Netherlands

Website: <https://www.pal-v.com>





PRANDTLPLANE

PRANDTPLANE by PARSIFAL



The main objective of PARSIFAL is to establish the scientific and engineering basis to improve civil air transport in the future by introducing an innovative aircraft, known as PrandtlPlane. The project is focused on the medium-size commercial aircraft category.

The team aims to develop design tools that would allow them to investigate the application of the PrP configuration to other aircraft categories, such as ultra-large airliners, for which the PrP can provide increases of payload (passengers and freight) while keeping the dimensions fully compatible with existing airports.



Location: European Union

Website: <http://parsifalproject.eu/>



PROJECT ZERO

PROJECT ZERO by LEONARDO



PERFORMANCE

Occupancy:
11 or unmanned

Autonomy:
**35-45 minutes
(predicted)**

Project Zero is an unconventional electric-propelled tiltrotor aircraft, referred to by its creators as a 'convertiplane'. It has been described as being «half-helicopter, half aeroplane». It is an advanced demonstrator that was built to show the capabilities of electric propulsion in aviation.

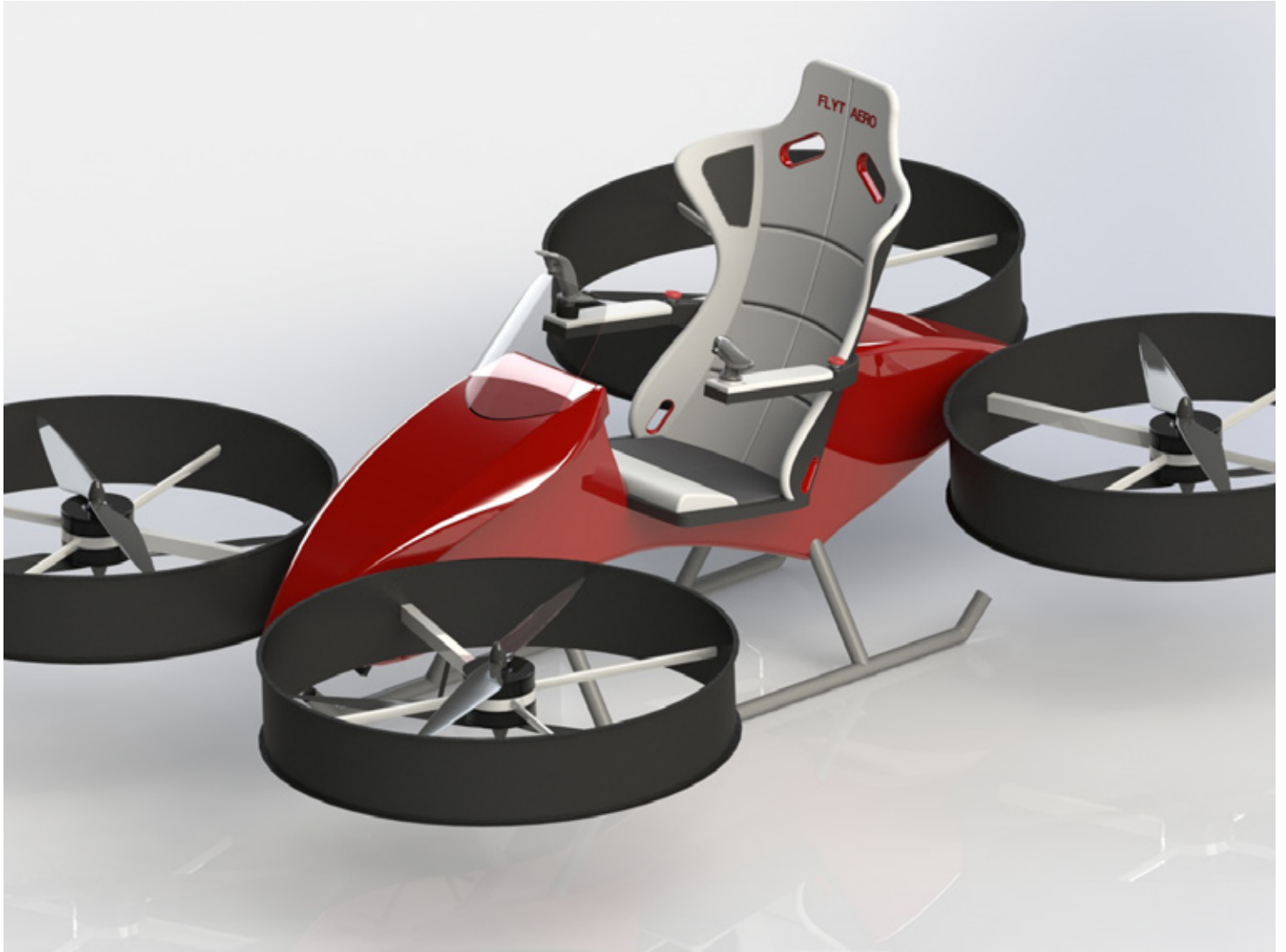
The aircraft is all electric, with power coming from rechargeable batteries. When equipped with a suitable powerplant, the aircraft could be capable of speeds equivalent to traditional tiltrotor designs and a typical cruising height that's double that of a conventional helicopter.

The technology demonstrator has not been optimised for production. It can either be flown by a single pilot seated within the cockpit or operated as an unmanned aerial vehicle.

Location: Rome, Italy

Website: <https://www.leonardocompany.com/-/project-zero>





RED HUMMINGBIRD

Red Hummingbird by FlytCycle



The Red Hummingbird is an electric Over Terrain Vehicle (OTV) that will become Flyt's first production model. By introducing a low-altitude hover bike first, they wish to prove their viability as a first-class eVTOL company. The Red Hummingbird hover bike will fill a niche for aircraft enthusiast's eager to own and fly an OTV. Flyt plans to market this vehicle in a fleet structure, including a rent-to-race environment. Similar to current go-kart racing facilities, we see a very similar model ahead. It is their intention to build and support a circuit of rental facilities to bolster any doubts this new technology might elicit. FlytCycle is currently testing their 12 rotor eVTOL prototype called the Liberator. While the Liberator is built on proven flight technology, its success will help them gain visibility so the team can raise capital and shift it's focus on the Red Hummingbird.

Location: Cupertino, California, USA

Website: <http://flytaerospace.com/>

PERFORMANCE

Occupancy:
1 person

Useful Load:
100 kg

Altitude:
<10 feet

Airspeed:
35+ Knots

Autonomy:
30 minutes



SKYDRIVE

SKYDRIVE BY CARTIVATOR



PERFORMANCE

Occupancy:
2 people

Useful Load:
400 kg

Altitude:
165 feet

Airspeed:
32 Knots

Autonomy:
1.25 hours

SkyDrive is a flying car with 8 counter-rotating propellers located at its four corners. Cartivator's goal is to light the Olympic flame with the SkyDrive at the 2020 opening ceremony of Tokyo's Olympics game and begin mass production in 2026.

Cartivator's team came up with this flying car to transition to an infrastructure-free system. By 2050, they aim to create a world where anyone can fly, anytime and anywhere. This necessitates a compact flying car with vertical take-off and landing technology that doesn't need roads and runways.

Creating a compact flying car is difficult due to noise control, all-weather handling, and safety, so the team is looking to collaborate with experts to expand their expertise.

Location: Tokyo, Japan

Website: <http://cartivator.com/>





TRIFAN 600

TRIFAN 600 by XTI AIRCRAFT



PERFORMANCE

Occupancy:
6 people
(including the pilot)

Altitude:
29,000 feet

Airspeed:
300 knots

Autonomy:
1 200
Nautical mile

Using three ducted fans, the TriFan 600 by XTI Aircraft lifts off vertically, and in seconds, the two wing fans rotate forward for a seamless transition to high-speed flight. Within just 90 seconds, the airplane reaches cruise speed, where the lift is provided by the wings—just like every other fixed-wing airplane.

The fuselage-mounted fan, no longer needed, closes up. The airplane flies directly to its destination and reverses the process, landing vertically right where it needs to be—wherever there's a clear, helipad-sized paved surface.

Website: <http://www.xtiaircraft.com/>

Location: Denver, Colorado, USA





VOLOCOPTER 2X

VOLOCOPTER 2X by VOLOCOPTER



PERFORMANCE

Occupancy:
2 people

Useful Load:
160 kg

Altitude:
6,500 feet

Airspeed:
54 knots

Autonomy:
27 minutes

Volocopter is building a fully-electric VTOL to make humanity's dream of flying come true. The Volocopter 2X is a two-seat, optionally-piloted, multirotor electric helicopter. It was introduced at the AERO Friedrichshafen airshow in 2017. One of its goals is to help modern cities to resolve their increasing mobility issues.

The Volocopter is powered by 18 quiet rotors, and the pilot can operate it with a single joystick. This aircraft could turn the vision of "flight for all" into reality. It doesn't have any combustion engine, it's quieter than traditional helicopters, and it has no complex mechanics. Just step on board, fly off and arrive in comfort.

Location: Bruchsal, Germany

Website: <https://www.volocopter.com>



INDUSTRIAL DESIGNERS



JORGE CIPRIAN
Buenos Aires, Argentina

STUDIES
Universidad de Buenos Aires
Student
Freelance Industrial Designer



ADOLFO ESQUIVEL
Colombia

STUDIES
Architecture & Design Faculty,
Bogota, 1998
Université du Québec à Montréal
Self-employed Industrial
Designer



RAY MATTISON
Minnesota, USA

STUDIES
College for Creative Studies
Cofounder and owner of
Proto-Hub Design Eye Q



**BRIAN ROSS
MILLER**

Colorado, USA
STUDIES
Metropolitan State College
of Denver
Art Center College of Design
Self-employed contractor,
BMGI



MARTIN RICO
Argentina

STUDIES
Facultad de Arquitectura
Diseño y Urbanismo (FADU),
Universidad de Buenos Aires
(UBA)
Self-employed industrial
designer



ROBIN RITTER
Stuttgart area, Germany

STUDIES
Hochschule für Gestaltung
Schwäbisch Gmünd, Germany
Postgraduate student (masters)
in transport field, in Sweden.



**MARTIN
ROJTENBERG**
Buenos Aires, Argentina

STUDIES
University of Palermo in BsAs
Owner of Roitdesign Studio



ABISHEK ROY
Mumbai, India

STUDIES
Raffles Design Institute,
Singapour
Owner of Lunatic Concepts



**MÖLLERASHISH
THULKAR**
India

STUDIES
Indian Institute of Science,
Industrial and Product Design
In-house entrepreneur
Indian Institute of Science

CONCEPTS

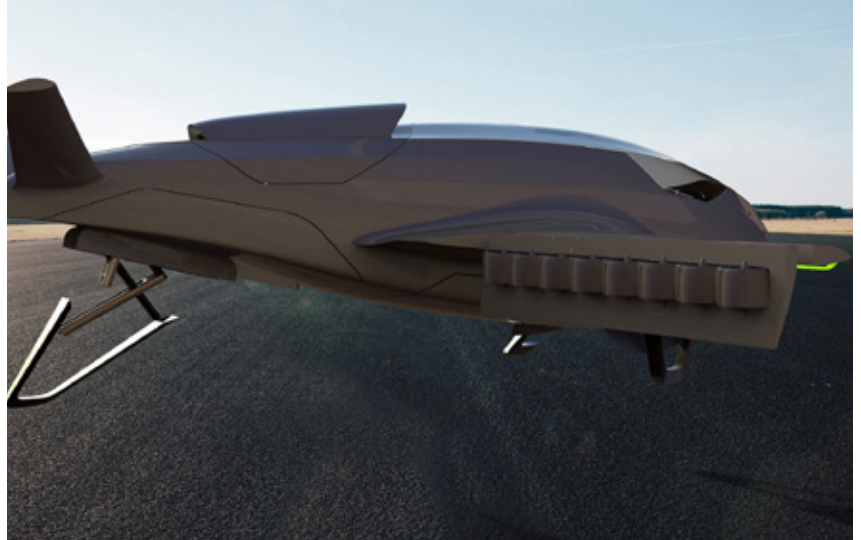
ALKONOS
AMBULAR
ANTARES
ARGENTIC
ATASHA
BITZER
CEROS
CUBOZOA
ELECTROSHIP
ESCATEK
FEUZY
HAKIMA
INVITATION
JETSOL
JETSON
KARMAN
KORBEN
KUGAARUK
MEDUSA
MERCURI
MOBULA
MODAL
NEXOVI
NEXPAD
NUNAVIK
ONYX
ORINOCO
ORION
ORIZON
PANORAMAIR
PELAGOR
RA 2020
ROCKETBOT
SKREEMR
TEMPLAR
VIKARE
VORTEX
WHISPER



Concept creator: Charles Bombardier
Industrial designer: Martin Rico
Imagined: August 2018

ALKONOS

HOW CAN WE DEVELOP EFFICIENT HYBRID POWERPACKS IN AIRCRAF?



The Alkonos is a vertical take-off and landing (VTOL) aircraft concept that uses a distributed layout to power micro-propellers embedded in its wings. It could cover ten times the range of similar aircraft with its recuperated Brayton cycle ceramic turbine and ground effect capabilities. The first energy source is a 250hp gas turbine; the second is an ion lithium battery that would handle peak power (500hp) demands during take-off.

Power from the turbine and batteries would be distributed to 24 electric propellers embedded between the wing and the flaps. These 16 Kw microprops would pull the air over the wings and permit the Alkonos to fly like an aircraft. The rear flaps would tilt upward and allow the Alkonos to take off vertically. By using a distributive and hybrid power approach, it would be possible to increase the range of the Alkonos compared to similar models. Flying in ground effect should further increase the range of the aircraft.





Concept creator: Charles Bombardier
Industrial designer: Martin Rico
Imagined: November 2018

AMBULAR

CAN WE USE AUTONOMOUS AIRCRAFT TO SAFELY TRANSPORT PATIENTS?



The Ambular is a medical transit drone designed to ferry patients by lifting them in the air and carrying them over short distances. It would be used by paramedics anywhere to rapidly send patients to hospitals or medical care facilities simply by stabilizing them and pushing an existing stretcher inside like a regular ambulance.

The Ambular would be equipped with six rotating propellers with a diameter of 1.2 meters each. The props would be powered by electric motors capable of producing 50hp each. A patient plus a stretcher can weigh over 300 pounds,

so the ambular should be able to lift them up and transport them over distances of a few miles at a speed of 50 knots. Small jet thrusters could be used to provide an additional boost to the aircraft to get it airborne.

The ergonomics will be a limitation, however the main objective is for the vehicle to keep the patient alive during transit and drop them off autonomously at the hospital.





Concept creator: Charles Bombardier
Industrial designer: Robbin Ritter
Imagined: September 2013

ANTARES

HOW WILL REGIONAL JETS EVOLVE TO SAVE FUEL AND BECOME QUIETER?



The Antares combines three aircraft designs that normally conflict with each other but could be made to work together. The Antares would be equipped with two turbofan engines mounted on top and at the front of its oversized wing. In the 1970s, NASA modified a De Havilland C-8A Buffalo to see how it would perform with the engines mounted in this position; the prototype was named QSR. Mounting the engines on top and at the front of the wing could generate five to ten times more lift than on a conventional aircraft. It would also help reduce noise by 30 decibels or more. The Antares would be able to land and take off on very short runways (3,000 feet), so it could serve smaller and less accessible airports and tap into new markets. The increase in lift and performance could also ultimately mean a lower cost per seat for the airline industry and a smaller ticket price for passengers.

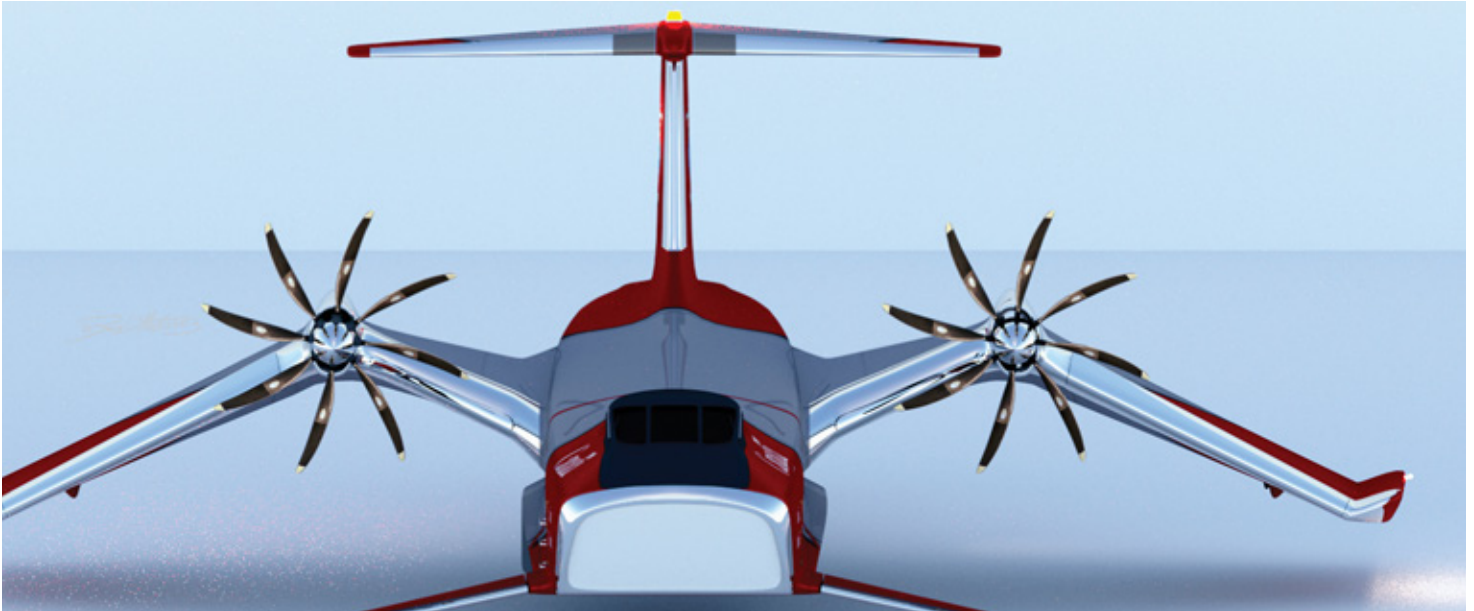




Concept creator: Charles Bombardier
Industrial designer: Ray Mattison
Imagined: March 2013

ARGENTIC

CAN GROUND-EFFECT VEHICLE BECOME A SAFE, RELIABLE AND EFFICIENT ?



The Argentic is a wing-in-surface-effect ship (WISE) designed to transport passengers, ferry cargo, or carry out missions near coastlines. It would be able to land on water or runways. Most of its fuselage would be made of composite material to reduce weight.

The 45-foot long cargo space would be big enough to fit two pick-up trucks or unit load devices ULD. The cargo bay would be twelve (12) feet wide by seven (7) feet high. The cargo entrance would be located in the front of the aircraft and would serve as ramp. The Argentic would be equipped with two (2) turboprop producing 1,600 shaft horsepower each, mounted with scimitar propellers constructed of composite material.

As a ground effect vehicle, the Argentic would fly up to 20 feet above the water's surface. It could also fly over rivers, lakes, deserts, tundra, and ice fields. It would have a cruising speed of 150mph, although it could be designed to fly much faster if needed.





Concept creator: Charles Bombardier
Industrial designer: Martin Rico
Imagined: October 2017



WILL ROBOTS, BIOMETRIC DATA AND AI IMPROVE FUTURE FLIGHTS ?

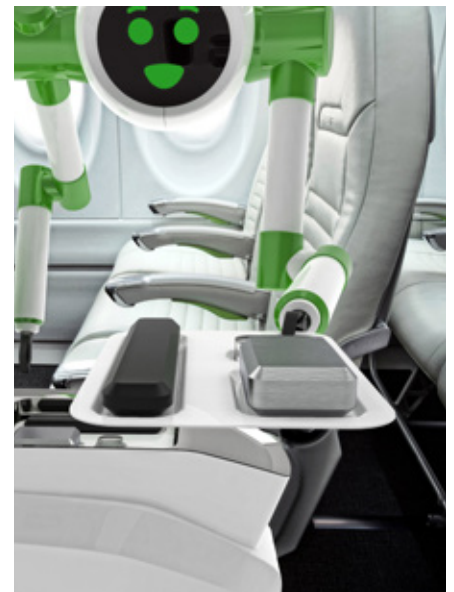


Atasha is a robotic flight assistant designed to provide in flight services to passengers on short regional routes. Hooked to the cabin's ceiling, the lightweight robot could easily reach the various luggage compartments, slide across the alley, and use state-of-the-art AI to attend to passengers' needs.

When a passenger signals, by hand or with his screen, that he requires food or drink or assistance, the Atasha would slide on its magnetic rail to respond to the signal. Since the Atasha is hanging from the ceiling, she won't risk crashing into autonomous trolley and will easily be able to bring out items from the galley.

Atasha's face would have an integrated OLED screen designed to display emotions and communicate with people using a soothing synthetic voice. Of course, Atasha would always remain polite and friendly. Various sensors could be used to detect a particular human behavior and read the mood of the passenger. Atasha would tend to a situation by analysing the voice analysis, use facial recognition, monitor heart-beat and other metrics.

Using robots to service passengers will help the aircraft personnel focusing on flying the plane, making sure all things are secure (reduce human error due to distractions). Atasha could also be used to clean up the seating and pick up trash in the alley at the end of each flight.





Concept creator: Charles Bombardier
Industrial designer: Martin Rico
Imagined: October 2017

BITZER

CAN WE DEVELOP AFFORDABLE DRONES TO WATCH OVER ANIMAL HERDS?



The Bitzer drone was created to guard sheep, goats and other grazing animals in fields, in the mountains or anywhere they might be of assistance. This lightweight flying robot could easily reach the far corners of a property, detect lost or wandering animals and bring them back to the herd using gentle nudges, lights or sound. It would also go out on night and dawn patrols to monitor predators and marauders.

The Bitzer is shaped like a curved cylinder with a 52 cm radius and 24 cm height. Its exoshell is made out of a lightweight composite materials that could double as a battery. The dual electric contra rotor in its center would provide lift. The air flows around the leading edge could be altered with flaps to steer the machine in the desired direction.

Using robots to watch over sheep might seem like a farfetched idea, but there are dozens of other features that could tip the balance in favour of their deployment, including surveillance during dusk and dawn, safety of the caretaker, weather forecasting, etc. As always, the challenge will be to create a simple and efficient prototype and measure if it generates enough value for wider production.





Concept creator: Charles Bombardier
Industrial designer: Martin Rico
Imagined: July 2018

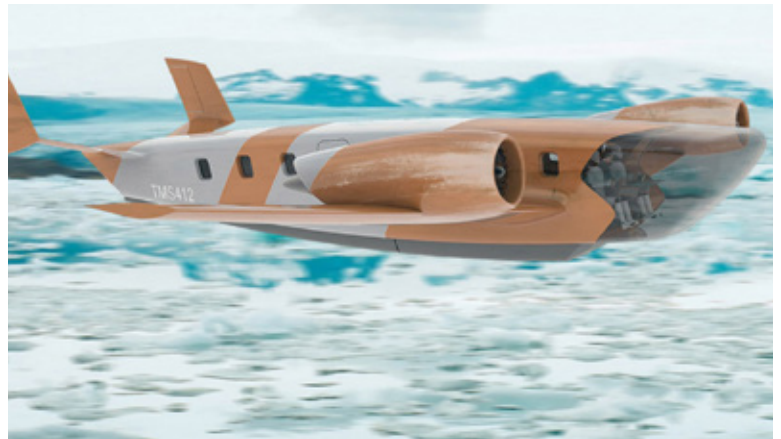
CEROS

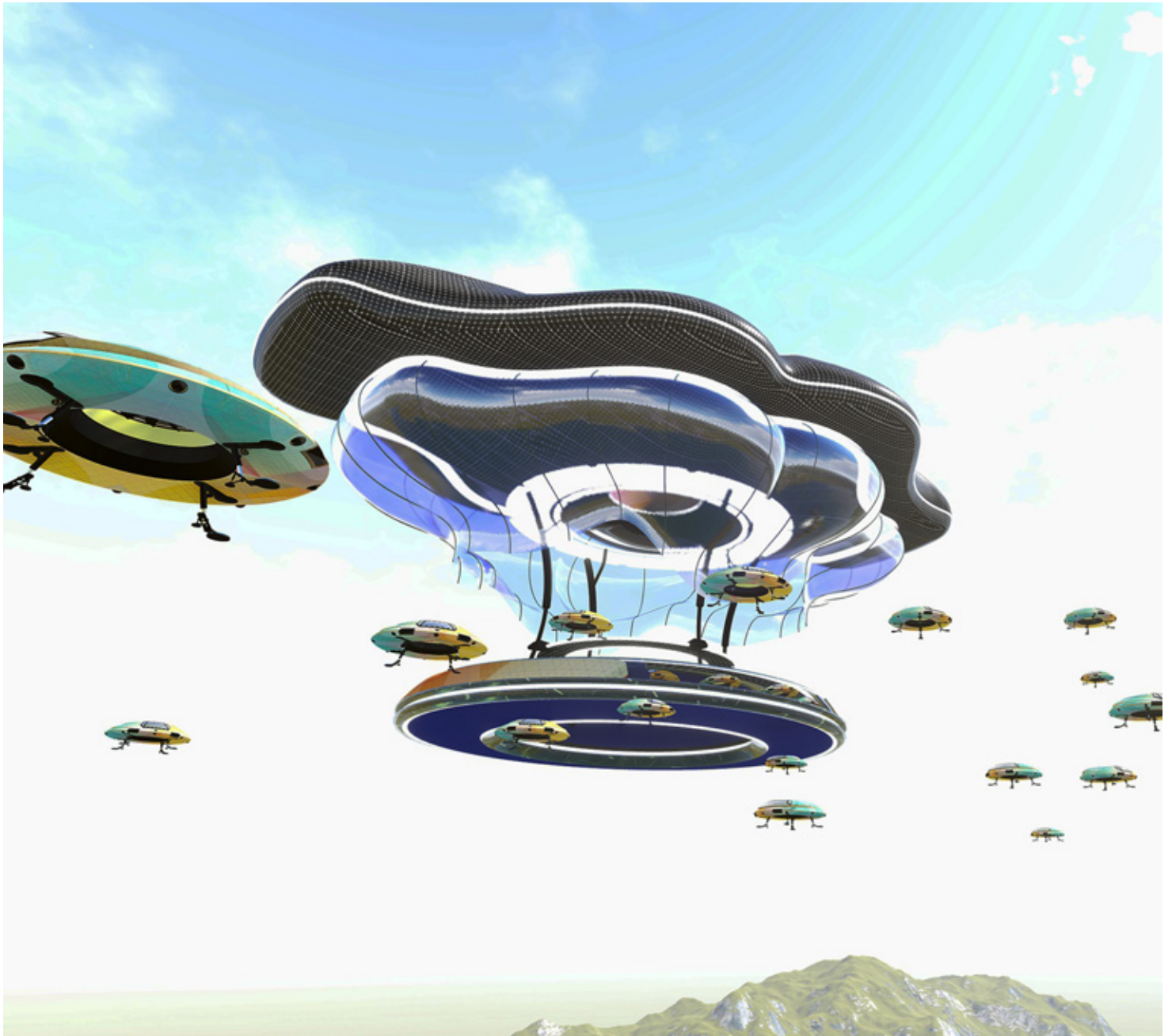
21ST CENTURY TWIN OTTER



The Ceros is a concept for a new generation of aircraft envisioned to ferry material, equipment and people between remote outposts of the northern Arctic countries. It would be designed to do short take-offs and landings on rough and icy runways to access most villages and outposts based in Canada, Russia, Norway, Greenland, and Antarctica. The Ceros concept aims to create a 21st century version of legendary aircraft like the de Havilland Twin Otter by introducing new engines, new system layouts, and new materials and technologies.

The Ceros has two wings fixed to the mid part of its fuselage. This will allow the aircraft to benefit from the ground effect while it's flying over calm bodies of water. Placing the wing closer to the ground will help create an adequate cushion of air to glide on; placing it a little higher than the belly will also reduce the risk of hitting objects on the ground. The turbofan engines mounted on top and at the front of its wings would generate more lift than they would on a conventional aircraft and could also help reduce noise/decibels. Its extended STOL capabilities would make it a perfect candidate to service and develop outposts and towns in the Canadian North and Russia.

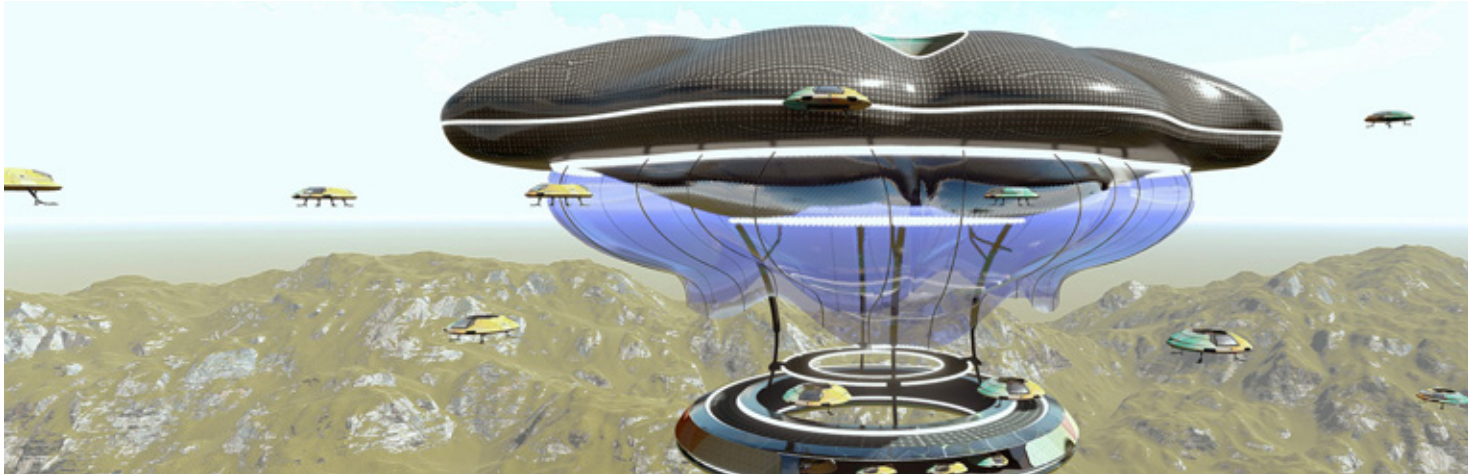




Concept creator: Charles Bombardier
Industrial designer: Adolfo Esquivel
Imagined: A new direction on the 2016 'Medusa' concept

CUBOZOA

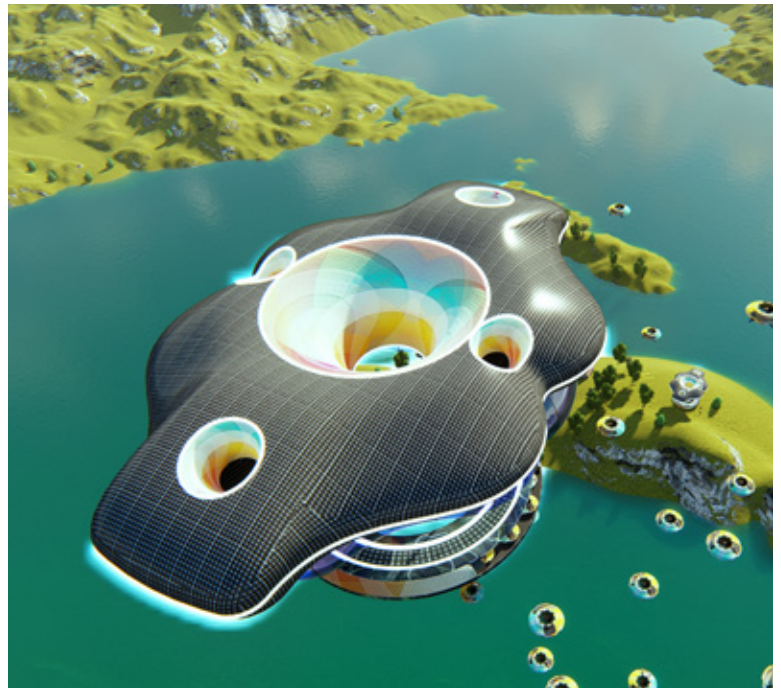
A FLOATING COMMAND CENTER FOR DRONES WHEN DISASTER STRIKES



The Cubozoa is a lighter-than-air (LTA) vehicle that combines light material and new types of propulsion, control and energy systems. It would be deployed to assist during disaster relief and it would use the solar energy to recharge drones batteries.

The Cubozoa would be designed as a landing and re supply station for various kinds of drones assisting ground teams during humanitarian crisis. Some drones would be tasked in delivering food, clothing or medical supplies. Others would be used to ferry wounded persons or medical personnel. Smaller autonomous drones would handle safety and surveillance.

The Cubozoa's main deck would be made of graphene fibre, a new type of material 100 times stronger than the strongest steel. The airship would feature an ultra-thin membrane able to contract under electrical impulses to control and move the airship by learning how to use wind currents to move about. Is it feasible to develop a biomimetic craft such as this one? Would it make sense to use capture the sun's energy with every available surface?





Concept creators: Yuri Fattah, Charles Bombardier
Industrial designer: Martin Rico
Imagined: October 2018

ELECTROSHIP

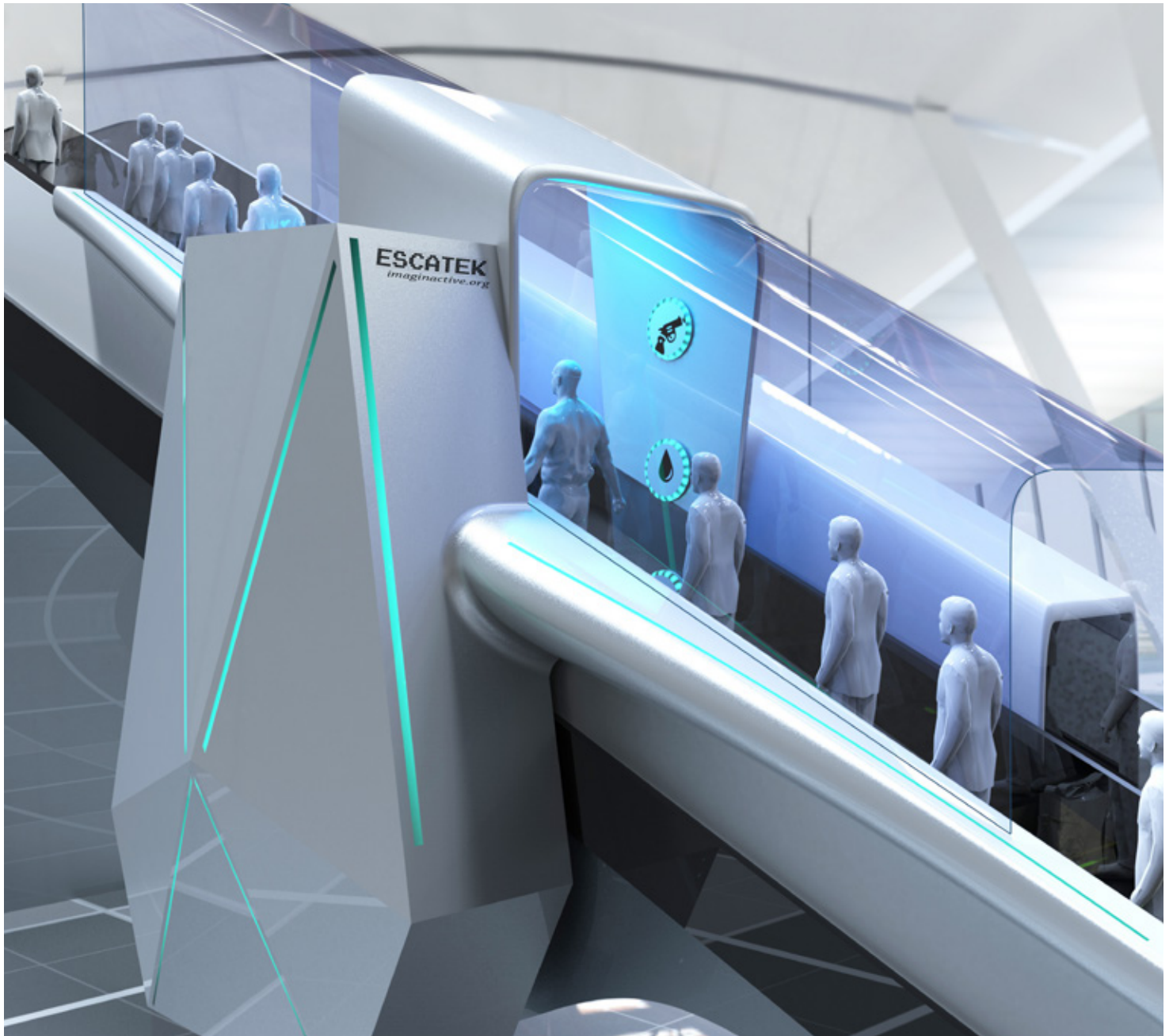
HIGH VOLTAGE SHIPPING LANES



There are many power cables in North America and they go all around the country. What if we could use them with slight modification to the infrastructure to feed flying cargo robot aircraft? What if electrified rail lines could also power this aircraft?

The Electroship looks like a modified version of the Antares regional aircraft concept. It uses a lower flying and it's equipped with electric motors. The Electroship would only fly cargo and it would have enough batteries to fly without connection [to the power lines] for 20 minutes. Because it uses power lines or rail lines, it would already be flying in protected space. Because it flies, it means there can be several one of them overlapping each other. Even in the cities, smaller versions could use the tramway infrastructure to fly packages with drones.

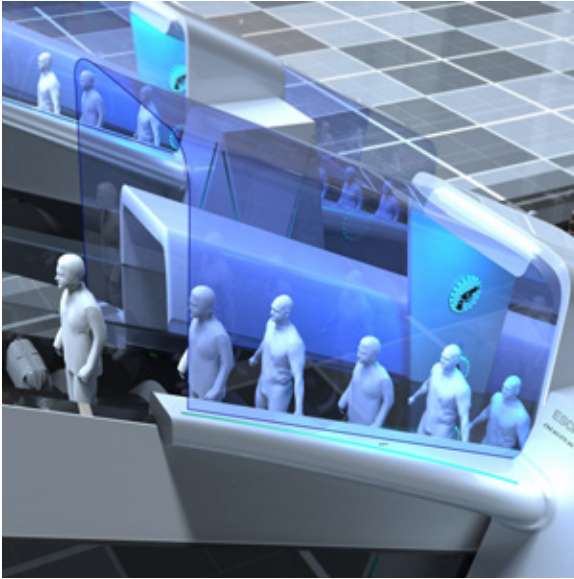




Concept creator: Charles Bombardier
Industrial designer: Ashish Thulkar
Imagined: March 2016

ESCATEK

SHORTER TRANSIT TIME



How can we speed up check-in, security, immigration and boarding at the airport? Would it be possible to complete these steps in less than a minute riding an escalator to the departure gate? That's the idea behind the Escatek concept: to simplify and accelerate the steps leading to a commercial flight.

When travellers arrive at the airport, rather than waiting in a separate security line, they would just walk towards the nearest Escatek on their way to the boarding gate, placing their passport on the left side of the machine and their luggage on the right. The linear robotic passport conveyor would then check if the passport is valid and if the person is registered for an upcoming flight. It would check them in, perform background checks on the passport, and set in motion a process to alert the authorities if needed (security, immigration, airline personnel, etc.).

The luggage conveyor would check if the bags contained any dangerous or prohibited items using multiple types of scanners. Each suitcase would be photographed, weighed, and associated with its owner automatically. Each traveller using the system would pass through a portal where they would be identified. Their height and weight would be recorded to optimize the weight and balance of the aircraft.





Concept creator: Charles Bombardier
Industrial designer: Martin Rico, Adolfo Esquivel
Imagined: Originally in July 2015

FEUXZY

USING SOUND WAVES AN ELECTRONIC NOSES TO COMBAT WILDFIRES

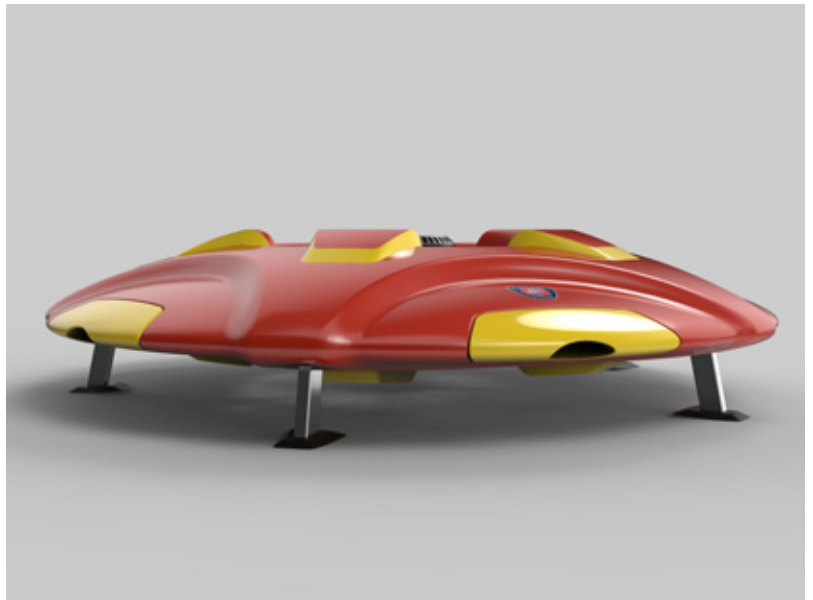


The Firesound is a medium-sized drone shaped like a flying saucer designed to patrol and inspect provincial or state parks for signs of fires. It would be able to douse out small flames with low-frequency sound waves using its built-in acoustic extinguisher. It would also record and report any incidents to park personnel with its cameras and electronic nose sensors.

The Firesound is shaped like a disc and measures 1 meter in diameter and 35 cm in height. Its shell is made out of composite and its energy source comes from a non-polluting hydrogen fuel cell located in its center for its electric turbofans located on each side of the saucer.

Two air intakes would be positioned at the front of the drone, and two at the back. The craft would feature four (4) fully directional jet nozzles located under its belly. These nozzles would provide vectored thrust to take off and maneuver. In flight mode, most of the thrust would be directed towards the back.

I envisioned fire extinguishers that would use sound waves on this drone, but they would be restricted to small fires. It would be more important to have electronic nose detectors, thermal cameras, and other sensors that would enable the Firesound to locate fires initiated by lightning strikes or campers before they spread out of control.





Concept creators: Charles Bombardier, Ansel Misfeldt
Industrial designer: Martin Rico
Imagined: August 2018

HAKIMA

AERIAL MOTORSPORTS IS ON THE RISE...



The Hakima is a light-sport, multi-rotor aircraft concept that would allow a new generation of pilots to safely experience flying at low speed and very low altitudes for 20 minutes at a time. The Hakima is powered by 8 fans composed of two contra-rotating blades with a total diameter of 70 centimeters each. The Hakima's 16 kw battery pack is composed of multiple cells. If we assume the pilot weighs 180lbs and the frame, controls, and batteries weigh 300lbs, then the battery's energy will last approximately 16 minutes. Of course a lighter pilot would be able to fly longer.

The Hakima would be used purely as a recreational aircraft. With its ability to fly anywhere at low speed and low altitude, this new kind of flying kart will make it possible to explore the backcountry and experience the joy of flight.





Concept creators: Charles Bombardier, Ansel Misfeldt
Industrial designer: Abhishek Roy
Imagined: November 2016

Invitation

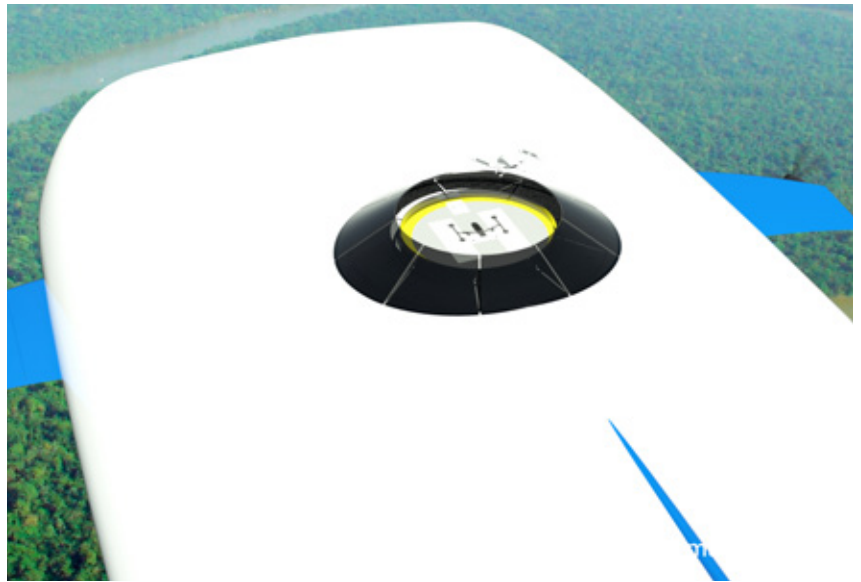
WILL CRUISE SHIP APPEAR IN OUR SKY THIS CENTURY?



The Invitation is a cruising airship designed to offer a dozen families a very exclusive one-week flight excursion experience. It would take off on calm days to sail over beautiful landscapes, including large cities, national parks, and lakes. At night, its observation deck would allow for a breathtaking dinner experience under the stars.

The Invitation's panoramic windows, located on each side of the aircraft, would offer a wide view for each stateroom. The airship would be powered by turbine engines mounted on its side wing. These lateral fins would generate lift in horizontal flight.

At the back of the Invitation, a large cargo bay door would serve as a special landing pad to be used by supply drones and aerial vehicles. After a day's worth of activities, passengers could relax at the lounge bar or eat at its intimate restaurant while watching shooting stars and satellites passing overhead.





Concept creator: Charles Bombardier
Industrial designer: Ashish Thulkar
Imagined: August 2018

JETSOL

EASY RIDER 2030



The Jetsol is a jet-powered flying motorbike that would be capable of flying at over 50 kph at very low altitude with an autonomy of 20 minutes.

The Jetsol would be the size of a touring motorcycle and would be capable of carrying a 200-pound pilot safely with enough fuel to land at all times. The vehicle would be equipped with 5 variable jet thrusters. There would be two jets in the front to support the fuel tanks, one in the middle section under the pilot, aligned with the aircraft's center of gravity, and two in the back that could also be used in part to increase forward momentum.

Each jet would be able to tilt using precise electric solenoids to optimize control during all parts of the flight. To feed the jet engines, the Jetsol would be equipped with two pressurized fuel tanks located inside its frame to fuel the system

for a duration of 20 minutes. Two lateral jet nozzles would reduce roll, making small corrections when necessary. The computerized flight system would stabilize the vehicle automatically every micro second, although the pilot would need to be trained to properly feel the Jetsol and learn how to react to its movements.

The Jetsol could be used as a recreational vehicle to fly over fields, lakes, and forests. The Jetsol could also be used for search and rescue operations since it could be brought rapidly in a pick-up truck and deployed in less than 3 minutes.



Concept creator: Charles Bombardier
Industrial designer: Adolfo Esquivel
Imagined: September 2016

JETSON

JET-POWERED FLYING SAUCERS



The Jetson is a jet-powered flying saucer that could be used to commute at 100 mph over the countryside. It could also be developed for the entertainment industry, civil aviation, or military missions.

The first Jetson would carry only one passenger and would be powered by five jet thrusters located under its fuselage. Two fuel tanks would be fixed inside the frame on opposing sides, and two additional spaces would store cargo. The overall shape of the Jetson would be optimized to save fuel and create more lift when it's flying horizontally. An onboard flying system would help control and stabilize the Jetson automatically.



This aircraft would be designed to stay airborne if one of its jet thrusters failed, so the number of thrusters could be increased and other backup systems could be incorporated in the design. For instance, the flying saucer could feature a parachute in case one of its jets malfunctioned. Interior or exterior airbags could be placed on the aircraft too.



Concept creator: Charles Bombardier
Industrial designer: Martin Rotenberg
Imagined: April 2018

KÁRMÁN

WILL YOU CROSS THIS LINE?



The Kármán Surfer is an 'orbital class' business jet aircraft concept capable of leaving the atmosphere to visit space stations and hotels in low-earth orbit.

The Kármán's fuselage comprises a front section containing an injectable passenger cabin and a rear section that houses four rocket engines. The power output and wing surface of the Kármán would allow it to take off from existing long airport runways and eliminates the need for new, complicated, and expensive infrastructure.

On take-off, the four modular rocket engines will generate sufficient thrust to take off, and climb high up into the atmosphere. If the destination is space, the aircraft would reach escape velocity while keeping its passengers comfortable despite the strong acceleration.

The aircraft would also be equipped with manoeuvring thrusters, life support systems, and a heat shield to re-enter the atmosphere. These specs could be optional if the buyer decided to limit its flight to within the atmosphere, which would also allow more payload and a reduced cost.

To fly across the globe, the Kármán would perform parabolic flights, skirting the Kármán line located at an altitude of 100km (hence the name) and then descend toward its destination. The speed on these flights could be much slower than the 40,000km/h needed to escape into space. In case of emergency (at lower speeds) the Kármán could eject its passenger cabin, which would be equipped with a parachute.

The Kármán would be used by business and world leaders to reach space stations in low Earth orbit directly from existing airports. The atmospheric version could be designed to transport people and equipment quickly from one side of the globe to the other.



Concept creators: Charles Bombardier
Industrial designer: Adolfo Esquivel
Imagined: November 2017

KORBEN

FLYING TAXI MADE EASY



The Korben is a flying taxi concept equipped with four electric thrusters and an intelligent control mechanism that makes flying as easy as driving a car. It could carry four passengers in medium-sized cities around the world similar to Montreal.

Aircraft have traditionally, with few exceptions, relied upon a single centre of gravity for guidance. This demands great skill and extensive training for any new pilot. With a harmonized, rapidly-actuating gimbaled variable thrust set to the four corners of an aircraft, a good level of control could be achieved, allowing new types of flight experience to be developed for small aerial vehicles like the Korben.

By isolating the pitch and roll moments required to manoeuvre at the gimbals, the aircraft and its occupants would no longer be subjected to these effects. This reduces the complexity of the flight controls to the point that anyone would be able to drive the Korben like a car. It also opens a completely new market for such aerial vehicles. Of course urban air traffic control systems will need to be designed and developed since the volume of vehicles like the Korben will probably rise exponentially in the years to come.



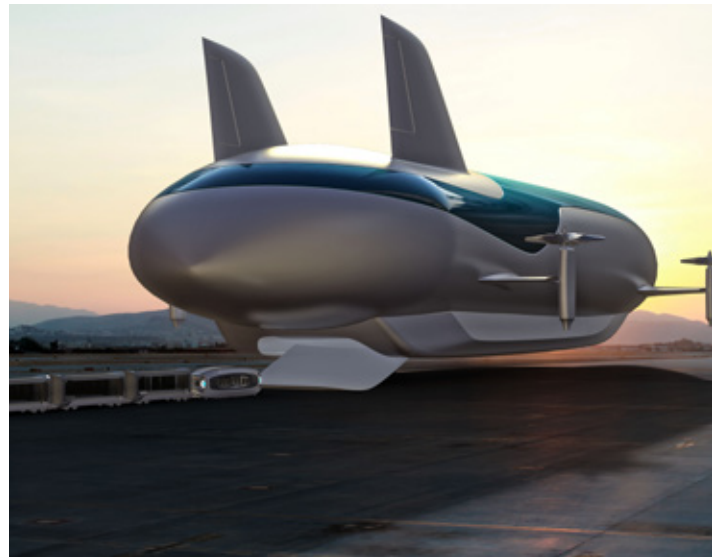
Concept creator: Charles Bombardier
Industrial designer: Martin Rico
Imagined: Follow-up to the 2014 'Alert' concept

KUGAARUK

CREATING AIRSHIPS TO PROVIDE HOUSING AND RESOURCES TO VILLAGES IN THE ARCTIC



The Kugaaruk is an airship concept designed to patrol and transport equipment and supplies over Canada's vast Arctic region. It could carry out humanitarian missions to remote villages by transporting food and prefabricated houses, which are in dire shortage. The airship would be capable of carrying at least 200 tons of cargo and covering a range of 5,000 nautical miles. It would be designed to fly in IFR conditions and work on autopilot for long periods. To prevent ice build-up, technologies would need to be tested like de-icing boots, fluid nozzles, and infrared heating. Four turbo prop engines, delivering up to 2,000 hp and equipped with scimitar propellers, would provide the necessary power to propel the Kugaaruk in flight and soften its landing by pivoting on their axis like VTOL aircraft.

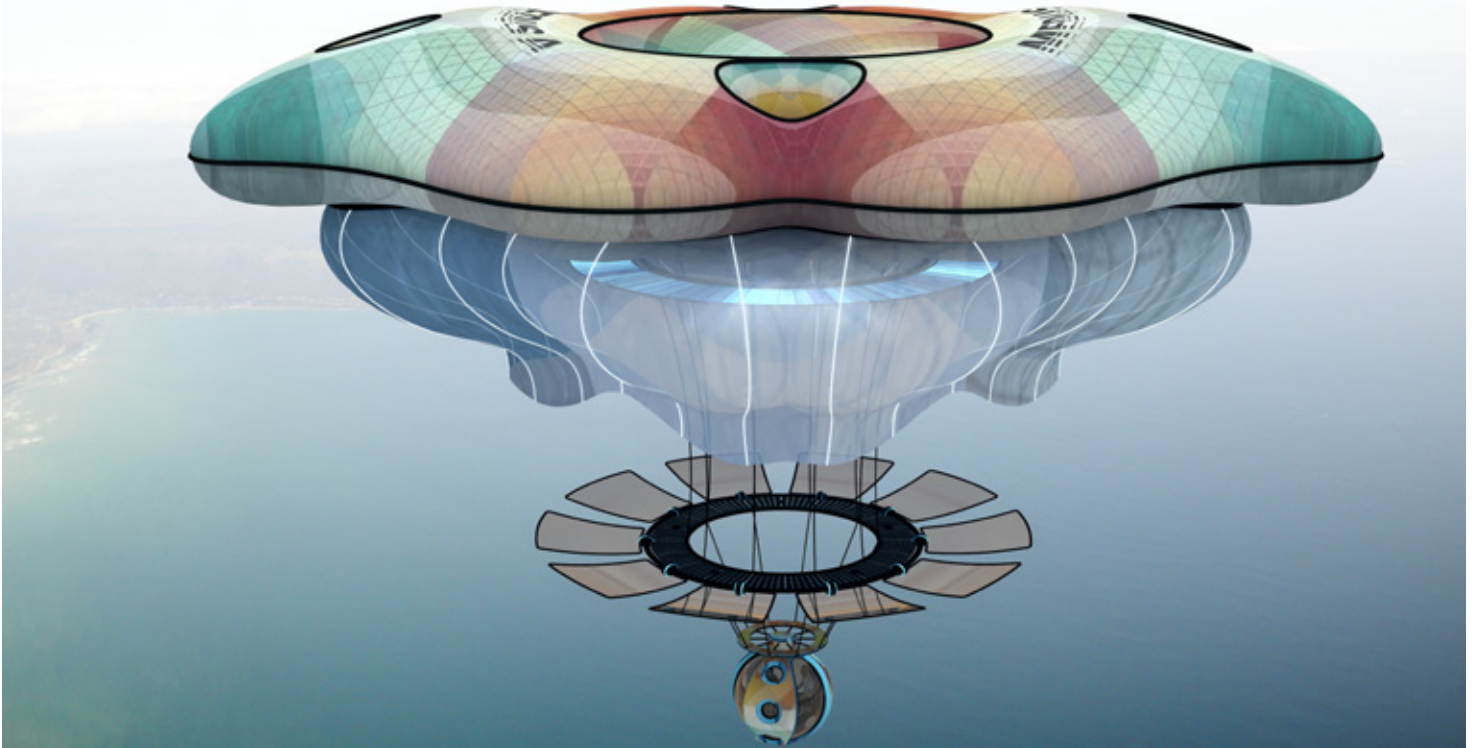




Concept creators: Charles Bombardier
Industrial designer: Adolfo Esquivel
Imagined: July 2016

MEDUSA

THE AIRBORNE JELLYFISH



The Medusa is a lighter-than-air (LTA) aircraft that imitates the movement of a giant jellyfish by using a combination of light material and a new type of propulsion system inspired by the most efficient animals moving in the sea.

The Medusa would be designed to carry two passengers at a time in an ultra-light spherical cabin made of graphene fibre, a new type of material 100 times stronger than the strongest steel. The cabin would be suspended under an intermediate drive and propulsion system made of flaps that could also be used to steer the vehicle in one direction or another by varying the amount of force exerted on them.

An ultra-thin membrane located at the top of the Medusa would be able to contract itself under electrical impulses to create movement similar to a jellyfish. This membrane would be filled with air and would serve the purpose of making the aircraft buoyant and moving it up or down through layers of air. This would be accomplished by playing on ultra-thin check valves embedded in the membrane

The Medusa could be used as a research platform or even a floating based station to assist with disaster response.



Concept creators: Charles Bombardier
Industrial designer: Martin Rico
Imagined: February 2016

MERCURI

THE HYBRID VTOL AIRCRAFT



The Mercuri is a radical aircraft concept that uses a distributed layout to power 40 micro propellers embedded in its wings. It is capable of vertical take-off (VTOL) and could cover ten times the range of similar aircraft with its recuperated Brayton cycle ceramic turbine and ground effect capabilities.

The Mercuri's main power source is a 300hp gas turbine that uses a recuperated Brayton cycle engine. The second source of energy is an ion lithium battery that would handle peak power demands during take-off (500hp+). The turbine's blades would be made of ceramic (alumina) held within a composite rim to withstand internal temperatures of 1850° Kelvin and thus achieve high efficiency.

Power from the turbine and batteries is distributed to dozens of electric propellers embedded between the wing and the flaps. These 10 Kw micro props pull the air over the wings and permit the Mercuri to fly like an aircraft. The rear flaps can tilt upward to allow the Mercuri vertical take-off. The use of ground effect can further increase its payload or range.

The cockpit is roomy enough for one large person and his luggage. Most of the flight would be automated to reduce the risk of incidents.





Concept creator: Charles Bombardier
Industrial designer: Martin Rico
Imagined: September 2018

MOBULA

A SILENT & WATCHFUL EYE



The Mobula is flying airship inspired by the shape of manta rays and the Festo Air Ray prototype. It has large, flexible, beating wings filled with helium. It would carry sensors able to detect and follow human populations living in remote areas. This will allow local governments to keep an eye on populations at environmental, health or other risks without infringing on their privacy or interfering with them. The Mobula would also collect data on air quality, weather data, solid conditions, water levels, etc.

The Mobula would travel as an autonomous aircraft. It would be powered by a hydrogen fuel cell which would provide

the necessary power to contract the wings and propel the buoyant aircraft forward. Small electric propellers could help it reach faster speeds. The shape of the Modula would be optimized for speed.

The Mobula would bend its wings to turn, gain or lose altitude, and even propel itself forward at low speed without using any pistons, hydraulics, or solenoids. It would use flexible materials, some of which could retain memory of shapes and bend with the help of an electric current. It would use a machine learning algorithm to optimize its flight efficiency.



Concept creator: Charles Bombardier
Industrial designer: Abhishek Roy
Imagined: July 2016

MODAL

DRONE & CONTAINERS



The Modal is a logistics drone designed to move empty shipping containers by lifting them in the air and carrying them over short distances. It could be used to move containers in ports or position container homes in places that are hard for a truck or crane to reach.

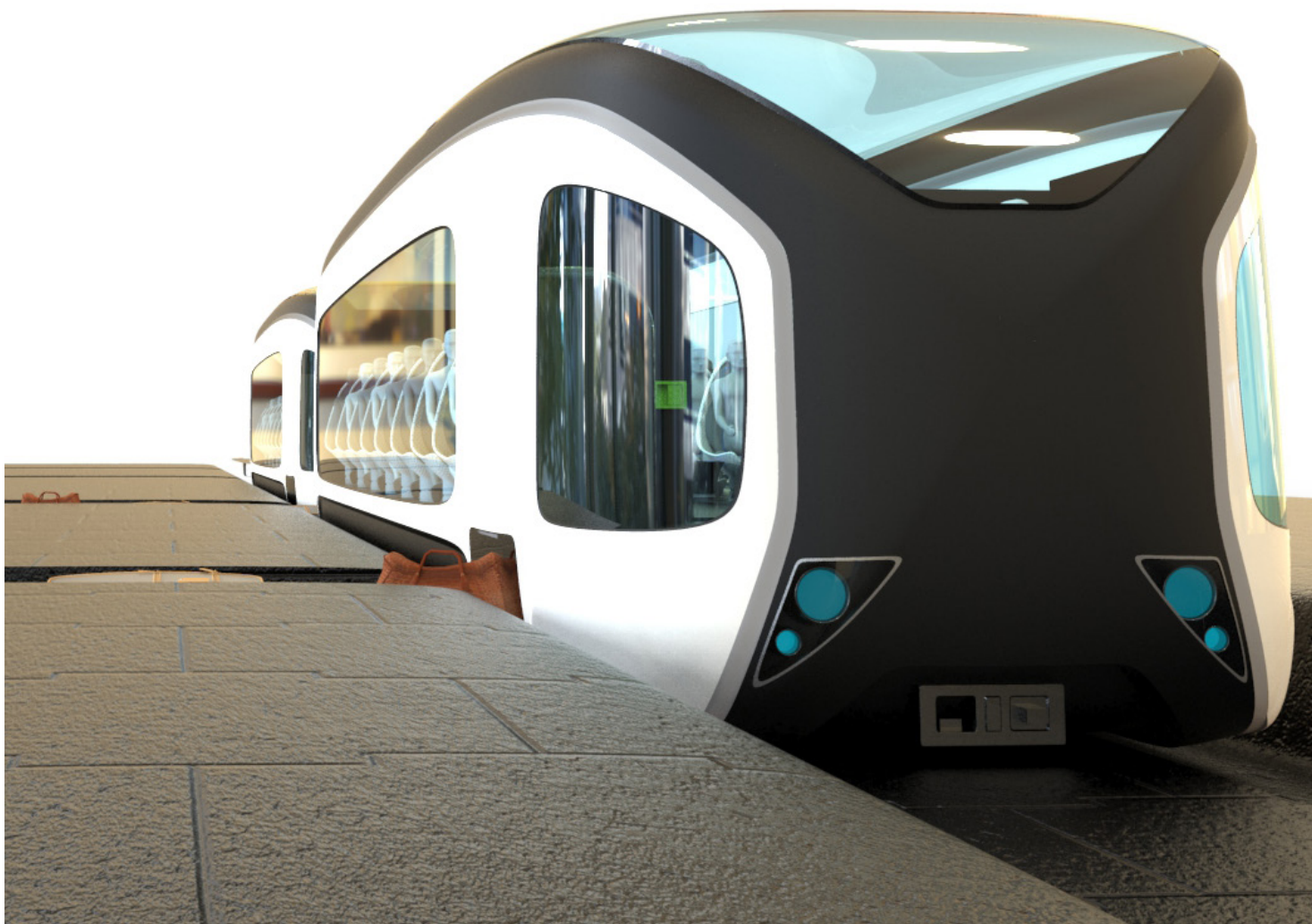
The Modal would have multiple propellers and a shape similar to a quadcopter or a hexacopter. A clamping system could be used to attach the vehicle to 20' or 40'-long intermodal containers. A 2,000 hp Pratt & Whitney PW100TS turboshaft engine would deliver power to the four propellers. The frame of this vehicle would need to be light and robust. The drone could be controlled remotely or by an on-board operator.

An intermodal container weighs between 5,000 and 8,000 pounds depending on its size. The Modal would be able to use the ground effect to lift them up and transport them over distances of a few miles. The shape of the aircraft could be

altered to optimize lift, and additional jet thrusters could be used to provide a boost to the aircraft. Lighter boxes made of composite could also be developed to reduce fuel consumption or increase the vehicle's autonomy.

During crises, Modal could be used to deliver emergency provisions from ships to the disaster zone.

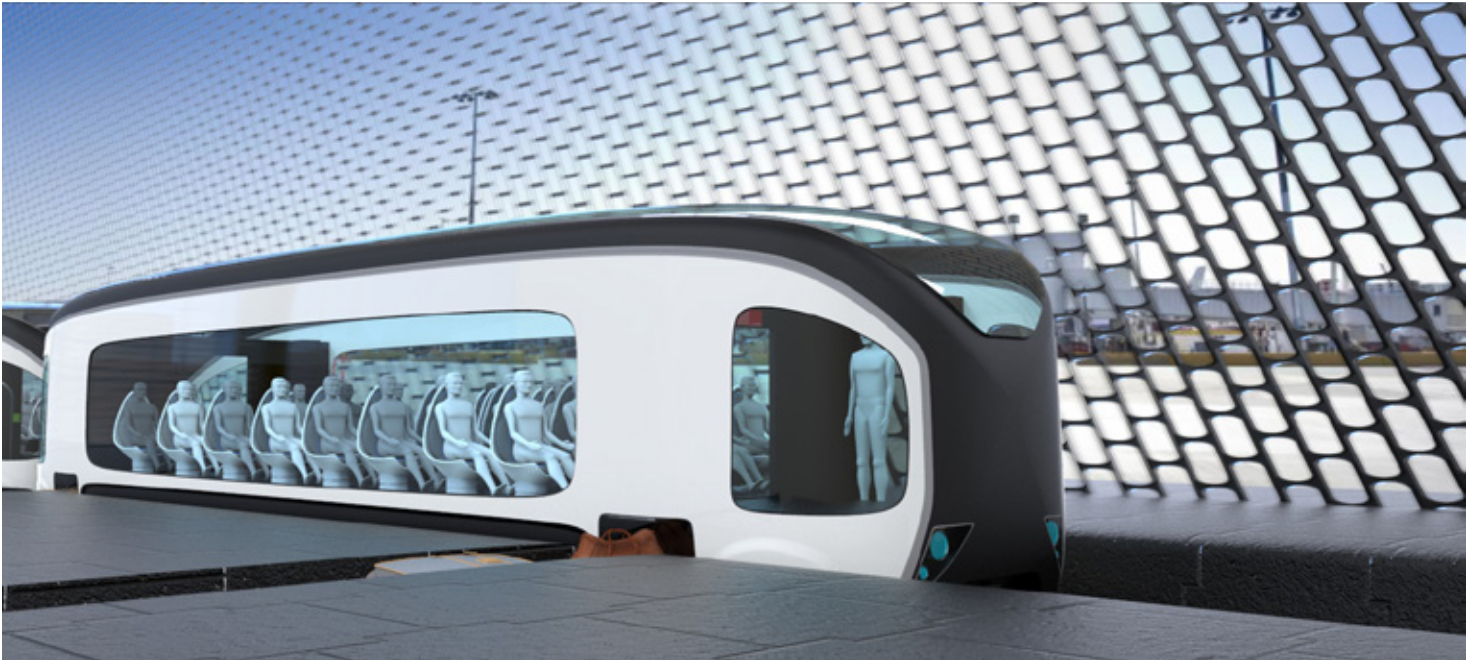




Concept creator: Charles Bombardier
Industrial designer: Ashish Thulkar
Imagined: November 2016

NEXOVIA

AUTOMATED PASSENGER CHECK-IN



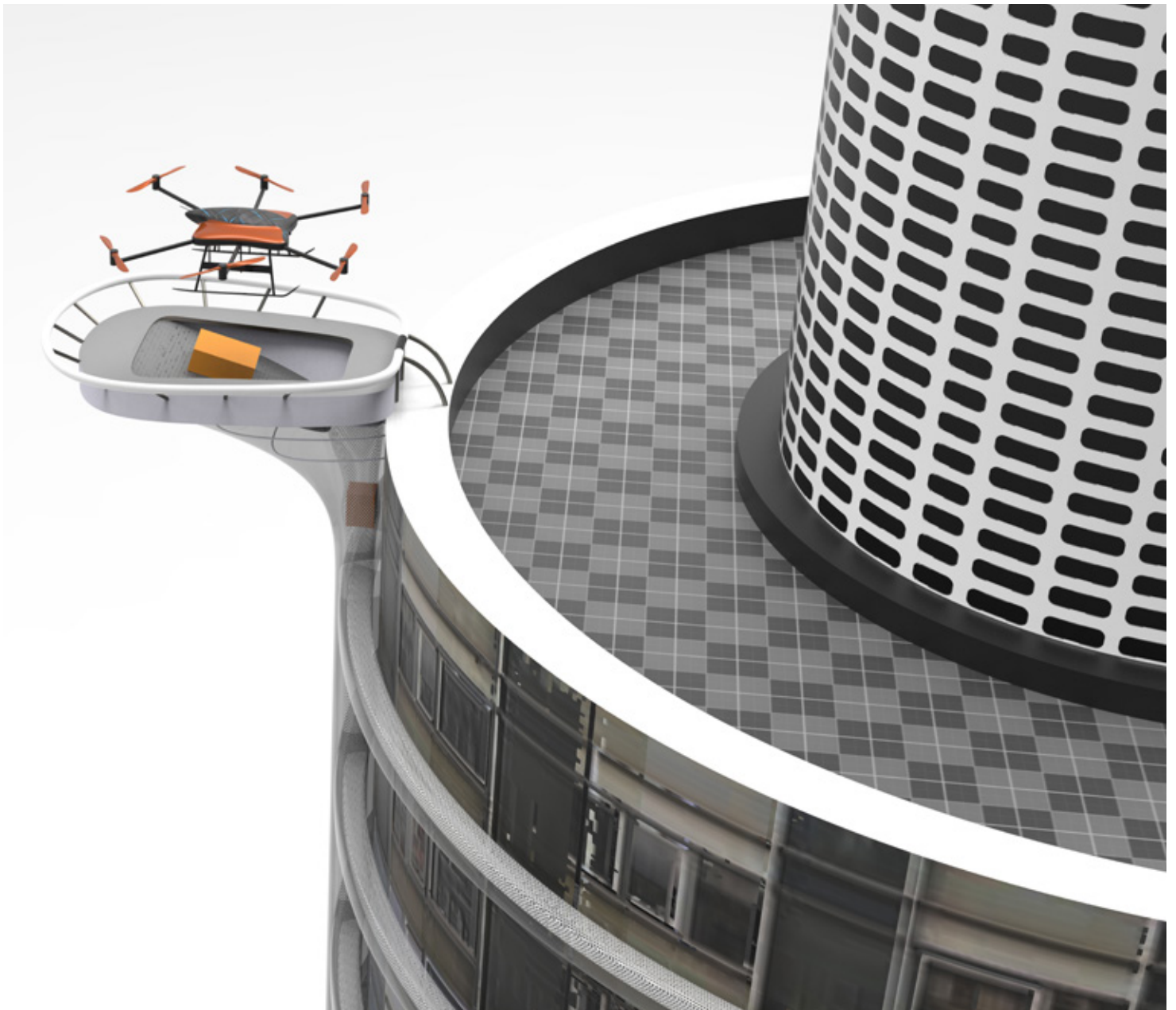
The Nexovia is an automated people mover concept designed to check in passengers while simultaneously clearing customs and security en route to the airport. Each car could seat up to 32 passengers with their luggage and bring them directly to their gate. It could use existing rail and other infrastructure with some minor modifications.

The vehicle itself could be derived from an existing Innovia platform built by Bombardier. A special section would be created at each end to board and exit the people mover. The luggage handling system would be designed to screen baggage during the trip to the airport. Each piece of luggage would be scanned, tagged, and delivered to the airport's conveyor system upon arrival.

During the short trip, information related to your flight, visa, and screening process would be displayed on a digital screen located on the seat in front of you. Each passenger would need to scan their passport using a built-in scanner located in each seat and take their photograph.

The Nexovia would be equipped with multiple detectors, chemical analysis systems, and other sensors. Upon arrival to the airport, you would be cleared to your gate, thus saving time. This system could be developed in partnership with cities, countries, and airport operators.





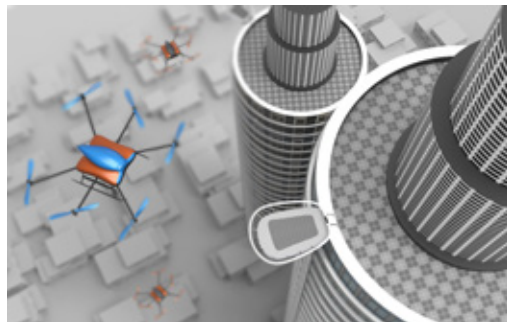
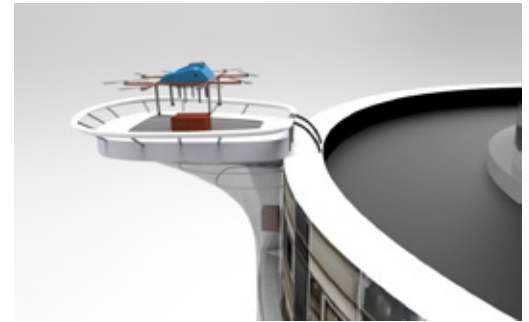
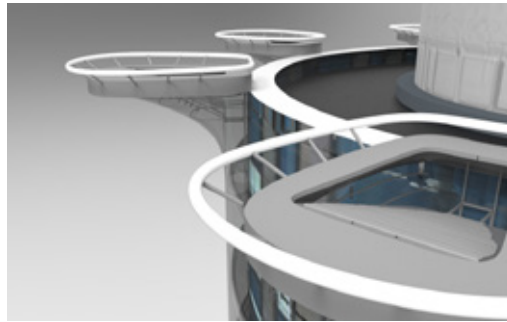
Concept creator: Charles Bombardier
Industrial designer: Ashish Thulkar
Imagined: October 2018

NEXPAD

DELIVERING PACKAGES TO RESIDENTIAL TOWERS



In the future it will be possible for logistic drones to deliver packages to new and existing residential condo towers. How will these towers be constructed? Will packages be delivered on the roof or in front of the lobby? The Nexpad is add-on system to existing condo towers. it could be designed to receive packages and deliver them in the lobby. This would reduce the impact of drones on lower areas of our cities.





Concept creator: Charles Bombardier
Industrial designer: Robbin Ritter
Imagined: November 2013

NUNAVIK

ARCTIC SUPPLIES



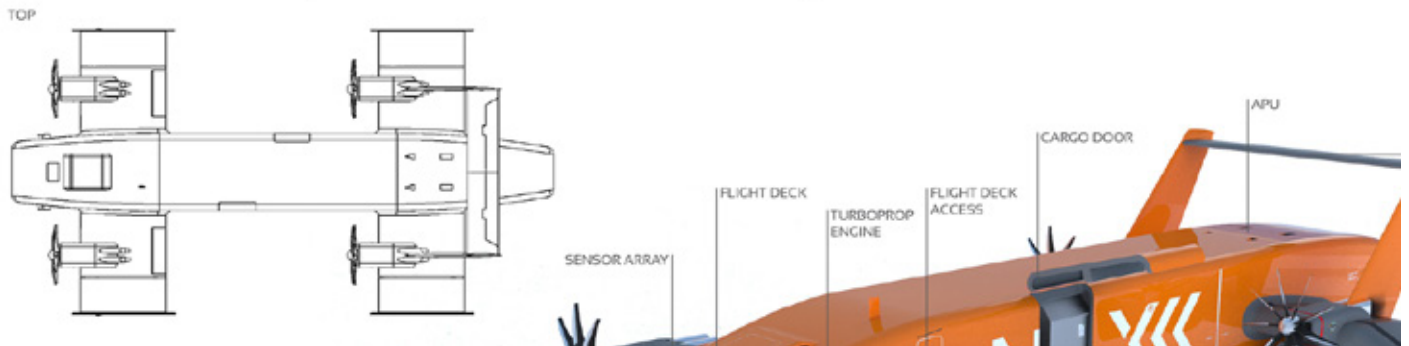
The Nunavik Arctic Express (NAX) is a ground effect cargo plane concept inspired by the Russian Ekranoplan that first flew over the Caspian Sea in 1966. The Nunavik Arctic Express would be rugged and built with the Arctic region in mind. The use of composite materials will minimize its weight. The boxy shape of the aircraft is similar to the Short 360. It has large bay doors on each side that can be accessible to forklifts.

This ground effect vehicle would fly approximately 20 feet above the surface (tundra, ground, ice, water), with a top speed would be around 200 mph. It would be possible to increase the size of the engine based on functionality and performance specifications.

The Nunavik would be designed to fly with an autopilot that would use radar and laser sensors. Flight routes and corridors would be determined by

authorities. Flying would therefore be a mix of instruments (IFR) and visual (VFR) for the robotic pilot.

The aircraft could carry twice the cargo of similar-sized aircraft or use 50% less fuel. Changing heading rapidly would be difficult due to the flying altitude, and taxiing needs to be engineered in subsequent concepts.





Concept: Charles Bombardier, Gary Daprato
Design: Jorge Ciprian
Date: April 2017

ONYX

THE RISE OF FLYING CARS



The Onyx is an electric aircraft that can directly land in, and take-off from, parking spaces built for cars, thus removing the need to use helipads or build new infrastructure for the upcoming 'breed' of personal urban aircraft.

The Onyx would be powered by interchangeable battery packs providing electricity to six propulsion units each containing two contra-rotating props. Each of those props would be composed of three blades with a special shape similar to Blue edge blades from Eurocopter. This particular blade design significantly reduces rotor noise and is quite efficient. In addition, the pairs of propellers on the port side of the Onyx would rotate symmetrically to the propellers on starboard thus cancelling the induced torque.

When the Onyx is ready to embark passengers, the top portion of the cabin would open upward and passengers would hop in on either side like it is for existing cars. Each flight would be managed by the autopilot and through an urban air traffic system.

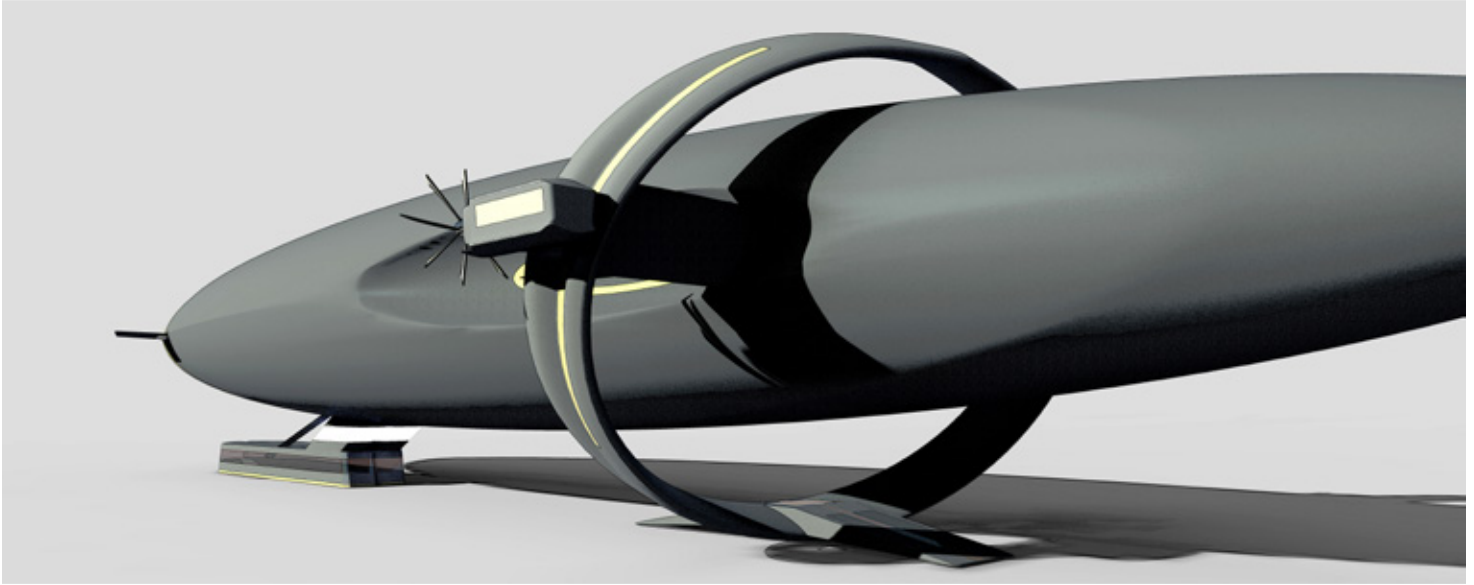
By combining advances in technology a whole new market of aerial vehicles can be developed. One important step is making sure legislators are preparing the necessary frameworks that will allow prototypes to be flown inside designated corridors.



Concept creator: Charles Bombardier
Industrial designer: Abhishek Roy
Imagined: November 2017

ORINOCO

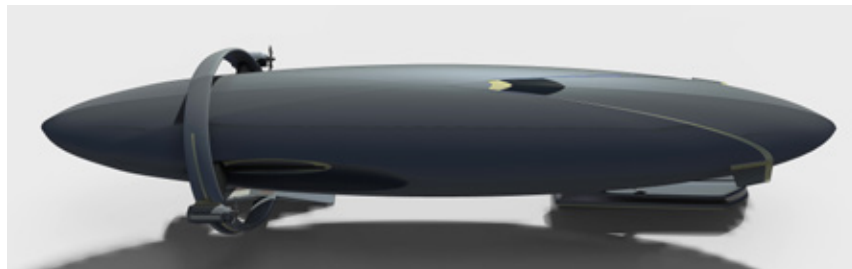
HUMANITARIAN RELIEF DIRIGIBLE



The Orinoco is an immense airship that would be able to transport over 500 tons of food, medical and other supplies, material, and people during humanitarian missions and disaster relief operations.

The Orinoco would be able to land in a field and load up with 500 tons food and supplies to carry them to the relief location up to 5,100 nautical miles away. The cargo compartment would feature large enough doors through which forklifts and even trucks could enter. The fabric covering the airship could capture the solar energy to cool the cockpit and the cold storage rooms.

The airship would be equipped with four on-board ducted fans to help push the Orinoco in the air and assist it for soft landings. It could also land in fields, whereas cargo planes must land on airstrips, and helicopters cannot carry as much for the same cost. These types of dirigibles could be owned and operated by humanitarian relief organizations including the U.N. and the Red Cross.





Concept creator: Charles Bombardier
Industrial designer: Ashish Thulkar
Imagined: October 2016

ORION

ELECTRIC PLASMA PULSE ENGINES

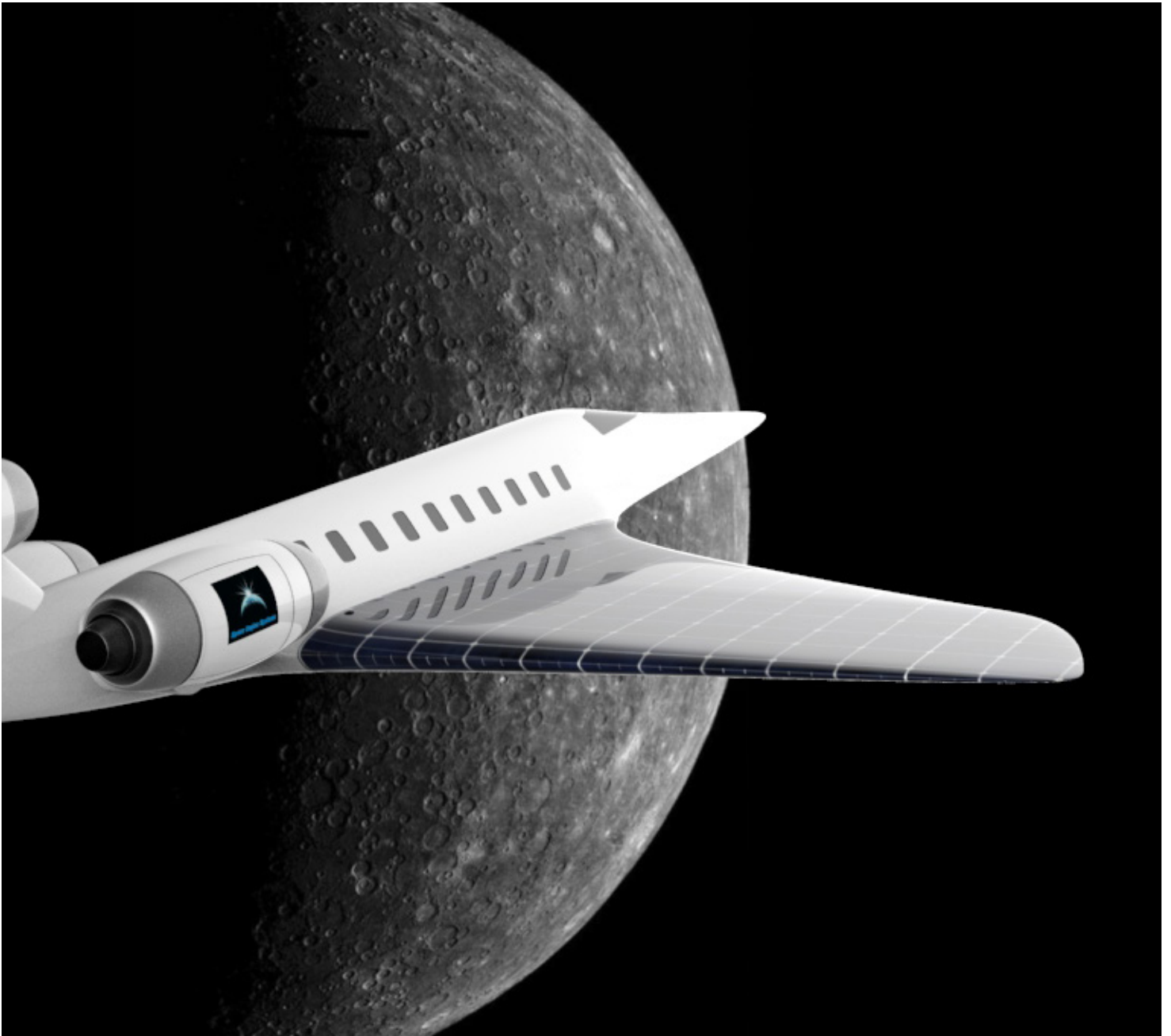


The Orion is a sub-orbital electric aircraft equipped with an air-breathing magneto-plasma jet propulsion engine that could go from the tarmac to an altitude of 80,000 feet and cruise at about 500 mph (800 km/h). It would bring passengers to the edge of space with stunning views from its ultra-wide panoramic windows.

The Orion would take off from a conventional airport runway using a multi-array of 1,000 magneto-plasma flux compression thrusters, each having a jet-focused nozzle and a unit thrust of 2.25 lbf (10 N). (The 3.2 MW electric power pack system would be composed of four 800 kW new-generation aircraft fuel cell systems with a power density of 2.2 lb/kW (1kg/kW).

At sea level, the exhaust speed of the thrusters would be in the range of 3,300 ft/s (1,000 m/s). At higher altitudes, the plasma exhaust speed would reach values of 5-50 km/s, so the final effect is similar to a rocket nozzle. The core of this idea lies in a new ignition method for high-thrust plasma engines.

The Orion would be developed to carry at least thirty people. Future derivatives with more distributed trailing-edge plasma propulsion could even be used as single-stage-to-orbit (SSTO) vehicles or aerospace planes as the magneto-plasma thrusters can be fed by gases like argon, thus they would also operate in deep space.



Concept creator: Charles Bombardier
Industrial designer: Ashish Thulkar
Imagined: December 2016

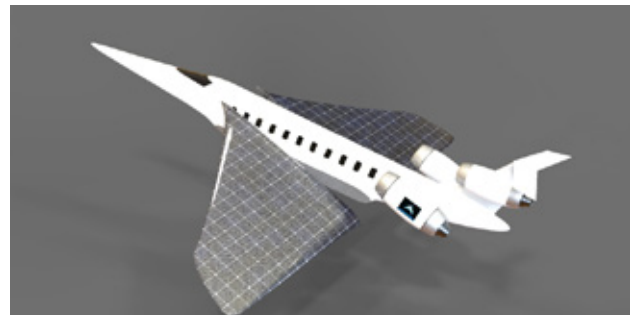
ORIZON

SPACE BOUND BUSINESS JETS



The Orizon is a business jet equipped with two types of engines: one capable of operating in our atmosphere and the other in the vacuum of space. It could take off from most airports, cruise between Mach 3 and 5, and then fly all the way up into space by using the on-board oxidizers of the DASS GNX engines. Its two air-breathing engines would provide enough power to lift off and climb to an altitude of 30 kilometres at Mach 5 and then exit space and land back on earth. Passengers would sit in a large, boardroom-like cabin, which could be configured to seat up to 20 passengers or replicate any type of business architecture.

The Orizon would be developed to carry its passengers at supersonic speed anywhere around the world and even into space. It could be used to fly tourists to inflatable space hotels located in low earth orbit. The DASS GNX air breathing engine has more than 3.5 times the specific impulse of a regular rocket engine. This saves on fuel and storage and reduces the mass which must achieve escape velocity.

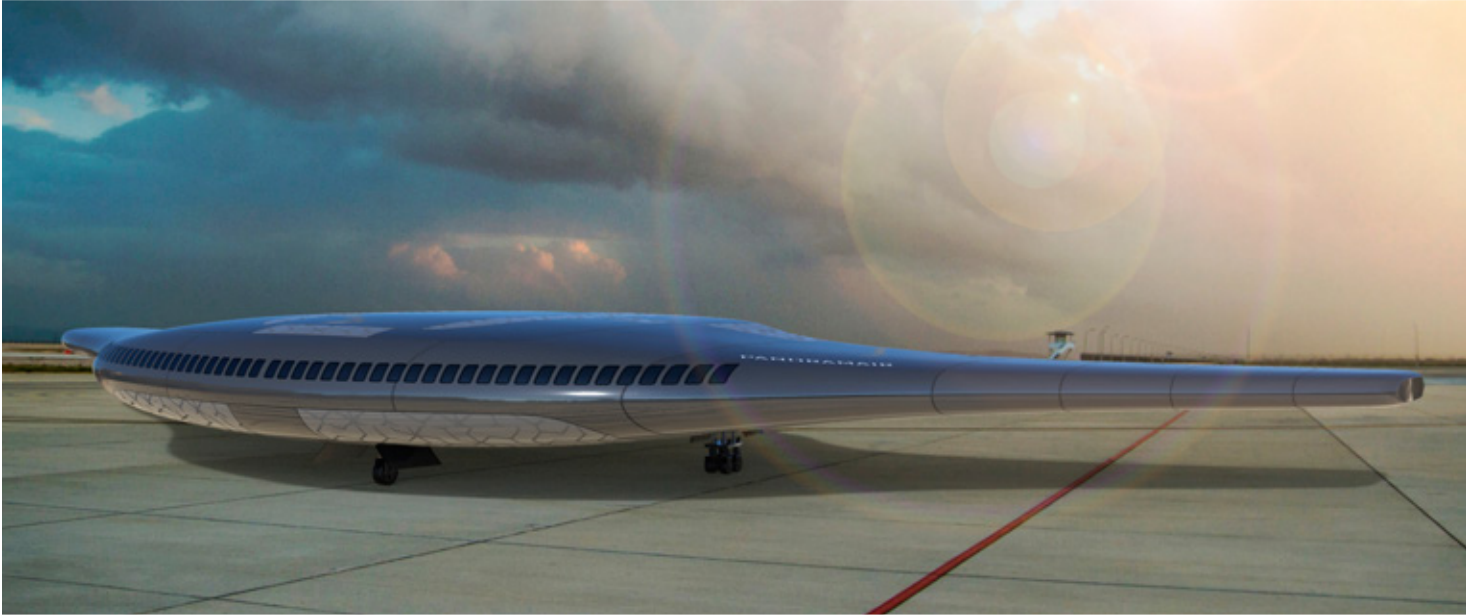




Concept: Charles Bombardier, Gary Daprato
Design: Jorge Ciprian
Date: September 2018

PANORAMAIR

A PANORAMIC VIEW OF EARTH & SPACE

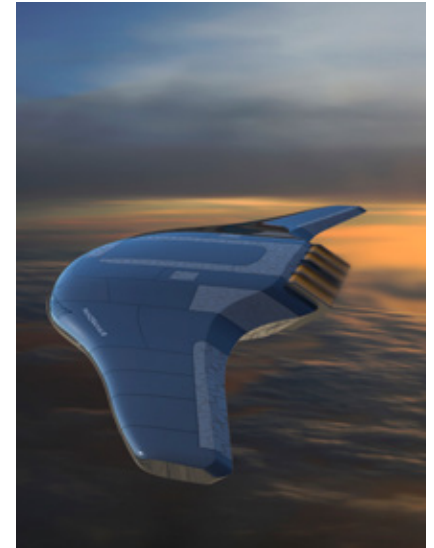


The Panoramair is a hypersonic commercial aircraft that could fly between distant parts of the globe within hours. It uses a novel rocket developed by NASA called an 'Aerospike' to reach low earth orbit. It would thus be able to fly from Los Angeles to Sydney in less than 3 hours (7,585 miles) and make a gracious parabolic incursion into space for a fascinating view of our planet or even dock on space hotels

The Paradoxal has a blended wing body shape with one long leading edge. Passengers sit in a large theatre-like cabin; gone are the days of tube-and-wing planes with their long rows of cramped seats.

The rocket inject liquid oxygen (LOX) into the gas exhaust channels. In mid-flight, at an altitude of 40 miles (the very edge of space), passengers would see earth's curvature and experience weightlessness for one brief minute before heading back towards earth.

About 45 minutes before landing, the LPM flow would be restarted using compressed air to cool the plane during atmospheric re-entry and slow it down gradually to subsonic velocity. By the time it returned to 50,000 feet in altitude, it would use its air-breathing turbine engines for its final landing approach.





Concept creator: Charles Bombardier
Industrial designer: Ray Mattison
Imagined: March 2016

PELAGOR

WING IN GROUND EFFECT CARGO



The Pelagor is an amphibious aircraft concept envisioned to ferry 40-foot-long intermodal containers to islands and remote locations. It would be capable of landing on short airstrips or water and would use ground effect to save fuel.

The Pelagor would use a distributed propulsion system composed of a set of batteries and a jet turbine. This combination of electric power pack and fuel turbine would provide the necessary energy for take-off, since this is the portion of the flight which requires the largest amount of power.

The batteries would power forty (40) electric propellers, which could be positioned on the leading edge of the wing, between two expandable wings (shown), or between the flaps and the wing. Of course, the drag, lift, complexity, cost, efficiency, and autonomy would have to dictate the optimal design.

A new generation of light & watertight containers made of ultra-strong composite materials should be developed to reduce the total weight of the cargo.

In the unlikely event of the aircraft needing to shed some weight rapidly, the container could be jettisoned without loss of the craft. Since it would be watertight, the container would float, so both the container and the goods inside could be salvaged.

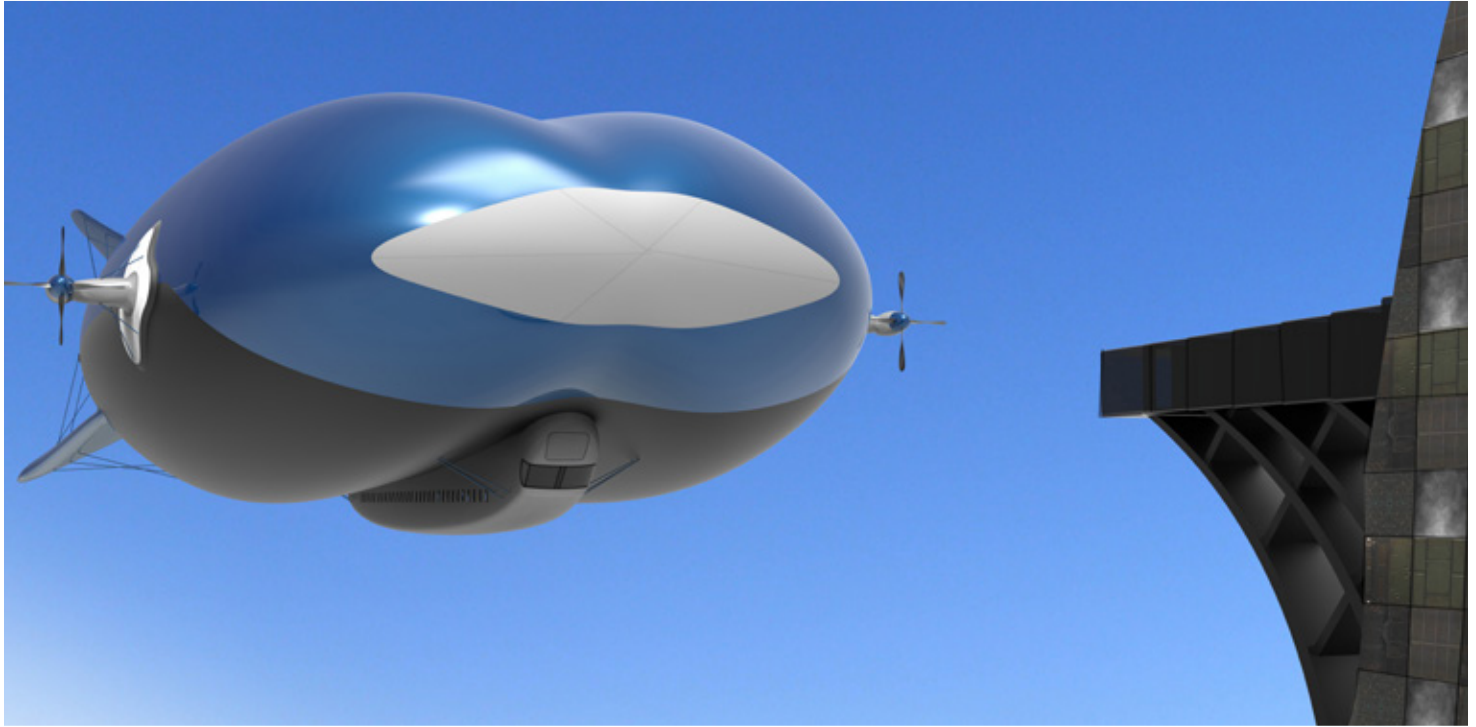




Concept creator: Charles Bombardier
Industrial designer: Ashish Thulkar
Imagined: August 2018

RA 2020

REGIONAL AIRSHIP LINES



The RA 2020 is a regional airship system designed to ferry passengers and transport goods across regions of the world where roads are poorly maintained, clogged by traffic, or non-existent. It includes the deployment of regional docking stations and a way to simplify the whole flying experience. Airships are slower than planes, but they are quieter, and pollute less than other forms of transportation.

The RA 2020 was inspired by the Airlander prototype developed by Hybrid Air Vehicles. It would dock on bases located on the outskirts of towns,

on plateaus and in valleys inaccessible by plane, and, in the city, on high-rise towers built especially for them. Docking bases are designed to issue tickets, handle security, and process passengers very efficiently.

The front of the airship would be attached automatically by robotic grips and winches and in general the automated docking process will take less than five minutes.

Operators could invest in regional hubs like a business or franchise. They would acquire the land, build the structure

to specs, and incorporate additional businesses in the terminal for passengers like a Sleepbox hotel, food vendors. These stations could be prefabricated and delivered by the larger Airlander 50 (see video).





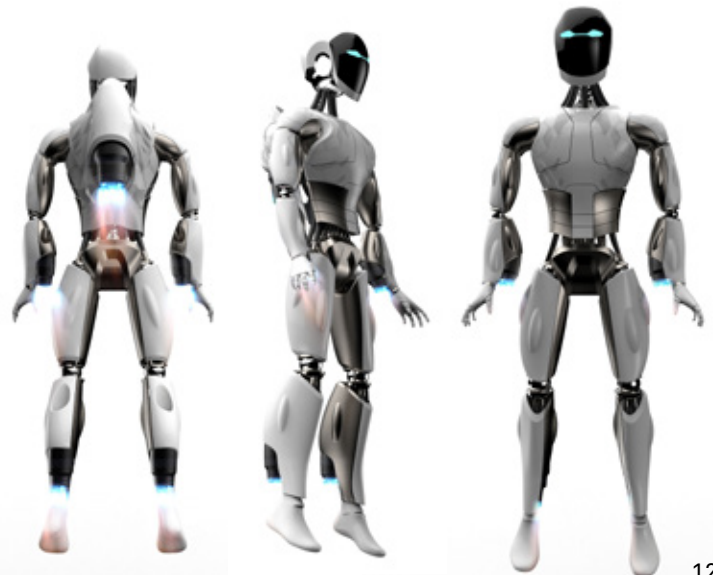
Concept creator: Charles Bombardier
Industrial designer: Martin Rico
Imagined: October 2018

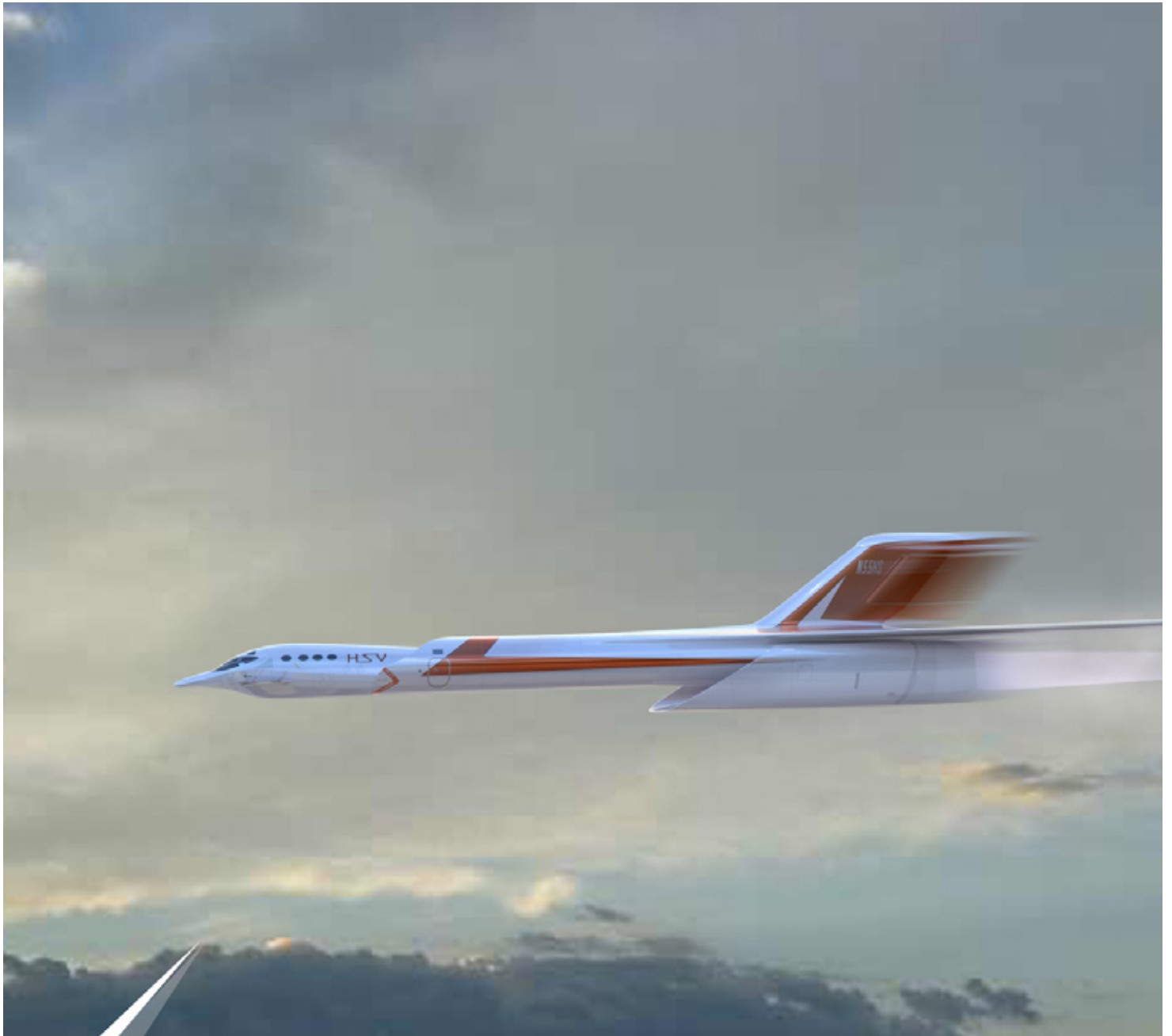
ROCKETBOT

COMBINING ROBOT AND JET THRUSTERS...



Do you think it would be possible to use robots developed by Boston Dynamics (Atlas) or Kawada Robotics (HRP-4) and use jet thrusters like the ones created by Gravity and Zapata to build an actual flying robot? Probably the answer is yes but how would this robot be used?





Concept creator: Charles Bombardier
Industrial designer: Ray Mattison
Imagined: June 2015

SKREEMR

FLYING COMMERCIAL AT MACH 10

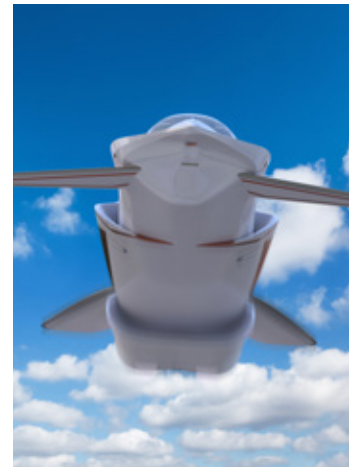


Scramjet engine designs are being developed right now by several countries. They will probably first be used in drones, but could eventually be used, in the distant future, to fly passengers across oceans at very high speed. The Skreemr is an aircraft concept that would be launched at very high speed with the help of a magnetic railgun launching system. The launch system would need to be long enough to achieve supersonic speed.

Once it's airborne, the Skreemr would ignite reusable liquid-oxygen / kerosene rockets to gain altitude and reach a speed of Mach 4. At Mach 4, the plane would ignite its scramjet engine and burn hydrogen and compressed oxygen to continue accelerating up to Mach 10. The need for rocket power would depend on two things: the materials used

to withstand the heat and pressure on the aircraft, and the acceleration that could be sustained by the passengers.

The Skreemr would be used as a commercial aircraft to fly from one continent to another. It would fly five times faster than the Concorde and carry approximately 75 passengers. The magnetic launching system could use clean electricity to accelerate the aircraft. The reusable rockets and scramjets could burn hydrogen manufactured with hydro-electricity, solar, or wind power.





Concept creator: Charles Bombardier
Industrial designer: Jorge Ciprian
Imagined: August 2018

TEMPLAR

REFORESTING THE EARTH WITH AIRSHIPS



The Templar is a specialized airship concept designed to plant trees and create new mixed forests. It could also be used to monitor and protect crops.

First it would land next to a tree nursery and load up very young trees specially designed for this type of aerial transplantation. The operators would have the possibility of mixing coniferous and hardwood trees and choosing special species to design unique, custom, forest patterns. Second a palletizing system would place each tree in a slot where they would await transplantation by an injection system. The challenge would be to handle various species appropriately for their different transplanting needs.

The cargo compartment would be large enough to plant 10 trees across, spaced 1 meter apart. The Templar would be able to plant 200 trees. To accomplish this, the Templar

would remain stable over each area in light wind conditions, using electric transversal fans or ducted outlets on its sides. The Templar could also be used to monitor crops, assess the health of regional forests, and replace trees in areas where they have been knocked down by heavy winds or burned by forest fires.

The Templar is simply one idea out of a hundred that takes into account new airship designs and the future of agriculture. It will hopefully inspire thoughts about life in the 21st century and how such aircraft can improve lives and the earth.





Concept creator: Charles Bombardier
Industrial designer: Jorge Ciprian
Imagined: September 2018

VIKARE

ROLLING UP THE SKY WITH MAGNUS

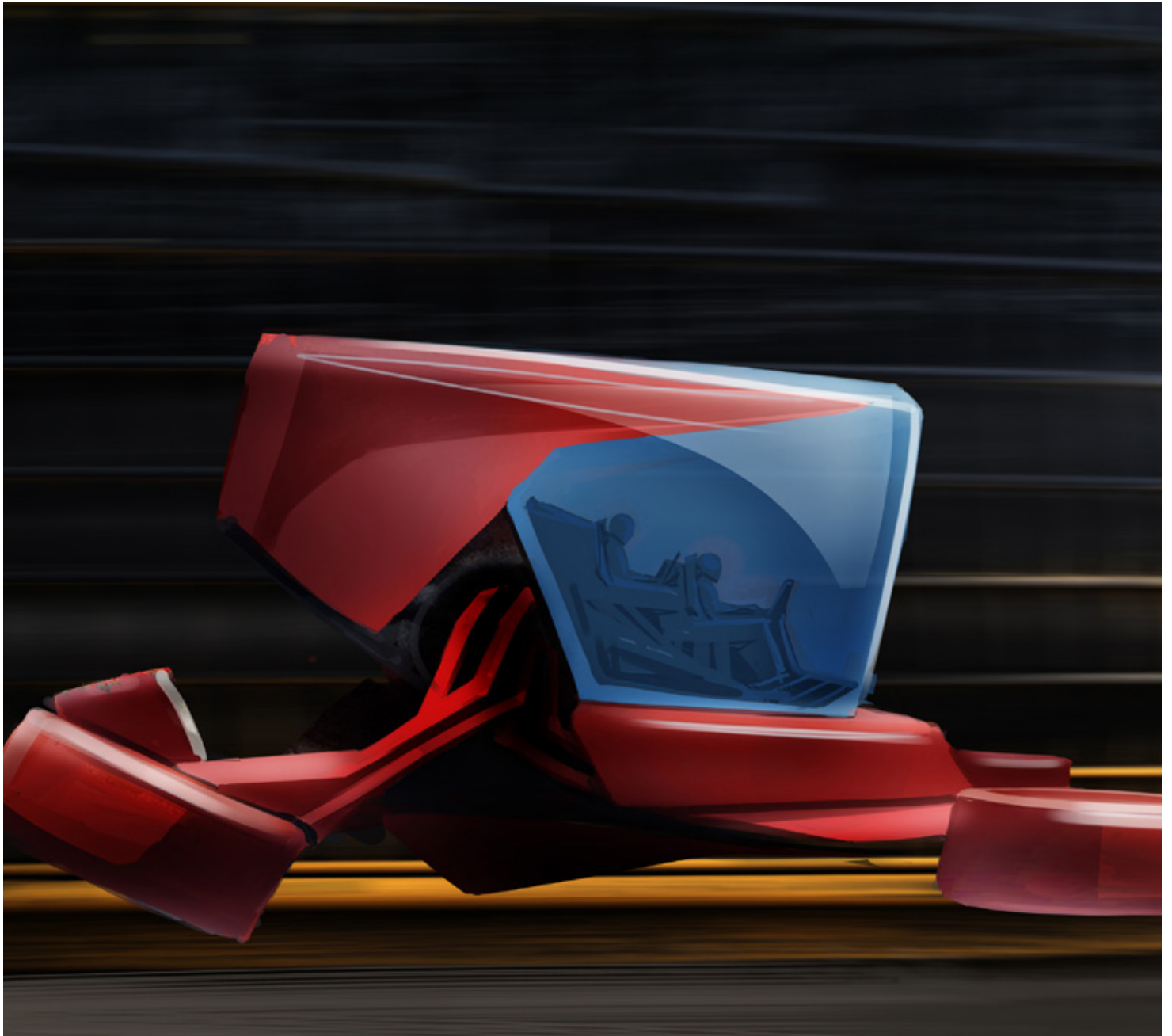


The Vikare is wingless flying powersport aircraft concept that uses the Magnus effect to fly. It would be equipped with a gas turbine that would provide power to four rotating cylinders to create lift and a rear propeller for propulsion.

It is inspired by the Rotor Aircraft prototype built by Anton Flettner and the Icar 101 flying car concept from Jean-Louis Ligné.

The Vikare uses a commonly-observed effect in which a spinning cylinder curves away from its principal flight path, just like the curve of a spinning baseball or soccer ball. Instead of wings, the Vikare would be equipped with front lateral cylinders that measure 33 cm in diameter and 3.4 meters long and two smaller rear cylinders (26cm / 2.2m). These four cylinders would spin around their axis and create lift as the rear propeller would push the aircraft forward.

The centrifugally deployable Magnus effect spinning wings of the Vikare are compact, made of Zylon, and would generate enough lift to get the 950 kg aircraft off the ground. A compact 500 hp gas turbine would propel the 4 motorized wings. As the lift generated by each wing depends on its rotation speed, a high-speed clutch will make it possible for the pilot to control the aircraft's flight attitude and lift properties.



Concept creator: Charles Bombardier
Industrial designer: Brian R. Miller
Imagined: August 2013

VORTEX

THE FLYING OFFICE

The Vortex concept is a flying car propelled with four bladeless engines inspired by the Moller M400 Skycar. Its turbine would rotate a series of fan blades that would suck air into the aircraft to be directed to the four circular diffusers located at each corner of the aircraft.

These diffusers would push air under the Vortex similar to how a Dyson fan works. The air is ejected on the rim's leading edge so there would be no blade at the centre of the nacelles. The volume of air exiting the nacelles would be greater than what is coming in since additional air would be provided by the turbine's ducting system.

The engine powering the Vortex would be a Pratt & Whitney PT6T-3D Twin Pac with air compressors. The cabin of the Vortex is roomy; it has a huge panoramic window and could be equipped with four comfortable seats. The Canopy would have the capability of projecting augmented reality media to assist the pilot and entertain the passengers.

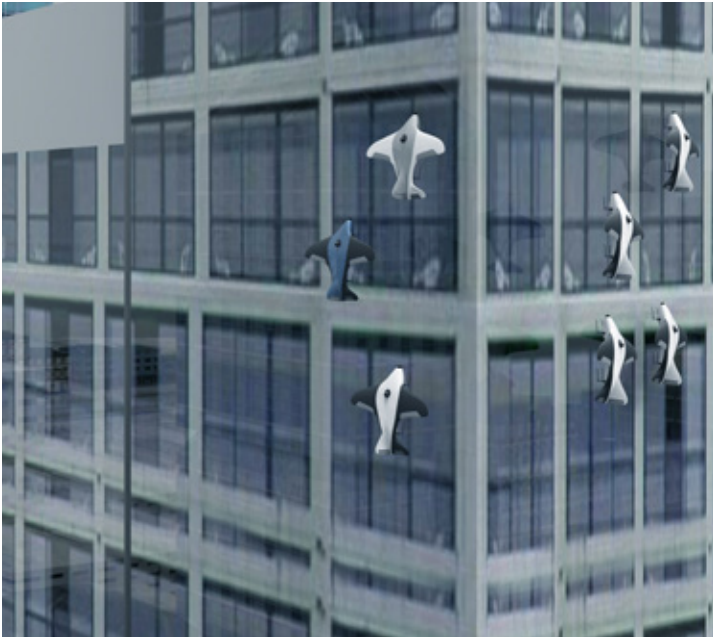




Concept creator: Charles Bombardier, Yuri Fattah
Industrial designer: Ashish Thulkar
Imagined: October 2018

WHISPER

PERCHING ON VERTICAL SURFACES TO CONSERVE ENERGY



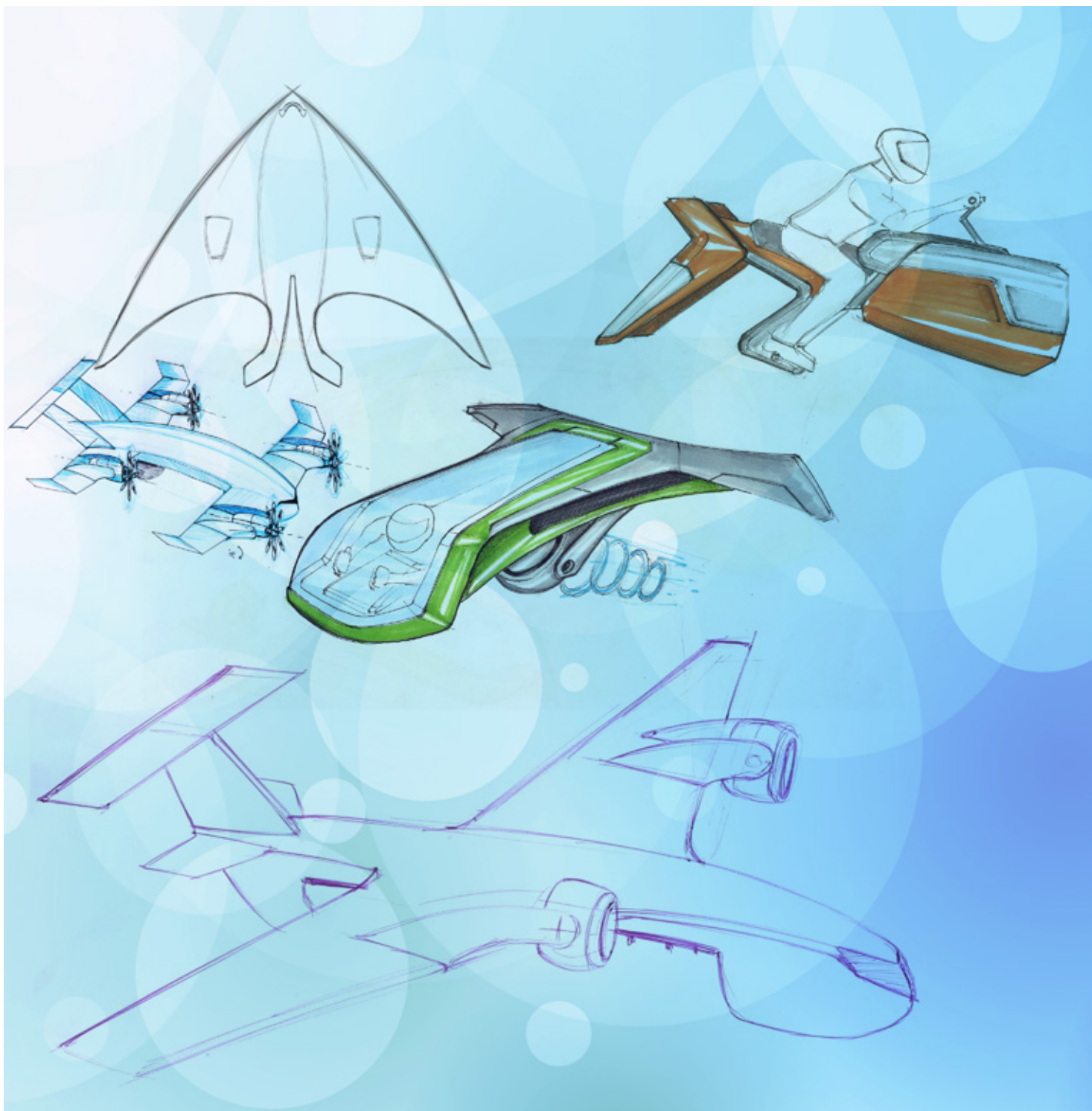
The Whisper concept was inspired by Sherbrooke's University Multimodal Autonomous (S-MAD) prototype. It's a reconnaissance drone able to perch and take-off from any vertical surface by mimicking the behaviour of birds.

The Whisper is equipped with a sensor that detects vertical surface, which then guides the onboard computer to softly land on it. While perched the Whisper is able to use a camera, mounted on its back, to provide an overview of the area.

The Whisper can be used to provide aerial monitoring during disaster response, perform inspection of critical, hard to reach, infrastructure, and monitor the wildlife. It can also

be deployed in swarms. In such a configuration additional functionality, such as 3-D imaging, extending a peer-to-peer wifi service, or multiple sensors (each drone having a different one) can be achieved.

By perching the Whisper does not need to waste energy to stay on station (unlike a traditional drone that would need to spend energy to hover). In more advanced systems it could also seek out sources of wind (e.g. the exit duct from a building) to recharge its batteries through the propeller.



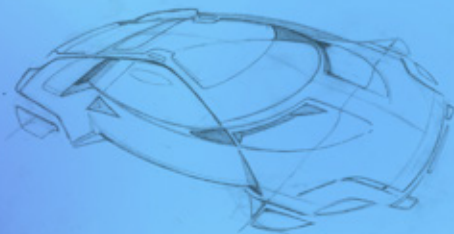
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