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FACT

FUTURE ALL AVIATION CNS TECHNOLOGY

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Abstract

This document is prepared for the evaluation of exploitation and dissemination results, as well as to provide the plans for the dissemination activities that will be implemented after submission of this report. It includes the activities that were and/or will be carried out during the project and the evaluation data about these activities.

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1 Introduction

This Dissemination Assessment and Report on the Final Summit is to be used to evaluate the exploitation and dissemination activities of the project. The activities can be classified mainly in two groups:

1. Communication activities that are carried out either internal communication between project partners, and/or general public (e.g., website, social media, interviews, etc.).
2. Dissemination activities towards scientific communities and/or stakeholders (e.g., participation at SESAR Innovation Days (and/or related events), publication of scientific papers, organization of a workshop with advisory board).

The objectives of the exploitation plan were detailed in D6.1 Exploitation and Dissemination Plan as follows:

- Informing stakeholders of the project development and encourage interactions/ networking.
- Coordinating all levels and types of exploitation of the knowledge produced by the project.
- Ensuring that information is shared with appropriate audiences on a timely basis and by the most effective means.
- Maintaining a continuous tracking of the project status and its results to the interested public.
- Taking initiative in open discussions about the conceptual and technical aspects of the project, especially among the interested audience.

All the dissemination, exploitation and communication activities will be enriched with the forthcoming publications, posts and contributions from all partners which is detailed in section 5.

1.1 About

The Future All Aviation CNS Technology (FACT) is a SESAR Exploratory Research Project addressing ATM / CNS modernization and performance improvements by proposing and validating an integrated CNS (iCNS) functional architecture. The project aims to build the bridge between future U-space and conventional ATM considering both technological and user's perspective with a particular focus on coexistence of drones and general aviation in low altitude airspace.

The iCNS concept is explored considering operations in both controlled and uncontrolled airspace with particular attention paid to possible use of existing and future cellular network infrastructure and how to combine it with aeronautical technologies in an affordable and safe way. Project aims to show benefits associated with the use of such iCNS concept for traffic and flight information sharing services supported by real time position and trajectory reporting, while complemented with suitable monitoring and alerting services.

The main project achievements were demonstrated during the flight demo in Eskisehir Technical University Hasan Polatkan International Airport and Airspace (Turkey) held in early summer 2022.

1.2 Document Structure

This document consists of 6 Sections:

- Section 2 presents the communication activities carried out.
- Section 3 presents the dissemination activities.
- Section 4 provides information about involvement and preliminary results discussions with stakeholders.
- Section 5 describes the future plans.

2 Communication Activities

This Section summarizes both internal and external communication activities carried out during the project to exploit and disseminate the FACT's project outcomes.

2.1 Communication towards general public

As it was stated in D6.1 Exploitation and Dissemination Plan, the outcomes of the project were and are shared with stakeholders and possible beneficiaries (e.g. researchers, airspace users, policymakers, and airspace audience). There were different communication channels which are detailed as follows.

2.1.1 FACT project website

The project FACT website provides information about project objectives, partners, news, public deliverables, planned activities and dissemination events as stated in D6.2 Website and Social Media document. Website address is <https://fact.itu.edu.tr/> and it has been published on November the 23rd 2020.

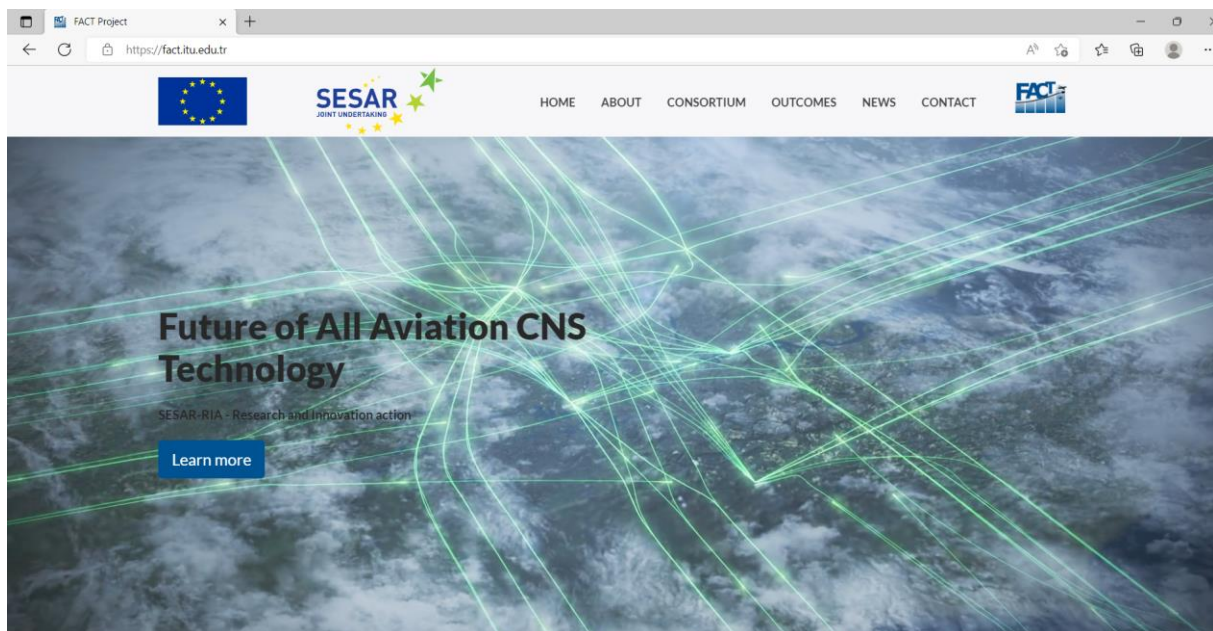


Figure 1 FACT homepage screenshot

The entire site was designed as a single page, with the top menu enables jumping to the desired section of the page. Structure of the website is following:

- Home
 - Main topics of the project
 - Each activity description is linked to a short insight for a more detailed textual description in a dedicated page
 - In the second part of the page, the list of the most interesting articles is shown, while in the right part the social activity of the twitter profile is shown.
- About

- Brief description of the project
- ID of Grant Agreement
- Start date
- Overall budget
- Consortium
 - Partners and logos
- Outcomes
 - List of project deliverables
- News
 - Project news
- Contact
 - E-mail address
 - LinkedIn account
 - Twitter account
 - Instagram account

Bottom part of the webpage contain logos – FACT project logo, SESAR logo, logo of European Union, and H2020 funding information.

The data obtained from Google Analytics Tool for the FACT project website in the time period from the release of the website to 29th of October 2022 are summarized in Figures 2-5.

Figure 2 shows that overall 348 users visited FACT project website and the average interaction time was 1 minute and 31 seconds.

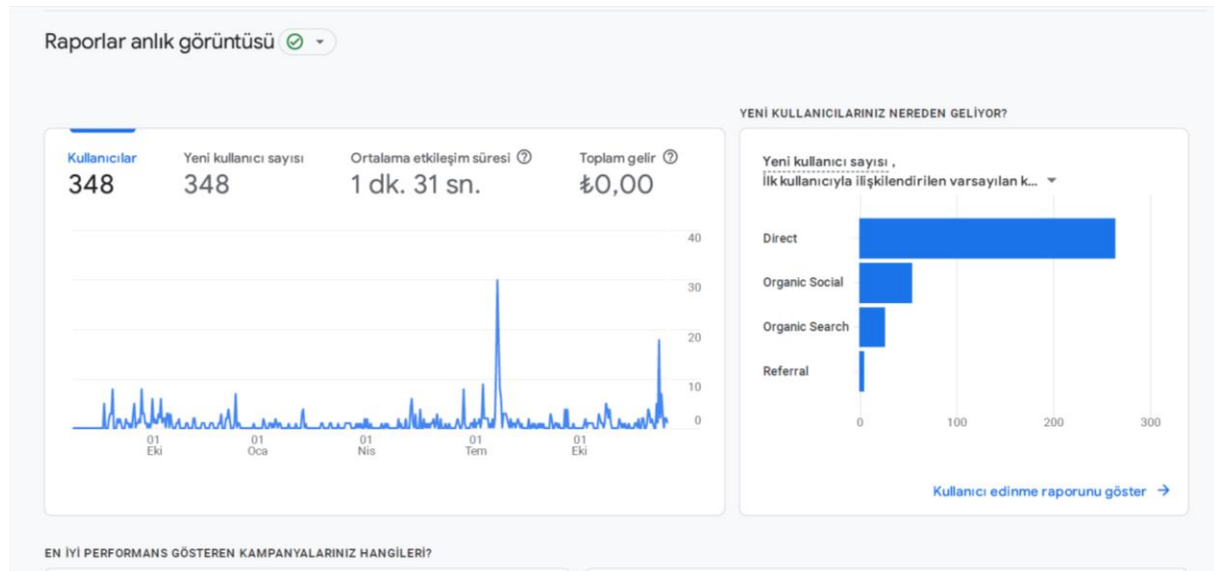


Figure 2 Number of users visiting the FACT project website and average interaction time

The demographic overview of the FACT project website users is shown in Figure 3. The project website was mostly visited from Türkiye with 138 users, followed by United States 45 users, Germany 44 users, Belgium 23 users, and France 16 users.

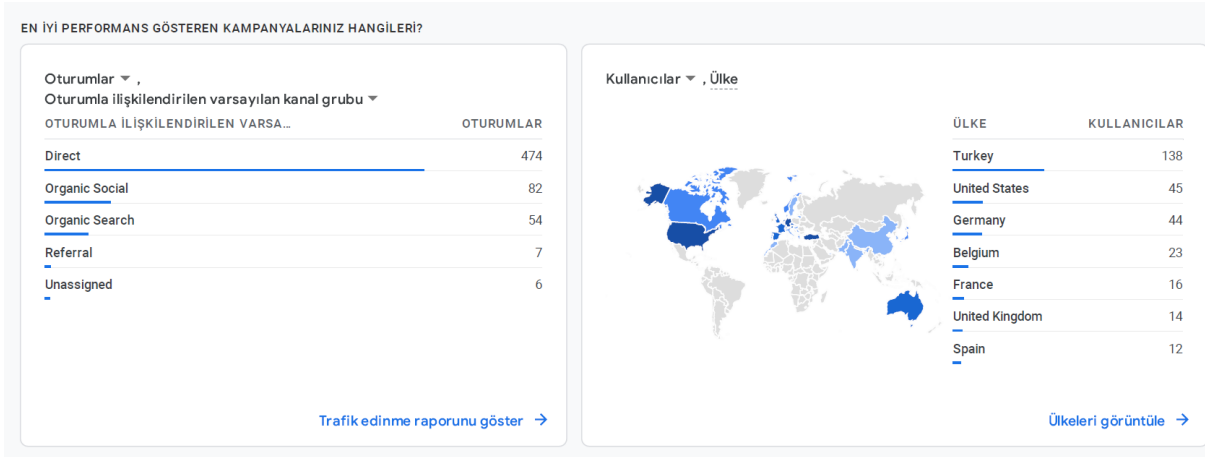


Figure 3 Demographic overview of the website users

As shown in Figure 4, the overall number of the FACT project page view is 962. Total number of interactions are measured as 3125, and the detailed list is given below in Figure 5.

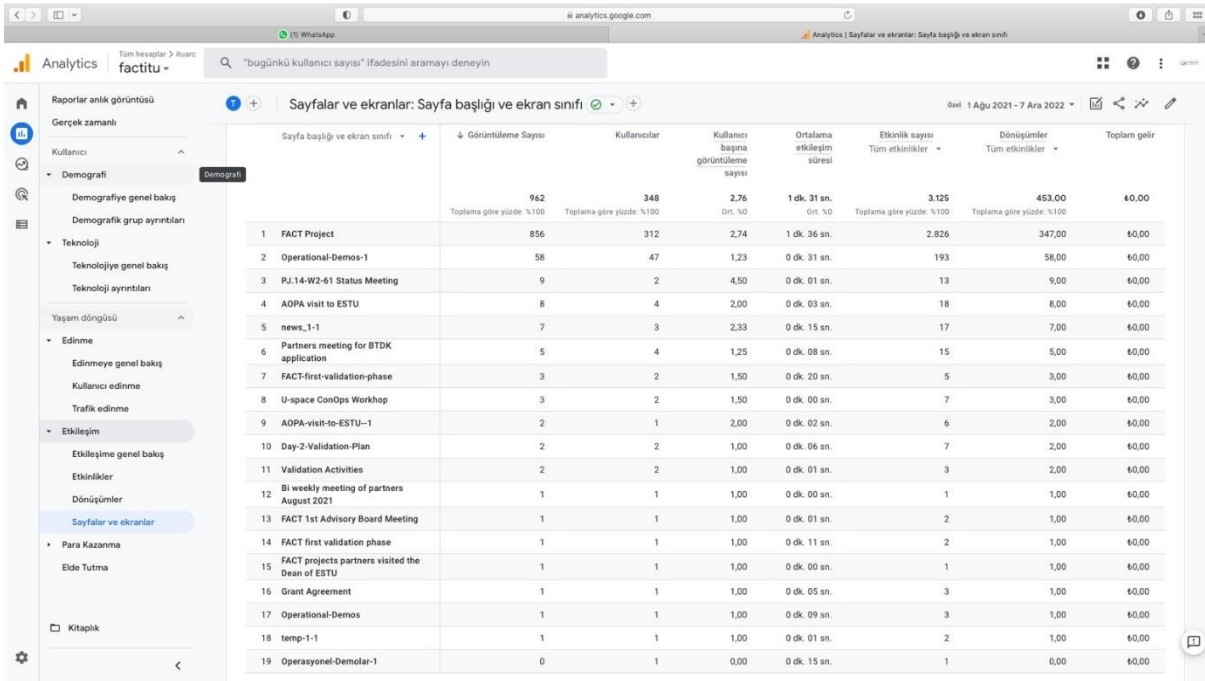


Figure 4 Number of views for the FACT project website

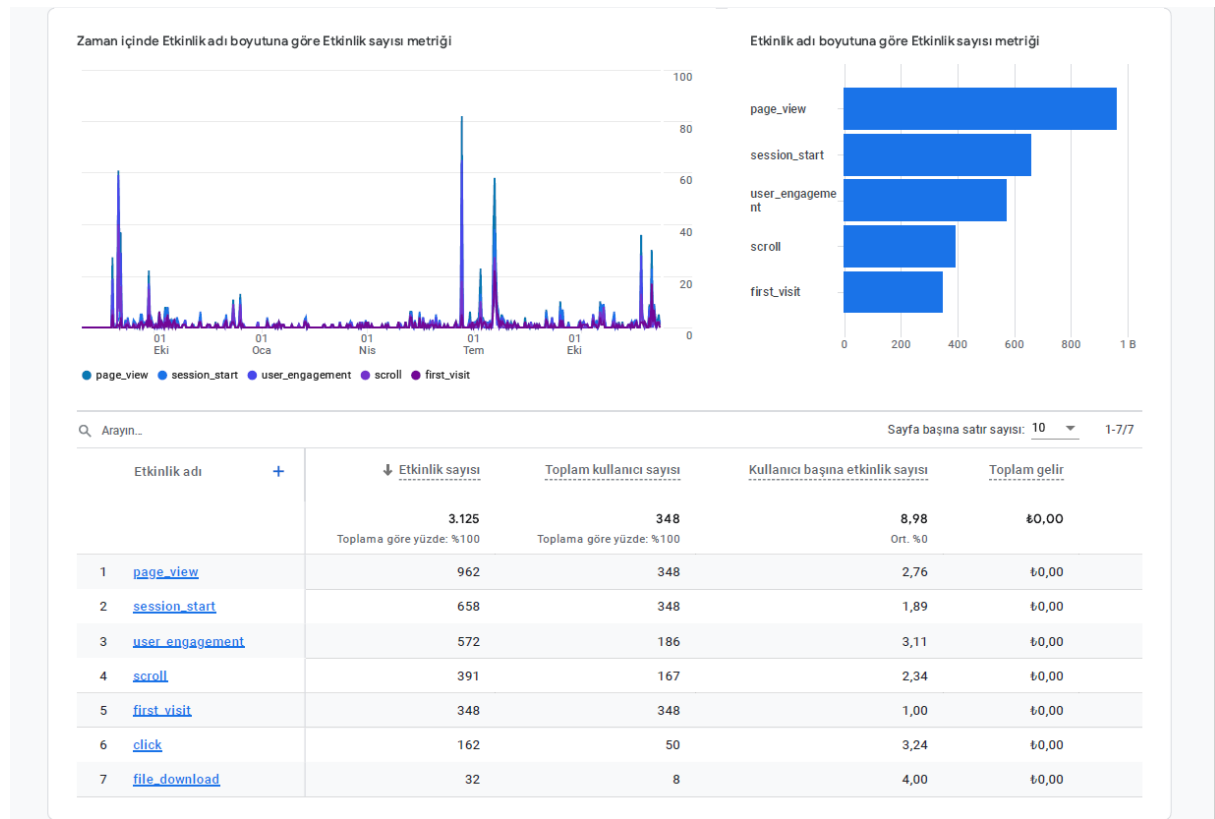


Figure 5 Detailed information on FACT project website views.

2.1.2 LinkedIn account

The FACT project started a closed group in LinkedIn during the preparations of D6.2 Website and Social Media document. Although the aim was to discuss in a closed group with the end users who will benefit from the project, this target was not realized. An open LinkedIn profile was created during the Validation Tests and the website was updated with the correct links. As shown in Figure 6, there are 142 followers and also 122 connections and 151 profile views of the FACT project LinkedIn account.

There have been 17 LinkedIn posts; there will be 12 more posts till the end of December and they are planned as:

- 5 videos for technical results
- 3 for the closure meeting's invitation
- 4 for related activities such as conference papers or outputs of the discussions

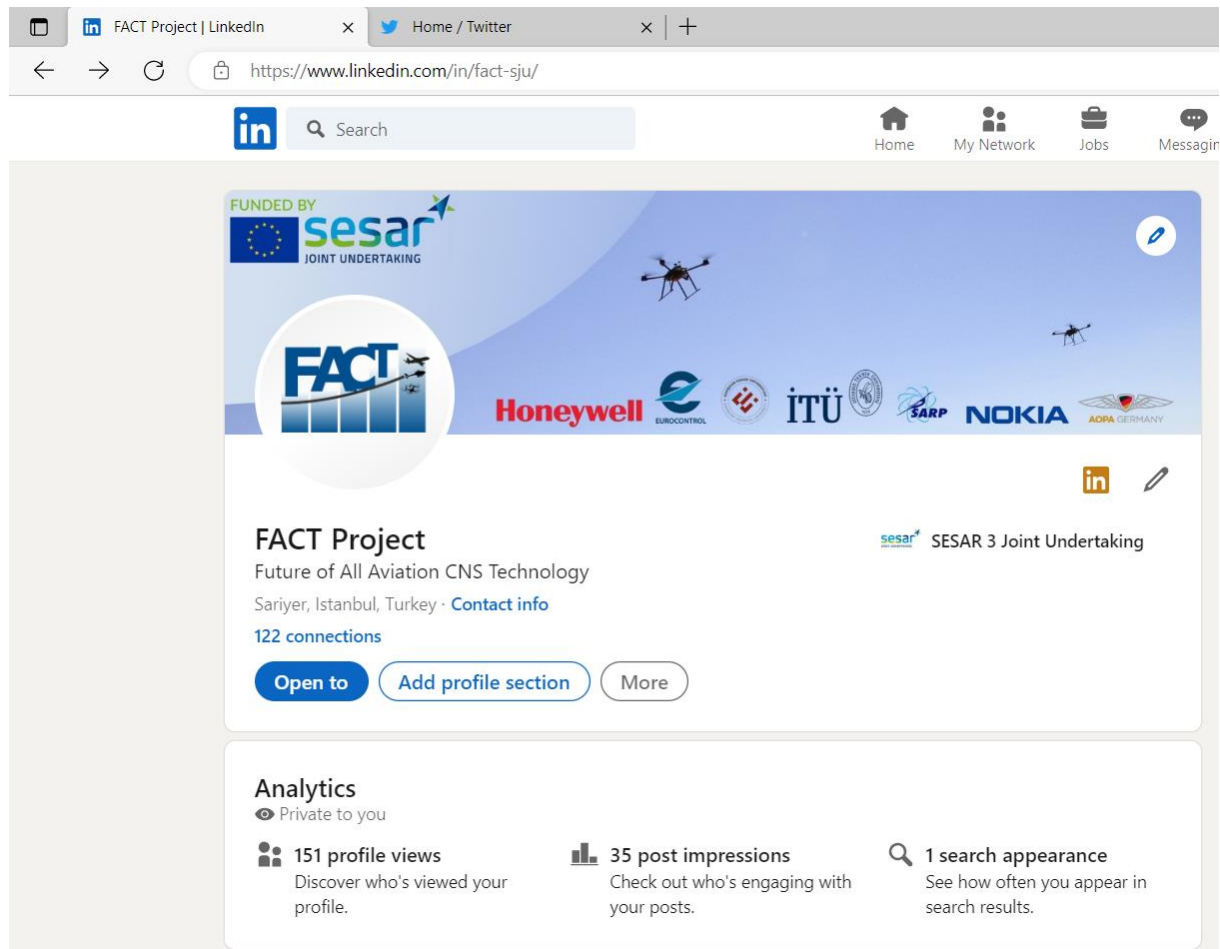


Figure 6 LinkedIn profile of the FACT project

2.1.3 Twitter Account

The FACT project Twitter profile has 28 followers and 2 following (Figure 7). The total likes of the 22 posts are 79, and 23 re-tweets for all the profile activities. Total estimated impressions are 11813.

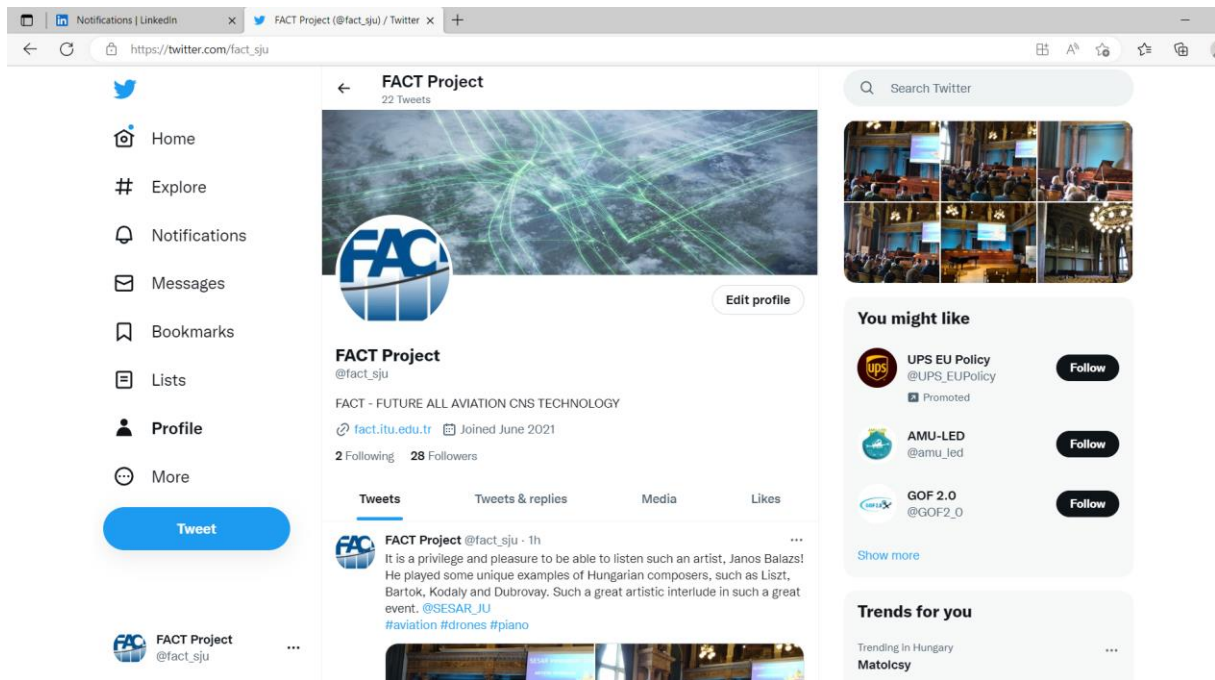


Figure 7 Twitter profile of FACT project

2.1.4 Instagram account

FACT project Instagram account has 31 followers and the total amount of the 9 post likes are 133 by the time this report is re-submitted (07 Decemberber.2022) as shown in Figure 8.

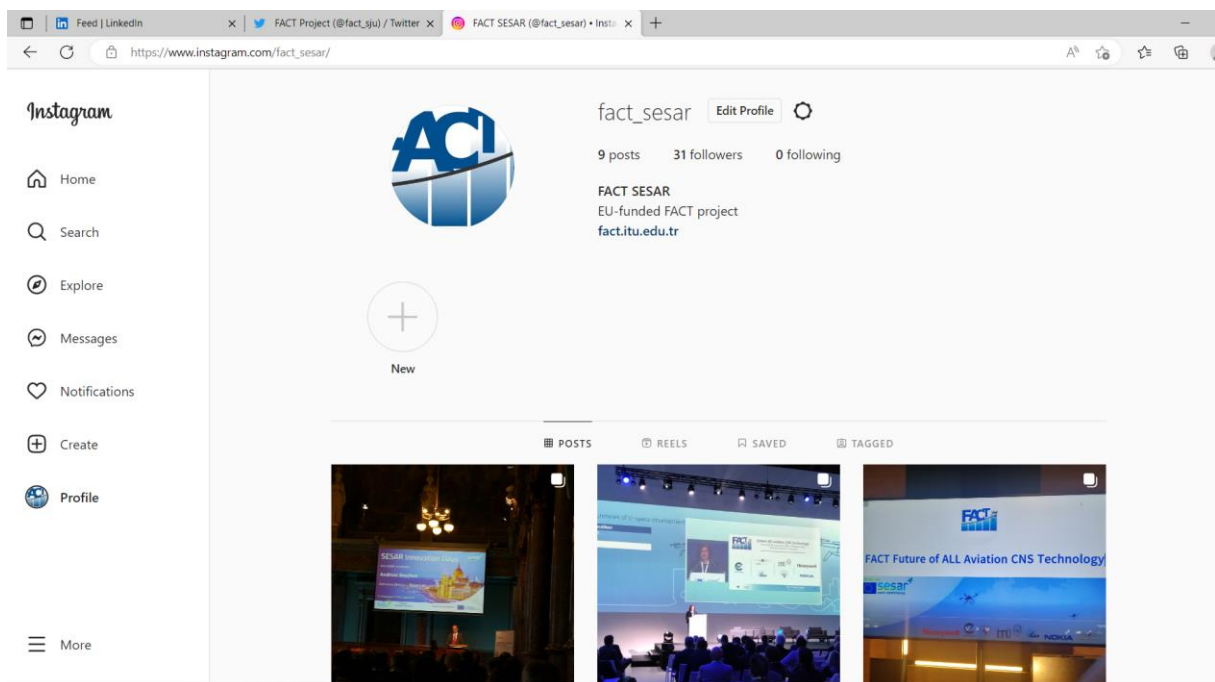


Figure 8 Instagram profile of FACT project

2.1.5 Other websites that mentioned FACT project

Since the beginning of the FACT project, the developments have been shared by different websites. Links and images of these sites are as given below:

<https://www.aviationtoday.com/2020/11/09/new-sesar-project-test-nokia-4g-5g-connectivity-controller-pilot-data-communications/>



Figure 9 Articles published in Avionics International

<http://abmerkezi-arastirma.itu.edu.tr/haberler/2020/05/27/fact-projesi-kabul-edildi>



Figure 10 Istanbul Technical University web page sharing an article about the approval of FACT project

<https://mf.eskisehir.edu.tr/tr/Duyuru/Detay/fact-projesinde-onemli-bir-asama-daha-geride-kaldi>

The screenshot shows the website of Eskişehir Teknik Üniversitesi (Eskişehir Technical University). The header includes the university logo and navigation links: Ana Sayfa, Fakülte, Yönetim, Akademik, Bölümler, Öğrenci, Sürekli İyileştirme, Araştırma, Mezun, İletişim. The main content area features a news article titled "FACT Projesinde Önemli Bir Aşama Daha Geride Kaldı" (A Significant Step Further Back in the FACT Project). The article is dated 26.07.2022 14:44:21. The text of the article discusses the progress of the FACT project, mentioning the support from Horizon2020-SESAR and the involvement of various institutions like Nokia, İstanbul Teknik Üniversitesi, EUROCONTROL, and AOPA. It also mentions the role of Prof. Dr. Tuncay Döğeroğlu and the successful completion of validation tests.

Figure 11 Eskişehir Technical University shared news about Validation Tests

<http://www.eskisehirhaberler.net/?sec=1&newscatid=13&newsid=188817>

The screenshot shows a local news website with a banner for "Eskişehir Öğrenci Apartları ve Yurtları" (www.eskisehirapartlari.com). The main article is titled "FACT Projesi Ekibinden Rektör Prof. Dr. Tuncay Döğeroğlu'na Ziyaret" (Visit to Rector Prof. Dr. Tuncay Döğeroğlu from the FACT Project Team). The article includes a photograph of the visit. To the right, there is a sidebar with a map showing the location of Nisan's Hotel and Capacity Alışveriş ve Yaşam Merkezi. Below the map, there is a section for "Gerekli Bilgiler" (Necessary Information) listing various services like Eskişehir Telefon Rehberi, Estram, Nöbetçi Eczaneler, Tiyatro Etkinlik, Ulaşım, and Üniversiteler. At the bottom, there is a section for "POLİTİKA" (POLITICS) with a small image of a person speaking.

Figure 12 Local Eskişehir news website sharing an article about our courtesy visit to Eskişehir Technical University rector

<https://www.eskisehir.edu.tr/tr/Haber/Detay/fact-projesi-ekibinden-rector-prof-dr-tuncay-dogeroqluna-ziyaret>



Figure 13 Eskişehir Technical University shared about our courtesy visit to the rector

3 Dissemination towards scientific community

One of the most important goals of the dissemination, exploitation and communication plan of the FACT project was to effectively share the outcomes and results of the project with the scientific community. In order to achieve this goal, the project outputs were and will be presented at various events which have related scientific committees as audiences, during and even after the project duration.

3.1 26th ICAP Frequency Management Group (FMG) and 18th Network Manager Radio Frequency function (RAFT) meeting

Project was presented in the form of a presentation (30.9.2020) and a short supporting white paper.

3.2 Communication Steering Group (COMSG) and Future Communication Infrastructure (FCI) Task force meeting

Project overview focused on scope and validation plans was provided by project coordinator the 15th September 2020.

3.3 U-space ConOps Coordination Cell Workshop

Workshop was held on 21.5.2021. The aim of this initiative led jointly by SJU and Eurocontrol was to setup U-space ConOps Coordination Cell as a collaborative platform among SESAR/H2020 projects addressing different U-space aspects. FACT is involved as one of the two projects focused on CNS (together with Safeland). This working group supports development of U-space ConOps Edition 4. Overview of the FACT project scope and objectives was provided by project coordinator.

3.4 PJ.14-W2-61 Status Meeting

The meeting was held on 17.5.2021. Project coordinator presented FACT project at the working meeting of PJ.14-W2-61 (Hyper Connected ATM) which aims at identifying and specifying the high-level operational requirements for a fast and exponentially capable broadband air/ground and air/air datalink for supporting future ATM and U-space operations, air/ground data exchanges, etc. It was agreed that it would be useful to discuss jointly the results of the FACT performance evaluations in the context of requirements as defined in PJ.14-W2-61 project.

3.5 SESAR Innovation Days, 2021

In 2021, SESAR Innovation Days were a virtual event due to pandemic regulations on 7-9 December, 2021. Project partners, Honeywell, presented a poster in the virtual event as shown in Figure 14.

5G for Low Altitudes



Integrated CNS for mixed operations

FUTURE ALL AVIATION CNS TECHNOLOGY

Main R&D Questions addressed:

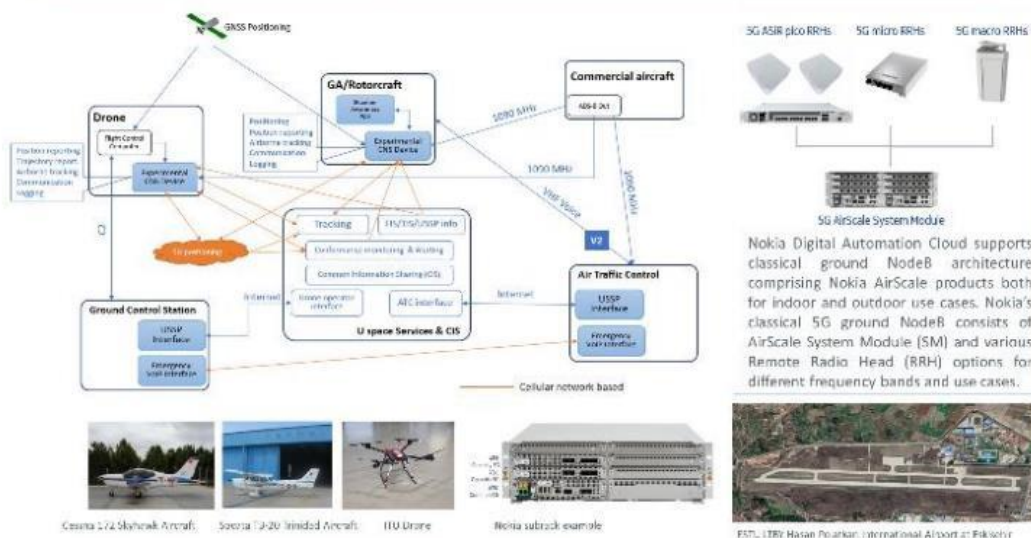
- Possible implementation of performance-based CNS for heterogeneous low altitude traffic (GA, rotorcraft/eVTOL, drones)?
- How to maximize benefits from cellular network infrastructure for low altitude operations?

Main technological topics: Integrated CNS, 4G/5G, TIS/FIS, 4D trajectories, services for GA and U-space services

Targeted Operational Environment: U-space in controlled and uncontrolled airspace

U-space services considered: Tracking & position reporting, Monitoring, Surveillance data exchange, Geo-fence provision, Traffic Information & Flight information (drone aeronautical information).

Final Operational Demo: Eskisehir airport and its proximity with mixed GA/drones operations within experimental 5G network.



Main Validation Objectives:

- Technical Validation of CNS performance (feasibility): datalink & positioning using cellular network (4G/5G) to complement current aero technologies:
 - Public networks – specific performance evaluations 4G and 5G in different environments
 - Dedicated networks – Nokia’s experimental network for operational demo at Eskisehir
- Demonstration of benefits due to CNS enhancements: GA pilots, drone remote pilots, ATCo.

Final Operational Demo

- The Faculty of Aeronautics and Astronautics of ESTU operates own international airport: ESTU LTBY (Hasan Polatkan International Airport) – multiple mixed traffic scenarios planned
- Experimental dedicated 5G network will be deployed by Nokia



This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement 894616.



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<https://fact.ttu.edu.tr/>
https://twitter.com/fact_sju
<https://www.linkedin.com/company/9007980/>

Figure 14 Poster presentation of FACT project on SID 2021 virtual event



3.6 FCI/COMSG 18th Meeting

FCI meeting was held on 19.10.2022 and project coordinator has presented there a short summary of the projects activities and results.

3.7 Joint CNS Stakeholder Platform (JSCP) Meeting

The meeting was held 23-24th November 2022 at Eurocontrol HQ and FACT's results were presented in terms of presentation and a short paper.

3.8 EU Drone Days, 2022

The Directorate General for Mobility and Transport (DG MOVE) and SESAR 3 Joint Undertaking have organised the EU Drone Days, taking place 29-30 November in Brussels, Belgium. As project FACT, we presented during the event FACT results, also have a dedicated stand where a combined video/poster presentation were done (Figure 15).



Figure 15 Drone Days activity of the FACT Team

3.9 SESAR Innovation Days, 2022

The biggest event of the year, SESAR Innovation Days (SIDs) was the main vehicle for SESAR Joint Undertaking to share progress and disseminate exploratory research results. This year, the event was hosted by HungaroControl at the Hungarian Academy of Sciences in Budapest, 5-8 December, 2022. During the event, we presented the project results with the aim of high interaction with broader ATM audience.



Figure 16 FACT Team on SID22

4 Stakeholders' Involvement and Discussion of the Preliminary Results

An important group among the target audiences of the project is the stakeholders. The views/opinions and/or feedback of the stakeholders are not only important at the end of the project, while sharing the outputs, but also in all steps during the project. For this purpose, different activities were held to share the developments with the stakeholders.

4.1 Launch Event

The first event was the project launch with Turkish national stakeholders (DGCA, DHMI, Academia).

4.2 Advisory Board Workshop

FACT 1st Advisory Board meeting was executed on 8.6.2021. First of the series of Advisory board workshops organized by the project. The main objective of this workshop was introduction of the project and its scope & high-level plans, and discussion of the stakeholders' opinions/expectations for the 4 identified priority topics: Airspace users' perspective for low altitude airspace; Preparation of operational demo in Eskisehir; U-space and ATM services in low altitude airspace; Technical matters (spectrum, infrastructure).

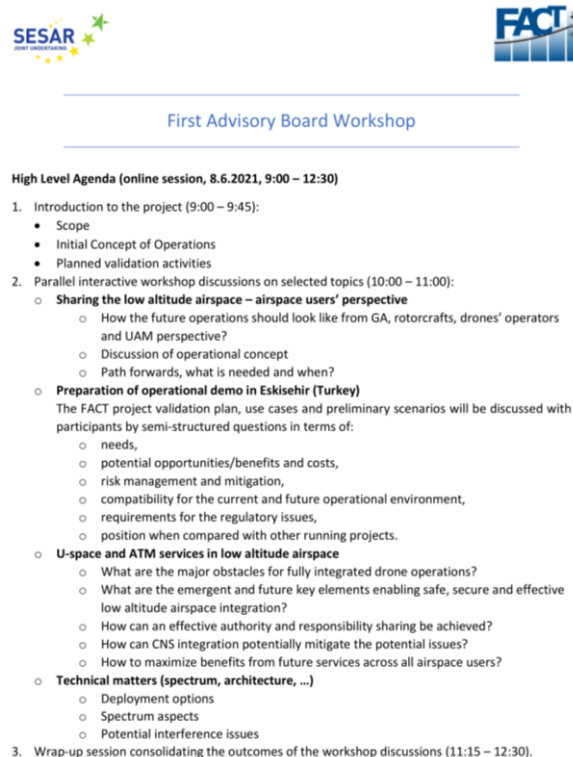


Figure 17 FACT 1st Advisory Board Agenda

4.3 Interviews/discussions as smaller groups

Beyond many discussions with company CNS experts and pilots, Honeywell benefited from its involvement in several parallel projects addressing applications of CNS functions for different types of users and environments. This allowed to discuss elements of FACT concept also within technical and operational meetings organized by this project. In particular:

- In U-space4UAM project, CNS needs of drones and UAM operators were discussed. Also, FACT team profited from several flight tests in that project to collect some complementary technical data which supported FACT studies.
- Surveillance performance needs of Detect and Avoid systems (considered in the project's ConOps) were coordinated with PJ.13 team.
- Common Information Sharing (CIS) and possible interactions between ATM and U-space were consulted with the team working in PJ.34 project.

5 Conclusion and Future Plans

In D6.1 Dissemination and Exploitation Plan and D6.2 Website and Social Media documents, numerical data's desired to be obtained were stated as dissemination and communication actions. In order to achieve the targeted numerical results, and more importantly, to reach wider audiences, the activities planned to be carried out until the end of the project (and the end of the additional time allowed for the academic publications) are as follows.

5.1 Close-Up Meeting

Close-up Meeting will be held on Istanbul Technical University Ayazağa Campus on December 19, 2022. Since this will be the last event of the project, it will have a higher impact than former events and it will replace originally planned Final Summit (in combination with the intensive dissemination in EU Drone Days and SID). Local authorities such as Directorate General of Civil Aviation, General Directorate of State Airports Authority, Airport Managers and academicians are invited to the meeting. The main objective of the Close-Up Meeting is to share-disseminate the outputs and also, have discussions on how to use the results in future.

5.2 Social Media Posts

In the upcoming period,

- a total of 5 videos will be prepared to be published both on social media accounts and shared on the website. There were 5 different scenarios carried out during the validation plans, each scenario will be explained with video contents of 44-56 seconds involving the setup of each and the tests performed for the scenario.
- 3 different invitation posts will be prepared related to the Close-Up Meeting. The results will be shared in 4 separate posts together based on all the discussions made at the event.

5.3 Conference Papers and Peer-reviewed Journals

Another way planned for the project results to reach the relevant target end users is to be presented as a conference and research paper. For this purpose,

- A conference paper was prepared and now revised to be submitted to The 2023 Int'l Conference on Unmanned Aircraft Systems (ICUAS '23), which will be held on June 6 – 9, 2023 Warsaw, Poland (http://www.uasconferences.com/2023_icuas/). The possible title of the paper is “
- Another conference paper is being prepared with the title “Utilizing Cellular Networks Infrastructure in UAV-enabled Cooperative Surveillance Scenarios”. The paper will be submitted to IEEE VTC2023-Spring (IEEE 97th Vehicular Technology Conference (<https://events.vtsociety.org/vtc2023-spring/>)).
- A research paper with the title “On Applicability of Timing Advance-based Localization in 5G Cellular Networks” is being prepared to be submitted to IEEE Access (Impact Factor 3.476) (<https://ieeaccess.ieee.org/>)

5.4 Articles and Magazines

For future activities, FACT project results will be published at “Pilot und Flugzeug” either on 12/22 or 01/23. Related material can be found on: <https://www.pilotundflugzeug.de/>

An article will be also published at AOPA Letters in German, <https://aopa.de/aopa-letter-4-22/>.

Both of these materials will be reported as they are published.

6 General Assessment

Indicator type	Indicator	1 st phase target (M0-M12)	2 nd phase target (M13-M24)	3 rd phase target (M25-M30)	Target for M30 (total)	Realized	Planned (mostly till 30 th of December and some will be in the following 6 months)
Execution	Number of conferences and seminars celebrated	1	3	2	5	3	2
	Number of FACT website uploads	6	28	12	40	24	6
	Internet sites where FACT project is placed	2	3	4	7	5	2
	Number of publications released	1	2	3	5	0	2
	Workshops	1	3	2	6	5	2
	FACT presence in ATM Publications	1	2	2	5	2	3
Results	Number of ANSPs Reached	4	12	8	24	8	*
	Interested innovation companies reached	2	5	2	9	1	2
	Number of promotional links achieved to FACT website	1	3	2	5	2	3
	Number of FACT website hits	0	140	90	230	348	62
	Number of members in FACT's LinkedIn Group	10	180	120	310	122 *142 followers	22
	Number of entries in FACT's LinkedIn Group	0	18	12	30	17	12
	Attendees in seminars and conferences	0	10	12	22	14	4

7 Acronyms

ATM	Air Traffic Management
FACT	Future of All Aviation CNS Technology
CNS	Communication, Navigation and Surveillance
COMSG	Communication Steering Group
EU	European Union
FCI	Future Communication Infrastructure Task Force
FMG	Frequency Management Group (ICAO)
JCSG	Joint CNS Stakeholder Group
RAFT	Network Manager Radio Frequency function
SESAR	Single European Sky ATM Research
SJU	SESAR Joint Undertaking

