



# Overview of community noise annoyance research: New trends in Community Reaction in Europe and in the USA

*Uwe Müller (DLR)*





## Outlook

- Survey of research projects on aircraft noise effects in the last 5 years in the EU member states (+ Norway/Switzerland)
- FAA Civil Aviation Noise Policy and Roadmap in the United States
- WHO initiative to update Environmental Noise Guidelines for the European Region
- Appendix: More detailed descriptions of the studies on aircraft noise effects in the last 5 years in the EU member states



# Survey of research projects on aircraft noise effects in the last 5 years in the EU member states (+ Norway/Switzerland)





## 2009 - 2015

**Health**

6.8 M€

+

? k€

(+ 1.8 M€ Switzerland)

**Annoyance**

3.1 M€ +  
(3 k€ Norway)

**Metrics**

1.8 M€

**Sleep**

1.0 M€

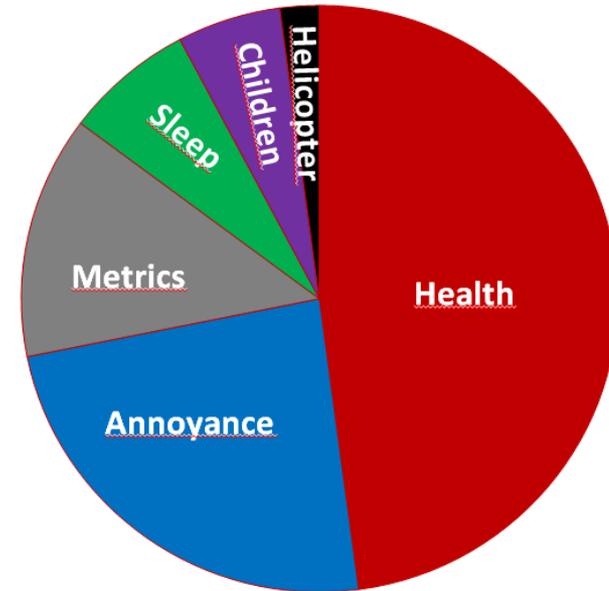
**Children**

800 k€

**Helicopter**

300 k€

=====



13.8 M€

+

? k€

(+ 2.1 M€ Norway and Switzerland)

<b>Health</b>	<b>Sleep</b>	<b>Sound Quality</b>	<b>Helicopter</b>
<b>Annoyance</b>	<b>Metrics</b>	<b>Children</b>	



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Datei Start Einfügen Entwurf Übergänge Animationen Bildschirmpräsentation Überprüfen Ansicht Add-Ins Acrobat

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36 37

Foliensortierung "template session 2" Deutsch (Deutschland) 66%

More detailed information on the studies: see Appendix of this presentation



The following countries were involved in the EU-FP7 Project COSMA  
(Community Oriented Solutions to Minimise aircraft noise Annoyance)

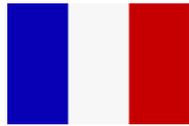
2009-2013



Budget WP2 « Annoyance Examinations »: 2.2 M€



Belgium



France



Germany



UK



Hungary



Italy



Sweden



The Netherlands



## The following countries were involved in the EU-FP6 Project MIME (Market-based Impact Mitigation for the Environment)

2007-2010

Budget: 2.6 M€



Belgium



France



Germany



UK



Norway



Spain



The Netherlands



# FAA Civil Aviation Noise Policy and Roadmap in the United States



# Review of Civil Aviation Noise Policy in the United States

Presented to: ICBEN

By: Rebecca Cointin, FAA

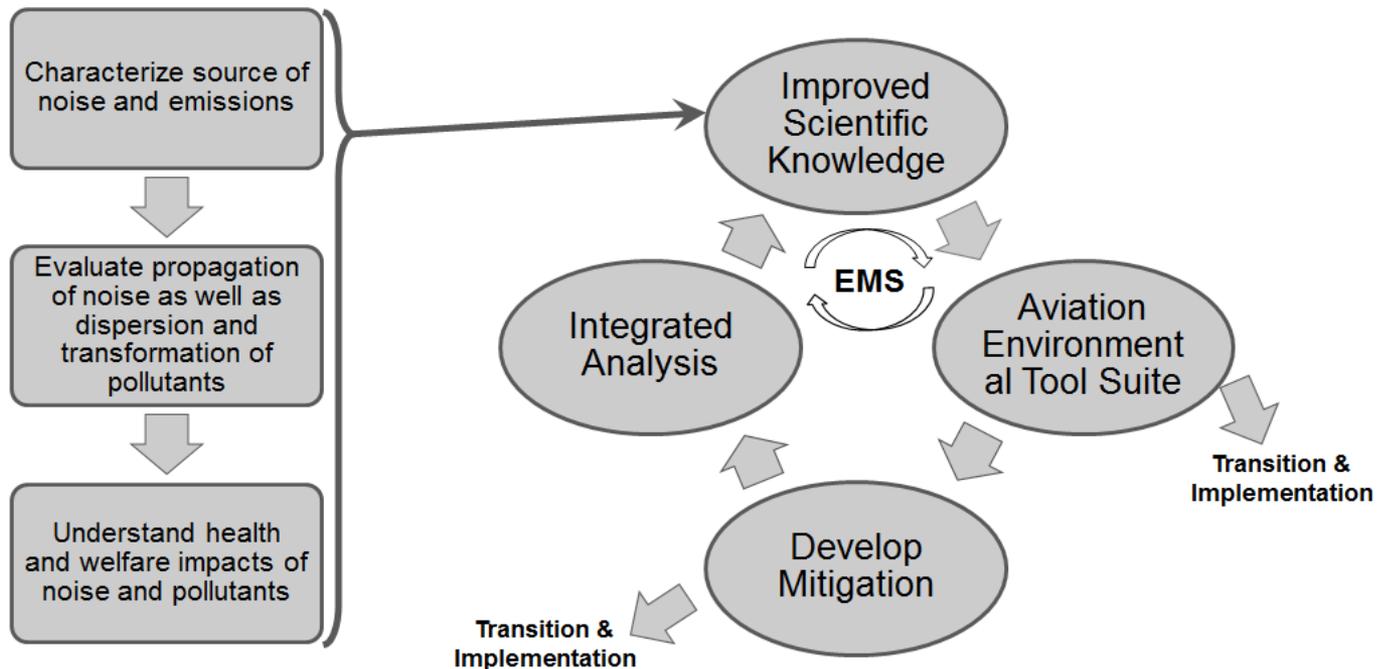
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## Goals: Resolve key questions related to impacts of civil aircraft noise & provide sound data to inform policy

### Research Framework: Knowledge, Tools, Mitigation, Analysis & Implementation



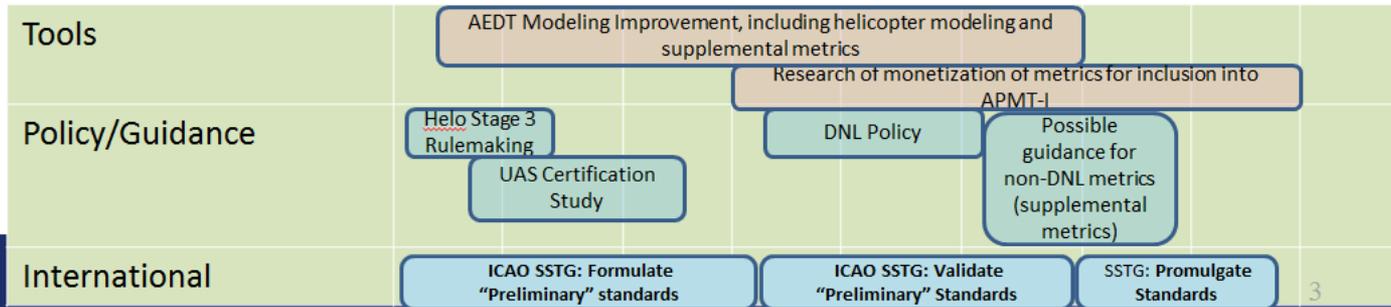
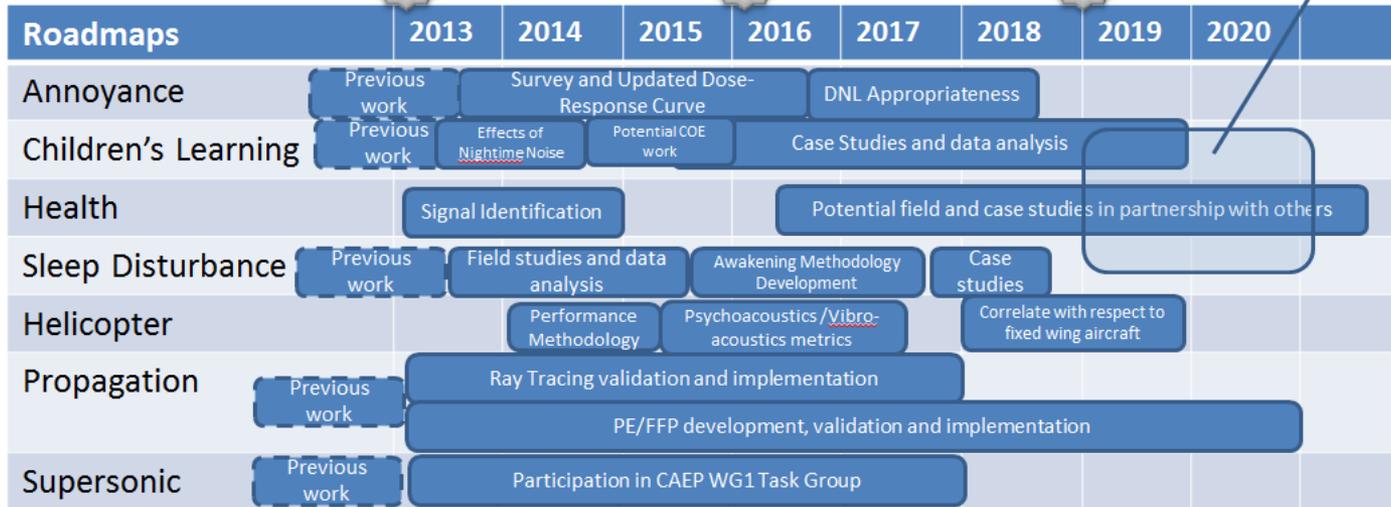
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# FAA Noise Research Roadmap

Is there a metric besides DNL we should continue to pursue?





# FAA Noise Research Roadmap

Roadmaps	2013	2014	2015	2016	2017	2018	2019	2020
Annoyance	Previous work	Survey and Updated Dose-Response Curve		DNL Appropriateness				
Children's Learning	Previous work	Case Studies in schools and data analysis						

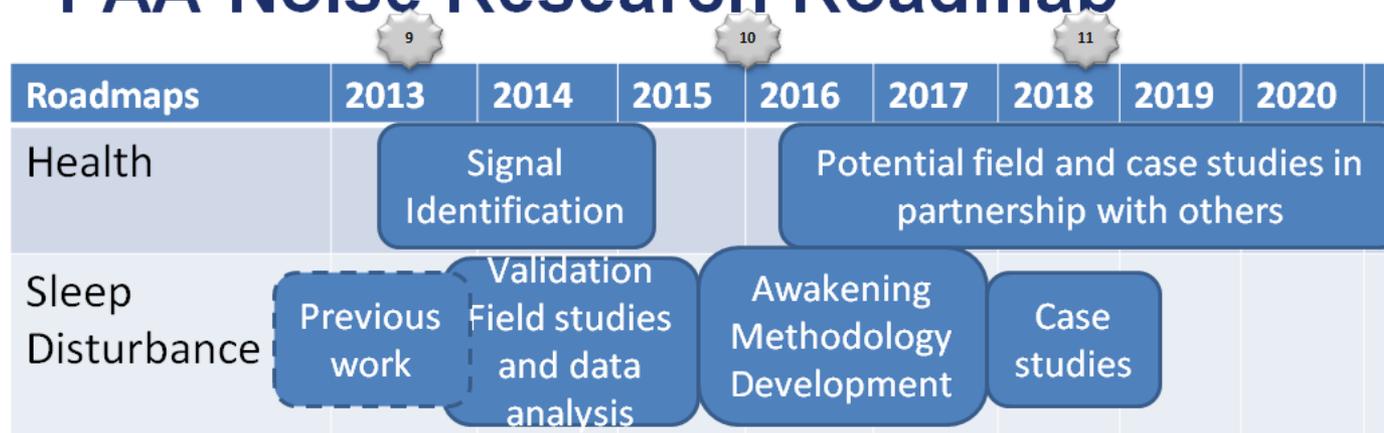
- **Annoyance**
  - DNL 65 dB appropriateness through social surveys
  - DNL Appropriateness
- **Children's Learning**
  - Benefits of sound insulation of schools to test scores
  - Case study of reactions in classrooms of aviation noise
  - Exploration of the appropriate metric to measure the noise associated with children's learning



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# FAA Noise Research Roadmap



- **Health**
  - Further exploration of link between aviation noise and cardiovascular disease in the elderly
- **Sleep Disturbance**
  - Development of methods for conducting field studies to study the impact of aviation noise on sleep
  - Pilot field study to test such methods



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# Thank you

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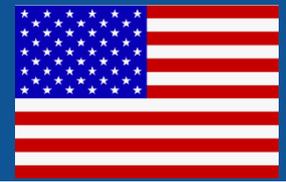
**Katherine Andrus**

**James Hileman, PhD**



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**ACRP - Annoyance studies** and updating the exposure-response curve for annoyance („Schultz curve“) - there will be surveys at 20 civil U.S. airports served predominantly by jet aircraft, 2014–2016.

**Sleep studies** - FAA currently funding a pilot study at Philadelphia airport (University of Pennsylvania in cooperation with DLR), 2013-2015. Further studies intended.



# WHO initiative to update Environmental Noise Guidelines for the European Region



**Acronym:** *WHO Environmental Noise Guidelines for the European Region*

**Objective:** Updating the current WHO guidelines for noise effects on annoyance, sleep, cognitive impairment, cardiovascular diseases, hearing impairment, tinnitus, adverse birth outcomes, and mental health and wellbeing.

**Method:** systematic review and meta-analysis of existing publications

**Duration:** 2013-2015

**Budget:** ~? k€

**Partners:** Scientists worldwide, who are required to declare all potential personal, financial, and academic interests by completing the WHO Declaration of Interests form.



# Implications for EU roadmap and aircraft noise policy?

## Suggestions tomorrow!





**Day 2** Location: Room CCAB-4D, Centre Albert Borschette,  
36 rue Froissart, 1040 Etterbeek (Brussels)

**8h30** Registration and Welcome Coffee

**9h00** **Session 4: Noise research priorities and roadmap**  
*Chair: Hervé Consigny (ONERA, EREA)*

- Overview of aviation noise research roadmap  
*X-NOISE Coordinator / D. Collin 20'*
- EREA proposal for advanced and coordinated research on noise: 1h30'
  - General introduction  
*ONERA / L. Leylekian*
  - Research action on methods, low-TRL enablers and thorough understanding of noise generation and propagation  
*NLR / Harry Brouwer*
  - **Research action on noise impact, perception and community annoyance**  
*DLR / Uwe Müller*
  - Integrating and assessing noise research efforts at European and national levels  
*X-NOISE & ONERA / D. Collin & L. Leylekian*



**Thank you to everyone  
contributing to the compilation of  
all this information!**

**Thank you very much for your  
attention!**



# Appendix

# France



**Acronym: DEBATS (Discussion sur les Effets du Bruit des Aéronefs Touchant la Santé)**

**Objective:**

Impact of Aircraft noise on health.

**Duration:** 2011-2018

**Budget:** 3.3 Mil. €, la Direction Générale de la Santé, la Direction Générale de la Prévention des Risques (Ministère de l'Écologie, du Développement Durable et de l'Énergie), la Direction Générale de l'Aviation Civile, l'Ifsttar et l'Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (Anses).

**Partners:** Ifsttar, Bruitparif, CépDc Inserm



**Acronym: *harmonica* (HARMOnised Noise Informations for Citizens and Authorities)**

**Objective:**

Increase the assimilation of the noise issue by the general public and local public authorities and to improve information on noise pollution in Europe. To build innovative tools to publish information on environmental noise in an easy-to-understand way and to develop a common noise index, CNI

**Duration: 2011-2014**

**Budget: 1.7 Mil. € European Commission (50%)**

**Partners: Acoucité, Bruitparif, Working Group Noise, Eurocities**



**Acronym: PARASOFT (PsychoAcoustics Research aiming at Assessing Sonic unpleasantness of aircraFT flyovers)**

**Objective:**

the PARASOFT project aims at keeping on the previous European projects SEFA and COSMA:

- Proposing a quantification of spectral effects on sound quality
- Proposing a quantification of temporal features on sound quality
- Proposing a quantification of cross combination effects
- Comparing the effects of these factors to the one of a reduction of overall loudness.

**Duration: 2013-2015**

**Budget: 320 k €, FRAE (Fondation de recherche pour l'aéronautique et l'espace)**

**Partners: ONERA, UCP, Genesis**

# Germany



**Acronym:** *NORAH* (Noise-Related Annoyance, Cognition, and Health)

## **Objective:**

Health effects of transportation noise (in particular aircraft) at Frankfurt Airport

- hypertension, cardio-vascular diseases
- changing noise exposure => annoyance & HQoL
- changing nocturnal aircraft noise exposure => sleep;
- cognitive performance and HQoL in children

Comparison of responses to transportation noise (annoyance, sleep disturbances, disturbances at daytime)

Effects of aircraft, road and railway noise (and combination)

Expanding (Frankfurt, Berlin) and steady state airports (Cologne/Bonn, Stuttgart)

**Duration:** 2011-2015

**Budget:** 7.3 Mil €, German Federal State of Hesse (86.4 %), airport municipalities (2.3 %), Frankfurt airport (10.1 %), airlines (1.2 %)

**Partners:** Ruhr-University Bochum, German Aerospace Centre DLR, Hörzentrum Oldenburg, Möhler + Partner, SUZ, Technical University of Kaiserslautern, University of Dresden, University of Giessen, ZEUS

# Germany



**Acronym:** Bremer *Fluglärmstudie*

**Objective:** Health impact of aircraft noise at Bremen airport  
(epidemiological study using health insurance data and mortality indices)

**Duration:** 2011-2015

**Budget:** ~? k€ (no information available), German Federal Environment Agency UBA

**Partners:** EpiConsult GmbH

# Germany



**Acronym:** *The FLIGHT-Study*

**Objective:** Effect of nighttime aircraft noise exposure on endothelial function and stress hormone release in healthy adults

**Duration:** 2009-2013

**Budget:** ~? k€(no information available), University of Mainz

**Partners:** University of Mainz

# Netherlands



**Project:** Health research South Limburg

**Objective:** Research on Health effects of aircraft noise for the NATO Airbase Geilenkirchen and Beek Airport

**Duration:** 2012-2014

**Budget:** ~500 k€, Dutch Ministry of Infrastructure and Environment

**Partners:** National Institute for Public Health and the Environment RIVM - partners: NLR and Municipal Health service GGD

# Netherlands



**Project:** Rattle

**Objective:** Research on Helicopter Rattle (vibrations) perception

**Duration:** 2013-2014

**Budget:** ~300 k€, Dutch Ministry of Defence

**Partners:** NLR, TNO

# Norway



**Acronym:** VARIANCE

**Objective:** To assess possible differences in the response to noise around civil and military airports

**Duration:** 2014-2015

**Budget:** 300.000 €

**Partners:** The Norwegian Defence Estates Agency and SINTEF

# Sweden



**Acronym:** *MaxFlyg*

**Objective:**

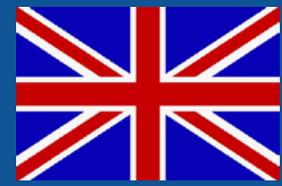
How does the number of aircraft passages above 70 dBA correlate to annoyance?  
Questionnaires (4786 sent 3130 answers) to residents near seven Swedish airports & listening tests (physiological, annoyance & speech interference)

**Duration:** 2009-2012

**Budget:** ~330.000 €

**Partners:** University of Stockholm

# Great Britain



**Acronym: OMEGA Community Noise Study;** *Indices to enhance understanding and management of community responses to aircraft noise exposure*

**Objective:**

To test public understanding of a range of conventional and supplementary noise communication metrics, through focus groups

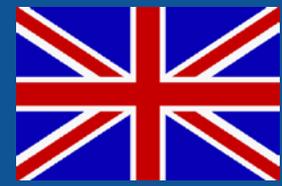
**Duration:** 2008-2009

**Budget:** £ 46 k Higher Education Funding Council for England (HEFCE)

**Partners:** study: Manchester Metropolitan University, Southampton University, British Airports Authority & Manchester Airport

**OMEGA:** 9 UK Universities: lead by Manchester Metropolitan University, Cambridge and Cranfield Universities ; a £5 Mil consortium for 3 years (2007-2010)

# Great Britain



**Acronym: Noise Metrics: Testing Supplementary Options**

**Objective:** to investigate additional or supplementary aircraft noise metrics that could be used to complement or reinforce existing standard metrics when describing or communicating aircraft noise exposure to the general public and other airport stakeholders.

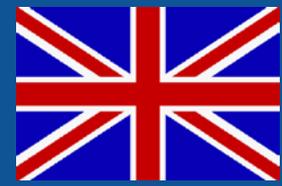
- extension to the original OMEGA work

**Duration: 2010-2011**

**Budget: £ 48k , Heathrow Airport Limited**

**Partners: Manchester Metropolitan University, Southampton University**

# Great Britain



**Acronym:** Engaging with Residents: Heathrow Operation Freedom Trials

## **Objective:**

- to investigate the impact of the suspension of runway alternation at Heathrow during a period of 'operational freedom' trials designed to address delays and stacking arising from the capacity constraints imposed by alternation
- understand the impact of the Operation Freedom Trials on residents;
- establish residents' preferred airport response to excessive delays – current limited response versus a short period of dual-mode operations
- identify whether there are other aspects of airport management that residents would prefer to be changed

**Duration:** 2011-2012

**Budget:** £ 87k; Heathrow Airport Ltd

**Partners:** MVA (now Systra), Southampton University, Manchester Metropolitan University

**Acronym: SiRENE - Short and long term effects of transportation noise exposure**

**Objective:**

SiRENE aims at identifying the noise exposure patterns that most strongly elicit effects on the organism and that may result in long term health consequences (e.g. cardiovascular diseases and metabolic syndrome).

**Duration: 2014-2016**

**Budget: 1.65 Mio €, Swiss National Science Foundation**

**Partners: University of Basel, Swiss Tropical and Public Health Institute, Swiss Federal Laboratories for Materials Science and Technology, Swiss Federal Office for the Environment, n-sphere**

**Acronym:** No acronym, but study was part of the Swiss National Cohort

***„Aircraft noise, Air pollution, and Mortality from Myocardial Infarction“***

**Objective:**

Huss et al present the first large-scale epidemiologic study investigating a link between residential exposure to aircraft noise and mortality from myocardial infarction (MI) in Switzerland.

**Duration:** published in 2010, data from 2001-2005

**Budget:** probably a minor budget < 100.000 €, Swiss National Science Foundation

**Partners:** University of Bern, University of Basel, Swiss Tropical and Public Health Institute, University of Utrecht

# Romania



**Acronym: ME - Study for the development of guidelines to determine dose-effect relations for assessing the annoyance on population, due to the noise from traffic**

## **Objective:**

The study identified and developed a methodology that allows a unified approach to assess the effects of noise from road, rail and airport on the population.

The objective was to determine dose-effect relations that can be used to establish the degree of population discomfort and annoyance created by transport noise.

A methodology is proposed to develop regulations and guidelines and to establish strategic approach to assess, manage and monitoring the ambient noise including the evaluation of a human response to the estimated discomfort and annoyance.

**Duration: December 2012**

**Budget: around 9000 EUR / Financed by the Ministry of Environment and Forests**

**Partners: CEPSTRA GROUP, PhD.Eng. Mihai ZAPLAIC**