10th | European CubeSat Symposium

Welcome to the 10th European Cubesat Symposium!

Prof. Bénédicte Escudier   Davide Masutti

On behalf of the CSUT (Centre for nano Space systems at the University of Toulouse), VKI (Van Karman Institute for Fluid Dynamics) and ISAE-SUPAERO, it is our pleasure to extend a warm welcome to everyone attending the10th edition of the European Cubesat Symposium.

This event was possible thanks to the joint efforts of ISAE-SUPAERO, VKI and members of the CSUT.

We would like to thank Professor Michel Bousquet, Chair of the Technical Committee who prepared an exciting technical programme with high quality speakers and Matthieu Compin, Chair of the Organizing Committee for his great support together with the organization team at ISAE-SUPAERO.

Prof. Bénédicte Escudier, ISAE-SUPAERO

Davide Masutti, VKI, 10th ECS co-chair

Prof. Michel Bousquet

The objective of this Symposium is to present trends and innovations together with return of experience in all fields relevant for cubesats.

Another very important goal is to strengthen the links for academic interchange and research cooperation.

The European Cubesat Symposium has already become a prominent forum, where students, researchers and professionals openly exchange ideas, discuss and compare research and experimental results and report progress in the exciting and growing area of nanospace.

The response to the call for papers has been excellent in terms of numbers, diversity, countries of origin and last but not least quality of the abstracts. Considering the time available and with the wish to avoid parallel sessions, 55 abstracts for oral presenation and 12 abstracts for poster presentation been selected to be included in the Technical Programme.

There are 10 session topics reflecting the diversity of the proposed abstracts:
- Scientific Missions
- Subsystems and Technologies
- Design Concepts and Tools
- Launch Vehicle and Cubesat Deployment
- Flight Dynamics and Attitude & Orbit Control
- Communication Subsystems
- Communication Experiments
- Ground Segment
- Scientific Instruments
- International Cooperation

We hope these technical sessions constitute a very attractive technical programme for both industry and academia, and will help you obtain better insights into the latest trends and directions in the field.

The poster sessions are organized in the exhibit area where you will have the opportunity to see cubesat related products and to meet active players from industry, organizations and academia.

The technical programme also features keynote speeches who will highlight the state-of-the art advancements from different perspectives.

Finally, the outstanding aerospace environment of Toulouse offers a chance for a series of technical visits.

Many individuals and organizations contributed to the success of this Symposium. Thank you everyone who has contributed to the technical program, the authors and speakers who are providing the impetus to put together this outstanding technical programme, the session chairs, the persons involved in the organization of the technical visits, the exhibitors, not to forget the local organization committee. Special thanks to our keynote speakers. We greatly value their participations and look forward to their insightful vision and thoughts.

We hope that you will enjoy the technical program, as well as the overall experience of attending the 10th European Cubesat Symposium in the aerospace city of Toulouse!

Prof. Michel Bousquet, Technical Chair

08:00 **Welcome @ Main Gate of ISAE-SUPAERO**

09:00 OPENING O. LESBRE, B. ESCUDIER & D. MASUTTI

09:15 Keynote Speaker M-A. CLAIR (CNES)

09:45 SPACE MISSIONS - Chairs D. Masutti (VKI) and B. Escudier (CSUT)

N. Andre (IRAP) - Europa Plume Investigation by CubeSat (EPIC)
S. Nevens (Royal Meteorological Institute of Belgium) - SIMBA, Measuring the Earth's Radiation Budget
A.H. Jallad (American University of Ras Al-Khaimah) - Design of MeznSat, a 3U CubeSat for GreenHouse Gas Monitoring

10:35 POSTER SESSION - COFFEE BREAK

P. Petit (IRAP) - The CUTE Small Satellite Mission
J. Navarro (ASTRE) - Tolosat: a CubeSat for GNSS-r altimetry and IRIDIUM relay demonstration

11:00 SPACE MISSIONS - Chairs S. Corpino (PoliTo) and B. Escudier (CSUT)

T. Cang (IRAP) - Infrared CubeSat-type Photometric Follow-up of SPIRou Legacy Survey
L. Fergrieve (University of Alberta) - Ex-Alta 2: An Earth Observation CubeSat for the Study of Wildfires
R.F. Garcia (ISAE-SUPAERO) - Can we Estimate Air Density of the Thermosphere with CubeSats?
D. Masutti (VKI) - QARMAN
R. Votta (CIRA) - The First IPERDRONE Mission: ISS Inspection, Rendez-Vous and Deorbit Capabilities
V. Petrov (SINP MSU) - "Universat" Constellation as Integration Point for Scientific Nanosatellite Missions.

12:40 LUNCH

13:45 SPACE MISSIONS - Chair S. Corpino (PoliTo)

D. Mimoun (ISAE-SUPAERO) - ENTRYSAT, a 3U CubeSat to Study Atmospheric Reentry
A. Ressouche (ISAE-SUPAERO) - EYESAT: a Student Triple CubeSat for Astronomy

14:15 CUBESAT SUBSYSTEMS & TECHNOLOGIES
Chairs V. Broun (HELP) and C. Chalumeau (CSUT)

E. Halliwell (University of Alberta) - Low-Cost, Open-Source Customizable CubeSat Solar Panels
R. Bannatyne (VORAGO Technologies) - Radiation Hardened Solutions for CubeSats
E. Toson (T4i) - REGULUS Electric Propulsion Module In-Orbit Demonstration
L. Herrero (COMAT) - Plasma Jet Pack (PJP) Technology Overview
F. Marmuse (Ecole Polytechnique) - IonSat: integrating an Ion Thruster in a 6U CubeSat

15:30 POSTER SESSION - COFFEE BREAK

V. Broun (HELP) - Description of secondary payload of upcoming educational OUFTI-2 1U CubeSat for testing a new multilayer shield for protecting electronics against space radiations
D. Falguère (ONERA) - A Universal Space Environment Radiation monitor for CubeSats

16:00 CUBESAT DESIGN CONCEPTS & TOOLS
Chairs G. Palmerini (Uni La Sapienza) and F. Apper (CSUT)

S. Vega Martinez (UFSC) - Nanosatellite Energy Harvesting Estimation Combining Thermal-Computational and Electric-Analytical Models
P. De Saqui Sannes (ISAE-SUPAERO) - Use of SysML and Model-Based System Engineering in the Development of the Brazilian Satellite VCUB1
D. Sors Raurell (Open Cosmos) - Simple-i: Simple innovation to Design Missions and Support the Development of Space Technologies
C. Lowe (SoXSA) - Mission, System, and Operational Analysis Tool for CubeSats
F. Dreger (ESA/ESOC OPS-G) - Flight Dynamics Operations and Mission Analysis Support for CubeSats
S. Damkjar (University of Alberta) - Platform for Rapid Radiation Testing of CubeSat Subsystems in Particle Accelerator Beam Lines
J. Zhang (Northwestern Polytechnical University) - A Modular CubeSat Concept for On-Orbit Assembly on the Space Station

18:00 *Shuttle Buses to Welcome Reception*

18:30 WELCOME RECEPTION
21:30 Cité de l'Espace

08:00 Lecture Amphitheater 4 - Registration

08:30 Keynote Speaker A. VALLET (ITU)

09:15 LAUNCH VEHICLES & DEPLOYERS
Chairs S. Tirley (RoketLab) & G. Roux (CSUT)

A. Frenea-Schmidt (PLD Space) - ARION 2: The European and Reusable Microlauncher for Small Satellites
M. Bailey (Rocket Lab) - Opening Access to Orbit for Small Satellites
R. Hague (Skyrora) - The development of the Skyrora Launch Vehicle System
B. Perry (Virgin Orbit) - LauncherOne: Responsive & Flexible Launch for CubeSats
G. Grommers (Airbus Defence and Space Netherlands) - Secondary Payload Structure (SPS): Qualification of the European Solution for a 'Plug- In' Small Satellites Carrier for Piggy-Back on Light Launch Vehicles
S. Roemer (Astro) - Driving factor on CubeSat Deployer Designs for New Low-cost Launcher Business

10:35 POSTER SESSION - COFFEE BREAK

B. Segret (ESEP) - Trajectory Propagator for a Deep-space CubeSat
G. Islas Lopez (U of Würsburg) - First evaluation of a set of Spin Control algorithms applied to a Picosatellite equipped with Magnetic Torquers and Reaction Wheels
H. Evain (CNES) - Design and Tests of a New Attitude Control System using Nano-Control Moment Gyros in a Parabolic Flight Campaign

11:00 Flight Dynamics & AOCS - Chairs G. Palmerini (Uni La Sapienza) & L. Inguere (CSUT)

V. Koryanov (Bauman Moscow State Technical University) - The Study of the Spatial Motion of a Small Spacecraft with a Solar Sail
C. Louembet (LAAS-CNRS) - Spacecraft Rendez-vous Control: a Predictive Strategy and Hardware-in-the-loop Demonstrator
F. Viaud (CNES) - GNC Validation Process for the High Performance 3U Nanosatellite EyeSat
M. Rizwan (Aalto University) - Design of Integrated Magnetorquer for Attitude Control of Nanosatellites

12:05 LUNCH

13:15 Keynote Speaker M. MARGERY (EC)

13:45 COMMUNICATION SUBSYSTEMS - Chairs A. Duverdier (MESRI) & N. Humeau (CSUT)

N. Capet (ANYWAVES) - Compact S-band and X-band Antennas for CubeSats
S. Jarrix (IES) - Ni and Cu Cased Shape Memory Alloys for CubeSat Antennas
P. De Saqui Sannes (ISAE-SUPAERO) - Graphene-Based Ka Band Tunable Antenna for Nanosatellites Applications
M. Tekin (STM) - RF Analysis Inputs for Antenna Accommodation in PİRİSAT Mission
C. Whaits (Cape Peninsula University of Technology) - The Design of a High Efficiency S-Band Inverse Class-F Power Amplifier for a CubeSat

15:00 POSTER SESSION - COFFEE BREAK

G. Tavares (INESC-ID) - A Compact ADS-B Receiver for a 1U CubeSat
T. Kale (TUM) - Low Power Optimization for Sensor Data Processing on CubeSats

15:30 GROUND SEGMENT & COMMUNICATION EXPERIMENTS
Chairs A. Duverdier (MESRI) & T. Gateau (CSUT)

P. Brochet (ENAC) - Nanosatellite Activities at ENAC: the TETX Receiving Ground Station and the EYESAT Mission Control Center
F. Apper (ISAE-SUPAERO) - Real-time Command and Control of Nanosatellites
E. Kerstel (University of Grenoble CSUG) - NanoBob: Quantum Communication Using a CubeSat
L. Barros (IMT Atlantique) - A Watermarking Like Scheme for 1U CubeSat Communications

17:00 Technical Visits

Shuttle Buses to Conference Dinner

18:30 CONFERENCE DINNER
22:30 Le Manoir du Prince

08:00 **Lecture Amphitheater 4 - Registration**

08:30 **Keynote Speaker - F. TESTON (ESA)**

09:00 **Scientific Instruments - Chairs M. Barthelemy (CSUG) & N. Nolhier (CSUT)**

P. Devoto (IRAP) - Development of a Low Energy Threshold Particle Detector and Application to CubeSats
B. Lavraud (IRAP) - AMBRE: a Compact Instrument to Measure Ions, Electrons and Electrostatic Charging On-board Spacecraft
A. Kohfeldt (IDEAS) - Radiation Detector and Spectrometer suitable for CubeSats
H.K. Fang (National Cheng Kung University) - Miniaturized Solar Extreme Ultraviolet Probe for CubeSat Missions
A. Fedorov (IRAP) - CubeSat Oriented Instrument for Detection of Energetic Neutral Atoms Generated in the Earth Magnetosphere
C. Palla (Imperial College) - MAGIC on RadCube: Design and Development of a Miniaturised Magnetometer for Space Weather Monitoring

10:35 **POSTER SESSION - COFFEE BREAK**

C. Viallon (LAAS-CNRS) - A Nanosatellite Optoelectronic Payload Dedicated to Radiation-Induced Degradation Measurement in Erbium-Doped Fiber
R. Mathon (IRAP) - AMBRE: overall resource savings for embarkation on nano- and cube-Sats.

11:00 **Scientific Instruments - Chairs M. Barthelemy (CSUG) & N. Nolhier (CSUT)**

A. Michel (ONERA DOTA) - Urban Heat Islands Monitoring with 12 U HESTIA mission: a Thermal Infrared Multispectral Camera
D. Mildenberger (University of Alberta) - Compact Extended Range VIS-SWIR (0.4 – 2.2 um) CubeSat-based Multispectral Imager
L. Feruglio (AIKO SRL) - Convolutional Neural Network for autonomous on-board image analysis
M. Nohmi (Shizuoka University) - Development of Pico Telescope CubeSat "Stars-AO"

12:40 **LUNCH**

13:45 **International Cooperation**
Chairs D. Masutti (VKI) & M. Bousquet (ISAE-SUPAERO)

D. Masutti (VKI) - QB50
A. Palun (Innovative Solutions in Space) - An international collaboration for Scalable Earth Observation CubeSats
A. Rustem (Istanbul Technical University) - İTÜ-SSDTL CubeSats and International Cooperation
C. Lissina (University of Alberta) - Ex-Alta 1 CubeSat

Round Table: Cubesats Trends & Challenges ; International Cooperation
Moderator: P. de Selding (Space Intel Report)

Participants (TBC):
I. Belokonov (Samara University)
P. Brudieu (French Ministry of Higher Education, Research & Innovation)
D. Masutti (VKI)
N. Multan (NEXEYA)
P. Revillon (Euroconsult)
F. Teston (ESA)

15:30 **Closing - D. MASUTTI & B. ESCUDIER**

von KARMAN INSTITUTE FOR FLUID DYNAMICS

CSUT
Centre Spatial Universitaire de Toulouse
Space innovation, together

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Institut Supérieur de l'Aéronautique et de l'Espace
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