



**REPORT D3.3.1**

# **CATS Exploitation & Dissemination Plan**

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## Executive Summary

Air traffic is expected to triple by 2025. However, the current air traffic management system is very close to its functional limits and with the tools and procedures in use today the increase of capacity is fundamentally limited.

The SESAR target concept of operations is a trajectory-based concept. All partners in the ATM network will share trajectory information in real time to the extent that is required from the earliest trajectory development phase through operations and post-operation activities. ATM planning, collaborative decision making processes and tactical operations will always be based on the latest trajectory data. A trajectory integrating ATM and airport constraints is elaborated and agreed for each flight, resulting in the trajectory that a user agrees to fly and the ANSP and Airports agree to facilitate.

CATS introduces, additional to the 4D trajectory management, a new element, the Contract of Objectives (CoO), negotiated and agreed by all parties for a particular flight. This Contract of Objectives defines objectives applicable to a flight and links actors together through agreed interfaces, called Target Windows (TW). These Target Windows represent not only the respect of the arrival time at destination, but also integrate ATM constraints and contain built-in margins for flexibility and disruptive factors management.

In this context, CATS appears as a candidate to assess the impact for an En-Route controller and a pilot if maintaining adherence to the Contract of Objectives, or in other words, Control Time Over (CTO) and/or Target Time of Arrival (TTA).

The expected benefits are at first, the respect of flights' adherence to their schedules and therefore the improvement of predictability, and at second, the optimisation of the scarce resources of all ATM actors.

The CATS project proposes to evaluate this concept through three experiments, ensuring that all the operational issues of the Contract of Objectives are addressed. In the same time, safety and risk assessment, cost benefit analysis, and legal implications will be carried out, as well.

The objective of this document is to present all the planned actions related to communication on the CATS project and the way to achieve successful dissemination, in order to ensure awareness amongst the Air Transport community.

The WP3, responsible for the dissemination, works on plan, website development and forum/workshop organisation, to disseminate results throughout the Air Transport community.

# 1. Introduction

## 1.1. CATS Project

The CATS project was selected during the 4th call of the European Commission FP6. It started on 1<sup>st</sup> of November of 2007 for three years. The CATS project proposes an integrated ATM organization, where all the actors negotiate and agree on their own objectives. This organization is based on the spreading of responsibility between the different actors. The transfer of responsibility between them is then explicit and formally contracted. This will reinforce the arrival punctuality.

The trade-off process, driven by actors' interests and constraints, will reinforce autonomy and responsibility, while allowing a high level of integration between all stakeholders and consistency of the ATM organization, in order to optimize the use of their scarce resources.

The main aim of the CATS project is to experimentally assess the operational validity of the Contract of Objectives concept.

This will be achieved by:

- ▶ defining the interfaces between various actors and operators:
  - ▶▶ ATCO and ATCO in airborne cycle (between two ANSPs);
  - ▶▶ ATCO and air crew in airborne cycle;
  - ▶▶ Airport, airline and ANSP during the renegotiation process;
- ▶ assessing, through Human-In-the-Loop experiments, the operational acceptability and the technical feasibility, particularly in case of renegotiation;
- ▶ evaluating the impact of this contract in terms of Human Factor issues, safety and operators' workload;
- ▶ evaluating the benefits (cost benefit analysis, safety & risk analysis) and the legal implications.

## 1.2. Scope of this document

The main goal of this document is to present all the intended actions related to communication on the CATS project and the way to achieve them. It provides information about the project plan for disseminating, as well as using and exploiting the knowledge gained throughout the CATS project.

One of the strategic aspects of the research projects is to communicate and share with the scientific and the aeronautical communities their results, questions and progress. The objective of the document is to clearly define the main emphasis of communication, the key messages to deliver, the target and the best way to achieve a better and proactive dissemination strategy.

The CATS Consortium will guarantee appropriate awareness of its work within the aeronautical community by ensuring the right level of use and dissemination of results.

This will include, in the early stages of the project, preparation of this Dissemination Plan. This Dissemination Plan will describe all the communication activities the

Consortium will carry-out to convey the key CATS messages efficiently to its stakeholders. This plan will be updated regularly.

Dissemination to the scientific community will include preparation of project presentations, participation in external publications and conferences (for example ICNS, ICAS, DASC, ATM R&D Seminar, etc.). Furthermore, the consortium will organise and participate in the two workshops dedicated to the ATM community.

### 1.3. Document Structure

This document is structured on 8 main chapters:

- ▶ Chapter 1 introduces the CATS Project.
- ▶ Chapter 2 describes the Dissemination Strategy defined to promote knowledge sharing, public awareness and transparency.
- ▶ Chapter 3 presents the CATS key messages to disseminate.
- ▶ Chapter 4 indicates the resources available.
- ▶ Chapter 5 presents the intended exploitation opportunities.
- ▶ Chapter 6 describes the expected communication work plan and gives an overview of dissemination activities planned or executed.
- ▶ Chapter 7 lists the public deliverables.
- ▶ Chapter 8 describes the conferences, presentations and exhibitions given by the CATS partners.
- ▶ Chapter 9 lists the workshops and forum organised as dissemination event.
- ▶ Chapter 10 presents the animated media prepared and audience targeted.
- ▶ Chapter 11 gives the references used in this document.

### 1.4. Document evolution & approval

An iterative approach is applied for carrying out the dissemination activities: At the beginning of the project, after each experiment to and also at the end of the project, the results will be disseminated as described in Table 6-1. This document has been revised according to the different steps of the assessments' activities, in order to highlight the results of the different achieved validations.

### 1.5. Definition, abbreviations and acronyms

<b>ACARE</b>	Council for Aeronautics Research in Europe
<b>ACC</b>	Area Control Centre
<b>ACI</b>	Airports Council International
<b>AEA</b>	Association of European Airlines
<b>ANSP</b>	Air Navigation Service Provider

<b>AIS</b>	Aeronautical Information Services
<b>AOC</b>	Airline Operator Company
<b>ATC</b>	Air Traffic Control
<b>ATCA</b>	Air Traffic Control Association
<b>ATCO</b>	Air Traffic Controllers
<b>ATFCM</b>	Air Traffic Flow and Capacity Management
<b>ATFM</b>	Air Traffic Flow Management
<b>ATM</b>	Air Traffic Management
<b>ATS</b>	Air Traffic Services
<b>CAA</b>	Civil Aviation Authority
<b>CAATS2</b>	Cooperative Approach to Air Traffic Services II
<b>CANSO</b>	Civil Air Navigation Services Organisation
<b>CATS</b>	Contract-based Air Transportation System
<b>CBA</b>	Cost Business Analysis
<b>CDM</b>	Collaborative Decision Making
<b>CNS</b>	Communication and Navigation System
<b>CONOPS</b>	Concept of Operations
<b>CoO</b>	Contract of Objectives
<b>CTO</b>	Control Time Over
<b>CWP</b>	Control Working Position
<b>EASA</b>	European Aviation Safety Agency
<b>EATM</b>	European Air Traffic Management
<b>EBAA</b>	European Business Aviation Association
<b>EC</b>	European Commission
<b>ECAC</b>	European Civil Aviation Conference
<b>E-OCVM</b>	European Operational Concept Validation Methodology
<b>EXE</b>	Executive Controller
<b>FAA</b>	Federal Aviation Administration
<b>FMS</b>	Flight Management System
<b>FTS</b>	Fast-Time Simulation
<b>GAT</b>	General Aviation Traffic
<b>HF</b>	Human Factors
<b>HIL</b>	Human In the Loop
<b>HMI</b>	Human Machine Interface
<b>IANS</b>	Institute of Air Navigation Services
<b>IATA</b>	International Air Transportation Association

<b>ICAO</b>	International Civil Aviation Organisation
<b>IFALPA</b>	International Federation of Pilots' Association
<b>IFATCA</b>	International Federation of Air Traffic Controllers' Association
<b>IT</b>	Information Technology
<b>JAA</b>	Joint Aviation Authority
<b>KPA</b>	Key Performance Area
<b>MoD</b>	Ministry of Defence
<b>NATO</b>	North Atlantic Treaty Organisation
<b>NLR</b>	Nederlands Lucht-en Ruimtevaart Laboratorium
<b>MTCDD</b>	Medium Term Conflict Detection
<b>NOP</b>	Network Operational Plan
<b>OATA</b>	Overall ATM Target Architecture
<b>OAT</b>	Operational military Air Traffic
<b>PC/PLN</b>	Planner Controller
<b>RBT</b>	The business trajectory, which the airspace user agrees to fly and the ANSP agrees to facilitate. Most times indicated in the RBT are estimates, some may be target times of arrival (TTA) to facilitate planning and some of them may be constraints (Controlled Time of Arrival - CTA). The RBT consists of a 2D route, altitude and time constraints when required, altitude, time and speed estimates at way points and trajectory change points.
<b>R&amp;D</b>	Research & Development
<b>RTA</b>	Required Time of Arrival
<b>RTS</b>	Real Time Simulation
<b>SESAR</b>	Single European Sky Applied Research
<b>STCA</b>	Short-Term Conflict Detection
<b>SWIM</b>	System Wide Information Management
<b>TC</b>	Tactical Controller
<b>TTA</b>	Target Time of Arrival
<b>TMR</b>	Trajectory Management Requirement
<b>TWs</b>	Target Windows
<b>WMO</b>	World Meteorological Organisation

Table 1-1: Acronyms and abbreviations

## 2. Dissemination Strategy

The specific aim of communication is to draw attention of the different stakeholders on the concepts, progress and results of the project. At the same time it may attract the interest of potential partners and encourage scientists and students to integrate the research area.

The CATS project uses an integrated approach for dissemination activities. The project dissemination manager will create, deploy and coordinate a unified program of internal and external use that brings together the partnership's industrial and research partners with non-industrial partner and academic partners.

The CATS consortium was set up to involve representatives of the main stakeholders in the ATS (ANSPs, airports airlines, pilots, ATCos, etc.). This wide range of actors will facilitate the "permanent feedback" of project results amongst their peers.

The project will ensure awareness of its work within the aeronautical community by guaranteeing the exploitation and dissemination of results. This dissemination plan will be continuously updated.

The two main points of the CATS dissemination strategy are to:

- ▶ Demonstrate that CATS is compliant with SESAR recommendations and other current R&D projects.
- ▶ Highlight CATS benefits, through its own distinctiveness.

### 2.1. Stakeholders segmentation

The target of the CATS communication activities are issued from the EEC Stakeholders segmentation model.

Some of these segments are aimed at more accuracy, as they are the real goal for dissemination.

- ▶ Airspace users
- ▶ ANSPs
- ▶ Airport Authorities
- ▶ Society
- ▶ Aeronautics Industry
- ▶ R&D Community
- ▶ Regulatory Authorities

It should also be noticed that the Advisory Committee was put in place to obtain comments. It consists of representatives from various parts of the Air Transport Community.

Hereafter a more detailed description presents the different segments, their particular needs and objectives and the main CATS messages delivered to them.

Sector	Inter-organisational	Organisations	Needs of the stakeholder	Key messages for the stakeholder	Importance for the project	Success factor
Airspace Users						
GAT	IATA, AEA, IFALPA	(Cargo-) Airlines, GA	Efficient, cost effective ATM infrastructure	Cost efficient system, increase capacity	High	Airline involved? Approved CBA?
OAT	NATO	MoDs, armed services	Reserved airspace, time access, flexibility	Real negotiation of constraints from all actors	Medium	
ANSPs						
ATM providers	CANSO	National ANSPs	Efficient use of resources	Best use of resources	High	Buy in
	IFATCA		Employment stability safety first	Human centred system Safety first ATCO organize their work inside negotiated/shared objectives	High	Buy in
ATFCM services	CFMU		Cooperative and dynamic airspace management	Data sharing	Low	
CNS providers	SITA, ITU	BT				
AIS providers		Jeppesen,				
Met services	WMO	National met offices		accuracy	Low	
Airport						

Sector	Inter-organisational	Organisations	Needs of the stakeholder	Key messages for the stakeholder	Importance for the project	Success factor
Authorities						
	ACI		Profitability	Punctuality Integrated Air-ground	Medium	
Society						
The Public	Passengers		ATS will meet their needs	Punctuality, tax	High	
	Tax payers		Efficient system		Medium	
	Third party		Reduced impact of ATS	No added constraints	Low	
Aeronautics Industry						
ATM System Manufacturer	AECMA	Thales	Functional architecture	Exchanges normalisation	Low	
CNS System Manufacturer		Frequentis			Medium	
Aircraft and Engines		EADS, Boeing			Low	
Avionics	EUROCAE	Honeywell	FMS	Functionalities, accuracy	Low	
Standardisation bodies	ARINC, JAA				Medium	
R&D Community						
European	EC		Effective ATM	Compliance with	High	Buy-in

Sector	Inter-organisational	Organisations	Needs of the stakeholder	Key messages for the stakeholder	Importance for the project	Success factor
Research Management			research	SESAR recommendations		
Research provider		Nat'l Research Centres, R&D units of ANSPs, EATM		Research expertise	Medium	Common research studies References in their publications
Universities			Academic achievement	Research expertise	Medium	References in their publications Common studies
Regulatory Authorities						
	ICAO, EC, EASA, EUROCONTROL	ICAO bodies, EC Commission, National CAAs, Ministries of Transport		Legal aspects have to be tackled/suggestions for changes have to be made	Medium	Discussions
Support Industry						
IT & Software Houses & consultants			Profitability	Software development expertise	low	

Table 2-1: Stakeholders segmentation

### 3. Key messages

The first step in any communication exercise is to define the messages to be transmitted.

The paragraph below contains the key messages to be conveyed to the CATS stakeholders.

Those key messages will be the basis of the delivery of the communication actions.

- ▶ **KM1:** Contract of Objectives is a way to implement the Business Trajectory, advocated by SESAR Program, by contractually agreeing on the transfer of tasks and duties between all ATM actors.
- ▶ **KM2: CATS will provide results and demonstrations, as an input to SESAR.**
- ▶ **KM3:** Contract of Objectives will allow a better organisation of ATM actors' resources to achieve ATM system efficiency.
- ▶ **KM4:** In its execution, the Contract of Objectives will allow a better collaboration between air and ground sides.
- ▶ **KM5:** Contract of Objectives proposes an operational way to monitor air navigation services performances (SES2, COM/2008/0388).

These key messages may be updated during the project life cycle, to make the values more concrete to the targeted stakeholders.

For example, the performance of HIL2, linking a real-time ATCO platform with Flight Simulator, led to many presentations to different projects (e.g. FASTI) or stakeholders (e.g. DFS). The Consortium agreed to use the platform support to promote the crew-ground integration as a key message.

## 4. Resources

This paragraph provides a comprehensive list of all communication media, tools and resources available to drive the CATS communication:

- ▶ Final report
- ▶ Presentations
- ▶ Scientific articles
- ▶ Conferences participation
- ▶ Exhibition (workshop)
- ▶ Dedicated public web site
- ▶ Leaflet
- ▶ Poster
- ▶ Animated media (film, video)
- ▶ Promotional means (goodies)
- ▶ Web site
- ▶ Press releases
- ▶ Partners' internal communications (newsletters, web site...)
- ▶ External resources [4] (Research Commission, Cordis, ...)

The main dissemination activities will comprise contributions to dedicated user forums in which user needs will be collected and discussed following presentations given in the course of the project.

The project plans to organise and attend:

- ▶ Two workshops<sup>1</sup> dedicated to European ATM community, to present the current status of the project and to obtain requirements and feedback from the stakeholders. Such joint meetings will favour exchanges and awareness and provide broader support for the various project teams than coordination meetings;
- ▶ A user forum at the end of the project to present the operational concept and the final assessment results.

Technical awareness will be obtained through close coordination with related projects or programmes (e.g. SESAR, SWIM-SUIT, ERASMUS, etc.).

Additional dissemination activities will consist of presentations to the SESAR JU, to reinforce the link with SESAR activities; this may also lead to a possible introduction of CATS early benefits into SESAR mid-term activities.

Additional scientific dissemination activities will involve ad-hoc participation in conferences/colloquiums.

Finally, the CATS website will ensure day-to-day access to information related to the project. It will contain:

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<sup>1</sup> These workshops will take place after the first and after the second HIL experiment.

- ▶ a general presentation of the project and its objectives;
- ▶ a general presentation of the Consortium;
- ▶ the programme of future events, such as workshops;
- ▶ information on project events and major milestones;
- ▶ public deliverables;
- ▶ links to related programmes and projects.

The Consortium will prepare specific materials such as leaflets, presentations, press releases, final project proceedings, etc., to ensure that a wider public audience is addressed.

#### 4.1. Indicators/monitoring

We propose to use the following methods to measure the impact of the different instruments of communication:

- ▶ Web site tracking,
- ▶ Number of scientific articles selected in major conferences and journals,
- ▶ References to the CATS project in other projects, research, studies,
- ▶ Feedback got from Advisory Committee.

#### 4.2. CATS Planned effort

To achieve the dissemination foreseen by this document, human resources have also been planned in the CATS Description of Work [2], to ensure broad communication within the aeronautical community in order to promote the concepts developed by CATS and also to obtain opinions and feedback from the community on the proposed concept.

The table below shows the planned effort for all dissemination activities within CATS.

Work package number	WP 3	Start date or starting event:				T0	
Participant id	FRQ	EEC	AFC	Unique	IIASL	ETH	ORTS
Person-months per participant:	4	4	3.5	1	2	1	2
Participant id		ENAV	SkySoft				
Person-months per participant:		1	3				

Table 4-1: Planned WP3 Efforts

## 5. Exploitation opportunities

The main objective of the CATS Project is to provide an operational concept scenario and tool specifications to increase the overall ATS capacity and efficiency without endangering safety. If the results are promising, the project partners intend to make direct use of them in the following manner:

- ▶ The research institute (EUROCONTROL Experimental Centre) aims to extend its working relationship with the operational actors (ANSPs, airlines and airports) and will produce guidelines describing the specificities of the CATS concept in order to help decision-makers to select the procedures which best match the constraints imposed by their local criteria.
- ▶ The air traffic services provider (ENAV) could use the results obtained from CATS to develop new procedures at their ANSPs. The results of the CATS Project will be used by ENAV to improve their understanding and expertise in the preparation of advanced procedures, and to further its expertise in the ATM validation area.
- ▶ SkySoft & Frequentis will use the results of this project to improve the functions and architecture of their ATC tools. Prototypes also represent an initial approach for new tools by exploiting one or more specific functionalities to be introduced onto the market.
- ▶ The project activities will be used by universities to develop the expertise of post-graduate researcher(s), making them available for employment in the European aerospace industry at the end of the project. The project will promote the working relationship between universities and the aerospace industry. In particular, universities will benefit by the close contact and information exchange with the industrial partners, obtaining crucial input for their research and increasing the visibility of their results in the aerospace community. Industry, on the other hand, will profit from a reduction in the time taken to exploit research findings from the universities and by being able to recruit specialized scientists trained in the universities as part of the project.
- ▶ Airlines could use the results obtained from CATS to develop a better understanding of collaborative flight management resources, particularly for the airline operation centre officers.
- ▶ Airports could use the results in the CDM initiative (which is already under way) in order to primarily design and evaluate the tools and needs for both airport-airport and airport-air segment collaboration within a regional or even system-wide information management system.
- ▶ Furthermore, the aeronautical community may benefit from the results of TW modelling. They could be used to obtain a better understanding of reverse constraint propagation. CATS project will also input some significant understanding to the validation required for complex system and can provide aeronautical community with an opportunity to further understand SESAR business trajectory.

## 6. Communication Work Plan

This section identifies the products and services to be delivered and the process followed to achieve them to have the most beneficial impacts on the Air Transport Community.

The table below describes the activities planned to achieve an efficient awareness of the CATS work.

Problem / Opportunity		Strategy and Tactics		Objectives	Measurements		Management	
Issue	Segment	Message	Media	Expected outcome	How evaluated	Responsible for measurement	Responsible for implementation	Priority
CATS (after T0)	R&D Community, Industries, ANSPs, Airspace Users, Airports	Concept	Presentations	Feedbacks, contacts	Quantify	ALL	ALL	M
	All stakeholders	Project overview	Leaflet	Knowledge of the project	Number distributed	EEC	EEC	M
	All stakeholders	Concept, Results	Web Site	Knowledge of the project	Number of visitors	FRQ	FRQ	H
	R&D Community, Industries, ANSPs, Airspace Users, Airports	Project start, Concept	Press release	Contacts	Quantify	ALL	EEC	M
CATS (after HIL Results)	R&D Community, Industries, ANSPs, Airspace Users, Airports	Preliminary results	Conferences	Feedbacks, contacts	Quantify	EEC	EEC	H
	R&D Community, Industries, ANSPs, Airspace Users, Airports	Preliminary results	Presentations	Feedbacks, contacts	Quantify	ALL	ALL	M
	All stakeholders	Preliminary results	Web site		Number of visitors	FRQ	FRQ	H

Problem / Opportunity		Strategy and Tactics		Objectives	Measurements		Management	
Issue	Segment	Message	Media	Expected outcome	How evaluated	Responsible for measurement	Responsible for implementation	Priority
	R&D Community, Industries, ANSPs, Airspace Users, Airports	Preliminary results	Exhibition	Feedbacks, contacts	Quantify	EEC/SkySoft	EEC/SkySoft	L
CATS (end of project)	R&D Community, Industries, ANSPs, Airspace Users, Airports	Final results	Conferences	Feedbacks, buy in	Quantify	ALL	ALL	H
	R&D Community, Industries, ANSPs, Airspace Users, Airports	Final results	Presentations, final report	Feedbacks, buy in	Quantify	ALL	ALL	H
	All stakeholders	Final results	Web site	Feedbacks, buy in	Number of visitors	FRQ	FRQ	H
	R&D Community, Industries, ANSPs, Airspace Users, Airports	Final results	Exhibition	Feedbacks, buy in	Quantify	EEC/SkySoft	EEC/SkySoft	M
	R&D Community, Industries, ANSPs, Airspace Users, Airports	Final results	Press release	Feedbacks	Quantify	EEC	EEC	M
	Society	Concept and results	Animated media	Knowledge		EEC/FRQ	EEC	M

Table 6-1: CATS Communication Work Plan

## 6.1. Action Plan

The aim of this paragraph is to provide a clear view of all the dissemination activities planned to be carried out by the CATS project.

All public deliverables, as listed in Section 7, will be made available through the CATS Web site.

January 2007	February 2007	March 2007	April 2007	May 2007	June 2007	July 2007	August 2007	September 2007	October 2007	November <sup>2</sup> 2007	December 2007
SESAR Presentation	ATC Maastricht					Leaflet in ATM Seminar			EEC WebPages Updated	SESAR Presentation	Poster in 6 <sup>th</sup> INO Workshop ARDEP Update

Table 6-2: 2007 Action Plan achieved

January 2008	February 2008	March 2008	April 2008	May 2008	June 2008	July 2008	August 2008	September 2008	October 2008	November 2008	December 2008
	Luggage Tag Press Release (Cordis)	Poster & Leaflet in ATC Global	CATS Website EEC Newsletter					26 <sup>th</sup> ICAS			7 <sup>th</sup> INO Workshop Exhibition 1st CATS Workshop

Table 6-3: 2008 Action plan achieved

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<sup>2</sup> Official Project Start

January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009	November 2009	December 2009
		ATC Global			Public Service Review French Academie de l'air et de l'espace Annual Conference			13th EWGT	28th DASC HIL2 Press Release		8 <sup>th</sup> INO Workshop (Exhibition & paper) 48 <sup>th</sup> IEE/CDC French Academie de l'air et de l'espace

Table 6-4: 2009 Action Plan achieved

January 2010	February 2010	March 2010	April 2010	May 2010	June 2010	July 2010	August 2010	September 2010	October 2010	November 2010	December 2010
2 <sup>ND</sup> CATS Workshop Media Flash presentation	Media Flash on social media	ATC Global	ATOS2010	Journal of Air Transport Management	4 <sup>th</sup> ICRAT American Control Conference 2010			AIRO 2010 27th ICAS	Final User Forum IEEE Transactions on Automatic Control paper	HCI Aero 2010	9 <sup>th</sup> INO Workshop?

Table 6-5: 2010 Action Plan foreseen

Conference

Article

Web pages

Presentation

Workshop and exhibition

Other

## **6.2. Coordination with others projects**

A number of meetings have been attended by the CATS partners with the goal of either promoting CATS to the wider community or gaining further understanding of aspects that will be used within the CATS program. The aim was also to coordinate activities .This includes:

### **6.2.1. ATM R&D Projects Coordination and Networking Meeting**

The 2<sup>nd</sup> ATM R&D Projects Coordination and Networking Meeting was held in Brussels on November 14<sup>th</sup>, 2007. The aim of this meeting was to show to the EC how the CATS project ensures that the research goals and the intended results are in line with SESAR targets.

### **6.2.2. Coordination Meeting with EPISODE 3**

The first coordination meeting with EPISODE 3 was held on January 10<sup>th</sup>, 2008 in EEC Brétigny sur Orge. Frequentis, SkySoft and EEC as well as the EPISODE 3 project coordinator attended this meeting.

The meeting aim was to agree on the further coordination between these two projects and how to share information.

### **6.2.3. Coordination Meeting with CARE projects**

At the end of the 6<sup>th</sup> INO workshop, after the CARE review, some CARE projects have to be reoriented. EC asks CATS partners to cooperate with two of them, MAMMI and 3D/2D projects.

The CATS project was presented by Laurent Guichard to the MAMMI/2D-3D Workshop in Brétigny on the 24<sup>th</sup> of January 2008.

On May 22<sup>nd</sup>, 2008 a meeting with the 2D/3D project leader was held. The CATS team presented their work program and 2D/3D will see if collaboration could be established regarding their own schedule.

### **6.2.4. Coordination Meeting with Advisory Board members**

The first meeting with Ms. Sherry Borener (FAA/Safety), member of the Advisory Committee, was held in Brétigny on March 26<sup>th</sup>, 2008. Mr Warren Randolph (FAA/JPDO) also attended the meeting. They were interested in the CATS concept.

### **6.2.5. Coordination Meeting with E-OCVM trainers**

On 26<sup>th</sup> of January 2009, a first meeting was held in Brétigny with Fabrice Drogoul, one of the E-OCVM trainers. The idea was to present the CATS Validation Strategy and concepts, in order to see if CATS could be one project example to be shown during the E-OCVM training.

### **6.2.6. Coordination meeting with EUROCONTROL Legal Services**

On 29<sup>th</sup> of April 2009, a first meeting was held in Brussels between Pablo Mendes de Leon (IIASL) and Ann Frederique Pothier (senior lawyer) and Roderick van Dam Head of EUROCONTROL Legal Services.

They found the approach of CATS towards the organisation of air traffic management in European innovative and interesting. They referred to a number of instances in which similar concepts have been addressed. They mentioned the relationship between signal providers in the context of GNSS, underpinned by contractual arrangements between such signal providers. Suggestions are made to include airlines with this contractual relationship. They put forward that safety should never be jeopardised under CATS. Also, the public service character of ANSP should not be underestimated. In all cases, it should be avoided that public interests are sacrificed to private or commercial objectives. A cost benefit analysis might be useful for determining the economic side of the CoO/CATS. It was questioned if and to what extent the CoO would put pressure on costs via contractual arrangements (proof of fault, liabilities and insurance). References were made to the Route charges systems developed under Eurocontrol Conventions (see Annex IV of the revised convention of 1997 providing for a cost based provision of air navigation services).

### **6.2.7. Coordination meeting with EUROCONTROL HQ**

On 8<sup>th</sup> of May 2009 a first coordination meeting was held between EEC and SESAR WP10.2.1 Leader (Ibrahim Bayraktutar) and his colleague (Carlos Garcia Avello) to start cooperation on negotiation/ renegotiation process. EEC presented the CATS concept and they were very positive about it. Carlos sees in CATS a real refinement of the SESAR RBT. He shares the vision of the TW, allowing freedom. If S-JU confirms the CATS alignment, they will be happy to collaborate with the project.

### **6.2.8. Coordination meeting with CARE Project**

On 19<sup>th</sup> of May, 2009 a workshop was held between MAMMI project and EEC CATS Team firstly to present MAMMI results after the 2<sup>nd</sup> year and secondly to discuss on scenario chosen by MAMMI Team for the 3<sup>rd</sup> year.

### **6.2.9. Coordination meeting with CAATS II project in Madrid on May 27<sup>th</sup>, 2009**

ORTS attended. The goal of this meeting was to discuss the guidelines provided by CAATS II for developing a Business Case in the SESAR framework

### **6.2.10. Participation to Joint Episode3 / CAATS II Dissemination event in Brussels on 13-14<sup>th</sup> October, 2009**

ORTS attended. The goal of this participation was to acquire an overview on both projects and align the CATS Benefit Assessment with CAATS II findings.

### **6.2.11. Networking Meeting with Swiss rail**

In Geneva, on October 26<sup>th</sup>, 2009, EEC presented the HIL2 experiment to the SBB CFF FFS Ergonomist. Similar study has been conducted in the Swiss rail and similarities have

been discussed. CATS will be invited to present the TW concept to the 2010 Swiss Ergonomic Conference.

#### **6.2.12. CATS presentation to Legal Experts**

On October 26<sup>th</sup>, 2009, EEC presented the HIL2 experiment to legal experts from Europe, led by Francis Schubert. The notion of performance monitoring led interesting discussions. Following persons attended this meeting:

- ▶ Annabel Backs (Belgocontrol)
- ▶ Christian Berlinger (Belgocontrol)
- ▶ Onno Reitsma (EUROCONTROL/MUAC)
- ▶ Peter Tannhäuser (EUROCONTROL)
- ▶ Engbert Hofstee (LVNL)
- ▶ Thomas Müller (DFS)
- ▶ Michel Rocca (DSNA)
- ▶ François Castellucci (Lux ANA)
- ▶ Francis Schubert (Skyguide – chairman)
- ▶ Stefan Mennella (Skyguide)
- ▶ Hans Christian Holst (NUAC)
- ▶ Michael Thomsen (NUAC)

#### **6.2.13. CATS presentation to FASTI Team in Geneva on October 27th, 2009**

EEC presented the HIL2 experiment to the FASTI team. The platform and the HMI proposed were appreciated.

#### **6.2.14. CATS presentation to DFS in Geneva on October 22th, 2009**

SkySoft presented the HIL2 experiment to DFS representatives. The platform proposed, linking ATCO simulator to pilot simulator (Microsoft Flight Simulator) gave rise to curiosity and interest.

#### **6.2.15. CATS presentation to the French Academie de l’Air et de l’Espace on December 8<sup>th</sup>, 2009**

IIASL presented the CATS Legal Framework to the Section IV of the Academie de l’Air et de l’Espace as a topic of discussion.

#### **6.2.16. CATS presentation to EC representative on January 22<sup>nd</sup>, 2010;**

EEC presented the CATS Project and objectives to Ms. Christine Fassert, which has been delegated by the EU Commission as representative for the 2<sup>nd</sup> CATS Workshop.

**6.2.17. CATS report on Legal issues disseminated to IFLY project coordinator in May, 2010.**

A copy of the CATS Legal issues report was disseminate by ETH to H. Blom, iFLY project coordinator (FP6 project ).

## 7. Publishable results

This section lists the deliverables, which will be made public, according to the DoW [2] including their delivery dates.

Deliverable No	Deliverable title	Delivery date	Nature <sup>3</sup>
<b>D1.1</b>	Document describing the State of the Art	T0+1	R
<b>D1.2.2</b>	Concept of Operation Document	T0+35	R
<b>D1.3.1</b>	Validation Strategy and Plan	T0+34	R
<b>D2.1.1</b>	HIL1 primary results Analysis	T0+15	R
<b>D2.1.2</b>	HIL2 primary results Analysis	T0+27	R
<b>D2.1.3</b>	HIL3 primary results Analysis	T0+34	R
<b>D2.2.1.1</b>	Report on the selection of safety critical and risk sensitive case studies	T0+16	R
<b>D2.2.1.2</b>	Report on modelling and quantitative risk analysis	T0+26	R
<b>D2.2.1.3</b>	Report on Human-In-the Loop effects	T0+34	R
<b>D2.2.2</b>	Report on cost-benefits analysis	T0+34	R
<b>D2.2.3</b>	Report on legal assessment	T0+18	R
<b>D2.2.4.3</b>	Report on Target Window modelling	T0+30	R
<b>D3.3.1</b>	Dissemination Plan	T0+4	R
<b>D3.3.2</b>	Workshop 1 presentations	T0+13	O
<b>D3.3.3</b>	Workshop 2 presentations	T0+26	O
<b>D3.3.4</b>	Final User Forum presentations	T0+36	O

Table 7-1: List of public CATS deliverables

These deliverables will be available through the CATS web-site [www.cats-fp6.aero](http://www.cats-fp6.aero), as well as through EUROCONTROL dedicated web pages ([www.eurocontrol.int/eec/cats](http://www.eurocontrol.int/eec/cats)).

Via the CATS web-site also other relevant information such as publications, events, etc. are published.

<sup>3</sup> R = Report

P = Prototype

D = Demonstrator

O = Other

## 8. Conferences, Presentations and Exhibitions

This section lists the different papers, presentations, posters or exhibitions proposed by the CATS partners for conferences' participations.

Date	Venue	Conference Id	Paper title	Status
Feb. 2007	Maastricht, Netherlands	17 <sup>th</sup> ATC Maastricht Exhibition	Exhibition on NeoMetSys stand	Accepted
Jul. 2007	Barcelona, Spain	7 <sup>th</sup> ATM Seminar	"Contract-based Air Transportation System" Dohy, Guibert, Guichard	Rejected
March. 2008	Amsterdam, Netherlands	ATC Global	Platform Exhibition SkySoft ATM booth	Accepted
Sept. 2008	Anchorage, Alaska	26 <sup>th</sup> ICAS conference	"Contract-based Air Transportation System to fulfil the arriving-on-time objective" Guibert, Guichard, Rihacek, Castelli, Ranieri	Presented
Dec. 2008	Bretigny, France	7 <sup>th</sup> INO Workshop and Exhibition	Platform and poster exhibition	Accepted
March. 2009	Amsterdam, Netherlands	ATC Global	Platform Exhibition on SkySoft-ATM booth	Accepted
Jun. 2009	Napa, California	8 <sup>th</sup> USA/Europe ATM Seminar	"4D trajectory management through Contract-of Objectives" Guibert, Guichard, Grau	Rejected
22 <sup>nd</sup> Jun.2009 <sup>4</sup>	Toulouse, France	Annual Conference of the members titulaires of the French Academie de l'air et de l'espace.	CATS presentation, legal aspects Pablo Mendes de Leon,	Accepted
24 <sup>th</sup> -25 <sup>th</sup> Sept.2009	Padua, Italy	13 <sup>th</sup> Euro Working Group Transportation Meeting	"Analysis of a Collaborative Decision Making Concept in Air Traffic Management: an Airline Perspective" Castelli,Padoano, Pellegrini, Ranieri	Accepted

<sup>4</sup> Following this presentation French Academie de l'Air et de l'Espace will put CATS subject on the agenda of Section IV of the Academie - the legal section

Date	Venue	Conference Id	Paper title	Status
Oct. 2009	Orlando, Florida	28 <sup>th</sup> Digital Avionics Systems Conference	"A target window model for managing 4-D trajectory-based operations" I. Berechet, F. Debouck, L. Castelli, A. Ranieri, C. Rihacek	Accepted
Oct. 2009	Orlando, Florida	28 <sup>th</sup> Digital Avionics Systems Conference	"4D trajectory management through Contract-of Objectives" Guibert, Guichard, Grau, Rihacek	Accepted
Dec. 2009	Shanghai, China	48 <sup>th</sup> IEEE Conference on Decision and Control	"Air Traffic Management with Target Windows: An approach using Reachability" Margellos & Lygeros	Accepted
Dec.2009	Brétigny, France	8th INO Workshop and Exhibition	Platform and poster exhibition	Accepted
Dec.2009	Brétigny, France	8th INO Workshop and Exhibition	" A Business Trajectory Implementation through Target Windows: An AHP Analysis of the Flight Planning Phase" Castelli and Pellegrini	Rejected
Apr.2010	Delft, Netherlands	1 <sup>ST</sup> International Air Transport and Operations Symposium (ATOS)	"Short-term allocation of Time Windows to flights through a distributed market-based CDM mechanism" Castelli, Pesenti & Ranieri	Accepted Best paper Award
June 2010	Budapest, Hungary	4 <sup>th</sup> International Conference on Research in Air Transportation (ICRAT)	"The Air Traffic Flow management problem with Time Windows" Corolli, Castelli and Lulli	Accepted
July 2010	Baltimore, USA	American Control Conference	"Hamilton-Jacobi formulation for Reach-Avoid Problems with an application to Air Traffic Management," Margellos & Lygeros	Accepted
Sept. 2010	Nice, France	27 <sup>th</sup> International Council of the Aeronautical Sciences (ICAS)	"Human in the Loop to assess 4D Trajectory management with Contract-Of-Objectives" Guibert, Guichard, Grau	Accepted

<b>Date</b>	<b>Venue</b>	<b>Conference Id</b>	<b>Paper title</b>	<b>Status</b>
Sept 2010	Reggio Calabria, Italy	XLI Annual Conference of the Italian Operational Research Society (AIRO)	"Critical flights and airspace resources in air traffic flow management" Castelli, Corolli & Lulli	Accepted
Nov.2010	Cape Canaveral, Florida, USA	HCI Aero 2010	"Result of the evaluation of crew-ground integration with Contract-of-Objectives" Guibert, Guichard, Grau	Accepted
Dec.2010	Bretigny sur Orge, France	9th Innovative Research Workshop and Exhibition	"4D Trajectory management through Contract of Objectives" Guibert, Guichard	Proposed

Table 8-1: List of CATS publications

## 9. Workshops and Forum

CATS project will organise two dedicated workshops and a final forum, to present the current status of the project and obtain feedbacks from stakeholders.

### 9.1. First CATS Workshop

The first CATS workshop was planned to take place one year after the project start and mainly after the first experimentation, to present the concept and the intermediate results, in line with the SES and SESAR activities.

#### 9.1.1. Invitation

For this event more than 70 invitations were sent through the ATM Community.



The CATS project is pleased to invite you to a parallel session of the 7th INO Workshop

**Thursday 4th December 2008**  
EUROCONTROL Experimental Centre  
Bretigny-sur-Orge, FRANCE

The CATS Consortium is pleased to present an overview of their research project to an international audience.

The session starts with a presentation of the project background, with the emphasis on SES2 and SESAR.

A discussion follows based on the question: "Could the CoO proposal be seen as a possible driver to implement the SESAR RBT?"  
The remainder of the session focuses on a presentation of: primary results of the first experiment; initial analysis of how the proposed concept will impact the ATCOs during their daily work; and the ATM performances with regard to specific Key Performances Area (Safety, Capacity, Efficiency and Predictability).

The CATS parallel session is intended as a highly interactive forum to obtain feedback on the proposed concepts and ideas. There is also an opportunity to learn more about the Single European Sky (SES) and SESAR initiatives.



For registration, please send an email to: [eec.ino-workshop@eurocontrol.int](mailto:eec.ino-workshop@eurocontrol.int)

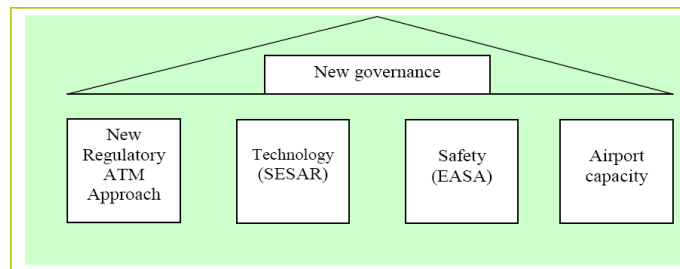


## Overview

As a way to manage the projected massive increase in demand for air transport, while improving safety and increasing environmental awareness, the European Commission (EC) has proposed a package of measures as follows.

First, the existing Single Sky legislation needs to be sharpened to deal with performance and environmental challenges. Second, the SESAR (Single European Sky ATM Research) programme is to provide for the future technological aspects of SES. Third, the competence of the European Aviation Safety Agency (EASA) is to be extended to encompass aerodromes, air traffic management, and air navigation services. Fourth, the "action plan for airport capacity, efficiency and safety" needs to be implemented.

### Building a new Aviation Governance, Based on four pillars:



The technological evolution of the current ATM will be supported by the SESAR programme to manage anticipated air traffic growth in a safe and environmentally sustainable manner. The future operational concept represents a paradigm change, creating a form of collaborative information system for aviation operations.

SESAR has changed the proposed approach of ATM from airspace-based to trajectory-based management. The main foundation of the SESAR ATM concept is based on the Business Trajectory (BT), which represents the intention of Airspace Users integrated with ATM and airports constraints. This BT is issued from a collaborative planning process, continuously reflected in the Network Operations Plan (NOP). The sharing of the same information (BT) by all partners is a key enabler of the ATM system.

High-level foundations of the BT have been described in SESAR D3, through the business trajectory life-cycle. However, further R&D work is required to go from a high-level concept to operations and also to evaluate impacts and prove benefits.

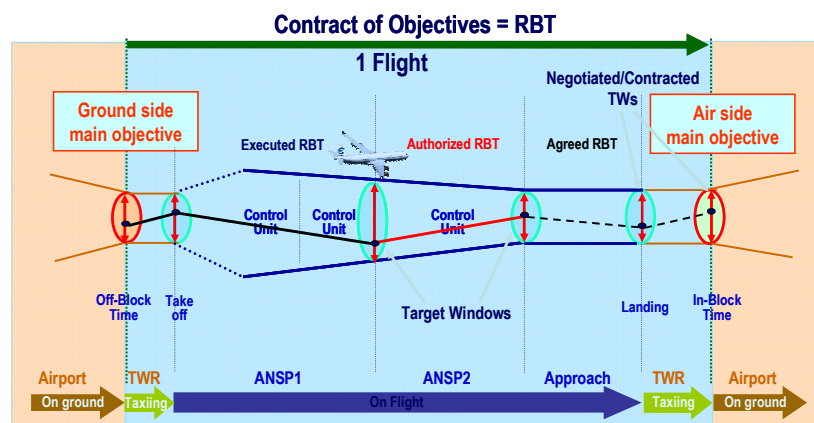


### The CATS project

The CATS project, co-funded by the European Commission (EC) through the Sixth Framework Programme (FP6), proposes the Contract of Objectives (CoO) as one possible implementation of the BT. This CoO can also be regarded as a new way of managing ATM by using mutually agreed objectives. CoO provides well-defined objectives for each actor involved in a flight. These objectives represent a commitment from each actor to deliver a particular aircraft within temporal and spatial intervals. These commitments are agreed on for specific transfer-of-responsibility areas, the so-called Target Windows (TWs). Each actor is fully accountable for meeting its own objective. The objectives are negotiated in terms of punctuality at the destination, while taking into account all actors' constraints. The Contract of Objectives is therefore a set of temporal and spatial intervals defined on the basis of:






- the aircraft's commercial flight envelope
- predictions, relating to en-route air traffic control limitations, airports constraints...
- the final objective to be attained (target time of arrival).

This is an outline of CATS . . . We look forward to discussing the project with you during our parallel session of the 7th INO Workshop.



More information can be found at [www.cats-fp6.aero](http://www.cats-fp6.aero) and at [www.eurocontrol.int/eec/cats](http://www.eurocontrol.int/eec/cats)



 09:00 – 09:20	Welcome and SES2	EC
 09:20 – 10:05	SESAR Business Trajectory	EEC
	Coffee Break	
 10:20 – 11:20	CoO concept	EEC
 11:20 – 11:50	HIL results	ENAV
 11:50 – 13:20	Discussion	FQS
	Lunch	



#### **Also . . . come and see us in the Showroom.**

The CATS experimental platform (developed by SkySoft-ATM) will be presented at the 7th INO Workshop & Exhibition from 2nd to 4th December 2008

### **9.1.2. Agenda**

For this first workshop, the idea was to present the CoO concept as one of the possible drivers to implement the SESAR RBT. For this reason the Consortium asked the EU Commission to open the event with a presentation of the four pillars of the SES2 initiatives. One of these pillars, SESAR, changed the proposed approach of ATM from airspace-based to trajectory-based management. The main foundation of the SESAR ATM concept is based on the Business Trajectory (BT) and the CoO concept and assessment could be seen as one of the possible implementation of this BT.

CATS Workshop Agenda		
■ 09:00-09:05	Welcome and Agenda	Laurent Guichard
■ 09:05-09:20	SES2	Kasia Gryc
■ 09:20-09:50	SESAR (Business Trajectory)	Bob Graham
■ 09:50-10:30	CATS Project and Concept	Christoph Rihacek
■ 10:30-10:45	TW calculation	Ion Berechet
■ 10:45-11:15	Break (Atrium)	
■ 11:15-12:00	HIL1 Goals, Hypothesis and Results	Sandrine Guibert + Jean Yves Grau + Giorgio Matrella
■ 12:00-12:50	Discussion	All
■ 12:50-12:55	Conclusions and close out	Christoph Rihacek
■ 12:55-13:10	7th EUROCONTROL Innovative Research Workshop closure (Auditorium)	Colin Meckiff
■ 13:15-14:15	Lunch	

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### 9.1.3. Minutes

On the 4<sup>th</sup> of December, the first CATS workshop was successfully carried out at the EEC, in a parallel track of the 7<sup>th</sup> Innovative Research Workshop and Exhibition.

This first CATS workshop was well attended (see below) with a range of experts from different companies.

The workshop opened with a detailed presentation of the Single European Sky 2 initiatives, held by Katarzyna Gryc (EC DG TREN) and continued with a presentation of SESAR Business Trajectory given by Bob Graham. He concluded his presentation by explaining that CATS project could provide an opportunity to further understand the SESAR Business Trajectory, how it may operate, and it will also provide significant input to understanding the validation required for complex concepts.

The CATS Consortium presented briefly the CATS project and concept, the TW calculation, and finally the first assessment and its initial results.

Then the floor was given to the audience for questions and a discussion session.

Through animated discussion several issues were raised about:

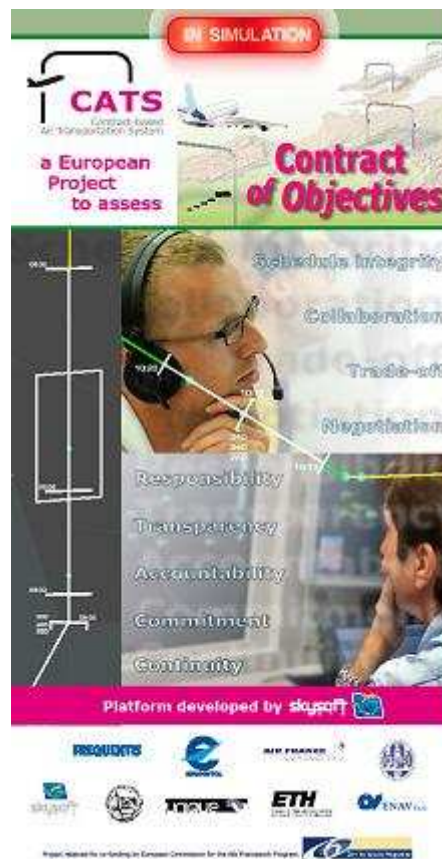
**Target Window calculation:** the model is very mathematical, but how are the values taken? How do we integrate the CDM approach into the calculation? What is the priority when building the TW modelling? Why do we take the assumptions to have TW centred about the boundary between two ATM sectors? *This calculation is really the central point of the project and the CATS team will refine and document their work on this topic.*

**KPA:** are TWs built to increase capacity? Why TW could improve efficiency? *The operational assessments are focused on en-route part, between two sectors. Therefore, it's difficult to evaluate the overall impact on the air transportation system. This will be*

done through CBA. Efficiency will be improved even at local level through measurements of aircraft throughputs (flight duration...).

**Others topics about the experiment**, mainly to know what kind of tools are needed for the second experiment (*coordination tools between PLN and EXE*) and also the link between TWs and TMR, advocated by SESAR (*TMR is a delta in 4D around the RBT triggering an update of this RBT when overtaken, TWs represent the constraints not the updates*) concluded the discussions.

In parallel to this CATS workshop, the SkySoft platform was exhibited during the 3 days of the 7<sup>th</sup> Innovative Research Workshop. A dedicated poster was developed for this event.



### 9.1.4. Attendees

First Name	Last Name	Company / Organisation	Country
Raimon	<b>ALBIOL</b>	<b>Advanced Logistic group</b>	Spain
Francois	<b>BARDIN</b>	<b>SITA</b>	Switzerland
Lucas	<b>BELLESIA</b>	<b>EUROCONTROL EEC</b>	France
Ion	<b>BERECHET</b>	<b>Air France Consulting</b>	France
Marc	<b>BOURGOIS</b>	<b>EUROCONTROL EEC</b>	France
Jean-noel	<b>BOY</b>	<b>Air France Consulting</b>	France
Bernard	<b>CHEGNION</b>	<b>Air France Consulting</b>	France
Dominique	<b>CIRRI</b>	<b>EADS</b>	France
Andrew	<b>COOK</b>	<b>University of Westminster</b>	UK
François	<b>COTTIER</b>	<b>SKYGUIDE</b>	Switzerland
Andres	<b>Cruz del Valle</b>	<b>GMV Aerospace and Defence</b>	Spain
Marc	<b>DALICHAMPT</b>	<b>EUROCONTROL EEC</b>	France
Didier	<b>DOHY</b>	<b>DKUB Consulting</b>	France
Vu	<b>DUONG</b>	<b>EUROCONTROL EEC</b>	France
Hinnerk	<b>EISSFELDT</b>	<b>D.L.R.</b>	Germany
Ros	<b>EVELEIGH</b>	<b>EUROCONTROL EEC</b>	France
Diane	<b>FRACHON</b>	<b>Air France Consulting</b>	France
Gerard	<b>GAILLARD</b>	<b>FNS</b>	France
Michel	<b>GOGUEY</b>	<b>INEOVA</b>	France
Robert	<b>GRAHAM</b>	<b>EUROCONTROL EEC</b>	France
Jean-Yves	<b>GRAU</b>	<b>INEOVA</b>	France
Kasia	<b>GRYC</b>	<b>European Commission -DG TREN</b>	Belgium
Sandrine	<b>GUIBERT</b>	<b>EUROCONTROL EEC</b>	France
Laurent	<b>GUICHARD</b>	<b>EUROCONTROL EEC</b>	France
Pierre-Henri	<b>GUISAN</b>	<b>SkySoft ATM</b>	Switzerland
Yves	<b>KERJEAN</b>	<b>FNS</b>	France
Bruno	<b>LAMBLA</b>	<b>Thales Research &amp; Technology</b>	France
Pascal	<b>LATRON</b>	<b>SKYGUIDE</b>	Switzerland
Yves	<b>LE ROUX</b>	<b>SKYGUIDE</b>	Switzerland
Philippe	<b>LEPLAE</b>	<b>EUROCONTROL EEC</b>	France
Soenke	<b>MAHLICH</b>	<b>EUROCONTROL EEC</b>	France
Kostas	<b>MARGELLOS</b>	<b>ETH Zurich</b>	Switzerland
Rubben	<b>MARTINEZ</b>	<b>Advanced Logistic group</b>	Spain

First Name	Last Name	Company / Organisation	Country
Giorgo	<b>MATRELLA</b>	<b>ENAV</b>	Italy
Gerard	<b>MAVOIAN</b>	<b>EUROCONTROL EEC</b>	France
Sakae	<b>NAGAOKA</b>	<b>ENRI</b>	Japan
Philippe	<b>NAVES</b>	<b>EUROCONTROL HQ</b>	Belgium
Hokan	<b>NILSSON</b>	<b>EUROCONTROL EEC</b>	France
Catherine	<b>PALAZZO</b>	<b>EUROCONTROL EEC</b>	France
Stephane	<b>PAUL</b>	<b>Thales Research &amp; Technology</b>	France
Paola	<b>PELLEGRINI</b>	<b>University of Trieste (DEEI)</b>	Italy
Andrea	<b>RANIERI</b>	<b>University of Trieste</b>	Italy
Christoph	<b>RIHACEK</b>	<b>Frequentis AG</b>	Austria
Gilles	<b>ROLLAND</b>	<b>FNS</b>	France
Khaled	<b>SOUEIDAN</b>	<b>DGAC / STAC</b>	France
Sonja	<b>STRAUSSBERGER</b>	<b>Eurisco International</b>	France

### 9.1.5. Outputs:

The concept was well understood by the 46 participants. Such workshop favours exchanges and awareness with stakeholders. Some concerns were raised about TW modelling. This topic, really central to the concept, will be more explained during the following communication actions.

Other topics, such as the link with the SESAR TMR or the CDM process around negotiation of the CoO were also tackled. This last point, even if the negotiation is out of the scope of the project, seems to be very sensitive and effort will be made by CATS project to tackle some of these issues around the third experiment, dealing with renegotiation (6.2.7).

## 9.2. Second CATS Workshop

The second CATS workshop was planned after the second year of the project and mainly after the second experimentation, to present the concept and the intermediate results, in line with the SES and SESAR activities.

### 9.2.1. Invitation

For this event more than 70 invitations were sent through the ATM Community.

**CATS**  
Contract-based  
Air Transportation System

**26th January 2010**  
Skyguide premises  
Geneva, Switzerland

**The CATS project is pleased  
to invite you  
to its second Workshop**

You are cordially invited to the second CATS Workshop that will be held by SkySoft-ATM in Geneva, on 26th of January 2010, hosted by the CATS project team and the European Commission;

The main objectives of the workshop are to demonstrate the progress made by the CATS project toward the goal of achieving punctuality at destination, by assessing a possible practical implementation of the Business Trajectory, namely the Contract of Objectives (CoO), on a joint simulation platform developed by SkySoft ATM, mixing four controllers positions and two flight simulators positions.

After an introduction of the project, the CATS Consortium will present the Concept of Operations, as well the platform demonstration. During the afternoon the activities carried out to demonstrate the feasibility, acceptability and benefits of the concept will be discussed. Finally we will look at the work remaining to be done for the last year of the project.

Convinced that it will be a real opportunity for beneficial exchanges, the CATS Consortium is looking forward to seeing you in Geneva.


More information on the CATS project could be found on [www.cats-fp6.aero](http://www.cats-fp6.aero) or [www.eurocontrol.int/eec/cats](http://www.eurocontrol.int/eec/cats).

For logistical reasons, advance registration is necessary. Please confirm your participation before 30<sup>th</sup> of December sending an email to [sandrine.quibert@eurocontrol.int](mailto:sandrine.quibert@eurocontrol.int).


**FREQUENTIS** **skysoft** **INVE FINANCE** **INAV** **DLR** **ETH**  
**UNIQUE**

### 9.2.2. Agenda

For this second workshop, the idea was to present an overview of the results achieved so far within the different assessments. Initially the idea was also to have a legal panel discussion, but unfortunately the invitees were not available.



© CATS	10:00 – 10:15	Welcome + project presentation	FRQ
© CATS	10:15 – 10:35	CoO concept	EEC
© CATS	10:35 – 11:00	TW modelling + Safety	ETH+AFC
© CATS	11:00 – 11:15	Coffee Break	
© CATS	11:15 – 12:30	Platform presentation	SkySoft
© CATS	12:30 – 13:45	Lunch	
© CATS	13:45 – 14:15	Benefits	ORTS
© CATS	14:15 – 14:55	Legal issues panel	IIASL
© CATS	14:55 – 15:10	Discussion	
© CATS	15:10 – 15:25	Coffee break	
© CATS	15:25 – 15:55	HILs results	ENAV+EEC
© CATS	15:55 – 16:10	Discussion	
© CATS	16:10 – 16:30	Future work and closure	FRQ



### 9.2.3. Minutes

On the 26<sup>th</sup> of January, 2010, the second CATS workshop was successfully carried out at SkyGuide premises.

The workshop opened with a warm welcome of Robert Stadler, SkyGuide Technical Director, and continued with a brief presentation of the CATS project and concept. It was the first event where the CATS film was presented. The feedbacks from participants were very positive.

The CATS Consortium presented then the different work packages results as well as the platform used for the second experiment. A demonstration allowed the participant to have direct contact with the operators and the HMI proposed.

Through animated discussions several issues were raised about:

**CoO/TWs:** Are there other projects currently on-going to implement the RBT? *Except the SESAR initiative, with the high level description of the RBT, no other known projects are at the same level of experimentation.*

Within the TW generation, are all the aircraft taken into account? Yes

Within the TW generation, what is the difference between the safety issues and other known safety tool like STCA/MTCD..? *The TWs are not free of conflict. The TW generator just take on board some modelling to avoid to have at the same time envelop, same FL envelope, same geographical position too much TWs, in order not to put ATCOs in difficulty and avoid overload.*

On cockpit HMI all TWs have been represented, and not only the contractualised ones, why? *This was a pilot decision for this experiment, but this does not change the concept: TWs are contractual only at the transfer of responsibility between actors.*

**Benefits:** EU Commission stressed the need to more open the CBA to more different actors, like non airport CDM, low cost companies....*Regarding the Maturity level of the CoO concept, an initial Business Case was judged enough by the Consortium. Furthermore, open the CBA to other partners not involved in the CATS project, will not guarantee the validity of the results. Finally, the WP2.2.2 activities are not restricted to this Business Case: one of the main activities has been also to evaluate the TWs negotiation mechanism and in particular the benefits of CATS concept for an airline, in the short term planning phase.*

**Legal:** EC stressed the need to go further than a state of the art on this issue. This topic is very important. The project will allow some research around accountability issues.

About the renegotiation, there is no possibility to have time to "contract" all the actors to obtain signature. How to deal with that? *The best solution will be to have the kind of umbrella at the European Level, and then allowing the actors discussing among each other. Airline legal ability should be delegated to pilot during the flight.*

Are FABs pre requisite for CATS? *No, this is only the best platform to have the legal framework, but not a pre requisite. And as the FAB are supposed to be part of SES 2 for 2012, it is also why this has been taken into account in the study.*

#### 9.2.4. Attendees

First Name	Last Name	Company / Organisation	Country
Ion	<b>BERECHET</b>	<b>Air France Consulting</b>	France
Florent	<b>BERON</b>	<b>SKYGUIDE</b>	Switzerland
Jean Noel	<b>BOY</b>	<b>Air France Consulting</b>	France
Axelle	<b>CARTIER</b>	<b>University of Leiden</b>	Netherlands
Lorenzo	<b>CASTELLI</b>	<b>University of Trieste</b>	Italy
Sifra	<b>CORVER</b>	<b>ETH</b>	Switzerland
Didier	<b>DOHY</b>	<b>DKUB Consulting</b>	France

<b>First Name</b>	<b>Last Name</b>	<b>Company / Organisation</b>	<b>Country</b>
Christine	<b>FSSERT</b>	<b>European Commission -DG TREN</b>	Belgium
John	<b>FENIX</b>	<b>SBB CFF FFS</b>	Switzerland
Luca	<b>FRASACCO</b>	<b>ENAV</b>	Italy
Jacques	<b>GROS</b>	<b>Air France Consulting</b>	France
Sandrine	<b>GUIBERT</b>	<b>EUROCONTROL EEC</b>	France
Laurent	<b>GUICHARD</b>	<b>EUROCONTROL EEC</b>	France
Pierre-Henri	<b>GUISAN</b>	<b>SkySoft ATM</b>	Switzerland
Massimo	<b>IANNULI</b>	<b>ENAV</b>	Italy
Pascal	<b>LATRON</b>	<b>SKYGUIDE</b>	Switzerland
Marco	<b>LAURENTI</b>	<b>ENAV</b>	Italy
Claude	<b>LEVACHER</b>	<b>SkySoft ATM</b>	Switzerland
Franck	<b>LUYSSEN</b>	<b>SkySoft ATM</b>	Switzerland
John	<b>LYGEROS</b>	<b>ETH Zurich</b>	Switzerland
Kostas	<b>MARGELLOS</b>	<b>ETH Zurich</b>	Switzerland
Pablo	<b>MENDES DE LEON</b>	<b>University of Leiden</b>	Netherlands
Massimo	<b>ORSONI</b>	<b>ENAV</b>	Italy
Christoph	<b>RIHACEK</b>	<b>Frequentis AG</b>	Austria
Leonardo	<b>RUSSO</b>	<b>ENAV</b>	Italy
Dirk	<b>Schulze-Kissing</b>	<b>DLR</b>	Germany
Teodoro	<b>VITALE</b>	<b>ENAV</b>	Italy

### 9.3. Final CATS User Forum

The final CATS User Forum was planned at the end of the project and mainly after the last experimentation, to present the final results, in line with the SES and SESAR activities.

#### 9.3.1. Invitation

For this event more than 70 invitations were sent through the ATM Community



20th October 2010 - Musée de l'Air - Le Bourget, France

The **CATS** project  
Contract-based  
Air Transportation System

**is pleased to invite you  
to its Final Forum**

The main objectives are to present the results obtained by the CATS project toward the goal of :

Achieving punctuality at destination,  
by assessing a possible practical implementation of the Business Trajectory,  
namely  
the Contract of Objectives.

Convinced that it will be a real opportunity for beneficial exchanges,  
the CATS Consortium is looking forward to seeing you in Le Bourget.

For logistical reasons, advance registration is necessary.  
Please confirm your participation before the 15th of September 2010  
by sending an email to

[sandrine.guibert@eurocontrol.int](mailto:sandrine.guibert@eurocontrol.int) .

<http://www.cats-fp6.aero/cats-fp6/>

[http://www.eurocontrol.int/eec/public/standard\\_page/proj\\_CATS.html](http://www.eurocontrol.int/eec/public/standard_page/proj_CATS.html)



### 9.3.2. Agenda

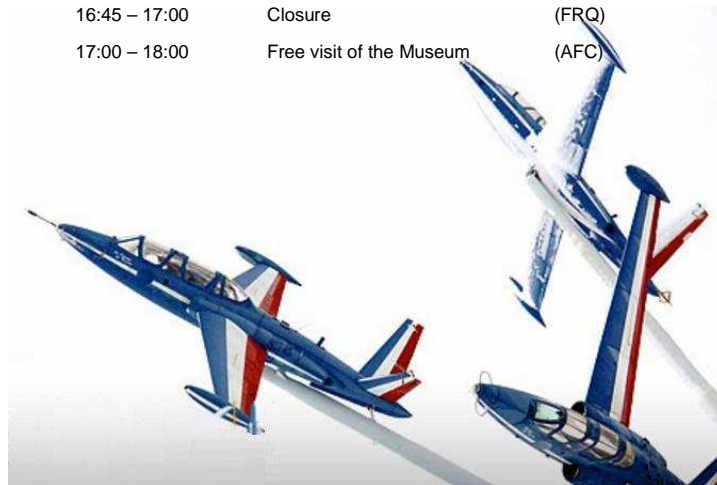
For this last workshop, the idea was to present an overview of the results achieved within the different assessments. A visit of the Museum will be also organised during the event.



### 20th October 2010 - Musée de l'Air - Le Bourget, France

#### Agenda

09:30 – 10:00	Registration & Welcome	
10:00 – 10:45	CATS Concept Presentation	(FRQ)
10:50 – 11:20	TW modelling	(AFC)
11:25 – 12:25	HILs results	(EEC)
12:30 – 13:30	Lunch : L'helice	
13:30 – 14:30	Visit of the museum	(AFC)
14:30 – 15:00	Legal assessment results	(IIASL)
15:05 – 15:35	Benefits assessment	(ORTS)
15:40 – 16:10	Safety assessment	(ETH)
16:15 – 16:45	Discussions	
16:45 – 17:00	Closure	(FRQ)
17:00 – 18:00	Free visit of the Museum	(AFC)



### 9.3.3. Minutes

On the 20<sup>th</sup> of October, 2010, the CATS Final Forum was successfully carried out at the Musée de l'Air et de l'Espace, in le Bourget.

The workshop opened with a warm welcome of Jean-Noel Boy, Museum managing Director, and continued with the different work-packages presentations. The presentations were cheered up with a commented visit of the Museum. Participants were given the opportunity to see the Concorde, manoeuvring its nose, and to visit its cabin, before seeing a search-and-rescue video on board of a Super-Frelon. The visit of the Museum ended by a commented visit of the 1939-1945 dedicated hall.

Through animated discussions, several issues were raised about:

**CATS versus SESAR and SES:** CATS emphasises its compatibility with SESAR and SES; when developing such a contract the position of non-EU states should be also taken into account. *Non EU-aircraft are also taken into account within CATS concept (see D1.2.2 and HIL3 scenarios). Compatibility is also ensuring through SESAR, which coordinates with NextGen program. CATS is a first attempt of the BT advocated by SESAR.* Regarding SES, CATS proposed a way to monitor the performance, but word like "penalties" could

restrain the project implementation. *This was not the goal of the project to discuss the SES2 framework. CATS Consortium proposes a mean to monitor performance, compatible with SES2 expectations. Penalties and rewards were suggested but implementation of such framework was out of the scope. Nevertheless such words could shock; this is also a first step forward ATM modernisation.*

**Renegotiation:** Is the airline part of the renegotiation? What is the role of pilot and controllers in the renegotiation process? *The airline is the principal actor of the renegotiation. Airline is really the focal point of the process, final responsible of the acceptance of the new set of TWs. The renegotiation is done at the actor level (airline, airport, ANSP), but this is clear that the constraints of the operators (pilots and ATCOs) are also taken into account by the actors during the renegotiation process. HIL3 experiment has shown a strong relationship between airline and crew during renegotiation.*

**Validation:** Validation was build through current sectorisation: how this concept will adapt? Could we imagine the benefits of such concept with the new technology foreseen in 2020? *The TWs are built and located at the transfer of responsibility of actors. This is clear that this transfer of responsibility between two entities would remain, so there is no problem to build TWs at the transfer of responsibility between two FABs, for example. The validation team made the choice to assess the CoO concept in the current system, to be able to really assess the concept and to control variables. If benefits are proven in such conditions, there is no reason that progress in technology will decrease these benefits.*

**FMS Use:** Some participants questioned about the use of FMS capabilities within the project, mainly for the Safety study. *Regarding the FMS, in the HILs the most accurate data (flight simulator ones), were down-linked to the ATCOs. The HMI presented the "best" top of climb or top of descent with the aircraft data on the ATCO platform, that ATCO could respect or not regarding the surrounding traffic. For the Univ. study, the model was an off-line tool, but used a TP inside, a realistic one (a 6° liberty mode,). Nevertheless it should be reminded that the TWs are fixed after take-off, and the data from FMS were used just to see the impact of the trajectory on the TWs, not to recalculate the TWs (except in case of renegotiation).*

**Economic aspects:** : Should an imbalance between demand and capacity occurs, the proposed Target Window negotiation mechanism leave only to airlines and the Network Management the task of decongesting the airspace. No involvement of ANSPs is foreseen. *The proposed Target Windows negotiation mechanism strictly follows the SESAR guidelines and introduces a possible way of implementing the User Driven Prioritization Process as advocated by SESAR: "The airspace users among themselves can recommend to the Network Management a priority order for flights affected by delays caused by an unexpected reduction of capacity. The airspace users will respond in a collaborative manner to the Network Management with a demand that best matches the available capacity".*

#### 9.3.4. Attendees

Twenty-four participants attended. Due to the strikes in France, six participants apologized.

First Name	Last Name	Company / Organisation	Country
Ion	BERECHET	Air France Consulting	France

First Name	Last Name	Company / Organisation	Country
Jean Noel	BOY	Air France Consulting	France
Lorenzo	CASTELLI	University of Trieste	Italy
Jean Francois	CRUCIS	Air France Consulting	France
Hinnerk	EISSFELDT	DLR	Germany
Jean Claude	EMOND	Air France Consulting	France
Timothy	EVELEIGH		UK
Ros	EVELEIGH	EUROCONTROL	France
Andreas	GAMMEL	Zurich Airport	Switzerland
Sandrine	GUIBERT	EUROCONTROL EEC	France
Laurent	GUICHARD	EUROCONTROL EEC	France
Massimo	IANNULI	ENAV	Italy
Alain	JEUNEMAITRE	Ecole Polytechnique/ CNRS	France
Pascal	LATRON	SKYGUIDE	Switzerland
Yves	LE ROUX	SKYGUIDE	Switzerland
Terry	LONGHURST	UK Civil Aviation Authority	UK
Kostas	MARGELLOS	ETH Zurich	Italy
Pablo	MENDES DE LEON	University of Leiden	Netherlands
Massimo	ORSONI	ENAV	Italy
Stefan	PUSKAS	Zurich Airport	Switzerland
Christoph	RIHACEK	Frequentis AG	Austria
Leonardo	RUSSO	ENAV	Italy
Helmut	SCHROETER	Expert for European Commission	Belgium
Teodoro	VITALE	ENAV	Italy

## 10. Animated Media

One of the segments identified in chapter 6.1 as a means to achieve efficient awareness of the CATS work, as well as to show the efficient use of EU funding, was the General Public. The idea was to create an animated media, presenting a high level view of the CATS proposal to be wider disseminated.

In the mean time, the necessity emerged to have a simple object for a business to business support of communication, and to promote the CATS concept and results.

The animated media was delivered by end of December 2009 to answer these two issues.

The table below describes the activities planned around the dissemination of this video to achieve an efficient awareness of the CATS work:

Targeted Audience	Message	Support	Expected outcome
General Public	Concept and results	EUROCONTROL Social Media Cordis website	Knowledge
SESAR WPs (4,7 & 10)	Concept and results (BT implementation)	Emailing	Knowledge of the project, maybe buy-in
S-JU representatives	Concept and results (BT implementation, legal issues)	Emailing	Knowledge of the project, feedbacks and buy-in
EU Commission	Concept and results (SES2 support)	Emailing	Knowledge of the project, buy-in
R&D Community, Industries, ANSPs, Airspace Users, Airports	Concept and results	Dedicated web sites, EUROCONTROL headlines, Twitter, Partners presentations	Knowledge, Feedbacks, contacts

Table 10-1: Video Communication Work Plan

The idea was to use this animated media from different supports:

- ▶ As a project presentation, for the CATS partners to introduce and explain the concept just before their own studies presentations
- ▶ On EUROCONTROL Social Media (LinkedIn, You Tube, EUROCONTROL TV Channel) for larger audience
- ▶ From EUROCONTROL Extranet Headlines (EUROCONTROL Home page , as Top Story), as well as from dedicated CATS website and ENAV website, for the R&D community, Industries, ANSPs, Airspace Users and Airports
- ▶ On targeted emailing for the S-JU, EU Commission and SESAR WPs representatives as well as specific stakeholders (98 targeted persons)

The success of this dissemination could be evaluated by measurements of:

- ▶ The number of connections to the web pages
- ▶ The number and content of messages received after posting

- ▶ The number of contacts taken after the mailing
- ▶ The potential buy in of S-JU or SESAR WP leaders.

## 11. References

The available documentation used to produce this deliverable is described hereafter:

- [1] EC CATS Contract TREN/07/FP6AE/S07.75348/036889
- [2] CATS Description of Work (Annex I of [1])
- [3] CATS Project Management Handbook - Deliverable D0.1
- [4] FP6 General Information: A guide to successful communications
- [5] FP6 Reporting Guidelines, Appendix 1 - Plan for using and disseminating the knowledge