

# THE MAGAZINE

EUROAVIA FORLÌ-BOLOGNA



THE LICIA CUBE AND  
THE NASA MISSION  
DART  
INTERVIEW WITH PAOLO  
TORTORA  
PG.15

## MEET THE LOCAL BOARD

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## PORPOISING IN F1

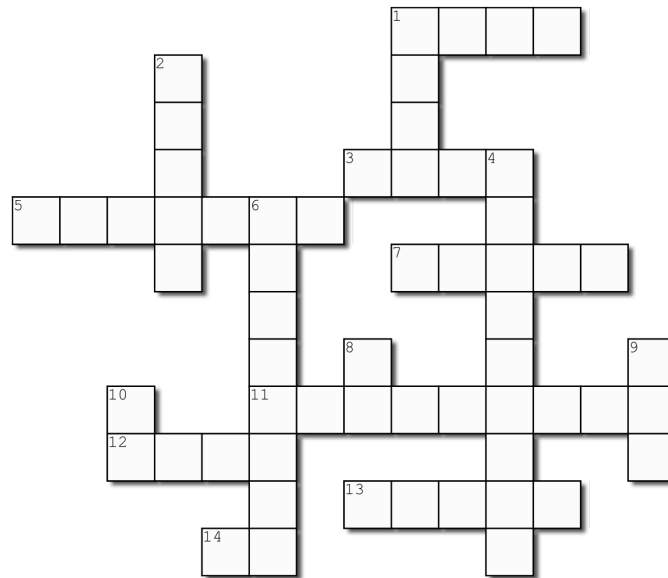
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Name: \_\_\_\_\_

## EUROAVIA

Complete the crossword puzzle below



Created using the Crossword Maker on TheTeachersCorner.net

### Across

1. Every Friday there is a...
3. The International Board is elected every...
5. Nationality of the president of EUROAVIA international
7. The one of EUROAVIA is 'build the wings of your future'
11. The hacker marathon
12. Swiss Institute for Disruptive Innovation
13. The bar that often hosts our events
14. Working group

### Down

1. The number of working groups in EUROAVIA Forli-Bologna
2. The most famous EUROAVIA Forli-Bologna workshop
4. Competition recently won by EA members
6. Airbus ... Rocket Workshop
8. Initials of the president of EUROAVIA Forli-Bologna
9. Train New Trainers
10. Affiliated society

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# **The EUROAVIA Forlì-Bologna Magazine**

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# **From the Editor**

Dear readers,

Christmas is coming, and there's no better way to celebrate it than with a new edition of the local magazine!

This is the first issue of this academic year, so I'm very proud to start the dance. In this magazine you will find a lot of very interesting news about the space sector, like the first images taken by the "James Webb Telescope" and the special interview with the Prof. Paolo Tortora, but also amazing aviation related insights and a special article about the porpoising in F1, a very current topic. But this issue will also show you the amazing opportunities that EUROAVIA provides to its members: the OpenFoam workshop or the Machine Learning workshop among many other events

I would like to thank Riccardo Casali, the coordinator of the Communication WG, who gave me the honor of taking care of this magazine, and that helped me to bring this issue to life. Naturally, I want to thank also all the contributors for participating in the creation of this magazine

Finally, I'd like to thank all EUROAVIAns, who allow our association to exist and help all of us to grow by exchanging ideas and beautiful experiences together, such as the sloshing competition or the amazing conferences we held. I wish you a merry christmas and a happy new year!

Best regards,

Michele Pio Lauriola

*Member of Communication WG, EUROAVIA Forlì-Bologna*

*Michele Pio Lauriola*



**Elia Ghisellini**  
President



**Davide Como**  
Secretary



**Matteo Di Giorgio**  
Treasurer



**Andrea Curatolo**  
Vice President



# LOCAL BOARD



## Meet the Local Board

### The President

HI EVERYONE! It's Elia Ghisellini here, the president of EUROAVIA Forlì-Bologna and Coordinator of the PR&EV WG for this year 2022-2023!

I joined EUROAVIA last year, but I soon got actively involved. I immediately joined the Communication WG to write articles on Instagram and on the Magazine, then I took part in two competitions promoted by EUROAVIA: the Rotathon 2021 and the Airbus Sloshing Rocket Workshop 2022.

Truly, I had no idea of the change EUROAVIA would have brought to my life in university: I rediscover my passion for aerospace, that the previous year was shimmering dimmer and dimmer. I first joined the WG as I wanted to grow my knowledge and always be updated on any activity in the aerospace field. Then I grew the need of making practical use of the notions, and so the competitions. Winning the Rotathon allowed me and my team to fly to Cologne, where I had a close experienced with the world that awaits all of us after university. There the change happened, and here I am. I am now currently involved also at international level, being part of the Grant Unit in the REC WG.

EUROAVIA is a journey, and I found many other great companions who share my vision and aspire to the same goals: to give the opportunity to open the eyes on the world after university, to rediscover the passion and to shape the person and the

future engineer the way it was dreamed of.

### The Secretary

I am Davide Como, current secretary of EUROAVIA Forlì-Bologna. I joined EUROAVIA in early 2021 and I took part to the local Communication WG later in the same year.

After one year I thought I could contribute a bit more to this AS and so I candidated for my current position.

The secretary is basically a trusted helper of the president. He shares his responsibilities, helps him and the whole Local Board in decision making and represents the AS, together with the president, in the EUROAVIA international meetings.

The secretary is also responsible of the bureaucratic documentation of the AS, in particular he drafts reports from every major meeting of the Local Board for future references.

Given my practical background I am also responsible for the major technical events of EUROAVIA Forlì-Bologna in the current business year

### The treasurer

Hello everyone!

I'm Matteo Di Giorgio, the treasurer of EUROAVIA Forlì-Bologna for this acade-





*The local board. From left to right: Davide, Elia, Matteo and Andrea*

mic

year. I became a EUROAVIA member during the first year of my degree studies in 2020 joining the EVENTS WG where I found incredible people who made me understand our association's spirit and potential. In these three years, I participated in two competitions and in one of these I flew to Colonie to receive the first prize with two of the other members of the LB, I had the opportunity to visit important companies like SITAEL and in general, I expand my knowledge in the aerospace field.

With the other members of the LB, we decided to set a high standard to propose to our AS the best and most useful activities we can organize: it became a reality thanks also to the WG coordinators that did and currently do a great job helping us in the management of the WG.

EUROAVIA is like a family to me: it's able

to create strong relationships among its members so I'm going to work to make understand all the EUROAVIANS and not the power of our association and how we can take advantage of it to improve our career possibilities.

## The Vice President

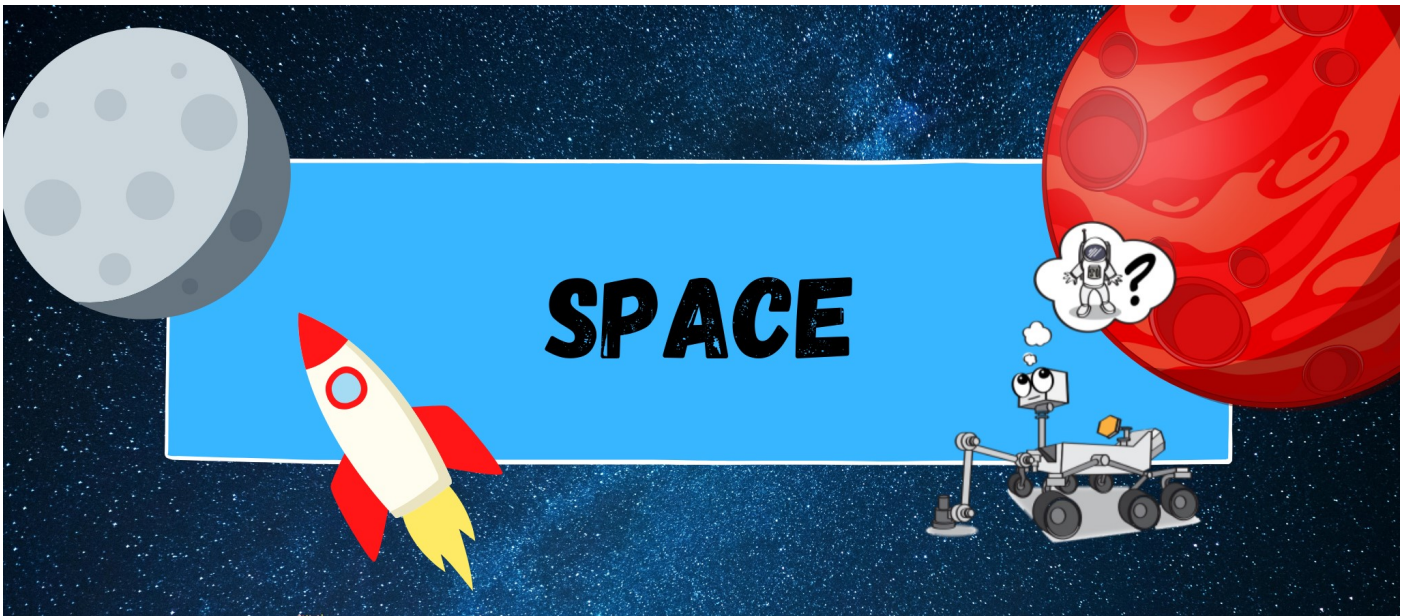
Hello dear members of AS Forlì-Bologna, I am Andrea Curatolo, 25 years old, current vice-president of EUROAVIA Forlì-Bologna and PhD student of Aerospace Science and Technology at the University of Bologna. I became a member of EUROAVIA in September 2019 and since there I have been involved in many activities. I participated in two international competitions and three congresses. I have been president of this AS and I am currently in three international WGs: Com-

munication, EUROAVIA Training System and the Regulation and European Connection WG.

This is my third year as a member of this association and I can say that during these years many things changed. AS Forlì-Bologna was only founded in January 2019 and it is very young compared to the more than 60 years old EUROAVIA. Nevertheless, it is one of the most active AS, evidenced by the fact that this year we reached second place in the AS Cup.

This fact doesn't come for granted, since after the pandemic we have seen a decrease of members participating in the AS activity. But during this year something has changed: a very motivated and passionate president has been able to bring many people on board; thanks to the work of the WG coordinators the number of people active in the Working Groups has drastically increased and we have been able to bring numerous activities for our members. I couldn't be more content with these results! Having seen the difference with my eyes I know how much it is worth and I couldn't be more hopeful for the future of our AS. So I take this chance to thank my colleagues in the LB and the people in the WG for their precious work.





## A Glimpse At Infinity

On December 25<sup>th</sup> 2021, the time was finally there, the launch of the James Webb Space Telescope. Named after one of the most influential administrators in

tirelessly to send the largest and most complex space telescope ever made into space.



*The James Webb Telescope*

the history of NASA, this new space telescope lays the foundation for a new era of astronomy. The successful launch is the result of the collaboration between NASA, ESA and the CSA (American, European and Canadian Space agencies respectively). Their scientists and engineers, spread out over more than 14 countries over the world, have worked

The James Webb Space Telescope is unique due to the way it captures images. Unlike common telescopes, it detects mainly infrared light. As a consequence of the large light-collecting area of its primary mirror and the high tech equipment on board, it can do this in a high resolution. In order to retain high quality images, the telescope needs to remain cool. For



this reason, the telescope has been placed 1.5 million kilometres from earth, in a halo orbit about the Sun-Earth  $L_2$  point. Here, it experiences minimum interference as it stays in line with the earth by orbiting around the sun, allowing the satellite to remain cool. To this end the telescope is equipped with radiators and large headshields consisting of five layers, each only as thick as a hair. These make sure the device remains below 50 K at all times. This is needed because objects with a higher temperature emit light within the same spectrum that is detected blurring the imagery.



*One of the first images captured by the JWS*

All this effort to capture infrared light has a reason. Capturing light around these wavelengths can provide a better insight in the workings of the universe. This is because infrared can pass more freely through cosmic dust, allows us to account for the red-shifted light from far away objects and provides the possibility to better study objects such as planets, which emit mostly infrared light due to their relatively low temperatures. This makes it possible to search for light coming from the first stars and galaxies formed after the Big Bang. It provides the possibility to better understand the formation and evolution of our galaxy or to study planetary systems and potentially the origins of life.

It is safe to say that whatever data is collected from the James Webb telescope, it will reveal information about the universe that was not available until now. With that information, undoubtedly, new revelations will be unearthed and the cosmos will feel more infinite yet again.



*Incredibly detailed image captured by the WJT*

## Bob Van Der Wijst

Calm, sensible and filled with laughter (when the occasion arises), his biggest passion is to discover and create. For this reason he loves to travel, cook and do science. Wherever he goes, he applies all he has learned to share the inspirations he has to others.





## From a seabird to an aircraft: AlbatrossONE

*Birds have always been an inspiration to aircraft designers, and in this new concept, this has not been an exception. In this case, Airbus has taken the albatross, a seabird known to be one of the most efficient travelers in the planet due to its wing characteristics.*

Let's first get to know a bit the **albatross**, or *Diomedei-dae* by its scientific name, it's a seabird with the longest **wingspan** when compared to other birds, it can extend up to

3.35 meters! This wingspan allows them to glide efficiently for hours without the need to flap (they can travel almost 1.000 km per day without flapping) thus, they are very energy efficient. Sadly, climate changes, slow reproduction rates, and fishing practices make the species vulnerable. In fact, 15 of the 22 albatross spe-

*cies are in danger of extinction.*

Airbus studied the gliding characteristics of the albatross for a new aircraft concept design, specifically, for the development of a new wingtip technology. The **semi-elastic hinged wingtips** developed by Airbus help the aircraft reduce drag, alleviate wing loads, increase roll-rate, avoid tip stall during

landing and counteract efficiently turbulence.

But you may ask, what are hinged wingtips?

The explanation might be obvious,

but for starters, let's in-

troduce the concept of **folding wingtips**. They are a part of the wing near the tip that folds upwards, for load alleviation. The mechanism that allows the wingtip to fold is called a hinge (like the ones on the doors). This movement may be commanded by a hydraulic or electric actuator



*Albatross showing its full wingspan*

with a worm-gear mechanism, which sets the tip to a specified fold-angle (used on the B777-X) or by **free-hinges** where the tip reacts to the wind conditions (as in the hinged rotors of helicopters). The latter was the approach taken by Airbus and would work in two flight modes: **locked** and **free**. In the locked mode, the aircraft is looking to travel more efficiently facing calm cruise conditions, while the free mode will allow improving the flight conditions during turning manoeuvres, turbulences, propulsive and others with changing wind conditions.



*AlbatrossONE prototype testing (from AIRBUS)*

The wingtips have been tested in a scaled radio-controlled aircraft model of an A321neo called **AlbatrossONE**, which showed positive results for further developments. This concept will allow the aircraft to fly more efficiently, by reducing drag and thus burned fuel leading to more sustainable aviation.

## Johan Birnie

He is a mechanical engineer who, one day, was driving in the chaotic Guatemalan traffic and, the next, was discovering Italy.





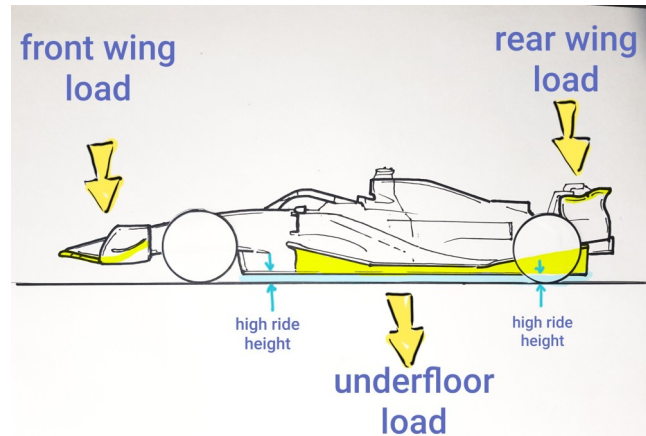
# Porpoising effect in F1

If you have seen a F1 race this year you may have asked yourself why cars are literally bouncing up and down. Why is this happening? The answer is an aerodynamic phenomenon called “porpoising”.

Let’s start from the beginning. The new regulations of this F1 season allow the engineers to project a car that enhances ground effect: the aerodynamic of the vehicle creates a depression under the car to increase downforce, which is the most important thing to achieve in order to make faster turns. This is permitted by removing the flat floor, present since 1983. In fact, the ground effect is created thanks to the geometry of the car’s floor, which acts as a Venturi tube, accelerating the flux below the car. This acceleration causes a depression, which creates the downforce. The problem with this geometry is the distance to the ground: too much and the downforce will decrease, too little and the air won’t pass under the car making the effect disappear abruptly. The last is the cause of porpoising: if the car gets too low downforce decreases making the car lift until the ground effect recovers and makes the car descend, and this movement repeats at a certain characteristic frequency, like an oscillator.

To go a little deeper into this phenomenon, aerodynamic knowledge is required. The faster the car goes, the faster the air in the Venturi tube is, so the depression increases, lowering the car and increasing the Venturi’s effectiveness, for geometrical reasons. But there is a critical speed, which is estimated to be almost 900km/h (air flow’s velocity), at which the flow detaches from the diffuser, causing an abrupt loss of depression. This is almost at the transition

speed between Venturi tube and nozzle so when the flux reaches sonic conditions, but nozzles act thanks to very high inlet pressure. Here inlet and outlet pressure are the same, so the flow is



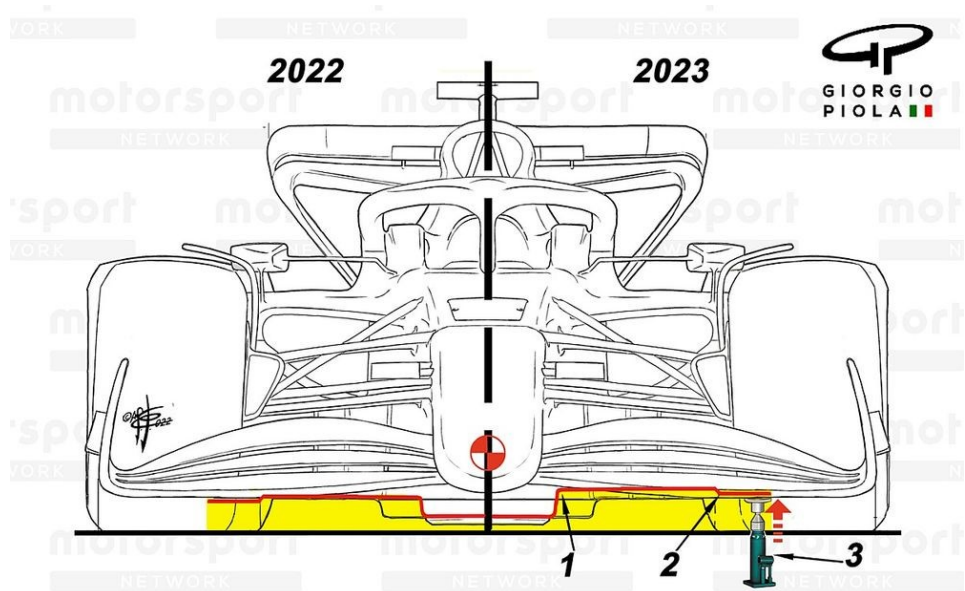
The porpoising effect

not able to reach sonic conditions and suddenly stops. Depression is very soon recovered when the car gets high enough to reduce the speed in the Venturi below the critical speed, and this cycle repeats several times.

This phenomenon is particularly bad for the car's performance if it happens during high-speed corners because in that part of the circuit, having downforce is the key to having a higher speed. On the straights, the porpoising doesn't directly damage the speed or performance of the car, but it is very annoying for the drivers because they have to brake, overtake and defend while their head is bouncing up and down. This movement is also tiring for the muscles of the back, chest and neck, which are very stressed even if there isn't porpoising. The top teams that suffered the most intense porpoising at the beginning of the 2022 season were Ferrari and in particular Mercedes. In fact, George Russell complained about

chest pain after the Emilia Romagna GP held in Imola due to the effect of suffering porpoising on the main straight for over 60 laps.

To solve this problem Formula 1 engineers implemented flaps and cuts along the side of the floor to create vortices, these are very complicated solutions and they are understandable only by CFD simulations and wind tunnel experiments. Other possible changes are increasing the ride height of the car or modifying the suspension setup, but these are not the best way to deal with porpoising because they have a negative effect on performance overall. There are also solutions that with the current regulations are not allowed like the inerter or systems with active suspensions that could reduce the bouncing of the cars effectively.



The 2023 proposals to reduce the porpoising

## Giovanni Mussoni

He loves watching films and he's a big fan of Scuderia Ferrari. He has other hobbies like mountain biking, gaming and exploring the world of economy and investing.



## Riccardo Casali

Keen on mountain sports such as ski racing but also mountain biking and hiking. The perfect holiday? A trek in the Dolomites coupled with camping with good friends.

He loves applying physics to reality and solving difficult problems. At the moment he is trying to get acquainted with the daily university routine.





# INTERVIEWS



## Interview with Paolo Tortora

Paolo Tortora is a Full Professor at the University of Bologna since 2017, carrying out his research in the field of Space Systems. His interests include small satellites and innovative spacecraft subsystems including the ground segment, and planetary exploration focusing on radio science experiments with deep space missions. Since October 2021, he is a Visiting Researcher at the NASA Jet Propulsion Laboratory, working on the LICIAcube CubeSat within the NASA mission DART.

**Professor, what is the goal of the LiciaCube Mission?**

LICIAcube (Light Italian Cubesat for Imaging of Asteroids) is a mission of the Italian Space Agency (ASI) and it is part of the NASA Mission DART (Double Asteroid Redirection Test), developed by Johns Hopkins University. Its objective is the realisation of the first full-scale test of the kinematic impact technique in the frame of planetary defence. The goal of the DART spacecraft, indeed, is a sensible modification of Dimorphos orbit, the natural satellite of the Didymos asteroid. The variation of the Dimorphos revolution period around Didymos will be



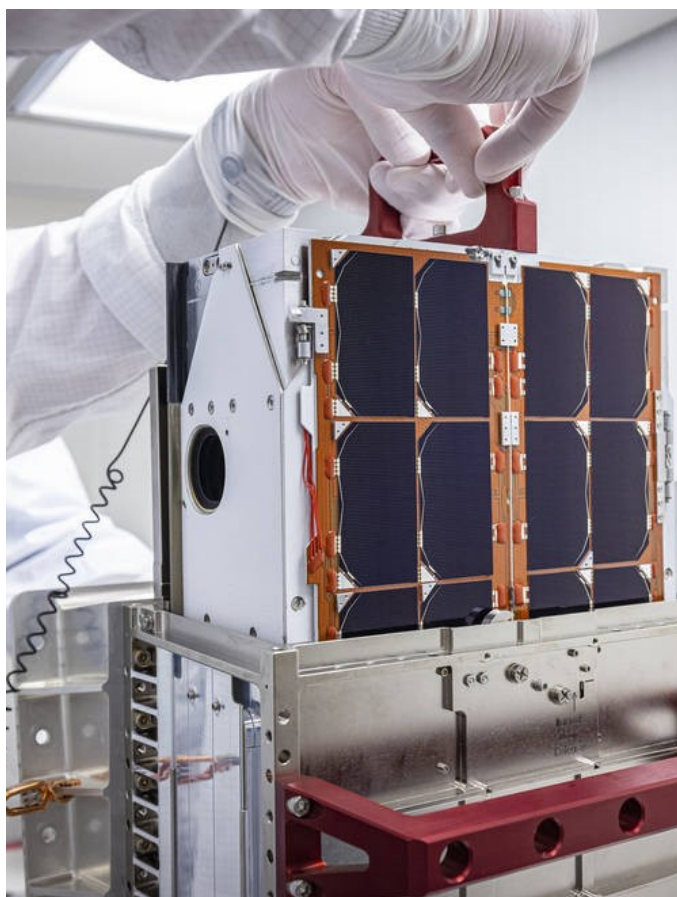
*Paolo Tortora*

measured from Earth and will provide a direct measure of the impact efficiency.

DART has been launched on the 24<sup>th</sup> of November 2021

and the LICIAcube CubeSat is hosted as a secondary payload during the whole interplanetary travel duration. It will be deployed about 10 days before the impact of DART on Dimorphos and will continue autonomously along its trajectory to be a direct witness, through the acquisition of images, of the impact.

LICIAcube has been developed by Turin Argotec company and has two instruments onboard: LEIA (LICIAcube Explorer Imaging for Asteroid) and LUKE (LICIAcube Unit Key Explorer). LEIA is a narrow field of view panchromatic ca-



*LICIACube satellite*

mera that will capture images from a long distance and with a high spatial definition, while LUKE is a wide field of view RGB camera for a multichromatic analysis of the environment close to the asteroid.

### How will the mission be carried out and why is it so important?

The mission will start with the deployment of LICIACube from its mothership DART, a few days before its impact with Dimorphos. The Didymos binary system has been chosen for its relatively close distance from the Earth ("only" 11 million km). It is made up of a primary 780 meters wide asteroid and a secondary 160 meters wide asteroid that orbits at a distance of about 1.2 km from the main one. In general, the mission is important for mainly four reasons. First of all, **LICIACube will testimony the success of the impact of DART with Dimorphos.** Second, the images that it will capture will allow the study of the cloud of debris rai-

sed by the impact, its structure and evolution are a direct consequence of the composition of the surface material of the asteroid. The images will allow the characterisation of the site of the impact on Dimorphos's surface, obtaining measures of the dimensions and the morphology of the crater. Eventually, LICIACube will be able to observe the hemisphere of the asteroid opposite to the impact and contribute to the measurements of its dimensions and volume.

### What will the role of the Radio Science and Planetary Exploration laboratory be in this mission?

A full Italian team composed of Argotec engineers and researchers from the Italian National Institute of Astrophysics, the Polytechnic University of Milan, the University of Napoli, the IFAC-CNR of Florence and the University of Bologna will lead the LICIACube operations. In particular, the activity of the University of Bologna, carried out by the Radio Science and Planetary Exploration Laboratory host in Forlì Tecnopolo through CIRI Aerospaziale, regards the determination of LICIACube's trajectory starting from the tracking data obtained by the ground stations of the NASA Deep Space Network. The LICIACube challenge is quite complex, as it requires extreme precision and advanced skills: at a distance of 11 million km from Earth, travelling at more than 6 km per second, three minutes after the impact, the satellite will modify its trajectory and use its propulsive system to do a fly-by of Dimorphos at only 50 km of distance from it.

### At the moment, is LICIACube attached to the DART mothership?

That is correct. This won't change until October, when it will be released to begin its real autonomous mission, some days before the impact of DART with Dimorphos. Some days after the launch,





*Artist's illustration of DART and LICIACube*

when the spacecraft was already distant from Earth around 2 million km, Argotec collected important telemetry data that indicate the health status of the satellite. The battery charge was confirmed to be on its nominal value and all temperature values were aligned with those obtained by the CubeSat development team.

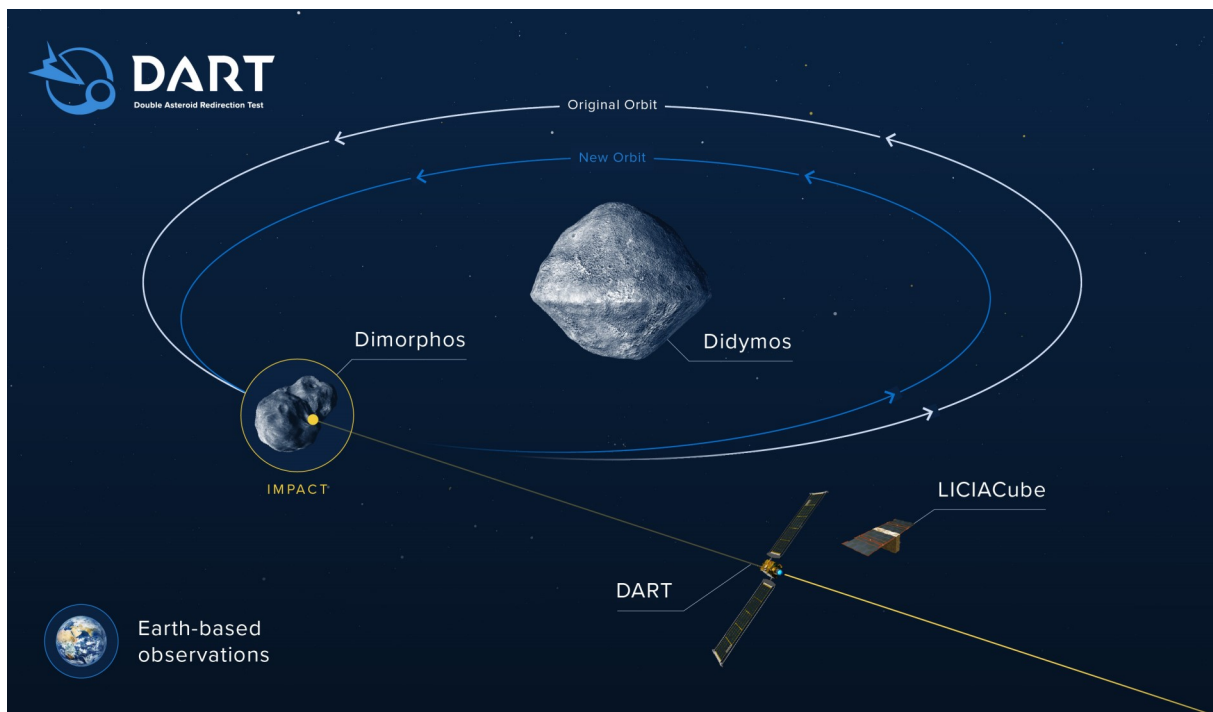
**In the next years, you will get back in the game with the HERA launch.**  
**What is it about?**

Indeed, our involvement does not stop with DART and LICIACube but we are heavily involved in HERA too, a new spacecraft that will be launched by the European Space Agency (ESA) in October 2024. After reaching the Didymos binary system in December 2026, HERA will perform the complete characterisation of the asteroid, analysing, in particular, the crater generated by the DART impact. Two small CubeSats will travel onboard with HERA and, once released, they will fly over the asteroid's surface. Within this mission, I hold the Instrument Lead role

of the Radio Science experiment that will measure the mass, the gravity field and the dynamics of the Didymos binary system. HERA experiments use not only the radio link between the mothership and the ESA ground station antennas, but also, for the first time ever, an innovative transceiver system between the mothership and the CubeSats. The extraordinary accuracy of the measurements of the relative velocity between the different satellites (about 50 microns per second over a minute time scale) will permit the estimation of the mass and gravity field of Didymos and Dimorphos with very high precision.

**How was your passion for aerospace research born?**

During high school, I developed the idea of enrolling to a scientific faculty and I was passionate about space. I was not completely sure if I was interested more in the scientific aspects or in the technological ones, so both astrophysics and engineering were viable solutions. Then, a little bit by chance as often happens, I



*Illustration of DART mission*

chose the engineering faculty since some friends from school chose that too. I studied aeronautical engineering at Sapienza University in Rome and, during my university years, I came closer to the study and exploration of space. I then completed a PhD in Aerospace Engineering, focusing on the frontier of deep space mini/micro-satellites, now under development. Today, after 20 years of service in the technological hub of Forlì, I am sure I have done the right choice.

## Andrea Curatolo

Space passionate, he wants to contribute to make humanity a multi-planetary species.

In his free time he practices sports and reads books. He's interested in personal development and continuous learning.

He won't refuse an evening spent in company.







## CYCLING DIARY: *WHEN CINEMA GOES INTO SPACE!*

*“There is one thing that I have always met along my bike trips, and I am not referring to the wild dogs attacking me (even if that happens frequently). It is instead a thematic which always appears wherever I go, regardless of the dogs: the space! Where will I cycle today? In the “Atelier des Lumières” in Paris!*

The history started at the beginning of April 2022 when I thought: “Why not cycle in France?”. So I crossed the Alps, without any elephants, just with my heavy bicycle, then the volcanoes of Massif Central and after the Loire river. The Loire is close to Paris, very famous for its gorgeous castles, that hosted illustrious people, such as Leonardo da Vinci. When I was cycling through the Loire’s castle, I discovered that my friend Christian, a German guy that I met in København, on a previous bike trip, was heading to Paris. I wrote to him to hang out and he invited me to a temporary exposition about space, in a sort of cinema. Of course, I could not say no for two reasons: first, it is always amazing to meet old friends around the world, and second I found a topic to write about in the EUROAVIA magazine!

The show was planned for 9 PM, we met at the entrance of the building, we joined in the “Atelier” and the main wide room welcomed us. To enjoy the exposition you had to walk around this big empty and dark room. If you turn left your head the-



*Atelier des Lumières entrance*



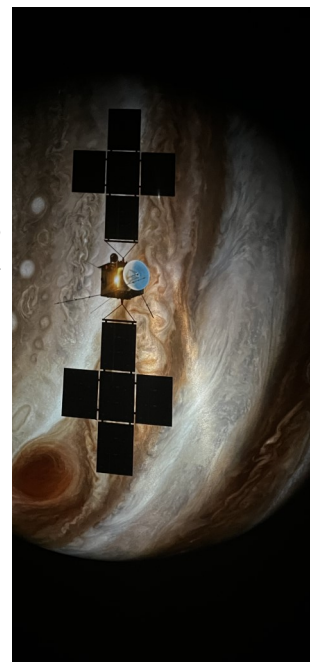


*Interior of the Atelier des Lumières*

re is a terrace, in my opinion, the best place to admire the show! Now move your eyes in the opposite direction, your attention will be caught from a cylindrical structure where you can find a smaller room. The projection was about to begin and in a couple of seconds, the whole room and even the floor will be covered by lights, lights in the shape of movies. In the beginning, the walls were covered by a lot of old televisions from the 60s, where were transmitted the highlights of the conquest of the Moon including the launch of Saturn V, the celebrations at the Johnson Space Centre and even Neil Armstrong's footprint on the Moon. In the meantime "Gimme Shelter" from "The Rolling Stones" (one of my favourite songs) played in the background. I do not know if it was a full immersion journey in those moments of history or just a psychedelic trip in your mind. To myself, the second one happened and I am still here! After this stunning intro, it was time to go into the space. An Ariane rocket from European Space Agency was ready to take off with us. The engines of the rocket were ignited, the countdown started: 3... 2...1 and it took off! As the rocket was lea-

ving its platform, the area below the rocket and even the floor were filled with fume and we found ourselves in space. Pictures of the Earth elaborated by satellites have been shown highlighting climatic areas and meteorologic maps. Then the architecture of the satellite was shown as well, making you feel the sensation that you were designing it. Then we explored the solar system! Sitting on the terrace we looked at the Sun, the floor was covered by the Sun's corona. It was the best spot to cry "the floor is lava!" It would have been very funny to see people's reactions.

Do you remember the small cylindrical room? We moved even there. This place is an exception inside the Atelier. In-



*Picture of a satellite around Jupiter*



*Asteroid picture of  
Rosetta mission*

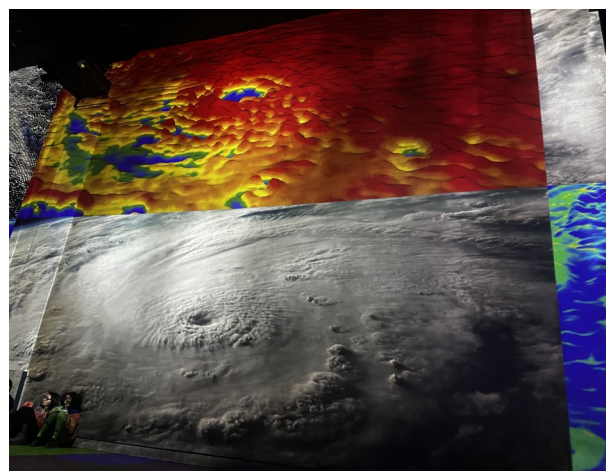
deed, the movie was projected on the ceiling and to look at it you have to lie down, that is what we did for the rest of the show. We left the Sun, a famous David Bowie song started, we approached the next planet, pictures from the latest expeditions were shown, an amazing spectacle of this alien world. If

you guess the song, are you wondering if there is “Life on Mars”? A barrier in the journey appeared, like the Alps on my way from Italy to France. Now we are in the “mountain pass” between the internal and external solar system. “Rocks” were between us, you are now approaching the other side, but let’s enjoy first our Asteroid belt. On the other side the panorama changed, two giant planets were our next and last destination in our dear solar system. From the “Great Red Spot” of Jupiter to Saturn’s rings and now “to infinity and beyond”! Now it is the moment of those marvellous “debris” of stardust called nebulae. Then let’s explore some of our neighbour galaxies. Not happy, take a small piece of space, zoom on it, take a long exposition photo and we got a Hubble Deep Space picture, an amazing shot full of galaxies! This universe is amazing we are nothing in comparison to it, we have just started to explore physically our system, and there are still many steps to do. To go further, we also need some he-

roes like astronauts, to which the last image of the movie was dedicated.

That was my journey on a space trip directly from Paris!

P.S. I were not bitten by any dog and to enjoy more the experience, you MUST eat a Paris Brest!



*Two images from a meteorological satellite*

## Francesco Pio Marasco

My name is Francesco and I am an explorer of everyday life. By pursuing the discovery of nature's best landscapes and panoramas, I adventure around the world with my bicycle or climb rocks of any type on my path.





# EAG 2022 Report

I would like to share my journey to the greatest or rather the largest Aerospace student games of all time. It was the European Aerostudent Games (EAG) 2022 held in ENAC (École nationale de l'aviation civile) at the hub of the Aerospace Industry in none other than Toulouse, France. The event was a 4-day



packed schedule of different competitions in sports from 7<sup>th</sup> to 10<sup>th</sup> April. I arrived in the afternoon of the first day of the event after a long bus journey from Milan. Firstly, ENAC is a very big campus with different buildings for lectures, sports as well as for accommodation. And I was the first one to arrive there so while exploring the campus it kind of felt like I was in an abandoned small city. First I completed my check-in as a player as I was participating in Table Tennis. I still remember what the organizers had told me that time, "You are very brave to come alone and as the only player from the University of Bologna". At that time I didn't understand what exactly he meant by that but later I did, as I found myself among over 1000 players and supporters. To sum up about 13 universities from 5 different nationalities came to the competition. Some universities had about 200 players and supporters. It was really overwhelming for me and to be honest if someone had told me about the numbers before, then I wouldn't have gone

there as the only player. But I am glad that no one did tell me because then I would have missed such a great experience in such a multi-cultural environment. As the first day went on, more and more people showed up and before I knew it there was a music battle where each university with their jerseys, flags and bands took the centre stage in showing their school spirit and support. This was the first time I saw a band playing and it was an exciting moment for me. I also joined in the dance with all the other school parties. Then the opening ceremony started in the Gymnasium where all of these performances were moved. This was followed by cheerleading performances by different schools. And finally, we kicked off the Aerostudent games with badminton. The day ended and after dinner at the university cafeteria, I moved to the hotel that they had booked it for me. It was a nice hotel and most importantly I was given a double room only for me which was extra nice.

The next day started with all sorts of games like football, volleyball, rugby, basketball, handball, tennis, you name it and they had the sport. It was really enthralling to watch all of these universities compete against each other and not to mention the supporters with the bands cheering for every single point. I spend the morning and



afternoon shuffling among the different fields and enjoying the action. For lunch, they had organized different food trucks where you can take anything according to your taste. I also met the guys from Sapienza Universita di Roma. Honestly, after meeting them it felt like I was at home. Maybe I am becoming used to Italians!! We shared some fun moments and a game of volleyball. In the evening I had my match of table tennis. It

was against ISAE SUPAERO. Not to mention I lost the opening round and my tournament was short-lived. At night there was a

party at a club. As usual, it was a blast especially it being a Fluo one. Being out of the tournament and having experienced every sport I went to the city of Toulouse the next day and it was really beautiful. First I went to the “Le Capitot”. It was magnificent, and it was made extra special by a sea of people from Toulouse who suddenly came out of nowhere and did a peaceful rally with music. I wish I could have shared the video. It’s worth a watch. Then I went to the Basilique Saint-Sernin de Toulouse. It is said to be the largest Basilica in the Romanesque style in Europe. It was yet again made extra special as I found a

picture of Mother Teresa inside the basilica and I am from Calcutta. Then I also visited Couvent des Jacobins and Pont Neuf. I would certainly say the view from Pont Neuf is breathtaking. On the final day of the event, there was an award ceremony for the winners of each category. It was mostly dominated by ENAC. No matter, they have such a huge sports facility for different kinds of sports. After the award ceremony, I had

to bid adieu to the few friends I had known for the past few days. I went on to the central bus station where

I caught a bus back home. It was certainly a great experience all in all from the games to sightseeing. I definitely want to participate next year also but this time with a group of people from our University so that they can also experience such a wonderful adventure.



## Mayuk Das

He's very quiet and an active listener . He's a huge football fan, one of the main reason he came to Italy. He likes to listen to music, to travel and see new places. One of his biggest aim is to travel all the European Countries.

He tries to solve problems by looking into unique solutions and using creativity. Right now he's trying to get used to the new Italian culture, traditions as well as cuisine.





# EVENT REPORTAGES

## EMEAC 2022

The EMEAC is the Electoral Meeting EUROAVIA Congress and this year took place in Bucharest from the 27th of March to the 1st of April. Two representatives of our association participated and had the responsibility to vote for decisions that affect the future of the association at an international level. They also had a delegated vote from AS Paris, whose representatives couldn't attend the congress.

In this type of congress the most important moment is the election of the Delegated International Board (DIB) members. There are also bylaw proposals that need to be discussed and voted, presentations of all the AS, AM and the Working Groups. In the EMEAC, PAS and PAM might have the opportunity to become AS or AM respectively by letting the congress vote to decide if they fulfill the requirements.

But the congress is just about voting and discussing bureaucratic stuff, in the congress there are moments in which representatives can share new ideas to make EUROAVIA a better association and at the end of the final day there is also a presentation about inside jokes created during the days of congress. During these days of congress representatives have fun

with other activities like parties, visiting the host city and having dinner together, in fact the congress is a great opportunity to get to know other members of EUROAVIA from all around Europe and to create useful connections between local groups.

In the 2022 edition Irina Stoican and Chiara Pennuti were elected as DIB, but the International Board needs at least 3 members, so an extra Electoral Meeting was approved and scheduled a day before the AMEAC in October in Napoli to elect all the new members for the IB. Regarding the bylaws, some changes to the corporate identity and other small corrections that made the bylaws clearer were accepted. The local groups that were accepted in the EMEAC were Kayseri, Gaziantep and Izmir as PAS (Prospective Affiliated Society) and Zewail City as PAM (Prospective Adjunct Member, denomination for local groups that are out of geographical Europe defined in the bylaws).

There were also two main open discussions: the geographical borders of where a local group is considered AS and not AM, and the change of the legal address of EUROAVIA. The latter led to the creation



of a task force to evaluate the different options and decide the best countries where the legal address could be moved. An extra online congress will take place on the 18th of June to make a decision on the address issue.

Congresses, as described before, are not only about deciding the future of EUROA-VIA (which is super important!), but also about connecting with fellow EUROA-VIAns from other local groups around Europe!

## **Giovanni Mussoni**

He loves watching films and he's a big fan of Scuderia Ferrari. He has other hobbies like mountain biking, gaming and exploring the world of economy and investing.



# AS Dresden Fly-In 2022

Have you ever visited Dresden, Germany? If not, you should! From the 8th - 12th of May I had the opportunity to stay in this beautiful city to take part in the Fly-In organized by the fantastic EUROAVIA Dresden group.

Over the course of four days, we relished the beauty and history of Dresden, which is famous for having been almost completely destroyed during World War II and then rebuilt as good as new, while retaining its splendor. Together with the Dresden group and other young people from various parts of the world, including Greece, India, Austria and Turkey, we entered the world of aviation and logistics.

First, we met companies and partners, from which we learned about the field of research they are active in. These included Rolls-Royce, which is working on cutting-edge technologies to ensure safe and clean solutions for the planet's energy needs; DLR, which is the Federal Republic of Germany's research centre for aeronautics and space, and the Technical University of Dresden (TUD), which presented us the research projects they are working on and they let us test their airline flight simulator.

In the field of logistics and aviation, we visited the DHL HUB LEIPZIG, the most important cargo hub in the area. The visit was planned at night, to get into the pulse of a classic shift at the hub and into the core of one of the largest logistics companies in the world.

Finally, we visited EFW, a German aerospace manufacturing company, where we had the opportunity to watch engineers and technicians building and servicing cargo and passenger planes.

They were full days full of knowledge and fun that ended with a dinner in one of the most beautiful restaurants in Dresden's downtown and that will forever remain etched in my memory, along with the people I met.

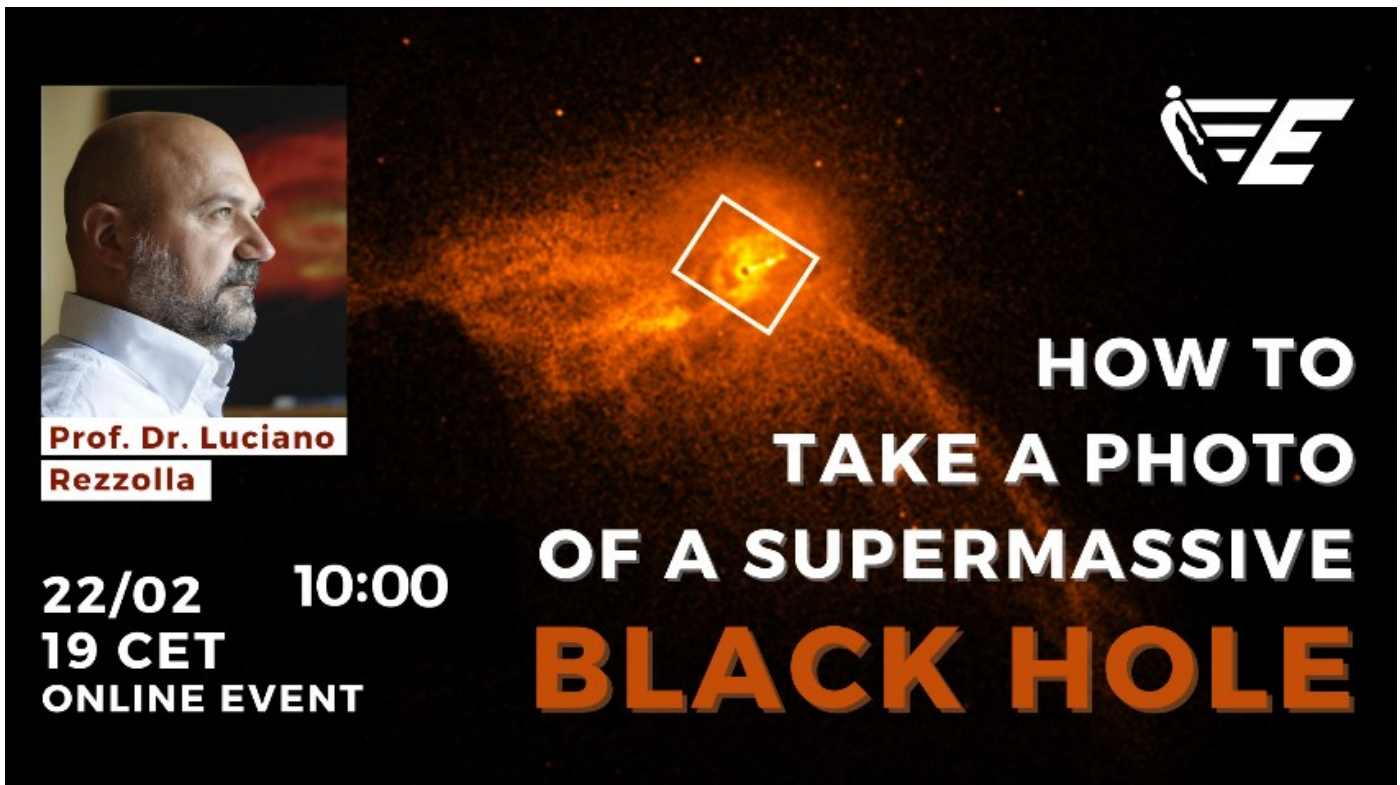
*So what are you gonna do now? Are you going to Germany?*

## Laura Borrelli

Passionate about books and nature, to find her peace would spend a solo-weekend in the mountains, reading and walking. She loves physics and she's keen on space questions.



# How to take a photo of a supermassive black hole with Prof. Dr. Rezzolla



**Prof. Dr. Luciano Rezzolla**

**22/02 10:00**  
**19 CET**  
**ONLINE EVENT**

**HOW TO  
TAKE A PHOTO  
OF A SUPERMASSIVE  
BLACK HOLE**

On the week where lessons started for the new semester here in Forlì, EUROAVIA Forlì-Bologna didn't miss the opportunity to bring a great online conference call with Prof. Dr. Luciano Rezzolla, who gave spoke about "How to take a Photo of a Supermassive Black Hole."

Prof. Dr. Rezzolla is an astrophysicist and director of the Institute for Theoretical Physics (ITP) from the Goethe Universität in Frankfurt. He is member of the Executive Board of the collaboration Event Horizon Telescope. He has been nominated Andrews Professor of Astronomy at the Trinity College of Dublin. His research has been focused on Black Holes, and he was part of the group who took the first photo of a supermassive black hole published back in 2019.

The conference was divided in three main parts: observations, theory, and comparison of the imaging of a supermassive black hole, which is located in M87, an

elliptical galaxy in center of Virgo cluster. The observation of the black hole was accomplished thanks to the VLBI (Very Long Baseline Interferometry) technique, which uses telescopes located in different locations in earth to create a virtual radio telescope which allows to capture the wavelength emitted by the black hole.

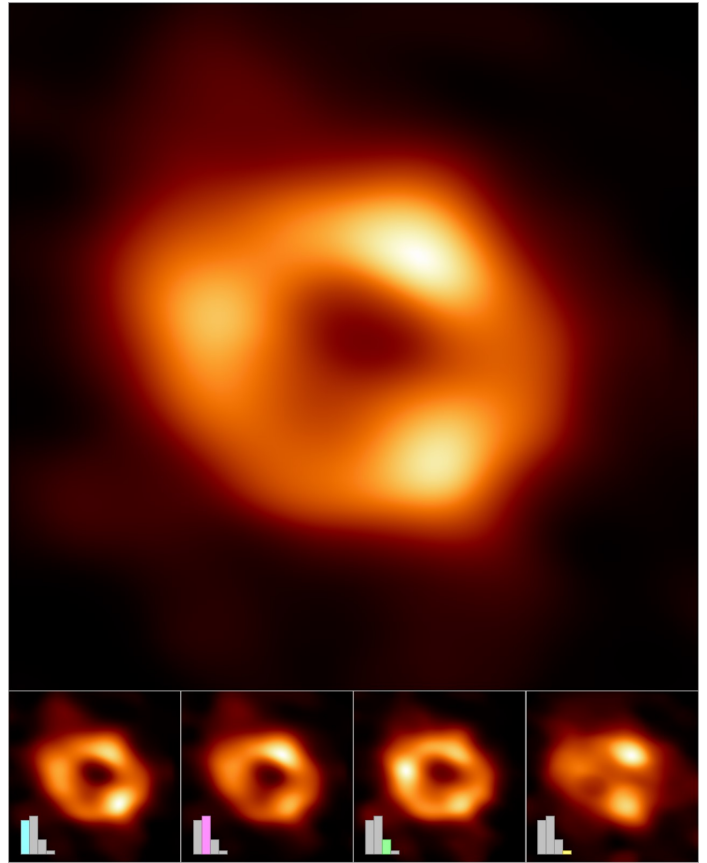
While the theoretical part looks to describe the plasma dynamics based on General Relativistic Magnetohydrodynamics (GRMHD) simulations, which describes how plasma falls into a black hole; understanding how this plasma looks like in terms of light with raytracing. Finally, a library of simulations were compared with the observations to describe the properties of the black hole captured.

During the conference, Dr. Rezzolla mentioned during the conference that the research team was looking into a supermassive black hole in our galaxy, called Sagittarius A\* and they were hoping to show



the results before summer. And on May 12th, the first image of Sagittarius A\* was published and covered the front pages from news all over the world.

It was an honor to have Prof. Dr. Rezzolla, who gave us an amazing view of blackholes and what's coming next on the field.



## Johan Birnie

He is a mechanical engineer who, one day, was driving in the chaotic Guatemalan traffic and, the next, was discovering Italy.



# OpenFOAM Workshop

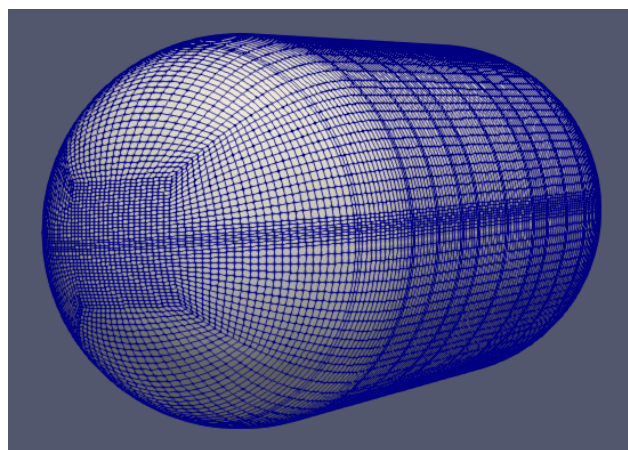
The Airbus Sloshing Rocket Workshop has already started and two teams from our association, EUROAVIA Forlì-Bologna, are participating. We organized an OpenFOAM Workshop to provide the teams some tools which might help them model the sloshing phenomenon in tanks. Sloshing means the movement of water inside tanks, which causes forces affecting aircraft and rocket's stability, so the goal of the competition is to reduce sloshing to obtain a smoother flight.

OpenFOAM is a free and open-source CFD software, this means that everyone can access its source code, which is written in C++ language, and develop the program or simply modify one to satisfy one's needs. Unfortunately, it is not that simple, since it is a very powerful software with applications that range from complex fluid flows involving chemical reactions, turbulence and heat transfer, to acoustics, solid mechanics and electromagnetics. It even has some financial libraries!

The workshop was given by Raoul Andriouly, a PhD student at the University of Bologna. His lessons were very useful, introducing the participants to OpenFOAM's world. We can call it "world" because of its characteristics: there is not a proper user guide, just some official tutorials and the documentation of the C++ libraries. It's their users who contribute to the documentation on how to use the software by writing in forums or making tutorials (which are super useful for beginners).

Using OpenFOAM is a challenge, but it's very satisfying once you learn the basics. A range of possibilities opens in front of you, and you can control the solver much more closely and precisely than you can do with commercial programs.

The workshop was divided into three online lessons. In the first Raoul introduced us to icoFoam, a simple solver participants used to simulate the common lead-driven cavity phenomena.



The second lesson was about interFoam, which allows multiphase simulations, the ones we needed to simulate sloshing. In the last lesson the participants learned how to launch simulations in parallel (so on multiple cores of the processor) and how to import mesh from various mesh software.

At the end of the Workshop the participants had the basic knowledge to perform fluid dynamics simulations, and the participants of the ASRW had tools to set-up their simulations. One of the members of the team stated that the workshop was very useful, since the team succeeded in performing the simulations and for them it was very satisfying. Our association is always looking to offer great experiences (like this one) to its members, so don't forget to participate in our next workshop!

*Riccardo Casali*

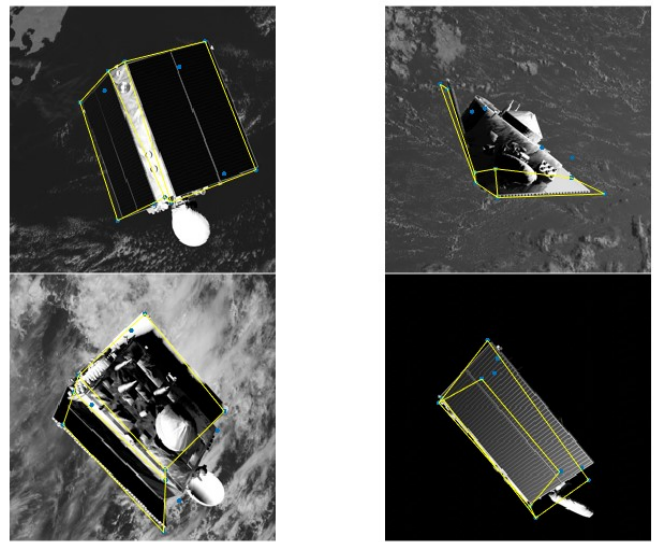
# Machine Learning for Space Applications

The **Machine Learning Workshop** in collaboration with **MathWorks** ambassadors Alessandro Lotti and Raoul Andriulli was held on Saturday May 14<sup>th</sup> at the Fabbrica delle Candele in Forlì. The participants not only had the opportunity to learn new things on MATLAB but also win prizes from EUROAVIA Forlì-Bologna and MathWorks.

The first part of the workshop consisted of a brief introduction to **deep learning and neural networks**, which are the base of machine learning. The whole workshop was focused on building neural networks for two main applications: classification of **remote sensing** images and estimation of a **satellite's pose**.

On the first exercise the participants had the opportunity to learn how to build, train and check a neural network, that, from an image data set containing runways, farmland, sea, snow, mountains, forest, deserts and city buildings could classify the images into these categories.

On the second exercise, since participants have already learned the base of machine learning, it became a competition! The competition consisted of deve-



loping a pose estimation algorithm taking advantage of neural networks. The participants should build/train and test their neural network based on the Sentinel Pose Data set to obtain the satellite's pose (position and orientation) and compare it with the real pose. The participant that had the smallest error was crowned the winner!

It was great to organize this event together with the MathWorks ambassadors, and we hope that in the future more amazing workshops like this one are organized!

*Johan Birnie*

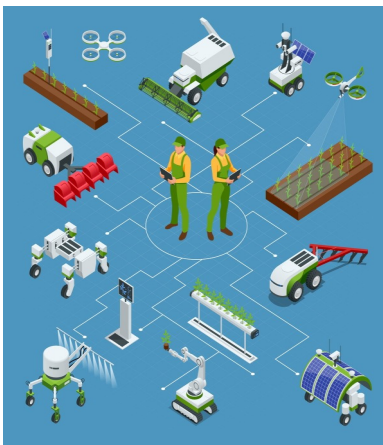






# COLLABORATIONS AND PARTNERSHIPS

## The School of Disruption



*Promotional post for  
webinar*

SIDI – Swiss Institute for Disruptive Innovation – is an organization founded in 2015 by Andrea Basso and Pietro Veragouth, together with a group of researchers, developers, entrepreneurs, and innovators. Some may see it just as an e-learning platform, others instead may identify it as a source of knowledge and a twisting point in their search for opportunities. SIDI makes available for you, as an individual, online courses and webinars on specific topics for detailed studies through the so called School of Disruption, but the Innovation Lab holds the important role of supporting companies in their technological innovation with research projects meant to use disruptive

technologies in new markets. Moreover, soft skills as well don't go overlooked thanks to the Think Tank.

“To disrupt” means “to cause significant change in an industry or market by means of innovation”. This perfectly resumes the vision the founders have of what SIDI should be: an institute that aims to turn future threats into opportunities through the use of technology and the spread of knowledge.

Thanks to the effort of the three Italian Local Groups (AS Pisa, AS Napoli and AS Forlì-Bologna), who first made contact with SIDI, all EUROAVIAns now have the opportunity to be part of the school of disruption with special discounts! You could learn about space architecture, space biology and disruptive innovation technologies, but also AI, VR and AR and so much more.

Disruption can now run through the veins of all EUROAVIAns!

### Elia Ghisellini

When in need of good vibes, give him a call. He loves laughing, reading and enjoys Nature and always wants to come up with a wierd philosophical view of common everyday happenings.



## Copia e incolla

A special thank to Copia & Incolla, who allowed us to print this magazine. They are our partners when something has to be put on paper, showing high levels of professionalism.

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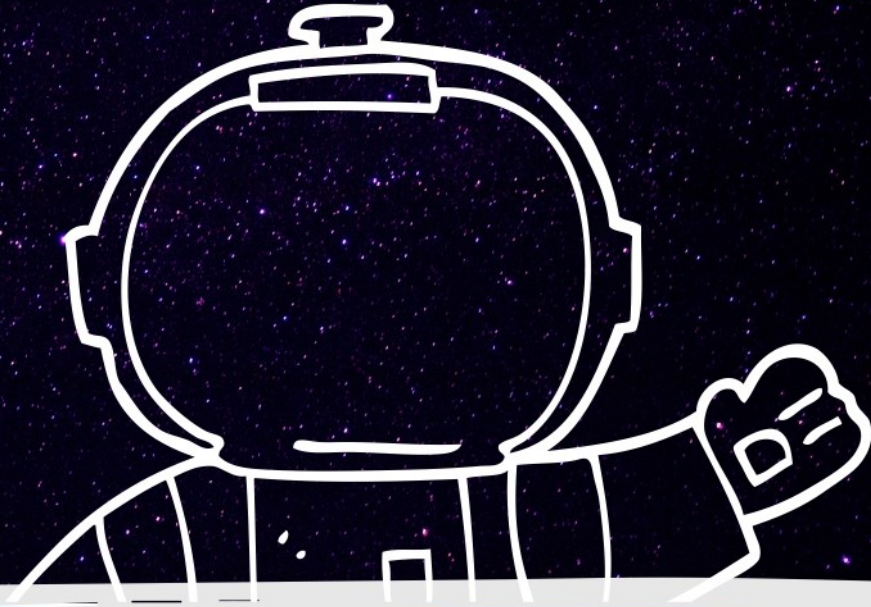






EUROAVIA FORLÌ-BOLOGNA

*wishes you  
a Merry Christmas*



*and a happy New Year*

