



FAI International Drones Conference and Expo

31 August - 2 September 2018
Lausanne, Switzerland

REPORT

www.fai-dronesconference.org



ABOUT

FAI INTERNATIONAL DRONES CONFERENCE AND EXPO

The FAI International Drones Conference and Expo offers a unique platform for sports organisations, businesses, government authorities and end-users from around the world to discuss how drones are used today, and create a framework for how they will be used in the future.

Part of the public EPFL (Ecole Polytechnique Fédérale de Lausanne) Drone Days 2018, the 2nd FAI International Drones Conference and Expo ran from 31 August to 2 September 2018, and welcomed expert speakers and visitors from around the world to discuss the rapid development of the drone ecosystem both recreationally and commercially.

In 2018 three main themes formed the backbone of the weekend conference: Safety, Sports and Innovation. Together, this allowed for a full exploration of the opportunities and challenges facing the world of drones and traditional aviation as they both seek to develop side by side, and look towards a fully integrated future.

DRONES

A drone, or unmanned aerial vehicle (UAV), is an aircraft or aerostat that does not carry a human. It can be remotely controlled by people, using either direct sight or a first person view (FPV) headset. Alternatively, a drone can be autonomously controlled by an onboard hardware and/or software system.

FAI

The Fédération Aéronautique Internationale, FAI - The World Air Sports Federation, was founded in 1905. Recognised by the International Olympic Committee (IOC), it is a non-governmental and non-profit-making organisation committed to furthering aeronautical and astronautical activities on an international level.

With more than 100 members, FAI is the global organisation for the promotion of aeronautics, air sports and recreational flying.

FAI activities include the establishment of rules for the control and certification of world aeronautical and astronautical records. FAI establishes regulations for air sporting events which are organised by member countries throughout the world. FAI also promotes skill, proficiency and safety in aeronautics.

In achieving these goals, FAI brings together people who take part in air sports from all over the world. Within the framework of FAI, each air sport has an International Commission which generally oversees the activities of their particular air sport.

Mission and Vision statements help the Federation prioritise strategies and move steadily towards its objectives and goals. The Mission Statement is: "FAI - the global organisation for the promotion of air sports and recreational flying." This serves as an overall guide to priorities, actions and responsibilities.

The Vision Statement outlines the clear and inspirational long-term desired change resulting from the Federation's work: "A world where safe participation in air sports and recreational flying is available to everyone at reasonable cost."

COMMUNITIES

The popularity of drones and their numerous applications means they impact an ever-growing and diverse range of people and communities, from local aeromodelling clubs to multinational businesses.

The aim of the FAI International Drones Conference and Expo is to bring these communities together so they can share information, learn from each other and gain unique insight into the global drones ecosystem.

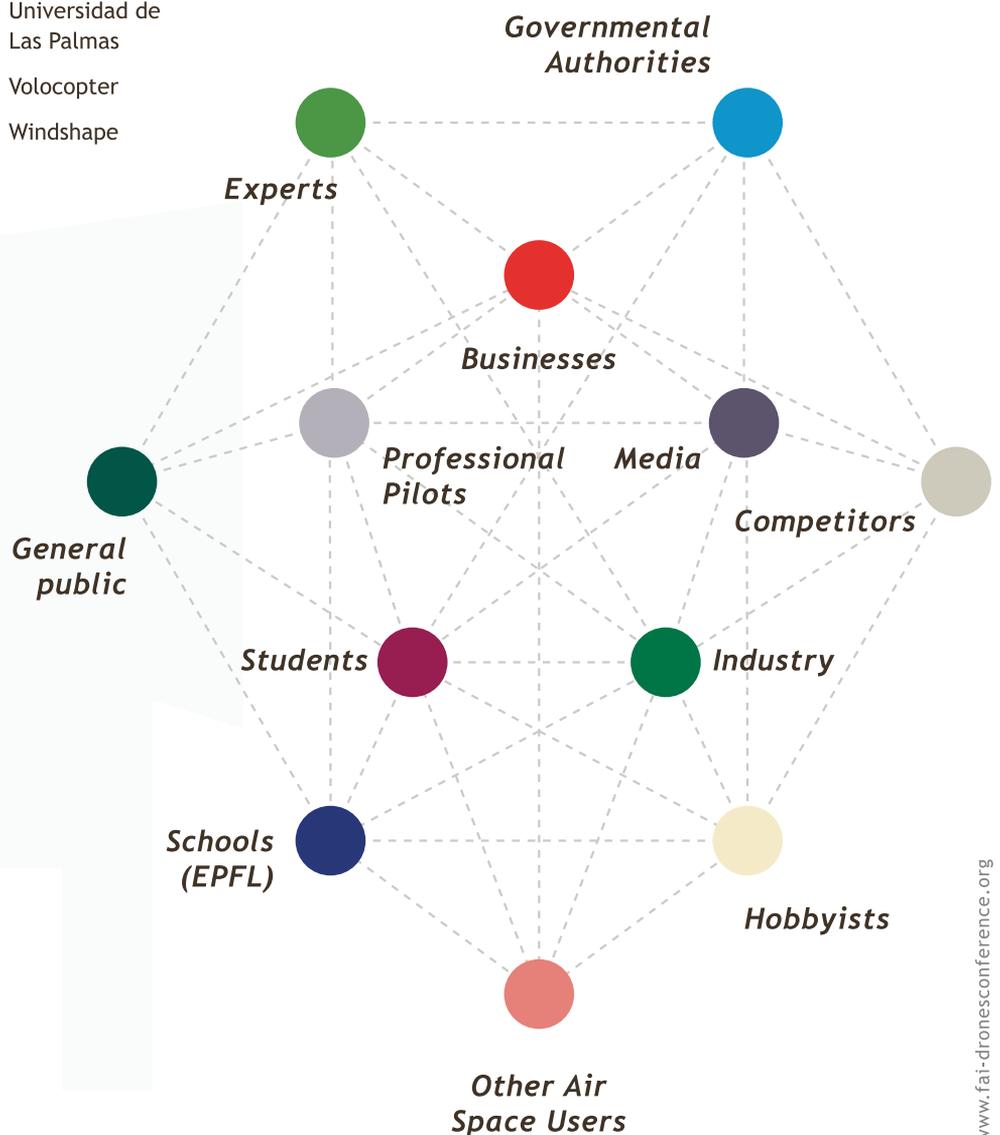
Alongside that in 2018, the FAI Drones Expo, the EPFL Robotics Showcase and the Drone Innovators Session made it an event that appealed to anyone interested in robotics as well as any form of aviation.

Groups represented by speakers at the 2018 FAI International Drones Conference and Expo included:

- AirMap
- Bluebird Mountain
- Copterproject
- Deutsche Telekom
- Drone Combat
- Drone Industry Association Switzerland
- European Aviation Safety Agency (EASA)
- FAI
- Frank Fuchs Consulting
- Freespace Drone Racing
- Global UTM Association (GUTMA)
- Graupner
- H55
- Hungaro Control
- Involi
- JARUS
- MotionPilot
- Picterra
- Présence Suisse
- Quadcopter Racing League
- Relmatech
- Schaeffler Group
- SenseFly
- SkyPull
- Sunflower Labs
- Swiss SkyGuide
- Tech4Impact
- Universidad de Las Palmas
- Volocopter
- Windshape

Their presentations covered a vast ground, including urban transportation, managing air space, public safety, drone technology, drone racing, eSports and more.

Attendees included professional, competitive and recreational drone pilots, government representatives, drone manufacturers, students, researchers, experts, start-ups, school groups, media, business and interested members of the general public.



SPORTS

The magic of drone sports is firing imaginations around the world. As more drones take to the sky, they bring new people into air sports. The FAI is committed to helping that new world develop. At the conference speakers from across the world of drone sports set out their vision for the future. These are exciting times. Here we summarise some of what was under discussion.

DRONE RACING AND THE FAI



Antonis Papadopoulos, President of the FAI Aeromodelling Commission, explained why Drone Racing is a priority for the FAI. With its long history in records and competitions, he said, the FAI is a natural home for drone racing - and it is committed to setting the bar for standards of sporting excellence across the sport.

"Drone Racing as a sport is developing at a fantastic pace," Papadopoulos said. "It's growing fast. It may look almost virtual, but in Drone Racing pilots fly a real machine, in accordance with rules. We believe the FAI is the organisation that can connect the two worlds - e-sports and air sports."

He added: "Drone Racing appeals to youngsters and spectators, it's media friendly, and it also aligns with our core FAI values."

Bruno Delor, Chairman of the FAI Drone Racing Subcommittee, expanded on the rapid development of Drone Racing within the FAI. "Drone Racing as a new class was introduced in the FAI on 1 January 2016," he said. "Since then we have seen phenomenal growth. In 2016 we had nine contests in seven countries, in 2018 we had 23 events in 18 countries - including the first FAI World Drone Racing Championships." He promised: "In 2019 there will be even more."

Looking ahead he listed technical improvements in scoring and onboard cameras as important priorities. "We are also looking at geo-caging, where the drone cuts out if it flies past the 'virtual cage' in the sky. That would be perfect for racing in cities."

The potential for attracting media coverage, an engaged audience online and at venues, and commercial partnerships is clear. "No other air sport class is as attractive as this," he said. "We know we have a good, attractive product. It's easier to get investors if you are on TV!"

Drone Racing is also perfect for going beyond traditional air sports venues and competitions. The FAI World Air Games in Turkey in 2022 will feature Drone Racing, as will the multi-sport event The World Games in Alabama, USA in 2021.

'NOT JUST A CONCEPT'

Drone sports don't need to mean Drone Racing as we know it at present. The conference heard from several speakers who are working on plans to develop other types of drone sports too.



Grantley Reed from Freespace Drone Racing in Australia described how he and his team had developed much larger drones for track racing. "Our drones measure 130cm long, weigh 25kg, fly at up to 220km/h and can pull 6G in the turn," he said. The concept is short-track racing, excitement and a sports-stadium atmosphere.

"How exciting would a field of 10 of these be racing around a track?" he asked. But of course you wouldn't need to be there in person to experience it. "It's all about the mobile phone," he said. "It's about creating and sharing the experience on social media. It's about moving emotions, a festival atmosphere. We want to create the feeling that no one else does it like this."

Create that, he said, and Drone Racing will continue to build its online audience. "Drone Racing needs fans. With fans comes sponsorship."

Meanwhile, **James Waite** from the UK presented his team's vision of a new made-for-TV drone game called **FlightBall**. "It's drone team sports. Think of five-a-side aerial soccer played by specially protected drones with a flying ball." The aim was to develop not just a TV concept, but also FlightBall venues where anyone can have a go. "We want to capture the spirit of e-gaming and bring it into exhibition venues, stadiums, arcades."

To that end they said they were already working with social media influencers and online gamers to promote the new idea. "We saw drone flying is a solitary activity. We have turned that on its head and said we want people to get together and bash drones into each other!"



Hannes Runknagel from Germany also showcased the drone team sport he had developed. **Droneball** is a game where teams of five have to "sweep" a Droneball through a course. "It's about skills and tactics rather than pure speed. It's slower."

Cristian Mendez Carmona from the nascent **Quadcopter Racing League** meanwhile shared his futuristic vision of manned drone racing. "Our vision is to deliver a groundbreaking zero-emission air race in a thrilling and competitive race series," he explained.

"A quadcopter racing league, a world championship, a world class standard. Artificial intelligence to increase safety and reduce incidents. Sensor programming so the quads don't collide." Yes, he agreed, there were many challenges to create such a vision, but they were not insurmountable. "We do not know what the future holds," he said, "But we do know these ideas are not fiction any more - they are a great opportunity."



André Borschberg

FAI world record holder **André Borschberg** gave the keynote address at the end of the Sports session at the conference. Together with Bertrand Piccard the pair successfully completed circumnavigating the world in Solar Impulse II, a solar-powered plane, in 2016.

During the Japan-to-Hawaii leg, André broke the FAI world record for the longest solo flight in an airplane of any kind: 117 hours and 52 minutes. He holds a total of 14 FAI world records.

He said that it is innovation, often driven by the quest for sporting achievement, that helps kickstart technological revolutions, including the revolution in drones and electric-powered aviation we see today. "When we started the Solar Impulse in 2003 the aviation industry told us it was impossible," he said. "But new technology and new thinking made the impossible possible."

The same would happen with drones: "Technologies are converging, we have new materials, lighter batteries, more computing power, artificial intelligence and data, sensors and cameras. All are getting better."

"We have to learn to use these new technologies," he said. "Drones will open a new world."

SAFETY

Safety was one of the three key topics on the agenda at the FAI International Drones Conference in Lausanne. The conference heard from eight speakers during a busy Sunday morning session, which focused on the issues around organising airspace to ensure safe operation of drones wherever they fly.

RULES

Yves Morier from the European Aviation Safety Agency took the floor first and explained the deep work involved in developing airspace for drones across Europe. "This is not theoretical work", he stressed, as he explained Europe has been active in developing a new type of airspace to accommodate drones since 2015. U-Space, a brand new, Europe-wide, un-manned air traffic management system, "will be a reality by 2019 with a step-by-step regulatory approach," he said.

Part of that approach will involve striking the right balance between creating the right environment for the drone industry in Europe to flourish, with appropriate regulation to ensure the safety of drone operators and the public. To that end the vision for Europe will see drones classified into three separate categories: open, specific and certified, with different levels of safety regulation and standards for each. The strictest will apply to the largest drones used in professional and industrial applications: height limits, registration, e-identification and other standards will apply across Europe.

SAFE ECOSYSTEM

Florent Béron from Switzerland's SkyGuide, an air navigation service provider which manages and monitors Swiss airspace, reinforced that message and showed how Switzerland could be used as a model for the development of a safe drone-operating ecosystem. "Twelve months ago we were in the demonstration phase," he explained, "Today we are talking about deployment. Things are moving very fast."

The challenge, of course, is how to integrate drones into what is already a busy airspace. "Air traffic management is not an easy thing!" he said. "In Switzerland alone we see 3,500 commercial aviation flights pass through our airspace every 24 hours. That requires a lot of management - we have 1,500 employees at 14 locations managing military and civil air space."

Bringing drones into that space safely will be - is already - challenging, he said. "We have known from the start that drones would change the industry forever," he said, "the challenge is welcoming drones into the sky." Today air traffic is managed using radar and voice communication; in the not-too-distant future, "we are talking about drones that will be connected to 4G and 5G mobile networks. They will be able to maintain separation autonomously."

Interestingly, he added, the technology being used is not new. "The know-how is available already, but it is dispersed. It is in

Start-ups and drone manufacturers. We have had to seek this knowledge out." He added: "It is disruptive technology in a positive sense. It is forcing those of us who work in air traffic management to think differently."

New safety standards and a new legal framework will be needed, but it is all possible, he said. "The future will see what takes 10 days to organise take literally 10 seconds. For example, today you can not fly a drone within 5km of a runway. It takes 10 days to get permission. That will change."

He added: "Our role is to foster this industry, not to get in its way."

DIGITAL ACCESS



Drones are "revolutionising" the traditional approach to airspace around the world, agreed Benoit Curdy from the Global UTM Association (GUTMA), a non-profit consortium of worldwide Unmanned Aircraft Systems Traffic Management (UTM) stakeholders. And it is happening now, in every country. "The vision is unified traffic management, digitalised, on all levels, from local to national and international," he said.

Looking to the USA he explained how this is already being done. The LAANC program - Low Altitude Authorisation and Notification Capability - is a test program currently being rolled out around some 500 airports in the USA. A collaboration between the Federal Aviation Administration and industry it directly supports the integration of drones into controlled airspace.

The system creates a "3D map" around airports, and allows "digital access" to the airspace by all airspace users, whatever they fly, manned or un-manned. "We have the seeds of what we want to do," explained Curdy, now we need to work together at all levels, national and local, to make it happen."

TRACKING AND MONITORING

Several speakers set out technical answers to tracking and monitoring drones in air space, and examined potential solutions to avoiding collisions and staying safe. **György Blazsovszky from Hungary's Hungaro Control**, an air navigation service provider, talked about the "white users" of air space. Glider pilots, balloonists, paraglider, paramotor and hang glider pilots are all, "almost invisible in the sky". You can add drone users to that list too, he said.

The vision was to make all those "white users" visible to other air traffic. That can be done - will be done - using a combination of GPS and the mobile network. "We think that the existing telecoms system is the right solution. The benefit is there is only one device. It would even allow roaming between countries."

Several speakers echoed that focus on using the mobile-phone network to provide easy access for thousands of users. Discussion ranged broadly, from the impact on traditional air sports and the potential costs for future airspace users, to cyber security and future-proofing.



Sebastian Babiarz, co-founder of GUTMA, emphasised ease-of-use, too. "When you are a pilot you have to understand, can I fly here? Today a pilot needs to search several sources to answer that question. The vision is to be able to answer that question in one place." That place looks increasingly like it could be your smart phone.

Across the world, he said, from the USA to New Zealand, air traffic management was looking at shifting "from manual approval that can sometimes take months, to digitalization approval that can in best case take seconds."

REVOLUTION



The morning session finished with an inspiring presentation from **Jonathan Evans from Skyward**, a drone company. A former military helicopter pilot and self-confessed "aviation geek" Evans set the development of drones in context. First came boats, then railways, then cars, then aviation. Now drones would be the next big revolution that will connect people.

Like global networks and ideas that had developed before, from establishing a unified Time convention in 1884 to mobile networks today, one of the main issues had always been "standardisation". "It seems like a huge hurdle, but this is where we are. Once we standardise the 'licence plates' of drones so they can operate internationally, then that will open up everything."

"We are at the stage of starting to build the intersections in the sky. We have not solved it yet, but we are working on it," he said.

INNOVATION

Innovation was the third theme of the 2018 FAI International Drones Conference - and there was no shortage of it on display.

From drone wind-turbines that promise a never-ending supply of clean energy, to drone "guard dogs" patrolling the perimeter of mansions in Beverly Hills, conference speakers showed there is no limit to how drones are set to affect our lives.

DRONE TAXIS



Max Hjarlmarsson from experimental electric-aviation company Volocopter started the dedicated session on Innovation by telling the audience that the dream of "drone taxis" was genuinely on the way. "Cities around the world are looking for a solution to traffic congestion," he said, "and they are looking to the sky."

The Volocopter team recently won international press attention when they flew an autonomous air taxi demonstration flight in Dubai. "Drone taxis are much closer than you think," Hjarlmarsson said. "We intend to bring air taxi services to major cities worldwide."

The technology "enabler" for all drone taxis will be the 5G mobile network, he said, which will allow drones to launch, fly and land autonomously. "We can start simply, going from A to B," he explained. "Take for example JFK airport to central Manhattan. That takes at least an hour in a taxi. We can do it less than 15 minutes." "VolHubs", or drone ports 15m x 15m on the ground or on the top of buildings will provide hubs through which they plan "10,000 people a day will be processed."

For any doubters, he pointed to their track record. "Over the last seven years we have consistently met our milestones. From our first YouTube demonstration to our maiden flight in 2016 in a certified Volocopter. We are on our way."

OUR ENVIRONMENT

Away from the futuristic dream of flying cars, several speakers showcased how they were putting drones to good use in

environmental and social spheres.

Beatrice Scarioni from Tech4Impact, a multi-stakeholder platform involving students and researchers as well as large enterprises, NGOs and start-ups, inspired the conference with case studies of real-world projects where drones are making a difference in "grand societal challenges".

In Rwanda drones are being used to transfer medical material, cutting travel time from four hours to 15 minutes, Scarioni said. Elsewhere in Africa drones are being used to monitor vast tree-planting schemes as part of "bio-carbon engineering projects" aimed at reducing the impact of climate change.

MAPPING



Stéphanie Cettou from SenseFly, a mapping company, showed how drones were being put to good use mapping glacial retreat and landslips near the Aletsch Glacier in Switzerland. "There is a dangerous part to this glacier now," she explained. "As the glacier retreats the exposed rocks become loose and dangerous."

"SenseFly mapped the area twice, one month apart. We discovered that in one zone of one square kilometer the rocks had moved more than 10 metres. That is great information - people can understand how and in which direction the ground was moving."

Other SenseFly projects included nature conservation in Namibia and mapping the suburbs of Lima. "We mapped the informal, poor part of Lima in Peru very quickly. From that we could identify the dangerous parts of the city to build, and the better places to build. This empowers the local people."

WIND POWER

Meanwhile, Simon Johnson from the Drone Industry Association Switzerland led a mini-session within the conference looking at start-ups and new ideas. Exploring everything from security systems to mapping, to a new type of drone wind tunnel - a "wind wall" from Swiss company WindShape - Johnson presented a drone-world of never-ending possibilities.



As part of that mini-session **Nicola Mona** caught the imagination with his presentation of **SkyPull**, a Swiss wind turbine company that is working to harness wind power three or four times higher than the tallest wind turbine. "The higher you go the more consistent the wind," Mona said. "SkyPull is an autonomous drone that can fly at 600-800m and capture very powerful winds."

After taking off vertically the SkyPull drone climbs until there is sufficient wind. There it automatically transitions into kite mode, before flying figure-of-eights, unwinding and winding a winch, which generates electricity." Fully automated, theoretically it can go on "for ever and ever."

By reaching such high altitudes, Mona said, SkyPull is able to create twice as much energy as a traditional wind turbine. Plus, the kite system doesn't need a big concrete footprint on the ground. Lighter, more efficient and with a smaller environmental impact than current wind turbines, the promise was a future of clean and green energy powered by wind drones - across the world.

Other innovations had other ambitions. **Alex Pachikov** from **Sunflower Labs** was building the "next generation of home security systems." Alongside sounding an alarm any security breach at a protected property would launch a "flying security camera" that would fly a pre-set route around a property, broadcasting the image direct to a home-owner's smartphone. Almost entirely 3-D printed, the target market was "mansions - think Beverly Hills."

On a broader scale, **Swiss start-up Picterra** showed how they are working with high-resolution drone imagery combined with artificial intelligence to analyse aerial photos at a regional scale. "We can map post-disaster areas, see how close trees are to powerlines, even detect the health of individual vines in vineyards," Picterra's **Julien Rebetez** said.

The Innovations session closed after an inspirational two hours with a presentation from **Nicolas Bideau** from **Présence Suisse**, an official Swiss government organisation that aims to promote Switzerland abroad. "I discovered Switzerland's drone ecosystem at this conference here last year, and we have embraced that," Bideau said. "Switzerland used to be known as the home of the cuckoo clock - but now we are re-branding Switzerland as the home of the drones."

From all the innovators at the conference, both during the official presentations and during the networking sessions, the message was clear: there are innovative and inspirational examples of drone use all around the world, and they are having a real-world impact right now.

EXPO AND SIDE EVENTS



EXPO

The Expo at the conference was open to all, and was a chance for the public to find out more about drones in industry and recreation. Hands-on demonstrations allowed children and adults to take their first flight, and learn more about how drones are being used around the world.

DRONEMASTERS MEETUP

Held as a distinct session within the conference, the Dronemasters Meetup brought together speakers from across Europe. A virtual incubator for drone start-up businesses, Dronemasters periodically organises meetups to connect the often-fragmented drone ecosystem. In 2018 a key topic of discussion was the “democratisation of airspace”. Drone pilot Haydar Blyik was also awarded a prize as the winner of Dronathon 2018, a drone endurance race.

DRONE INNOVATORS SESSION

In a side session that focused on presentations from small drone companies and their founders, the audience heard from pioneering start-ups. These included a company leading the way in industrial inspection drones, an organisation working in agricultural mapping in Kenya, and an innovative deer management and conservation project in Switzerland. From these and others it was clear that drone use is limited only by imagination, not technology.

ALVARO DE ORLEANS BORBON GRANT

Vincenzo Navaneri from Italy was awarded the \$20,000 Prince Alvaro de Orleans-Borbon Grant at the 2018 FAI International Drones Conference and Expo. Vincenzo, 34, won the grant to help him and his team develop their idea of a self-piloting drone ambulance that could carry a single person for up to 150km at 110km/h. The drone would be suitable for use by trained non-pilot staff, for example doctors. The power to drive the battery-driven propellers would come from two micro-turbines, each with its own high-speed generator. As well as the evacuation of people, the drone could be used to transport emergency equipment, medicines or even food.

The Prince Alvaro de Orleans-Borbon Grant is awarded to people or institutions involved in the creation or promotion of technical developments and innovation in sport aviation. The theme for the 2018 award was Drones for Humanity.

EPFL DRONE DAYS



EPFL DRONE DAYS

The 2018 FAI International Drones Conference and Expo was part of EPFL Drone Days 2018 - a three-day discovery showcase about the world of drones and drone technology. The EPFL (École Polytechnique Fédérale de Lausanne) is a renowned engineering college, research institute and centre for excellence in robotics research and innovation. A public institution founded in 1969, its disciplines range from Architecture to Engineering. One of the world's leading technological universities it regularly organises innovative public events like the EPFL Drone Days

EPFL ROBOTICS SHOWCASE

As part of the dedicated drone weekend at EPFL, the cutting-edge EPFL Robotics Showcase provided a platform for some of the hottest new ideas and applications in drones and robotics. Students, teachers, start-ups and industry took the opportunity to showcase their work and share ideas. From new ways to control drones to "robotic snakes" for surveying marshland, the fusion of robotics and drones is only just beginning.

EPFL DRONE RACING CUP

The 2018 EPFL Drone Racing Cup showed off drone racing at its finest during the EPFL Drone Days 2018. Switzerland's Moritz Werffeli won, coming out top on the final race after three days of competition. Fifty-eight pilots from seven countries took part. Werffeli, 25, from Zurich, Switzerland said it was the first FAI race he had flown in. "Cool race, good people, fast track."

Werffeli started out racing radio controlled cars but took up Drone Racing when first person view (FPV) goggles made it accessible. His advice for drone pilots who wanted to follow in his footsteps was simple: "To fly well is easy - you need air time. Go out and fly. No Facebook, no nothing, just fly!"



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