



**A
Symposium
on Noise from
UASs/UAVs
and eVTOLs**

QUIET DRONES

19 – 21 October 2020

**Paris,
France**

an e-Symposium

PROGRAMME Updated 18th October 2020



Supporting Organisations

This Symposium is organised by INCE/Europe in association with CidB.

It is supported by the
International Institute of Noise Control Engineering
and is endorsed by the
International Commission for Acoustics
and as such it is one of the events in the
International Year of Sound

In France it is supported by
the **Ministry for the Ecological Transition**,
the **French Directorate-General for Civil Aviation (DGAC)**
the **French Aerospace Lab (ONERA)** and
the **French Airport Pollution Control Authority (ACNUSA)**.



Sponsoring companies :



To register: www.quietdrones.org

OVERALL PROGRAMME

The programme for the symposium will consist of an opening session (Session 1) and nine more technical sessions at which authors will make presentations. At the end of Sessions 2 to 9 there will be a discussion centred round the session topic at which authors will be encouraged to take part. They will each last for one and a half to two and a half hours.

The Opening Session will consist of introductions from INCE Europe, CIDB, International INCE and Year of Sound. After that there will be three key presentations. We are keen that delegates from all time zones will be able to view the opening session before they see the rest of the symposium and with that in mind the whole session will be recorded so that, as well as being available from the symposium opening at 09:00 on Monday it will also be available to delegates in the Americas between 18:00 and 20:00 on Sunday evening.

There will also be "Conversation" sessions which will be informal and where you are invited to join in the conversation on a particular topic with the leaders of the conversation.

Sunday 18th October

18:00 - Prepeat of Opening Session for Delegates in the Americas

Monday 19th October

09:00 - *Session 1* - Opening Session

11:30 - *Conversation* - Come and meet the other delegates - 1 - Jean Turret and Dick Bowdler

14:30 - *Conversation* - Come and meet the other delegates - 2 - Jean Turret and Dick Bowdler

16:00 - *Session 2* - Assessing Noise and its Impact on People and Environment **16:00**
- *Session 7* - Acoustic Detection and Identification of Drones

Tuesday 20th October

09:00 - *Session 3* - Specific Noise concerns with packages and deliveries

09:00 - *Session 8* - Drone Audition - Listening with Drones

11:30 - *Conversation* - Mirjam and Roalt brainstorm about Drones - Mirjam Snellen and Roalt Aalmoes

14:30 - *Conversation* - Nathan and Andy's Drone Noise Listening Party - Andrew Christian and Nathan Green

16:00 - *Session 4* - Standardisation and Regulations

Wednesday 21st October

09:00 - *Session 5* - The impact of urban air mobility

09:00 - *Session 9* - Noise generation and mitigation - 1

11:30 - *Conversation* - What's the point of a remote conference? - Andy McKenzie and Dick Bowdler

14:00 - *Session 6* - Tools for measurement, analysis, prediction and control

16:00 - *Session 10* - Noise generation and mitigation - 2

SESSION 1 : OPENING SESSIONS

Sunday 18th October 18h00-19h30 and Monday 19th October 09h00-10h30

Welcome Address: *INCE-Europe, CIDB, International-INCE and International Year of Sound*

Introductory Lectures:

A summary of the 2018 Workshop on UAS and UAV Noise Emissions and Noise Control Engineering Technology in Washington, DC, National Academy of Engineering.

Robert Hellweg
(Technology for a Quieter America Workshop Steering Committee)

USA

Will Noise become a new Hurdle which could impair the development of Drones

Carine Donzel
(DGAC) and
Henry de Plinval
(ONERA)

FRANCE

Drone Noise, a new public health challenge?

Antonio Torija Martinez
(University of Salford)

GREAT
BRITAIN

SESSION 2 : Assessing Noise and Noise Impact on People and Environment

Monday 19th October 16h00-18h00 (session in parallel with session 7)

Session chaired by : **Patricia Davies** (Purdue University, USA)

Dick Bowdler (Ince-Europe, GB)

European Union legislation on managing noise from drones and e-VTOL	Marco Paviotti (European Commission)	EUROPE
Multi-rotor powered drone noise assessment	Xin Zhang (Hong Kong University of Science & Technology)	CHINA
Aeroacoustic measurements on a free-flying drone in a WindShaper wind tunnel	Roberto Putzu (Univ. Applied Science Geneva)	SWITZERLAND
Assessment of environmental noise characteristics of innovative aerial vehicles	Raphael Hallez (Siemens Digital Industries Software)	BELGIUM
Towards the Incorporation of Auditory Masking Effects into Assessments of Community Noise	Andrew Christian (NASA Langley Research Center)	USA
Methods for Providing Design Guidance to Improve Drone Sound using Community Input	David Bowen (Acentech)	USA
A whole-systems approach to building knowledge about human reaction to drones	Charlotte Clark (ARUP)	GREAT BRITAIN

Discussion : *Is the impact of drone noise on people different from other noise?*

SESSION 3 : Specific Noise Concerns with Packages and deliveries

Tuesday 20th October 09h00-11h00 (session in parallel with session 8)

Session chaired by : **Marion Burgess** (UNSW, Australia)
Andy McKenzie (Hayes McKenzie, GB)

Drone delivery and noise regulation in the Australian context

Marion Burgess
(UNSW)

AUSTRALIA

Delivery Drones at La Poste

Philippe Cassan
(DPD group / La Poste)

FRANCE

Commercial Delivery Drone Routing: A Case Study of Noise Impacts

Eddie Duncan
(RSG)

USA

Acceptance of drone delivery is limited (not only) by noise concerns

Hinnerk Eißfeldt
(DLR German Aerospace Center)

GERMANY

Discussion (with the participation of Wing Australia): Does the Impact on people depend on what is being delivered?

SESSION 4 : Standardisation and Regulations

Tuesday 20th October 16h00-17h30

Session chaired by : **Christopher Roof** (US Department of Transport / VOLPE, USA)
Jean Turret (Ince-Europe, France)

Research to Support New Entrants
to Public Airspace and Aircraft
Noise Certification

David Read / Christopher Roof
(U.S. Department of Transporta-
tion / Volpe)

USA

EU Drone Regulation

Nicolas Eertmans
(European commission)

EUROPE

ANSI/ASA Standards Activity on
Measurement of UAS Noise

Robert Hellweg
(Hellweg Acoustics)

USA

Noise requirements of Unmanned
Aircraft due to European Regula-
tion 2019/945

Michael Wieland
(UAV DACH e.V)

GERMANY

Noise pollution must be
approached with as much
attention as the issue of safety

Francis Truchetet
(ACNUSA)

FRANCE

Discussion : *Should noise from drones be regulated at the European level?*

SESSION 5 : The Impact of Urban Air Mobility

Wednesday 21st October 09h00-11h00 (session in parallel with session 9)

Session chaired by : **Roalt Aalmoes** (Royal Netherlands Aerospace Centre NLR)
Franck Cléro (ONERA, France)

Recommendations for research on the Noise impact of drones in an urban environment	Roalt Aalmoes (Royal Netherlands Aerospace Centre NLR)	NETHERLANDS
MOSQUITO Project : a fast estimation approach for urban acoustic environment	Franck Cléro (ONERA / DAAA)	FRANCE
From Helicopters to quiet eVTOLs : A manufacturer's perspective	Julien Caillet (Airbus Helicopters)	FRANCE
Noise considerations for designing Skyport Networks	Rohit Goyal (Uber Elevates)	USA
Achieving quiet flying passenger vehicles through numerical simulations, a LBM story	Wouter van der Velden (Dassault Systems)	GERMANY
Assessment of the environmental impact of drone noise in virtual flights	Siyang Zhong (Hong Kong University of Science & Technology)	CHINA

Discussion : Vehicle technologies, UAM operations

SESSION 6 : Tools for Measurement, Analysis, Prediction and Control

Wednesday 21st October 14h00

Session chaired by : **David Herrin** (University of Kentucky, USA)
François-Xavier Bécot (Matelys, France)

Sound Localisation of Drones
using an Acoustic Camera

Pablo Alloza
(GFAI Tech GmbH)

GERMANY

Scanning Laser Vibrometer measurements for assessing the origin of structure borne sound in drones

Florent Deux
(Polytech France)

FRANCE

UAS Sound Level Prediction using Panel Contribution Analysis

David W. Herrin
(University of Kentucky)

USA

Active Noise Cancellation of Drone Propeller Noise through Waveform Approximation and Pitch-Shifting

Ashwin Ashok
(Georgia State University)

USA

Exploring Noise reduction for fixed wings UAV

Michael J. Kingan
(University of Auckland)

NEW
ZEALAND

SESSION 7 : Acoustic Detection and Identification of Drones

Monday 19th October 16h00-18h00 (session in parallel with session 2)

Session chaired by : **Lucille Pinel-Lamotte** (MicrodB, France)

Martin Blass (Joanneum Research Forschungsgesellschaft, Austria)

Introduction Anti-Drone Solutions	Lucas Le Bell (Cerbair)	FRANCE
UAV detection from acoustic signature: requirements and state of the art	Lucille Pinel-Lamotte (MicrodB)	FRANCE
A Real-Time System for Joint Acoustic Detection and Localization of UAVs	Martin Blass (Joanneum Research Forschungsgesellschaft)	AUSTRIA
Flight path tracking and acoustic signature separation of swarm quadcopter drones using microphone array measurements	Gert Herold (Technische Universität Berlin)	GERMANY
UAV's localization from a microphone array by exploiting the harmonic structure of the sound produced	Torea Blanchard (LAUM / Le Mans University)	FRANCE
Two Dimensional Convolutional Neural Network Frameworks Using Acoustic Nodes for UAV Security Applications	Theoktisti Marinopoulou (Centre for Research and Technology Hellas / Information Technologies Institute - CERTH/ITI)	GREECE

Discussion: *Drone localisation and identification*

SESSION 8 : Drone Audition - Listening to Drones

Tuesday 20th October 09h00-11h00 (session in parallel with session 3)

Session chaired by : **Antoine Deleforge** (INRIA, France)
Makoto Kumon (Kumamoto University, Japan)

Drone Audition for Search and Rescue: Datasets and Challenges	Antoine Deleforge (INRIA Nancy)	FRANCE
Development of surface-processed low-noise propeller for search and rescue tasks with drone audition	Kotaro Hoshiba (Kanagawa University)	JAPAN
Proposal of Cognitive Drone Audition based on Cognitive Dynamic Systems	Hiroshi Okuno (Waseda University)	JAPAN
3D Sound Source Tracking for Drones Using Direction Likelihood Integration	Taiki Yamada (Tokyo Institute of Technology)	JAPAN
Signal-to-Noise Ratio Enhancement Method for Improving Sound Source Detection of Drone-mounted Phased Microphone Array	Yeong-Ju Go (Chungnam National University)	SOUTH COREA
Advances in Sound and Speech Signal Processing at the Presence of Drones	Oliver Jokisch (Leipzig University of Telecommunications)	GERMANY

SESSION 9 : Noise Generation and Mitigation - 1

Wednesday 21st October 09h00-11h00 (session in parallel with session 5)

Session chaired by : **Young-Min Shim** (Dotterel Technologies, New-Zealand)
Julien Caillet (Airbus Helicopters, France)

Aeroacoustic study of small propellers with Serrated Trailing Edge for a quieter drone

Paolo Candeloro
(UniCusano)

ITALY

Interpolation based acoustic transfer function for drone noise simulation

Hanbo Jiang
(Hong Kong University of Science & Technology)

CHINA

Experimental Investigation of Contra-Rotating multi-rotor UAV Propeller noise

Ryan S. McKay
(Dotterel Technologies)

NEW
ZEALAND

Multi-scale morphological effect on noise level and frequency characteristics of drone propellers

Ryusuke Noda
(Kyoto University)

JAPAN

Drone Noise and the Influence of Support Structure

Simon Watkins
(RMIT)

AUSTRIA

Experimental Investigation of Noise Characteristics of Rotors

Koichi Yonezawa
(Central Research Inst. of Electric Power Industry)

JAPAN

Discussion: *Blades optimization, rotor/structure interaction, multirotors*

SESSION 10 : Noise Generation and Mitigation - Part 2

Wednesday 21 October 16h00-18h00

Session chaired by : **Tiziano Pagliaroli** (UniCusano, Italy)
Julio Cordioli (University of Florianopolis, Brazil)

Experiments on UAV rotor noise at low Reynolds and low Mach numbers

Hélène Parisot-Dupuis
(ISAE-SUPAERO / Toulouse)

FRANCE

The Sound of the Drone Uprising' An Exploration into the Aero-acoustic Performance of Drone Blades

Josephine Nixon
(London South Bank University)

GREAT
BRITAIN

Experimental Investigation on Acoustics and Efficiency of Ducted Electric Rotors

Ronja Koenig
(Robert Bosch GmbH)

GERMANY

On the design of acoustic liners for drone ducted fans

Julio Cordioli
(University of Florianopolis)

BRAZIL

Chaotic and wavelet aeroacoustic analysis of twin rotors for drone propulsion

Tiziano Pagliaroli
(UniCusano)

ITALY

CFD-CAA approach for sound generation and propagation in the UAV propeller with subsonic flow

Sergei Timushev
(Moscow Aviation Institute)

RUSSIA

Discussion: *Blades optimization, rotor/structure interaction, multirotors*