Community **O**riented **S**olutions to **M**inimise aircraft noise **A**nnoyance

Aviation Noise Impacts Roadmap Annual Meeting,

Washington,

19th April 2011

Uwe Müller, DLR-German Aerospace Center, Cologne

COSMA's Goal

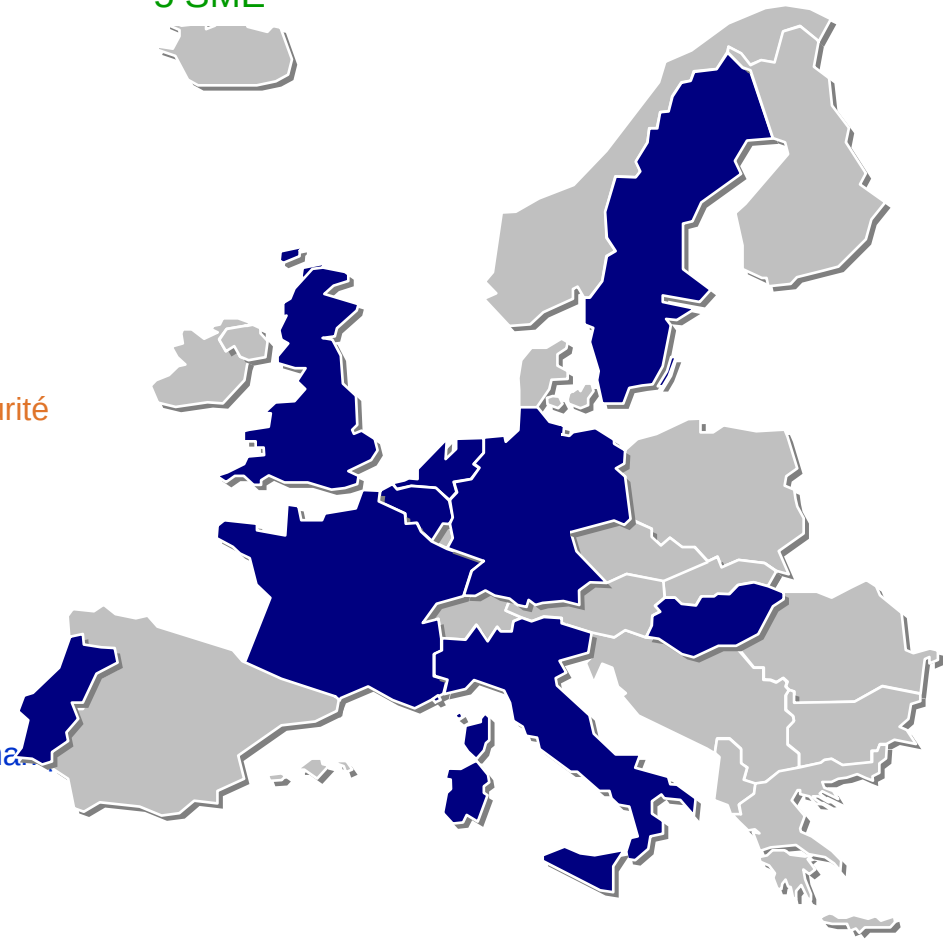
COSMA will help

- to improve the understanding of the effects of aircraft noise near airports
- to develop techniques for modelling the impact of aircraft community noise
- to develop engineering guidelines and operating practices aimed to minimise the noise annoyance, supported by a set of validated tools.

21 partners from 9 European countries.

- EADS Deutschland GmbH
- Snecma
- Leuven Measurement Systems International N.V.
- AIRBUS OPERATIONS SAS
- Alenia Aeronautica S.p.A.
- 01dB-Metravib
- SASS acoustic research & design GmbH
- Institut für Technische und Angewandte Physik GmbH
- ZEUS GmbH Centre for Applied Psychology, Social and Environmental Research
- Projecto, Empreendimentos, Desenvolvimento e Equipamentos Científicos e de Engenharia
- Deutsches Zentrum für Luft- und Raumfahrt e.V.
- National Aerospace Laboratory
- Institute National de Recherche sur les Transports et leur Securité
- Budapest Universtity of Technology and Economics
- Forschungsgesellschaft für Arbeitsphysiologie und Arbeitsschutz
- Dipartimento di Ingegneria Mecc. e Ind. Università degli Studi Roma Tre
- Université de Cergy Pontoise
- Kungliga Tekniska Högskolan
- Universita' di Napoli "Federico II" DPA
- Institute of Sound and Vibration Research - University of Southa
- Safran Engineering Services

6 from industry
7 universities
3 research organisations
5 SME



WP 1	WP 2	WP3	WP4	WP5
Specifications, Assessment and Exploitation	**Annoyance Examinations**	**Sound Engineering**	**Virtual Resident**	**Optimisation of airport noise scenarios**

Project leader: EADS

Project time: June 2009 – May 2012

Expert Panel:

Lufthansa

EUROCONTROL

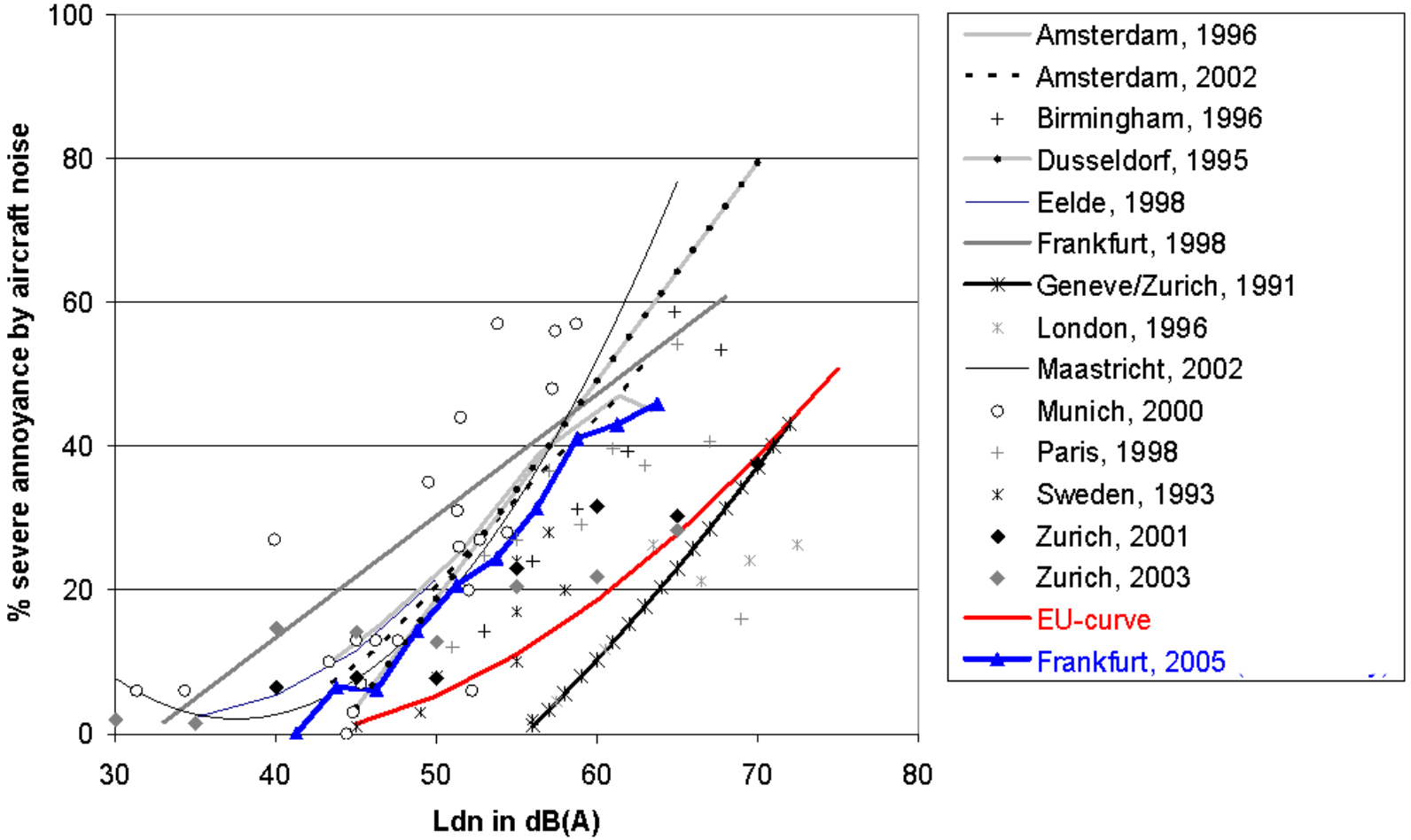
Manchester Metropolitan University

SNCF

GENESIS

Universiteit Leiden

UNIVERSIDADE FEDERAL DE SANTA CATARINA



Source: van Kempen & van Kamp 2005, p. 25, Fig.3b, modified and supplemented
Source of Zurich 2001/03: Brink et al. 2006

„Aircraft Noise Annoyance“, surveyed by the ICBEN scale for assessment of noise annoyance

~ 1/3rd of total variance explained by L_{Aeq}

~ ?% of total variance explained by moderators as

e.g. attitudes and expectations towards current and future air traffic, procedural fairness, coping measures, social status, noise sensitivity, age, sex, house ownership etc. etc.

~ ?% of total variance might be random

Guski, R. (1999). Personal and social variables as co-determinants of noise annoyance. *Noise and Health, 3*, 45-56

- T2.0 Current state of knowledge: **literature review** and **original data** from Frankfurt Airport study FRA-S (**current** airport scenarios)
  (involved partners: ISVR, NLR, ZEUS)

- T2.1 **Telephone** and **Field studies** (**current** airport scenarios, sound quality)
  London Heathrow, Stockholm Arlanda, Cologne/Bonn Airport
  (involved partners: DLR, IFADO, ISVR, KTH, statistical analysis: IFADO)

- T2.2 **Laboratory studies** (**future** airport scenarios, sound quality)
  (involved partners: BME, INRETS,UCP, statistical analysis: IFADO)

- T2.3 Interactive laboratory **SOUND SYNTHESIS MACHINE** examinations (**sound quality** of current and improvement of future aircraft sounds)
  (involved partners: BME, DLR, INRETS, ISVR, UCP, statistical analysis: IFADO)

Content of the telephone interview, 1200 at each airport

Section	Subject	Containing questions about …
0	Introduction	
1	Residential area	… duration of residency & satisfaction with living environment
2	Noise annoyance	… long-term aircraft noise annoyance & annoyance due to other noise sources
3	Attitudes	… general and specific attitudes towards local airport and air traffic, environmental consciousness, recent media coverage, suggestions for the airport
4	Coping measures	… measures to cope with noise
5	Personal information	…demographic data (age, sex, profession…), questions about, noise insulation
6	End of the interview	…further comments on aircraft noise

altogether more than 40 questions in telephone interview

Airports: **London-Heathrow, Stockholm Arlanda, Cologne/Bonn (50 participants each)**

Main questions

- How does aircraft noise annoyance develop throughout the day?
- How does this short-term annoyance contribute to the overall annoyance?

What is new?

- Sound pressure level is measured continuously (and not only calculated)
- One-hour examination periods to assess event-based aircraft noise annoyance and for two hours sound quality for every overflight

Experimental protocol

preliminary inquiry	time		evening before first testing day	1st day (ASTA)	2nd day (ASTA)	break	3rd day (ASTA)	4th day (ASTA)	break	5th day (ASO)	6th day (ASO)
Inspection of housing, Information about daily routine, extreme personality traits etc.	mornings	7:00		MQ	MQ		MQ	MQ			
		8:00		ASTA	ASTA		ASTA	ASTA			
		9:00		ASTA	ASTA		ASTA	ASTA			
		10:00		ASTA	ASTA		ASTA	ASTA		ASO	
		11:00		ASTA	ASTA		ASTA	ASTA			
	noon/ afternoon	12:00		ASTA	ASTA		ASTA	ASTA			
		13:00		ASTA	ASTA		ASTA	ASTA			
		14:00		ASTA	ASTA		ASTA	ASTA			
		15:00		ASTA	ASTA		ASTA	ASTA			
	early evening	16:00		ASTA	ASTA		ASTA	ASTA			
		17:00		ASTA	ASTA		ASTA	ASTA			
		18:00		ASTA	ASTA		ASTA	ASTA			ASO
		19:00	OQ, installation	ASTA	ASTA		ASTA	ASTA			uninstalli ng
	late evening	20:00		ASTA	ASTA		ASTA	ASTA			
		21:00		ASTA	ASTA		ASTA	ASTA			
		22:00		ASTA	ASTA		ASTA	ASTA			
		23:00						CQ			
		24:00									

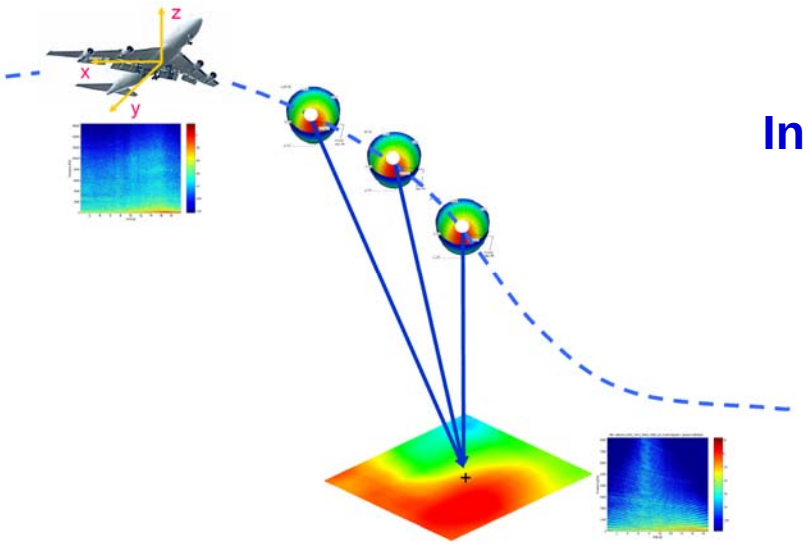
Key

OQ = Opening Questionnaire
ASTA = Assessment of short-term annoyance
MQ = Morning Questionnaire
CQ = Concluding Questionnaire
ASO = Assessment of single overflights

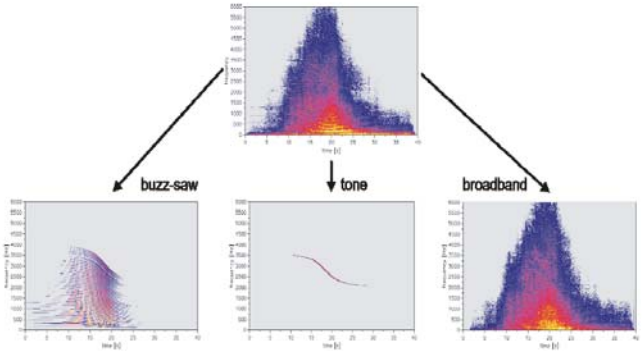
Observer has to be present

No observer has to be present

Improving Sound Quality of Aircraft Noise

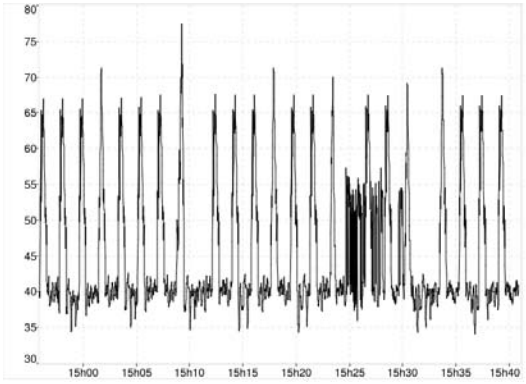


Input WP 3

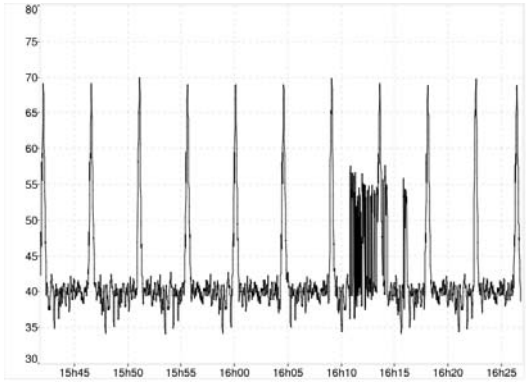


Faders representing different aircraft noise sources

Assessing future aircraft noise and airport noise scenarios



Seq1TO



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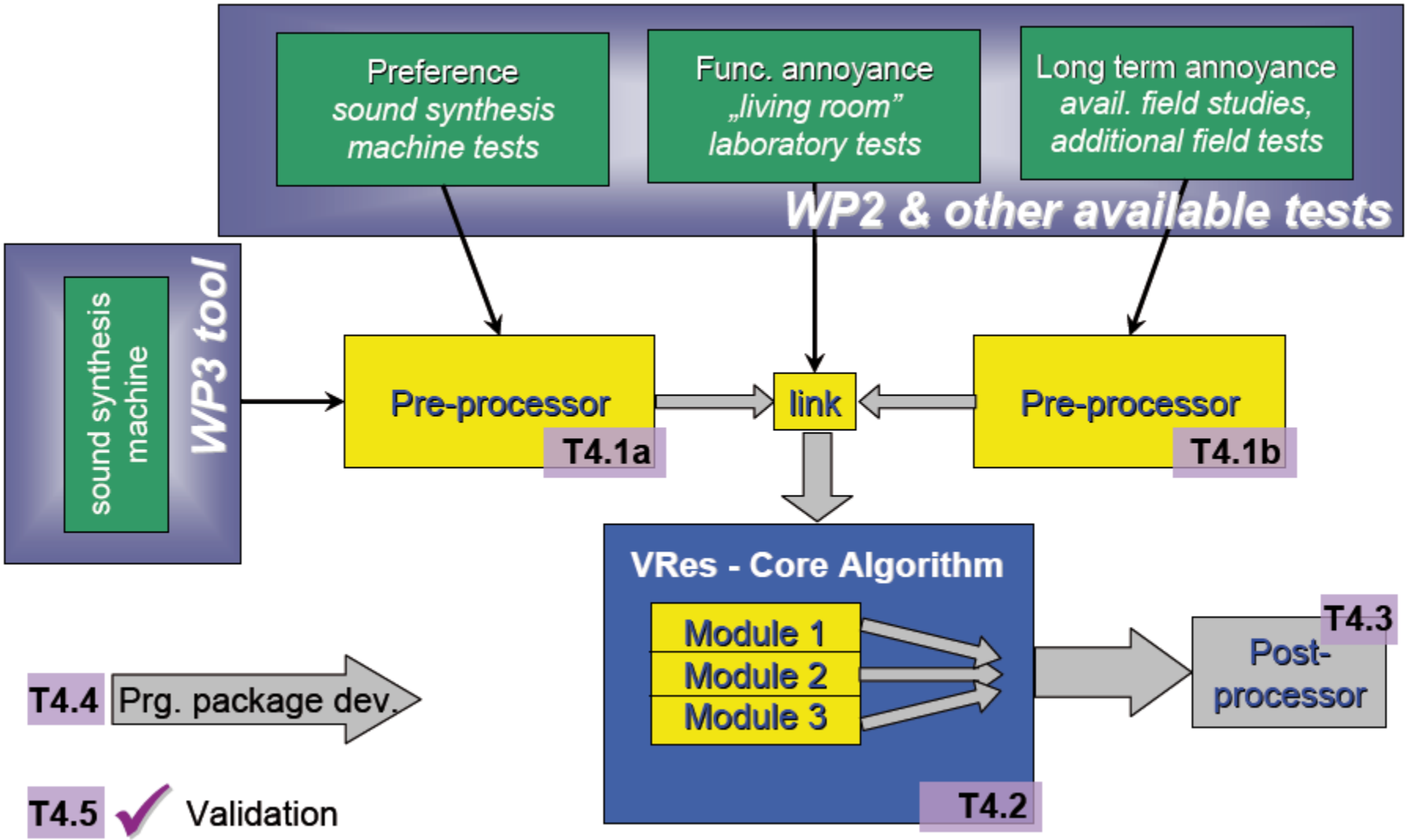
Input WP 3

Input WP 5

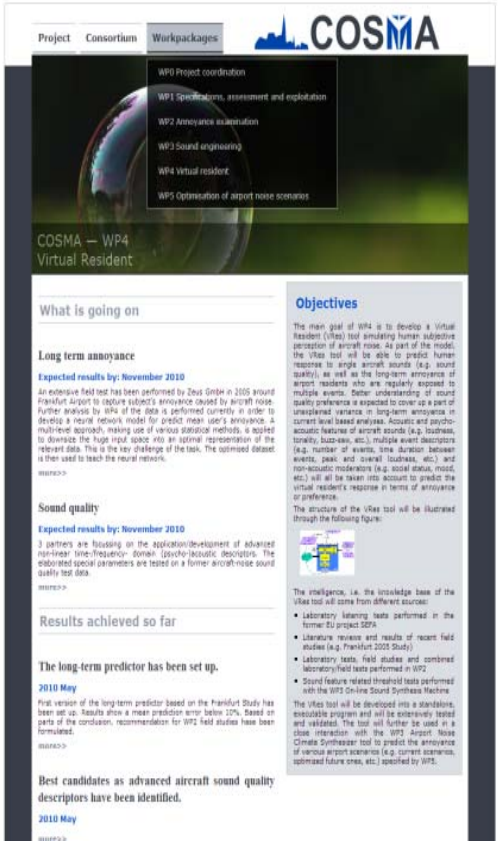
Experimental protocol (duration: 185 min)

Phase	Activities and tasks	Noise exposure	Time duration
1. Welcome	• Information and instructions about the experiments • Questionnaire (Q1) • Training Grammatical Reasoning Test or Stroop Test	Back. Noise	30 mn
2. Experiment *(1st run)*	Reading magazines	Aircraft & Back. noise	30 mn
	Grammatical Reasoning Test or Stroop Test		15 mn
	Short term annoyance and activity disturbance questionnaire (Q2a)	Back. noise	5 mn
3. Break	*free time - change of scenario*	Back. noise	10 mn
4. Experiment *(2nd run)*	Reading magazines	Aircraft & Back. noise	30 mn
	Grammatical Reasoning Test or Stroop Test		15 mn
	Short term annoyance and activity disturbance questionnaire (Q2b)	Back. noise	5 mn
5. Break	*free time*	Back. noise	10 mn
6. Assessment single overflights	Instructions	Back. noise	3 mn
	• Listening 5 aircraft passages • Questionnaire (Q3a to Q3e) : after each passage	Aircraft noise Back. noise	7 mn
7. Concluding questionnaire	Questionnaire 4 (moderators)	Back. noise	5 mn
8. Audiometry	Audiometric test	Quiet room	10 mn
9. Debriefing	Interview by the experimentator	Quiet room	10 mn

WP4 in COSMA, virtual resident tool



Public Website



www.fp7-cosma.eu

Cooperation EU - U.S.A:

Possible Call: **July 2012**

Any ideas? Please contact:

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Thank you for your attention!