Final Project Report

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Abstract

The project aimed at setting the baseline (OSED and Technical Specification) for future Independent Non-Cooperative Surveillance (INCS), complementing existing documentation on Composite Cooperative Surveillance, and encompassing future surveillance needs, at the horizon 2030.

The viability of the inferred (Cooperative and Non-Cooperative) baseline was assessed through field trials and post-trial analyses, relying on prototypes deployed respectively in the Madrid and London areas (for composite cooperative surveillance), and in the Stuttgart area (for combined non-cooperative and cooperative surveillance).

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Acronyms

Acronym	Definition
ADD	Architecture Description Document
ADS-B	Automatic Dependent Surveillance - Broadcast
ANSP	Air Navigation Service Provider
ASTERIX	All-purpose STructured Eurocontrol Radar Information eXchange
ATM	Air Traffic Management
DAB	Digital Audio Broadcast
DAP	Downlinked Aircraft Parameters
DVB-T	Digital Video Broadcast - Terrestrial
EUROCAE	The European Organisation for Civil Aviation Equipment
EUROCONTROL	The European Organisation for the Safety of Air Navigation
FM	Frequency Modulation
INCS	Independent Non Cooperative Surveillance
MSDF	Multi Sensor Data Fusion
MSPSR	Multi Static Primary Surveillance Radar
OSED	Operational Service and Environment Definition
PSR	Primary Surveillance Radar
RCS	Radar Cross Section
RF	Radio Frequency
SPI IR	Surveillance Performance and Interoperability Implementing Rule
SSR	Secondary Surveillance Radar
TDOA	Time Difference Of Arrival
TRL	Technology Readiness Level
UAS	Unmanned Airborne System
TS	Technical Specification
VP	Verification Plan

VR	Verification Report
VS	Verification Strategy
WAM	Wide Area Multilateration
WG	Working Group

1 Project Overview

The project aimed at setting the baseline (OSED and Technical Specification) for future Independent Non-Cooperative Surveillance (INCS), complementing existing documentation on Composite Cooperative Surveillance, and encompassing future surveillance needs, at the horizon 2030.

The viability of the inferred (Cooperative and Non-Cooperative) baseline was assessed through field trials and post-trial analyses, relying on prototypes deployed respectively in the Madrid and London areas (for composite cooperative surveillance), and in the Stuttgart area (for combined non-cooperative and cooperative surveillance).

1.1 Project progress and contribution to the Master Plan

The project has addressed in parallel two versions of a SESAR solution supporting the provision of future Surveillance service, namely the “Composite Surveillance”, and its extended version further referred to as “Composite-Plus Surveillance”, resulting from the combination of a “Composite Surveillance” system with a “Independent Non Cooperative Surveillance” system:

- The “Composite Surveillance” solution allows to improve the quality of individual ADS-B or WAM surveillance systems, by combining them into a single integrated service
- The “Composite-Plus Surveillance” solution aims to add a Distributed Independent Non Cooperative Surveillance (INCS) layer on top of the Composite Surveillance. This will extend the performances and operational domain of use of the solution (e.g. as providing the means to mitigate for transponder failures or to detect the intrusion of non-equipped aircraft in controlled airspace). This solution will also deliver an improved level of safety and security compared to the “Composite Surveillance” solution.

On the “Composite Surveillance” aspect, the project has enabled to demonstrate the end-to-end feasibility and the capability for an industrial system (up to TRL 5/6) to meet the revised technical standards (ED129B and ED142A) reflecting the implementation of an integrated ADS-B and WAM system.

On the “Composite-Plus Surveillance” aspect, the project has:

- Firstly, developed a draft operational and technical specification (OSED and TS) for the “Independent Non Cooperative Surveillance” layer;
- Secondly, defined the details of various possible implementations of the INCS concept, and developed a partial prototype, fit for de-risking the proposed technical design;
- thirdly, performed a number of trials, which demonstrate that the proposed INCS requirements baseline can be achieved by an affordable industrial solution, and give an illustration of the achievable performances of a “Composite Plus” solution.

The result is a clear step in the maturity scale of the concept (up to TRL 3), and allows to start now the next development phase of a “Composite-Plus” solution, i.e. an end-to-end prototype supporting Large Scale Validations and Demonstrations.

The following table addresses the status of the SUR related enablers in the ATM Master Plan addressed in the project

Code	Name	Project contribution	Maturity at project start	Maturity at project end
CTE-S02c	Multi Static Primary Surveillance Radar	Definition of the **Operational Service and Environment Definition** for the application(s) which were determined to place demanding requirements upon such systems. Establishment of **design targets** for the performance parameters that multi-static independent non-cooperative surveillance (INCS) systems are to meet to ensure such systems are capable of addressing emerging performance requirements and supporting future ATC operations. Identification of **capabilities,** such as instantaneous 3D velocity measurement, or height measurement on Non cooperative targets. Definition of **standards**, including the ASTERIX format (Cat 015).	TRL 1 (for L-band, and for Multi-band MSPSR)	TRL 3
CTE-S05	Gradual integration of more recent technologies to complement the conventional surveillance sensors (ADS-B/WAM vs SSR and MSPSR vs PSR) (ADS-B/WAM vs SSR and MSPSR vs PSR)	Identification of potential performance improvements at Multi Sensor Tracker level, of the integration of WAM, MSPSR and conventional Sensors	TRL1	TRL3
CTE-S06	Composite Surveillance	Creation of specifications for the Composite ***Cooperative*** Surveillance System (WAM/ADS-B). Definition of requirements derived from different standards and guidance material, including ED-142 and ED-129 and provision of feedback for new EUROCAE versions. Study on benefits offered by composite cooperative surveillance, such as: Reduction in the 1030 and 1090 MHz spectrum, information provision not available without composite surveillance and several improvements in performance, security and safety. Definition of system objectives and test exercises in order to validate & verify system operation.	TRL3	TRL5/6

CTE-S06	Composite Plus Surveillance	Study on benefits offered by Composite Plus Surveillance (i.e. integration of INCS into Cooperative Surveillance System).	TRL1	TRL3

The following table summarizes the contribution of the project to the SESAR Solution set

Solution N°	Solution name	TRL Level/Release
(Candidate solution, to be finalized)	Composite Cooperative Surveillance (Contribution from P15.04.02)	TRL 5/6
(Future Solution, to be refined)	Composite Plus (Cooperative & Non Cooperative) Surveillance (Contribution from P15.04.02)	TRL 3

1.2 Project achievements

1.2.1 Composite Cooperative Surveillance:

1.2.1.1 System definition

The project has contributed to the definition of a **new SESAR Solution** "**Composite ADS-B and WAM Surveillance System**", a surveillance system that exploits the similarities between the two surveillance techniques and combines them into a single system. The exploitation of synergies between the two surveillance techniques into a "composite surveillance system" supports a number of benefits and performance enhancements. These include:

- **cost savings**, achieved through the co-mounting of system components into a single unit and the associated savings in terms of site costs, communications and efficient utilization of certain common components
- Use of ADS-B message information to support passive acquisition of an aircraft, **reducing the 1030/1090 MHz footprint** of a WAM surveillance system, especially a reduction in the number of 1030 MHz interrogations
- **cost effective security mitigation** techniques, based on the use of additional 'raw' RF and timing data (not available in other components of a surveillance infrastructure), which can be used to derive additional indicators, such as Ground based 'confidence/credibility' measure enabling e.g. the early identification of anomalous avionic behaviour, or spoofed 'ADS-B transmissions'.
- Means for **performance monitoring** and alerting of faults in the system, by supplementing the WAM channels BITE with the comparison between the ADS-B position and WAM channel data as a way to detect failure conditions.
- **Improvement of the performance** of the ADS-B channel, e.g. by enabling the allowance of temporary reductions in ADS-B quality indicator values, by resolving ADS-B data-to-track association issues related to non-unique 24-bit address, by reducing the effects on the resulting along-track horizontal position error.

1.2.1.2 V&V achievements

This SESAR Solution has been validated through a series of activities including 2 Real-Time live Flight Trials (one in the UK, one in Spain), addressing a range of objectives focussing on the assessment of the abovementioned benefits.

The V&V activities conducted in UK included:

- DAP extraction assessments,
- ADD comparison and population assessment
- Performance assessment for 3NM separation
- User acceptance trials,

The V&V activities conducted in Spain included:

- TDOA validation (with at least 2 receiver stations).
- Range validation with active WAM.
- Full-WAM validation.
- Position comparison between ADS-B and WAM results, both vertical and horizontal cases.
- Track association through the ICAO 24 bit address.
- Study of uncompensated latency cases.
- Altitude validation
- Identification validation
- System performances analysis

The results obtained after the different verification exercises indicate that the development of the platforms has been properly performed and the results are as expected.

Validation techniques used for composite surveillance are valid methods to reduce interrogations and to enrich the quantity of data of a WAM system without the need of a continuously active interrogation system that increases the use of the RF spectrum.

The further developed and adapted infrastructure consisting of data generator, sensor, MSDF and analysis tools provides powerful means for rapid prototypical development in future research projects.

A more exhaustive analysis of the results is available in the deliverable "D11 Verification Report, composite cooperative surveillance".

1.2.1.3 Perspectives

The work conducted in the project has resulted in the development of new standards (ED129B and ED142A see section 1.4 below).

The solution is now ready for industrialization into products, and for operational deployment.

Further enhancements will be introduced in the solution, especially regarding security, through SESAR2020. Non-cybersecurity aspects focussing on RF signals and RF content and the resulting alarming methods and performance will be the key expected area for improvement.

Also, security enhancements developed in project WP 15.4.6 for implementation in ADS-B stations, should be further developed in view of their inclusion in composite surveillance systems.

1.2.2 « Composite Plus » Cooperative & Non Cooperative Surveillance:

1.2.2.1 System definition

In addition, the project has de-risked and increased the maturity of technologies and concepts which will be used in a **future SESAR Solution** "**Composite Plus Surveillance"** (i.e. Composite Cooperative Surveillance, combined with an "Independent Non Cooperative Surveillance System"). This future Solution benefits from innovation on three levels:

- The use of new ***Distributed Independent Non Cooperative Sensors***, such as MSPSR
- The ***integration at sensor level*** of different types of elementary sensors on a given site, such as multiple layers of MSPSR sensors (e.g FM, DVB-T, L band), and cooperative elementary sensors (WAM/ADB-B receivers)
- The ***integration at system level*** of cooperative and non-cooperative information, collected from a distributed set of elementary sensors, to provide a single, robust "Composite Plus" Surveillance picture

The expected ***operational*** benefits attached to this future solution, are multiple, but the most relevant have been considered to be:

- the support to ATC, for mitigation in the event of a transponder failure
- the detection of infringement by non-cooperative (non-transponding) aircraft or UAS flying at low altitude and/or higher altitudes

In addition, this future solution is expected:

- To increase the overall robustness, safety and security of the surveillance function
- To enable the transition towards a "Performance Based" surveillance service
- In a number of environments and circumstances, to improve the cost effectiveness of the provision of a surveillance service

Despite suffering from hardware issues which prevented the expected full scope of analysis of a multiple layer MSPSR, the project has achieved an initial definition, and a partial prototype implementation of the solution, including each of the three above mentioned layers (Distributed Non Cooperative Sensor, Integration at Sensor level, Integration at System level).

1.2.2.2 V&V achievements

The project has defined a verification and validation strategy, targeting to assess the capacity of the solution to meet a number of technical challenges:

- At INCS sensor level,
  - to provide the desired detection coverage in the vertical and horizontal domains (up to FL350, over an area of at least 900 Nm²) , with the desired resolution, accuracy, and update rate, on the desired range of aircraft types
  - while maximizing spectrum efficiency, cost effectiveness, and minimizing the geographical footprint and the impact on existing infrastructures
- At sensor integration level,
  - To improve the INCS performance through the combined use of various technologies (L-Band, FM, Digital Audio Broadcast (DAB), DVB-T);
  - To improve the quality of elementary sensor measurements, through the combined use of ADS-B, WAM, and MSPSR data
- At system integration level,
  - to reach the required surveillance performance at MSDF system level, while using the new INCS sensor technology instead of conventional PSR technology
  - to improve the robustness, and overall surveillance performance, in order to support the new operational challenges (such as mitigation of transponder failures, or of controlled airspace infringements by low RCS aircraft or UAS)

The capability of the solution to meet these challenges has been explored by three exercises:

- One exercise using an MSPSR prototype deployed in the Stuttgart area (Germany) has explored the challenges attached to the new INCS concept at sensor level.
- The second exercise, as a extension of the first one, has explored the challenges linked to the functional integration at sensor, and at system level, combining multiple layers of MSPSR sensors (L-band, DVB-T, FM) and cooperative sensors (WAM, ADS-B).
- A third exercise (based on the post-analysis of past trials conducted in the London area, UK) focussed on the validation of a specific improvement on the MSPSR concept, enabling to significantly extend its performance in some circumstances.

Despite a number of obstacles encountered throughout the course of the project (such as the difficulty to obtain an L band frequency allocation, or the failure of the DVB-T element of the multiple layers MSPSR during the trials) the obtained results indicate that the targeted performance objectives will be reachable by the considered new technology, which therefore enables to meet the operational objectives.

A detailed analysis of the results is available in the deliverable "D17 Verification Report, composite cooperative & non cooperative surveillance". Key lessons learned during the trials will help better understanding the possible trade-offs between achievable performances (e.g. high altitude coverage, geometric altitude measurement), corresponding system design constraints (e.g. length of horizontal baseline, receiver antenna design…) and the resulting impacts on cost.

1.2.2.3 Perspectives

The work conducted in the project has resulted in the material (OSED and Technical Specification) necessary to enable the development of a new standard for INCS systems (now under preparation by Eurocae WG103, see section 1.4 below).

The viability and feasibility of the concept envisaged for the solution are now de-risked, and further developments towards the end-to-end validation of the solution will be conducted in SESAR 2020.The deployment of operational systems can be envisaged at the horizon 2020 to 2025

1.3 Project Deliverables

The following table presents the relevant deliverables that have been produced by the project.

Reference	Title	Description
D07, D09, D11	Verification strategy (VS), verification plan (VP), and verification report (VR) on composite cooperative surveillance.	D07 defines the strategy used in the "cooperative surveillance" trials to assess the feasibility of meeting the requirements collected in the current draft standards. D09 defines the detailed implementation of this testing strategy, and D11 collects the achieved results.
D13, D15, D17	Verification strategy (VS), verification plan (VP), and verification report (VR) on integrated cooperative & non-cooperative ("composite-plus") surveillance	D13 defines the strategy used in the "integrated cooperative/non-cooperative surveillance" trials to assess the feasibility of meeting the requirements collected in the current draft standards. D15 defines the detailed implementation of this testing strategy, and D17 collects the achieved results.
D04	Revised Operational Services and Environment Definition (OSED) for Independent Non-Cooperative Surveillance Systems (INCS)	D04 describes the operational environment that will influence how the targeted performance requirements of the INCS developed within the context of the project are achieved. The document takes into account the feedback of the live trials campaign.
D05	Technical Specification (TS) Detailing the Preliminary System Requirements for Multi-Static Independent Non-Cooperative Surveillance Systems (INCS)	D05 provides an initial definition of the performance capabilities and high level functional requirements for a multi-static INCS System capable of fulfilling applications that assist ATC to mitigate the effect of a transponder failure, and which support the detection of an aircraft infringing into controlled airspace. The document takes into account the feedback of the live trials campaign.
D18	Summary report on standardization activities	D18 collects the supporting material provided by the project to standardization bodies such as Eurocae WG 51 and WG 103, Asterix WG on Cat 15 definition,…

1.4 Contribution to Standardisation

The projected has directly contributed to support three Standardization Working Groups:

- EUROCAE WG 51 (Cooperative surveillance), in the preparation of new standards:
  - ED129B : TECHNICAL SPECIFICATION FOR A 1090 MHZ EXTENDED SQUITTER ADS-B GROUND SYSTEM (published in June 2016)
  - ED142A: TECHNICAL SPECIFICATION FOR WIDE AREA MULTILATERATION (WAM) SYSTEMS (publication targeted in 2017)
- EUROCAE WG 103 (Independent Non-Cooperative Surveillance), as providing the input material to the Technical Specification for INCS systems (targeted in 2018). The project has been granted the authorization by the SJU to transfer deliverables D02 and D03 to the EUROCAE Technical Advisory Board, for usage in the activities of WG103.
- ASTERIX Working Group, in the preparation of the new Category 015 interface standard.
  - Project members have directly contributed to the creation of an initial draft standard by mid-2015
  - This draft standard has been used as reference for the prototype deployed in the project in the Stuttgart area
  - The lessons learned during the trials in Stuttgart have been fed back to the Asterix WG to provide a few additional improvements into the draft standard. This will allow for the publication of a formal Cat015 standard in 2017.

1.5 Project Conclusions and Recommendations

1.5.1 Composite Cooperative Surveillance

1.5.1.1 Conclusions

The end-to-end verification performed in the project has demonstrated the maturity of the “Composite Surveillance” concept.

This concept has been established into a SESAR Solution documented in the ATM Master Plan.

The standardization baseline is now partly available (ED129B) and will be completed by early 2017 (ED142A).

1.5.1.2 Recommendations

As the technology is now mature and validated, it is recommended that a SESAR Solution is finalized – as soon as the corresponding standards will be stabilized. In parallel, the ANSPs are encouraged to plan its introduction and deployment in their short term evolution roadmaps, as from 2017-2018 onwards.

Some further improvements of the solution, especially in terms of security (including the functionalities developed in 15.4.6 for ADS-B ground stations), will bring additional benefits, and will be further developed in SESAR2020. They should be introduced later in deployed solution as an evolutionary maintenance.

1.5.2 « Composite Plus » Cooperative & Non-Cooperative Surveillance

1.5.2.1 Conclusions

The project has defined the set of operational and technical requirements to be met by a "Composite Plus" surveillance system (extension of the "Composite" surveillance, including a distributed Non Cooperative Surveillance layer).

In addition, the project has defined a number of possible implementations of this concept, combined with WAM/ADS-B, and based on the MSPSR technology, which can be deployed in various frequency bands (FM, DAB, DVB-T, or L-band), and according to various transmission operational schemes (dual use of existing transmitters primarily used for non-ATM, broadcast purposes, or use of dedicated transmitters).

Finally, the project has performed a set of verification exercises, which have established the ability of the defined concept and solution, to meet the "composite plus" surveillance requirements. The feasibility of this future solution is now demonstrated, and the resulting operational benefits have been illustrated on some relevant use cases, even if at a limited scale.

The input material necessary for the development of a new technical standard has been transferred to EUROCAE, which targets the availability of this standard by 2018.

1.5.2.2 Recommendations

As the feasibility and achievable performance of the "composite plus" solution have now been assessed, the development of a full scale, prototype is strongly recommended, for end-to-end performance validation, and large scale demonstration. This development is expected to be conducted through SESAR2020 in Wave 1. Further validation and demonstration should also be planned, e.g. through a Very Large scale Demonstration project in Wave 2.

A close link should be maintained between SESAR2020 and EUROCAE WG103 in charge of the development of the INCS standards, to ensure that the standard will take advantage of all findings achieved through SESAR2020 activities.

A refined Cost-Benefit Assessment should be undertaken, in complement to the initial analyses conducted through project WP15.04.01 (Rationalization of Surveillance Infrastructures). This CBA should in particular identify the comparative advantages of the various possible MSPSR implementations, and the circumstances and conditions, where a "Composite Plus" infrastructure would generate cost benefits, in addition to performance improvements.

ANSPs interested in the concept for their future surveillance roadmap, should also initiate strategic planning actions, in order:

- to set-up the appropriate terms of agreements with non-ATM broadcast operators, if intending to get the best "dual-use" of their transmission infrastructures (while not mandatory if just for situational awareness purposes)
- and/or (depending on the ANSP preference) to get the attribution of the adequate frequency channels (typically in L band) if a dedicated transmission infrastructure is envisaged

Depending on the level and time profile of investments by ANSPs and Industry, the corresponding solution should be available for operational deployment between 2020 and 2025

2 References

[1] SESAR Programme Management Plan, Edition 03.00.01

[2] European ATM Master Plan

[3] European Master Plan - Integrated Roadmap - Data Set 16, 03/10/2016

[4] Multilateral Framework Agreement ("MFA") signed between the SJU, EUROCONTROL and its 15 selected members on August 11, 2009, amended on 14 June 2010, 19 October 2010 and 2 July 2012

[5] P15.04.02, Integrated Surveillance Sensor Technology, "Preliminary Operational Services and Environment Definition (OSED) for Independent Non-Cooperative Surveillance Systems", D02, Edition 00.01.01, 05/10/2015

[6] P15.04.02, Integrated Surveillance Sensor Technology, " Preliminary system requirements (TS) for Independent Non-Cooperative Surveillance Systems", D03, Edition 00.01.03, 05/10/2015

[7] P15.04.02, Integrated Surveillance Sensor Technology, "Final Operational Services and Environment Definition (OSED) for Independent Non-Cooperative Surveillance Systems", D04, Edition 00.01.00, 05/09/2016

[8] P15.04.02, Integrated Surveillance Sensor Technology, " Final system requirements (TS) for Independent Non-Cooperative Surveillance Systems", D05, Edition 00.01.00, 05/09/2016

[9] P15.04.02, Integrated Surveillance Sensor Technology, " Technical report, composite cooperative surveillance studies", D06, Edition 00.01.00, 16/04/2015

[10] P15.04.02, Integrated Surveillance Sensor Technology, " Verification Strategy, composite cooperative surveillance", D07, Edition 00.01.00, 30/04/2015

[11] P15.04.02, Integrated Surveillance Sensor Technology, " Technical report, composite cooperative surveillance prototype", D08, Edition 00.01.00, 19/11/2015

[12] P15.04.02, Integrated Surveillance Sensor Technology, " Verification Plan, composite cooperative surveillance", D09, Edition 00.01.00, 27/01/2016

[13] P15.04.02, Integrated Surveillance Sensor Technology, " Technical report, composite cooperative surveillance trials", D10, Edition 00.01.00, 29/07/2016

[14] P15.04.02, Integrated Surveillance Sensor Technology, " Verification Report, composite cooperative surveillance", D11, Edition 00.01.00, 12/09/2016

[15] P15.04.02, Integrated Surveillance Sensor Technology, " Technical report, composite non-cooperative & cooperative surveillance studies", D12, Edition 00.01.00, 04/12/2015

[16] P15.04.02, Integrated Surveillance Sensor Technology, " Verification Strategy, composite non-cooperative & cooperative surveillance", D13, Edition 00.01.00, 29/01/2016

[17] P15.04.02, Integrated Surveillance Sensor Technology, " Technical report, composite non-cooperative & cooperative surveillance prototype", D14, Edition 00.01.00, 29/07/2016

[18] P15.04.02, Integrated Surveillance Sensor Technology, " Verification Plan, composite non-cooperative & cooperative surveillance", D15, Edition 00.01.00, 17/06/2016

[19] P15.04.02, Integrated Surveillance Sensor Technology, " Technical report, composite non-cooperative & cooperative surveillance trials", D16, Edition 00.01.01, 3/10/2016

[20] P15.04.02, Integrated Surveillance Sensor Technology, " Verification Report, composite non-cooperative & cooperative surveillance", D17, Edition 00.01.01, 3/10/2016

[21] P15.04.02, Integrated Surveillance Sensor Technology, " Summary report on standardization activities", D18, Edition 00.01.00, 05/09/2016

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