



# International Conference on Airborne Research for the Environment

## ICARE-2010

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### Abstract

For the 10 years anniversary of the European network of instrumented aircraft for research in environmental and geo-science, an international conference will be organized in Toulouse at the Météo-France conference centre. All the scientists involved in airborne research will be invited to exchange experience and contribute to a forward-look on user requirements and operators development strategy, with a special focus on open access to airborne research infrastructures, joint development of a heavy-payload and long endurance aircraft, availability of a stratospheric aircraft in Europe and the development of UAS for environmental research.

This Supporting Activity aims to organize an exhibit of research aircraft, following the scientific conference, where decision makers will be informed of the recommendations from the meeting on the future of airborne geo-science. They will also inspect research aircraft from both Europe and the US, will witness inter-calibration flight experiments, and will have the opportunity to debate upon the benefits of open access and the constitution of a sustainable structure for the coordination of the European fleet. One day will be reserved to institutions and professionals and the second, possible a third day, the aircraft exhibition will be open to the public.

With most of the research aircraft worldwide based at the airport during three days, the operators will benefit, for the first time, from a unique opportunity to inter-calibrate their measurement systems. SMEs involved in airborne equipment will be invited to advertise their know-how and their most sophisticated products, and they will reach the largest possible collection of aircraft operators and academic laboratories involved in airborne measurements. Finally the public, by visiting instrumented aircraft at the ground and remotely participating in real research flights, will better understand the rationale for the development of cutting edge research infrastructures.

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# 1. Scientific and technical quality

## 1.1 Concept and objectives

The European Facility for Airborne Research in Environmental and Geo-sciences (EUFAR – [www.eufar.net](http://www.eufar.net)) is an Integrating Activity of the 7<sup>th</sup> EU Framework Programme. EUFAR was first constituted in 2000 (FP5), with 8 major operators of research aircraft. The follow-up FP6 project included 23 partners, operators of research aircraft, academic laboratories specializing in airborne measurements and SMEs. The FP7 EUFAR consortium has recently been enlarged to 33 partners by integrating infrastructures specifically dedicated to hyperspectral surface observations

Over the past 10 years, the culture of cooperation amongst the aircraft operators has markedly evolved, and many scientific specialists in airborne research have contributed to Joint Research Activities (JRA), Expert Working Groups (EWG) and the organization of training courses. Additionally, more than 100 meetings, scientific workshops and project committees have been convened, with participants from Europe and North America. But even with all of these activities, the international airborne geo-science community at large has never had the opportunity to meet.

The first International Conference on Airborne Research for the Environment (ICARE-2010) will be organized in 2010 for all scientists involved in airborne research to exchange experience and contribute to a forward-look on user requirements and operators development strategy, with a special focus on open access to airborne research infrastructures, joint development of a heavy payload and long endurance aircraft, availability of a stratospheric aircraft in Europe and development of UAS for environmental research.

During FP6, the EUFAR working group for the Future of the Fleet examined the main limitations of the European fleet and submitted a project for the construction of a heavy-payload and long endurance aircraft to the ESFRI. The COPAL project has subsequently been selected by the European Commission for a Preparatory Phase study, and it involves national research councils from countries where airborne research infrastructures are not available.

The construction/acquisition of a new aircraft is a lengthy process. Therefore, the immediate objective in EUFAR is to implement open-access to existing facilities, by constituting a sustainable structure in which countries that are presently excluded will contribute to the operation and share the scientific governance. Significant progress has recently been made, but numerous obstacles prevent the constitution of a sustainable coordination structure for environmental airborne research in Europe. It is thus timely to invite representatives of the national research councils and of the European Commission to a symposium where the merits of airborne research activities and their scientific impacts will be demonstrated and solutions proposed for the implementation of open access and shared scientific governance.

**This Supporting Activity aims to organize an exhibit of research aircraft, following the scientific conference, where decision makers will be informed of the recommendations from the previous day's meeting on the future of airborne geo-science. They will also inspect research aircraft from both Europe and the US, will witness inter-calibration flight experiments, and will have the opportunity to debate the benefits of open access and the constitution of a sustainable structure for the coordination of the European fleet.**

As a result of the threats of climate change and health impacts of pollution, the public is more interested in environmental research and increasingly concerned with research investments. However, research infrastructures, and research aircraft in particular, are rarely exhibited to the public because of logistical obstacles.

**This Supporting Activity aims to extend the research aircraft exhibit to the public.**

The plans are designed to maximise the unique opportunity that the ICARE-2010 will offer by convening the diverse communities involved in airborne research, namely the research funding institutions, the aircraft operators, the academic experts in airborne measurements, and the scientific users. The International Conference will be held from Monday afternoon to Thursday at the Météo-France conference centre. The aircraft exhibit will be organized on the Airbus premises at Toulouse-Blagnac airport, on Friday for the institutions and professionals, and on Saturday, and Sunday (optional) for the public. The dates will soon be finalized depending upon aircraft availability, either from 25 - 31 October, 1 - 7 November, or 15 - 21 November 2010.

### 1.1.1 International Conference on Airborne Geo-science

The ICARE-2010 programme includes EUFAR networking activities whose meetings are generally organized independently throughout the year. The main activities are:

**N1-SAC:** *the scientific Advisory Committee is constituted of eminent scientists to provide the EUFAR Consortium with independent strategic recommendations on EUFAR objectives and long term developments.* The SAC members attending the ICARE-2010 will first participate in their annual meeting for the evaluation of the EUFAR-FP7 activities during the second year, but their main contribution will be to lead a plenary session on the future of airborne research on Thursday. This session will be widely advertised to the scientific community.

**N2-TAC:** *the Trans-national Access Coordination aims to implement EUFAR Trans-national Access activities in a coordinated way.* The TAC members will organize a special session to discuss the extension of the EC Trans-national Access scheme to Open Access to all airborne facilities (Wednesday pm), and they will report at the plenary session on the future of airborne geo-science (Thursday).

**N3-FF:** *the working group on the Future of the Fleet aims to evaluate the performance of the existing fleet, to identify gaps, and to provide solutions for the long-term development of the fleet.* In FP7, the N3-FF WG is exploring solutions to provide the European scientific community with access to a stratospheric aircraft. Two approaches have been considered, either the M55 Geophysica aircraft operated by MDB in Russia, or the ER2 operated by NASA in the US. Both Russian and US operators will provide EUFAR with access proposals that will be evaluated by the N3-FF WG (Wednesday pm). The N3-FF WG will prepare recommendations that will be discussed at the plenary session on Thursday.

**N4-EWG:** *the Expert Working Groups exist to improve the expertise among the scientific specialists in the field of airborne research, to facilitate the transfer of expert knowledge to users, operators, and funding agencies, and to compile the knowledge in a high-level handbook on "Airborne Physical Measurements – Methods and Instruments".* Table I provides a list of the EUFAR EWGs.

**Table I: EUFAR Expert Working Groups**

Calibration/Validation	Hyperspectral Applications for Soil
Certification/Operation	Hyperspectral Applications for Vegetation
Data Processing	Hyperspectral Applications for Water
Imaging Sensors	Imaging remote sensing
Instrument Integration	In-Situ Aerosols
Quality Assurance / Quality Control	Polar Research
Unmanned Aerial Systems	Radiation
Active remote sensing	Stratospheric Measurements
Cloud Microphysics	Thermodynamics
Gas phase chemistry	Turbulence

Most of the EWG coordinators are involved in the preparation of the EUFAR hand-book on airborne measurements. The first draft of the book is expected by the end of 2009. After a general check by the editors, the draft will be sent to external reviewers for comments to be delivered by end of September 2010. The co-authors of the EUFAR hand-book on airborne measurements will meet on Tuesday, in subgroups to examine each chapter, to discuss the reviewers' comments and finalize the manuscript. On Wednesday, a plenary session will be organized to discuss issues of common interest, evaluate the EWGs activities at mid-term and select innovative instrumental developments to be included as part of the next EUFAR Joint Research Activities.

Quality Control / Quality Assurance (QC/QA) of aircraft data requires inter-calibration flights and these flights are a priority for all operators. However, such flights can rarely be performed because multiple research aircraft are seldom co-located. The ICARE-2010 will provide a unique opportunity to get many of the research aircraft from Europe and the US based at the same airport over three days. A key contribution of the EWGs to the ICARE-2010 will thus be the organization of an inter-calibration experiment in the Toulouse test flight area. Groups of aircraft (up to three at the same time) will fly inter-calibration tracks in this area during the exhibition on Friday and Saturday (Sunday optional). The scientific data, the aircraft trajectories and on-board video recording will be down-linked to the ground using satellite relay and/or VHF communication and displayed on screens in the Airbus premises. This will enable visitors to the exhibition witness flights in real-time, and thus get a good understanding of airborne research activities.

**N5-ET:** *the working group for Education and Training aims to attract and train new researchers and university lecturers in airborne atmospheric research and airborne hyperspectral remote sensing. The ET working group will benefit from the inter-calibration experiment to organize a training course on QC/QA. From Monday pm to Thursday, students will receive training on data processing and QC/QA. On Friday and Saturday, they will process the data in real-time, detect discrepancies between aircraft measurements and be tutored in the understanding of the sources of discrepancies and the mitigation actions that may be taken to improve the quality of the processed data.*

**N6-SP:** *the working group on Standards and Protocols aims to develop common protocols for airborne research, to support users and operators with recommendations on best practice and state-of-the-art software for airborne data pre-processing, to develop and publish open source software toolboxes for higher level data products, and data analysis, and to define standards for data transfer in real-time. This working group will actively contribute to the inter-calibration experiment and to the training course on QC/QA by providing workstations and state-of-the-art open software for the processing of the data collected during the experiment.*

**N9-SST:** *this working group aims to develop a framework for a sustainable EUFAR structure, to promote the extension of Trans-national Access (TA) beyond Community support, and to develop international coordination. For international coordination, and under the umbrella of the International Society for Photogrammetry and Remote Sensing (ISPRS), an international committee has been constituted. Table II indicates the terms of reference of the 11 working groups in this committee and their relationship with the EUFAR working groups.*

Non-European expert members of the ISPRS WG-I will actively participate in the activities of the EUFAR EWGs, as co-authors of the hand book on airborne measurements, or as members of specific EWGs.

<b>Table II: WG I/1 - Standardization of Airborne Platform Interface</b>	
<b>Related EUFAR Activity</b>	<b>Terms of Reference</b>
N9-SST	1) Coordinate a forum for discussion between the international airborne science communities
EWG Instrument Integration	2) Develop airborne sensor interface format standards in coordination with other working groups to promote maximum sensor portability between aircrafts increasing science yield from the sensors
EWG Certification/Operation	3) Develop airborne satellite data relay systems use for science research programs between aircraft and ground in coordination with other working groups
N9-SST	4) Develop an airborne science literature search to identify peer reviewed published papers and citations and make them available in a data base
EWG Certification/Operation	5) Support the regulatory agencies in supporting airborne science sensor certification and approval requirements for Lidar, Dropsonde and electromagnetic spectrum emissions
N9-SST	6) Maintain an inventory of the international airborne science capabilities and report annually
N2-TAC & N9-SST	7) Develop a forum to discuss TA system(s) for airborne users
EWG Unmanned Aerial Systems	8) Support the use of UAS vehicle activity for science observations in civil and restricted airspace on an international basis and engage the ICAO
N5-ET	9) Promote the education and outreach on an international basis of airborne based science activity
N4-EWG	10) Develop a forum to coordinate expert international workshops in categories of airborne science sensors for both Remote Sensing and in situ systems
N6-SP	11) Develop airborne data processing standards to facilitate instrument inter-calibration, inter-comparison and normalize international databases

### 1.1.2 Research aircraft exhibit at the Toulouse-Blagnac Airport

The scientific conference will be followed by an exhibit of the research aircraft at the airport on Friday for the institutions and professionals, and on Saturday, possibly Sunday, for the public.

A large hangar, kindly offered by Airbus Industry will house about 80 stands for the aircraft operators, the EUFAR Expert Working groups (where instruments, measuring principles, and data processing techniques will be explained), SMEs (both airborne instrumentation and aircraft equipment for research), and for the organizations sponsoring the exhibit. A conference room will be provided for the report on the future of airborne research, on Friday morning, and equipped with real-time display of the measurements performed by aircraft participating to the inter-calibration flights.

The smaller aircraft will be displayed in the hangar, and the larger ones on the tarmac. A secured visiting tour will be arranged for the participants to inspect the aircraft and scientific equipment.

On Friday morning, representatives of the national research institutions and from the European Commission will be welcomed from 9 to 10 am. A plenary session will be organised from 10 am to 1 pm for the report on the forward look on airborne research in geo-science, and the constitution of a sustainable structure for airborne research in Europe, implementation of open-access to the existing facilities and the construction of a heavy-payload and long endurance European aircraft.

Following lunch, a visit of the aircraft and stands will be organized from 2:30 to 3:30 pm, and the participants will then be convened to observe some of the inter-calibration test flights.

**Table III: Instrumented aircraft planned for the ICARE-2010 exhibit**

Aircraft type	Operator	Likelihood*	Aircraft type	Operator	Likelihood*
<b>EUROPE</b>			<b>US</b>		
Falcon20	SAFIRE (FR)	Y	ER2	NASA	L
ATR-42	SAFIRE (FR)	Y	P3	NOAA	L
Piper-Aztec	SAFIRE (FR)	Y	C-130	NSF	L
Do-228	NERC (UK)	Y			
CASA-212	INTA (SP)	Y	<b>RUSSIA</b>		
Learjet	Enviscope (DE)	Y	M55	MDB	P
Enduro	Karlsruhe Univ. (DE)	Y			
Polar5	Wegener Institute (DE)	Y	<b>AUSTRALIA</b>		
ASK16	Berlin Univ.(DE)	Y	Egrett	ARA	P
Cessna207	Manchester Univ.(UK)	Y			
ERA	CNR (IT)	Y			
Dimona	METAIR (CH)	Y			
G550	DLR (DE)	VL			
BAe-146	FAAM (UK)	UL			

\* Y: confirmed; VL: very likely; L: likely; UL unlikely; P no information yet

**Table IV: ICARE-2010 Agenda**

Venue	Météo-France Conference Centre						Airport				
	Mon	Tuesday		Wednesday		Thursday		Friday		Sat	Sun
Activities	PM	AM	PM	AM	PM	AM	PM	AM	PM		
Training Course on QC/QA											
EUFAR EWG											
Selection of JRA projects											
Open Access WG meeting											
EUFAR SAC meeting											
Stratospheric aircraft WG											
Forward look on airborne res.											
Aircraft static exhibit											
Inter-calibration flights											

## 1.2 Quality and effectiveness of the support mechanisms, and associated work plan

### 1.2.1 Overall strategy of the work plan

The two preceding subsections describe the overall strategy of the ICARE-2010. The structure of the International Conference described in Sec. 1.2.1, however, reflects current networking activities of the EUFAR I3, the only difference being that they will all be grouped over a 4 days period, while they are normally held separately. These activities are listed here to demonstrate the consistency of the project, but they are already fully supported by the EUFAR I3 contract. In addition, the inter-calibration flights will be supported through the EUFAR Trans-national Access scheme in support to N4-Expert Working Groups and N5-Education & Training. The present proposal is thus restricted to the organization of the airport exhibit and local support to aircraft participating to the inter-calibration flights that are not supported by EUFAR TA. The following working plan therefore only includes the organization of the aircraft exhibit and the related Work Packages (WP) and tasks. When necessary, the links with the EUFAR WPs engaged in the organization of the international conference are mentioned.

- **WP1:** Overall coordination, management of the project, and reporting.
- **WP2:** Conversion of the Airbus hangar to set up stands, meeting rooms, aircraft and instruments, and installation of the aircraft static exhibition on the airport tarmac.
- **WP3:** Planning and management of the inter-calibration flights and interface with the regional Air Traffic Control (ATC) authorities.
- **WP4:** Setting up of a real-time video and data link between aircraft and the airport. Installation of a large screen for the display of on-board video and real-time processed data.
- **WP5:** Dissemination.

### 1.2.2 Timing of the WPs

The starting date of the project is January 2010 for the exhibition to be held on October or November 2010.

Month	1	2	3	4	5	6	7	8	9	10	11
Milestone	1			2	3	4 5			6	7	
WP 1	↑			↓	↓	↓			↑	↑	
2											
3											
4											
5											

### 1.2.3 Detailed work description

#### 1.2a Work package list

WP No	Work package title	Type of activity	Lead participant No and short name	Person-months	Start month	End month
1	Management & coordination	MGT	1-CNRM	1,90	1	11
2	Hangar and tarmac installations	SUPP		1,20	1	10
3	Inter-calibration flights	SUPP		1,45	1	10
4	Real-time data link, processing and display	SUPP		2,45	1	10
5	Dissemination	SUPP		2,00	1	10
	TOTAL			9,00		

## 1.2b List of Deliverables

<b>Del. no.</b>	<b>Deliverable name</b>	<b>WP no.</b>	<b>Est pers-months</b>	<b>Nature (*)</b>	<b>Diss level (**)</b>	<b>Del date</b>
D1.1.1	Preliminary budget plan and call for tender for service suppliers	1	0,5	O	PP	1
D1.2.1	First coordination meeting report	1	0,25	R	PP	1
D2.1.1	Invitation to the exhibitors	2	0,1	O	PU	1
D2.2.1	Preliminary plan for hangar layout	2	0,1	O	CO	1
D2.3.1	Preliminary plan for the tarmac installations	2	0,1	O	CO	1
D2.3.2	Request to Préfecture Haute-Garonne for public access to the tarmac	2	0,2	O	PP	1
D3.1.1	Preliminary inter-calibration flight plans	3	0,25	R	PP	1
D3.1.2	Final inter-calibration flight plans	3	0,1	R	PP	1
D4.1.1	Preliminary description of the data and video downlink and display systems	4	0,2	R	PP	1
D4.2.1	List of the measured parameters for inter-calibration	4	0,2	R	PP	1
D5.1.1	Communication strategy and detailed description of expected services	5	0,25	R	PP	1
D5.2.1	Leaflet and registration forms	5	0,1	O	PU	1
D5.2.2	ICARE-2010 page on the EUFAR website	5	0,1	O	PU	1
D5.2.3	Summary information for external websites	5	0,25	O	PU	1
D2.1.2	Information to the exhibitors on provided services	2	0,1	O	PP	2
D3.1.3	ICARE-2010 request form for inter-calibration flights for the aircraft operators	3	0,1	O	PP	2
D3.2.1	List of specific operational issues	3	0,2	R	PP	2
D4.2.2	Implementation of the data processing software in a workstation	4	0,1	O	PP	4
D1.1.2	Final budget plan and selection of the service suppliers	1	0,25	O	PP	6
D1.2.2	Second coordination meeting report	1	0,25	R	PP	6
D2.1.3	Information to the exhibitors on final hangar layout	2	0,1	O	PP	6
D2.2.2	Progress report on hangar layout	2	0,1	R	CO	6
D2.3.3	Progress report on tarmac installations	2	0,2	R	CO	6
D3.1.4	Progress report on inter-calibration flight plans approval	3	0,1	R	PP	6
D3.2.2	Definition of the procedures for public security during operations	3	0,25	R	CO	6
D4.1.2	Final definition of the data and video downlink and display systems	4	0,5	R	PP	6
D4.1.3	Progress report on data downlink	4	0,1	R	PP	6
D4.2.3	Progress report on data processing and display	4	0,5	R	PP	6
D5.1.2	Final communication plans	5	0,1	R	PP	6
D4.1.3	Test flights for the data downlink system	4	0,1	R	PP	8
D5.3.1	Press release and invitations	5	0,2	O	PU	8
D1.2.3	Third coordination meeting report	1	0,2	R	PP	9
D1.2.4	Fourth coordination meeting report	1	0,2	R	PP	10
D2.2.3	Pre-exhibition check of hangar layout and security assessment	2	0,1	O	CO	10
D2.3.4	Pre-exhibition check of tarmac installations and security assessment	2	0,1	O	CO	10



D3.2.3	Assessment report on the procedures for public security during operations	3	0,25	O	CO	10
D3.2.4	Support to ATC during operations	3	0,2	O	PP	10
D4.3.1	Tests of the data downlink, processing and display systems	4	0,5	R	PP	10
D4.3.2	Demonstration of inter-calibration flights during the exhibition	4	0,25	R	PU	10
D1.3.1	Final report and cost statement	1	0,25	R	PP	11
D5.4.1	Audiovisual reportage	5	1	O	PU	11
<b>Total personnel effort (man.months)</b>			<b>9.00</b>			

\*R = Report, P = Prototype, D = Demonstrator, O = Other

\*\* PU = Public;  
PP = Restricted to other programme participants (including the Commission Services);  
RE = Restricted to a group specified by the consortium (including the Commission Services);  
CO = Confidential, only for members of the consortium (including the Commission Services).

### 1.2c List of milestones

Milestone number	Milestone name	WP involved	Expected date	Means of verification
1	1 <sup>st</sup> coordination meeting	all	1	Report
2	Hangar and tarmac use authorization by national administration	2&4	4	Letter of approval
3	EC decision	all	5	Letter of approval
4	Inter-calibration flights approval	3	6	Letter of approval
5	Second coordination meeting	all	6	Report
6	Third coordination meeting	all	9	Report
7	Fourth coordination meeting	all	10	Report

## 1.2d Description of each work package and summary

Work package number	1	Start date or starting event:	1
Work package title	Management and coordination		
Activity Type	MGT		
Participant number	1		
Participant short name	MF-CNRM		
Person-months per participant:	1.90		
<b>Objectives:</b> Overall management of the project and coordination.			
<b>Description of work:</b>			
<p><b>Task 1 - Overall management:</b> A preliminary budget plan will be established based on expected fund allocations. A call for tender will be published for suppliers to provide services for the exhibition, security, conference and video transmission, catering and buffet, support to the exhibitors, edition, and reception. After all the fund allocations are confirmed (month 5), a final budget plan will be established and suppliers selected accordingly. After the exhibition in month 10, costs will be accounted and the final report and cost statement will be produced.</p> <p><b>Task 2 – Coordination:</b> A meeting will be organized in month 1 with the WPs leaders to prepare a detailed description of all the services necessary for the airport exhibition. After the fund allocations are confirmed and the service suppliers selected in month 6, a second meeting will be organized to inform the WP leaders of their specific budgets. A month before the exhibition, the third coordination meeting will be organized with the WP leaders and the service suppliers, to monitor progress on each WP and decide on mitigation actions if necessary. The week before the exhibition, the fourth coordination meeting will be organized with the WP leaders, service suppliers and all the personnel supporting the exhibition, to distribute tasks and inform each participant upon his/her activities.</p> <p><b>Task 3: Reporting:</b> Final report and cost statement</p>			
The participants are the Coordinator and the representatives of the sponsoring organizations			
<b>Deliverables:</b>			Delivery month
No	Name		
D1.1.1	Preliminary budget plan and call for tender for service suppliers		1
D1.2.1	First coordination meeting report		1
D1.1.2	Final budget plan and selection of the service suppliers		6
D1.2.2	Second coordination meeting report		6
D1.2.3	Third coordination meeting report		9
D1.2.4	Fourth coordination meeting report		10
D1.3.1	Final report and cost statement		11

Work package number	2	Start date or starting event:	1
Work package title	Hangar and tarmac installations		
Activity Type	SUPP		
Participant number	1		
Participant short name	MF-CNRM		
Person-months per participant:	1.20		
<b>Objectives:</b> Conversion of the Airbus hangar to fit up stands, meeting rooms, aircraft and instruments, and installation of the aircraft static exhibition on the airport tarmac.			
<b>Description of work:</b>			
<p>The hangar has direct access to the tarmac of the Toulouse/Blagnac airport and the public will have the opportunity to access the tarmac to visit the research aircraft. This activity needs to be carefully planned and controlled since special authorization from the national administration will be required to comply with airport security procedures.</p> <p><b>Task 1 – Interface with the exhibitors:</b> Invitations will be distributed in month 1 to the potential exhibitors, namely research aircraft operators both from the EUFAR and from other countries, EUFAR Networking and Joint Research activity leaders, SMEs active in aircraft refurbishing for research and instrument development, and the organizations sponsoring the exhibition. The expected number of exhibitors is of the order of 80. After the hangar layout has been designed, the exhibitors will be informed of the available space and services to be provided such as power, lighting and internet connections</p> <p><b>Task 2 – Hangar layout:</b> A meeting will be organized in month 1 with Airbus to visit the hangar, identify logistics issues and establish a preliminary plan for the use of the hangar. A detailed description of the expected services for the conversion of the hangar will be prepared for the first coordination meeting. After the budget is consolidated and service providers selected, the exhibition plan will be finalized. The week before the exhibition, the installation will be carefully monitored and security procedures will be validated.</p> <p><b>Task 3 – Tarmac aircraft exhibition:</b> Public access to the “airside” areas is the most critical issue. A meeting will be organized in month 1 with Airbus and the airport security unit to delineate the tarmac area where research aircraft will be parked. The installations necessary to isolate and secure this area will be designed and a detailed description of the expected services for the fencing (guards, video monitoring) and public circulation will be prepared for the first coordination meeting. The request for authorization of public access to the secured area will be transmitted to the local governmental authorities. After the fund allocations are confirmed and the service suppliers selected in month 6, progress reports will be prepared for the coordination committee. The week before the exhibition, the installations will be carefully monitored and the conformity of the installation will be assessed for opening to the public.</p>			
The participants are the leader of WP2, the Airbus representative, and the Head of the Airbus security unit.			
<b>Deliverables:</b>			Delivery month
No	Name		
D2.1.1	Invitation to the exhibitors		1
D2.2.1	Preliminary plan for hangar layout		1
D2.3.1	Preliminary plan for the tarmac installations		1
D2.3.2	Request to Préfecture Haute-Garonne for public access to the tarmac		1
D2.1.2	Information to the exhibitors on provided services		2
D2.2.2	Progress report on hangar layout		6
D2.3.3	Progress report on tarmac installations		6
D2.1.3	Information to the exhibitors on final hangar layout		6
D2.2.3	Pre-exhibition check of hangar layout and security assessment		10
D2.3.4	Pre-exhibition check of tarmac installations and security assessment		10

Work package number	3	Start date or starting event:	1
Work package title	Inter-calibration flights		
Activity Type	SUPP		
Participant number	1		
Participant short name	MF-CNRM		
Person-months per participant:	1.45		
<b>Objectives:</b> Planning and management of the inter-calibration flights and interface with the regional ATC authorities.			
<b>Description of work:</b>			
Operation of numerous research aircraft, up to three aircraft simultaneously, for inter-calibration flights requires specific authorizations from the ATC authorities and efficient coordination during operations.			
<p><b>Task 1 – Inter-calibration flights design:</b> A restricted area exists South of Toulouse for test flights and it is managed by the regional ATC authorities at Istres. Preliminary flight plans will be designed with the EUFAR leader of the EWG on QC/QA. A meeting will be organized with the regional ATC authorities and the flight plans will be finalized. A standard flight request will be prepared for the aircraft operators to facilitate the flight request procedure. The process will be monitored to avoid delays and guarantee the acceptability of all flight plans. After the fund allocations are confirmed in month 6, progress reports will be prepared for the coordination committee.</p> <p><b>Task 2 – Inter-calibration flights operations:</b> Specific operational issues (for instance the provision at Toulouse airport of special fuel for the ER2 stratospheric aircraft) will be identified and addressed. A procedure will be defined for the public evacuation and tarmac security during aircraft engine ignition before take-off and parking after landing. The procedure will be implemented during the operations in coordination with WP2. A test flight expert from the Direction of the Civil Aviation will serve as interface between ATC and the aircraft operators to avoid any flight cancellation.</p>			
The participants are the SAFIRE Head of the certification/navigation unit, the representative of the French Civil Aviation and the representative of the regional Air Traffic Control.			
<b>Deliverables:</b>			Delivery month
No	Name		
D3.1.1	Preliminary inter-calibration flight plans		1
D3.2.1	List of specific operational issues		1
D3.1.2	Final inter-calibration flight plans		2
D3.1.3	ICARE-2010 request form for inter-calibration flights for the aircraft operators		2
D3.1.4	Progress report on inter-calibration flight plans approval		6
D3.2.2	Definition of the procedures for public security during operations		6
D3.2.3	Assessment report on the procedures for public security during operations		10
D3.2.4	Support to ATC during operations		10

Work package number	4	Start date or starting event:	1
Work package title	Real-time data link, processing and display		
Activity Type	SUPP		
Participant number	1		
Participant short name	MF-CNRM		
Person-months per participant:	2.45		
<b>Objectives:</b> Real-time video and data link (Iridium and/or VHF link) between aircraft and the airport. Installation of a large display for on board video and processed data in real-time.			
<b>Description of work:</b>			
<p>For the visitors to better understand research aircraft operations, a large display will be installed in the hangar where aircraft trajectories will be displayed with time series of the physical parameters measured along the trajectories and on-board video from the aircraft.</p> <p><b>Task 1 – Real-time data link system:</b> Technical solutions for data links between aircraft and the ground during the inter-calibration flights will be evaluated and their cost precisely quantified. A detailed description of the expected services for data and video downlink will be prepared for the first coordination meeting. After the budget is consolidated, and service providers selected, the data link system will be finalized and the specifications provided to the ground data processing team.</p> <p><b>Task 2 – Real-time data processing and display:</b> A list of the physical parameters measured during the inter-calibration flights will be established and processing software will be selected with the support of the EUFAR Standards and Protocols working group. Processing workstations will be configured for real-time processing of the downloaded data and graphic software will be developed. A network will be installed for the EUFAR training course students to access the raw data in real-time, evaluate and assess their quality.</p> <p><b>Task 3 – Inter-calibration flights demonstration:</b> Tests of the data downlink system and data processing workstation will be performed with the SAFIRE aircraft before the exhibition. During the exhibition, presenters will provide commentary on the flight figures, the measured parameters and on-board video from the flights.</p> <p>The participants are the SAFIRE Head of the airborne communication unit, the Head of the SAFIRE data processing group, the leader of the EUFAR N6-SP working group, and presenters selected from the meteorological and research community.</p>			
<b>Deliverables:</b>			Delivery month
No	Name		
D4.1.1	Preliminary description of the data and video downlink and display systems		1
D4.2.1	List of the measured parameters for inter-calibration		1
D4.2.2	Implementation of the data processing software in a workstation		4
D4.1.2	Final definition of the data and video downlink and display systems		6
D4.1.3	Progress report on data downlink		6
D4.2.3	Progress report on data processing and display		6
D4.1.3	Test flights for the data downlink system		8
D4.3.1	Tests of the data downlink, processing and display systems		10
D4.3.2	Demonstration of inter-calibration flights during the exhibition		10

Work package number	5	Start date or starting event:	1
Work package title	Dissemination		
Activity Type	SUPP		
Participant number	1		
Participant short name	MF-CNRM		
Person-months per participant:	2.00		
<b>Objectives:</b> ICARE-2010 interface with press and TV			
<b>Description of work:</b>			
<p><b>Task 1 - Overall communication strategy:</b> A meeting will be organized with representatives of all the sponsoring organizations to prepare the communication strategy and a detailed description of the expected services for the first coordination meeting. After the budget is consolidated, documents presenting the exhibition and the sponsoring organizations, and press releases will be finalized. Representatives of the sponsoring organizations will be designated to maintain an efficient interface with the press and media.</p> <p><b>Task 2 – Email and websites:</b> Starting in month 1, a leaflet presenting the international conference and the air-show, including registration forms, will be prepared and widely distributed to various groups, including individuals registered on the EUFAR website, the COPAL partners, and the research funding organizations. A specific page will be provided on the EUFAR website to present the event and the preliminary agenda of the conference. Summary versions of this page, with a link to the EUFAR website will be distributed to the EUFAR partner organizations and to the international organizations members of the ISPRS WGI for display in their websites.</p> <p><b>Task 3 – Press:</b> In month 8 press release will be distributed to international journals, magazines and TV stations to publicize the event. Contacts will be made and invitations sent to journalists.</p> <p><b>Task 4 – Exploitation:</b> Video and interviews will be performed during the conference and at the exhibition. Based on the collected material, movies will be prepared to be distributed to research organizations.</p> <p>The participants are representatives of the sponsoring organizations.</p>			
<b>Deliverables:</b>			Delivery month
No	Name		
D5.1.1	Communication strategy and detailed description of expected services		1
D5.2.1	Leaflet and registration forms		1
D5.2.2	ICARE-2010 page on the EUFAR website		1
D5.2.3	Summary information for external websites		1
D5.1.2	Final communication plans		6
D5.3.1	Press release and invitations		8
D5.4.1	Audiovisual reportage		11

## 1.2e Summary effort table

Participant N°/short name	WP1	WP2	WP3	WP4	WP5	Total person months
1-CNRM	1.90	1.20	1.45	2,45	2,00	9,00

### 1.2.4 Interdependencies of the components

The date of the ICARE-2010 depends upon logistical constraints, mainly the availability of the research aircraft, and it will be chosen from the last week of October, the first or the third week of November 2010. The scientific conference will last from Monday to Thursday, at the Météo-France conference centre. The aircraft exhibit at the airport will cover two, possibly three days. Friday will be reserved for representatives of the national research organizations and of the European Commission, and professionals. On Saturday, and possibly Sunday, depending on available funding, the exhibition will be open to the public.

Before submitting this proposal to the European Commission, the feasibility of the project has been examined with the Airport authorities, Air Traffic Control and Airbus, the owner of the hangar. All have now agreed to support the exhibition and will contribute in kind. In particular, Airbus will kindly provide access to the hangar and logistical support. Funding requests have been submitted to the local authorities and to CNRS. The final decisions will be known early in 2010. The decision from the European Commission is expected in May 2010.

The scientific conference, which is part of the EUFAR current activities, will be organized with the support of Météo-France which will contribute access to the conference centre (amphitheatre and 4 seminar rooms) during the whole week. Therefore the realization of the scientific conference does not depend upon additional funding.

Météo-France will also support all the personnel costs listed above in table 1.2.e for the management of the aircraft exhibition at the airport, but this activity also involves significant additional costs for security, aircraft operations, stands, buffet and catering, etc. The present proposal aims to support a fraction of these additional costs.

There are still uncertainties about which aircraft will be displayed at the airport, especially for those from the US. Proposals have already been submitted by the NASA, NOAA and NSF aircraft managers to their parent institutions for funding for their transit flights to Toulouse. Final decisions will be made in early 2010.

In summary, key issues about the feasibility of the exhibition and inter-calibration flights have already been addressed but uncertainties remain upon the number of participating aircraft and funding available.

Additional costs for the exhibition have been estimated based on two preliminary offers, and they will be adjusted in May 2010, when the number of participating aircraft and amount of available funding will be confirmed. The main budget lines that can be tuned to fit the final budget are the extension of the public exhibit to Sunday, the hangar installations, the video transmission of the inter-calibration flights, and the catering and buffet.

### 1.2.5 Risks and associated contingency plans

Two main risk issues remain, the authorization delivered by the “Préfecture de Haute-Garrone” for the public to enter part of the airport secured area, and the authorization delivered by the “Centre d’Essais en Vol” for the research aircraft to perform inter-calibration tests in the restricted test area South of Toulouse.

The first one is dealt with by the Head of the Airbus security, the second one is managed by the Head of the regional test flight unit at the Test Flight Centre of the Ministry of Defense at Istres.

If the first one is not delivered then the exhibition will be cancelled. If the second one is not delivered then the aircraft demonstration will be limited to standard flights in the vicinity of the Toulouse airport.

## **2. Implementation**

### **2.1 Management structure and procedures**

The **coordination committee** includes the coordinator, and representatives of the sponsoring organizations, as listed below:

- Météo-France: Deputy Director of Research at CNRM
- CNRS: Head of the Communication unit at CNRS-INSU
- SAFIRE: Deputy director
- Airbus: Head of Political Affairs and Communication
- Aéroport Toulouse-Blagnac: Head of the Public Relations unit
- Conseil Régional Midi-Pyrénées: Head of the Public Relations unit
- Réseau Thématique de Recherche Avancée Sciences et Technologies pour l'Aéronautique et l'Espace: Coordinator

The **Steering Committee** includes the coordinator and WP active members, as listed below with the WP leader in bold

**WP2:** Hangar and tarmac installations

- **Météo-France**: Manager of the Météo-France Conference Centre
- Airbus: Head Security Unit

**WP3:** Inter-calibration flights

- **SAFIRE**: Head of aircraft operations
- EUFAAR: Leader of the Expert Working Group on Quality control/Quality assurance
- Direction des Services de la Navigation Aérienne: Head « Mission Environnement »
- Centre d'Essais en Vol: Head « Centre d'Essai Régional »

**WP4:** Real-time data link, processing and display

- **EUFAAR**: Leader of the Networking activity on Standards and Protocols
- CNRM: Head of the data processing unit (GMEI/TRAMM)
- SAFIRE: Head of data acquisition and instrumentation

**WP5:** Dissemination

- **CNRM**: Head of the Communication Unit
- CNRS: Head of the INSU Communication Unit
- Conseil Régional: Head of the Public Relations unit
- EUFAAR: Scientific Assistant

The Coordination Committee will:

- make executive decisions on scientific and administrative issues,
- approve the WPs work plans,
- decide the distribution of the budget.

The Coordination Committee will be convened when necessary (at least in months 1, 6, 9 and 10 and with intermediate teleconference meetings if necessary).

The Steering Committee will:

- provide recommendations to the Coordination Committee, especially about the WPs work plans and budgets,
- inform the Coordination Committee of delays likely to affect the project,
- monitor the project daily by reviewing the work progress, checking the technical work and deliverables, writing the progress reports, etc

The Steering Committee will be convened when necessary (at least in months 1, 6, and 9) and with intermediate teleconference meetings if necessary.



## 2.2 Participant

1- Meteo-France (MF-CNRM)

Meteo-France, a public administration placed under the authority of the Ministry of Transport, employs 3700 salaried staff.

Within Meteo-France, the « National Centre for Meteorological Research » (CNRM) is the department responsible for conducting the largest part of the meteorological research activities, and for coordinating research/development undertakings conducted within other departments.

Dr. J. L. Brenguier is the Head of the Experimental and Instrumental Research Group at CNRM (GMEI). He is the coordinator of the EUFAR I3 project and of the COPAL ESFRI-PP project.

## 2.3 Resources to be committed

The overall budget is summarized in the following table. All costs related to the scientific conference are not reported since they are already supported by the EUFAR I3 (T&S for the participants) and by Météo-France as an in kind contribution for access to the Météo-France conference centre during a week. The inter-calibration flights will be supported by EUFAR as TA activities for the aircraft that can benefit from the support scheme. Other aircraft operators, especially from US, already support significant costs for the transit to Toulouse (of the order of \$ 400000 each). A provision is therefore planned to partially support their contributions to the inter-calibration flights (airport taxes, fuel and T&S for the crew).

<b>Table V: Preliminary budget plan</b>		€
<b>WP1 - Management and coordination</b>		
Personnel: 1 engineer ICPC (the coordinator), 1.9 months		17904
<b>WP2 – Hangar and tarmac installations</b>		
Personnel: 1 engineer IDT (the Head of the CNRM Communication Unit), 1.2 months		7303
Furniture, stands, podium, audio services, fencing, guards, hostesses, catering, buffet		48236
<b>WP3 – Inter-calibration flights</b>		
Personnel: 1 engineer IDT (the Head of the Data processing Unit) 1.45 months		8824
Airport taxes		2500
Flight crew T&S for aircraft that are not supported by EUFAR TA		39600
Fuel for aircraft that are not supported by EUFAR TA		15800
<b>WP4 – Real-time data link, processing and display</b>		
Personnel: 1 engineer IDT (the Head of the Data processing Unit), 2.45 months		14911
Pre-paid communication cards		4138
Large display screen in the hangar (11 m2)		5000
<b>WP5 – Dissemination</b>		
Personnel: 1 engineer IDT (the Head of the CNRM Communication Unit), 2 months		12172
Invitations, leaflets, posters, press release, publications in European and scientific journals		17700
<b>TOTAL DIRECT COSTS</b>		<b>194088</b>
<b>TOTAL INDIRECT COSTS</b>		<b>38818</b>
<b>TOTAL COSTS</b>		<b>232905</b>

Note that the above budget plan does not include the rental cost of the hangar and tarmac area where aircraft will be parked. This major item, including logistical support (electricity, internet connection, cleaning, security) will be provided by Airbus as an in-kind contribution. Also, it does not include personnel costs of the sponsoring organizations (CNRS, Toulouse-Blagnac Airport, Direction of Civil Aviation, Regional Test Flight Centre), whose members kindly contribute as experts and consultants. Finally, it does not include the

cost of the transit flights from their home base to the Toulouse-Blagnac airport of any of the aircraft, EUFAR aircraft included. This last item is a significant in-kind contribution from all the aircraft operators.

**The requested EU contribution is 75000 €, i.e. 32 % of the budget, hangar rental excluded.**

### **3. Potential impact**

#### **3.1 Expected impact**

Climate change and environmental pollution are headline global issues and any research in these topics tends to attract very close scrutiny from economists, policymakers, politicians and the general public. The measurements made by atmospheric research aircraft provide unique and extremely valuable data to scientists working in many diverse fields of atmospheric and earth sciences. Consequently it is anticipated that there will be considerable media interest in the event especially as the aircraft and instrumentation will provide excellent photographic opportunities and the conference will bring together experts available for interview and discussion.

More specifically, significant impact is expected for:

The **research funding institutions**, especially those from countries with no research aircraft in geo-science. Representatives of the institutions will be advised by eminent scientists on the perspectives in airborne research, challenges and future developments. During the exhibition they will discover the panoply of airborne instruments and how they contribute to all fields in geo-sciences. They will find quantified information on the scientific impact of the infrastructures in terms of publication in each field of science, and they will learn how this is biased in each country by the type of infrastructures available. During the inter-calibration flights, they will get a realistic panorama of airborne operations and data quality.

The **aircraft operators** will benefit, for the first time, from a unique opportunity to inter-calibrate their systems. The inter-calibration flights are expected to improve the general overall quality of airborne measurements by identifying existing weaknesses in procedures and instrumentation and providing improved estimates of measurement accuracy. This is a benefit with long-term effect which should improve the quality of future airborne data provided to researchers. With the real-time display at the ground, the aircraft operators which have not yet implemented air/ground communication systems, will discover the potential of such a technique: experienced scientists on the ground will be able to participate actively in observational decision processes in real-time, and students will be able to participate virtually in the flights and learn about experimental strategies in airborne research.

The ICARE-2010 will be the first joint meeting of all EWG categories, hence the **academic experts in airborne measurements** will have an ideal opportunity to exchange ideas and experiences for good practice in the organization of their expert workshops. It will also be the first, and only, opportunity for all the authors of the EUFAR hand book on airborne measurements to collectively finalize the manuscript.

**SMEs** presenting their know-how and their most sophisticated products, will reach the largest possible collection of aircraft operators and academic laboratories involved in airborne measurements.

**Scientific users**, even experienced ones, will get a broad perspective of all scientific fields which they can hardly approach within their own community.

Finally the **public**, by visiting instrumented aircraft on the ground observing real research flights, will better understand the rationale for the development of cutting edge research infrastructures.

Toulouse is a major centre of aviation and a high level of local interest from companies and individuals is expected for the aircraft themselves and the various modifications that have been made to them for their research role.

### 3.2 Dissemination and exploitation of project results

From months 1 to 8, the focus will be on advertising the event to the aircraft operators, to the scientific users of airborne infrastructures and to members of the research funding institutions. From month 7 to the date of the exhibition, the focus will move to press and media, with the production of press release and scientific synthesis of the main outcomes of airborne research. After the exhibition, the focus will move to the exploitation of the event, with the production of video material collected during the exhibition at the ground and in flight.

The dissemination plan relies on various tools addressing diverse communities as listed in the following table.

<b>Table VII: Dissemination plan</b>				
<b>Medium</b>	<b>Target</b>	<b>Actors</b>	<b>Diffusion</b>	<b>Tools</b>
Email	Participants to the exhibition	EUFAR scientific assistant	By email in month 0 and month 6	Leaflet, agenda, and registration forms
Websites	Scientists, aircraft operators, institutions, decision makers, journalists	EUFAR Webmaster and scientific assistant, partners' webmasters	Internet	Detailed description of the event on the EUFAR website; short release for announcement of the event on partners' websites
Press	Institutions, decision makers, all public	CNRM Com Unit, editors, press services	Radio, TV, newspapers and magazines, especially scientific press	Press release, contacts for interviews, synthesis
Audiovisual	Institutions, decision makers, all public	Météo-France Com Unit and/or production societies and TV	Mail, TV broadcast	Interviews and video of the conference, the static exhibition and the inter-calibration flights

**Table VIII: List of acronyms**

ARA	Airborne Research Australia
ATC	Air Traffic Control
AWI	Alfred Wegener Institute
BAe	British Aerospace
CNR	Consiglio Nazionale delle Ricerche
CNRM	Centre National de Recherches Météorologiques
CNRS	Centre National de la Recherche Scientifique
COPAL	COmmunity heavy-PAYload Long endurance Instrumented Aircraft for Tropospheric Research in Environmental and Geo-Sciences (FP7 Preparatory Phase project)
DLR	Deutsches Zentrum für Luft- und Raumfahrt e.V (DE)
EC	European Commission
Enviscope	Enviscope GmbH (SME)
ESFRI	European Strategy Forum on Research Infrastructures
ET	Education and Training
EUFAR	European Facility for Airborne Research
EWG	Expert Working Group
FAAM	Facility for Airborne Atmospheric Measurements (UK)
FF	Future of the Fleet
GMEI	Météo-France - Groupe de Meteorologique Experimentale et Instrumentale
HALO	High Altitude and LONG Range Research Aircraft
I3	Integrated Infrastructure Initiative
ICAO	International Civil Aviation Organisation
ICPC	Ingénieur en Chef des Ponts et Chaussées (Manager engineer)
IDT	Ingénieur Divisionnaire des Travaux de la Météorologie (Engineer)
INSU	Institut National des Sciences de l'Univers (FR)
INTA	Instituto Nacional de Técnica Aeroespacial (ES)
ISPRS	International Society for Photogrammetry and Remote Sensing
JRA	Joint Research Activities
MDB	Myasishchev Design Bureau (Russia)
MetOffice	UK Meteorological Office
MF	Météo-France
MGT	Management
NASA	National Aeronautics and Space Administration (USA)
NCAR	National Centre for Atmospheric Research (USA)
NERC	Natural Environment Research Council (UK)
NOAA	National Oceanographic and Atmospheric Administration (USA)
NSF	National Science Foundation (USA)
PP	Preparatory Phase
QA	Quality Assurance
QC	Quality Control
SAC	Scientific Advisory Committee
SAFIRE	Service des Avions Français Instrumentés pour la Recherche en Environnement
SME	Small and Medium Enterprise
SP	Standards and Protocols
SST	Sustainable Structure
T&S	Travel and Subsistence
TA	Trans-national Access
TAC	Trans-national Access Coordination
TOR	Terms Of Reference
TRAMM	Météo-France data processing unit
UAS	Unmanned Aerial Systems
US	United States of America
VHF	Very High Frequency
WG	Working Group
WP	Work Package