





## 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.

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### *Sunday 18th October*

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

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### *Monday 19th October*

**09:00** - *Session 1* - Opening Session

**16:00** - *Session 2* - Assessing Noise and its Impact on People and Environment

**16:00** - *Session 7* - Acoustic Detection and Identification of Drones

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### *Tuesday 20th October*

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

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

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

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

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### *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 use 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

*Opening Presentations : INCE-Europe, CIDB, International-INCE et International Year of Sound*

### Opening Presentations :

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

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**Drone delivery and noise regulation in the Australian context**

**Marion Burgess**  
(UNSW)

**AUSTRALIA**

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**Delivery Drones at La Poste**

**Philippe Cassan**  
(DPD group / La Poste)

**FRANCE**

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**Commercial Delivery Drone Routing: A Case Study of Noise Impacts**

**Eddie Duncan**  
(RSG)

**USA**

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

**Hinnerk Eißfeldt**  
(DLR German Aerospace Center)

**GERMANY**

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**Discussion : *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

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

Discussion



## 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

**Michael Narine**  
(Georgia State University)

USA

Exploring Noise reduction for fixed wings UAV

**Michael J. Kingan**  
(University of Auckland)

NEW  
ZEALAND

Discussion

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

**Discussion : Drone localisation and identification**

## SESSION 8 : Drone Audition - Listening 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	<b>Antoine Deleforge</b> (INRIA Nancy)	FRANCE
Development of surface-processed low-noise propeller for search and rescue tasks with drone audition	<b>Kotaro Hoshiba</b> (Kanagawa University)	JAPAN
Proposal of Cognitive Drone Audition based on Cognitive Dynamic Systems	<b>Hiroshi Okuno</b> (Waseda University)	JAPAN
3D Sound Source Tracking for Drones Using Direction Likelihood Integration	<b>Taiki Yamada</b> (Tokyo Institute of Technology)	JAPAN
Signal-to-Noise Ratio Enhancement Method for Improving Sound Source Detection of Drone-mounted Phased Microphone Array	<b>Yeong-Ju Go</b> (Chungnam National University)	SOUTH COREA
Advances in Sound and Speech Signal Processing at the Presence of Drones	<b>Oliver Jokisch</b> (Leipzig University of Telecommunications)	GERMANY

**Discussion : Drone Audition**

## 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 :**

## SESSION 10 : Noise Generation and Mitigation - 2

Wednesday 21 October 16h00-18h00

Session chaired by : **Tiziano Pagliaroli** (UniCusano, Italie)  
**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