



D5.13 Engage SESAR Summer School 2020

Deliverable 5.13

Engage

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Engage

THE SESAR KNOWLEDGE TRANSFER NETWORK

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Abstract

This report describes the second edition of the Engage SESAR summer school, which was held as a virtual event, between 21st and 25th September 2020.

The opinions expressed herein reflect the authors' views only. Under no circumstances shall the SESAR Joint Undertaking be responsible for any use that may be made of the information contained herein.

Table of Contents

Abstract	3
Executive summary	5
1 Introduction	6
1.1 Engage support for the summer school	6
1.2 Objectives of this document	6
1.3 Scope of D5.13	6
2 Programme	7
2.1 Building and publicising the 2020 summer school programme	7
2.2 Delivering the 2020 programme	8
3 Participants	13
4 Feedback from participants	16
5 Conclusions and outlook	19
5.1 Conclusions	19
5.2 Lessons learned	19
5.3 Outlook	20
6 References	21
7 Acronyms	22

List of figures

Figure 1. Final summer school programme	9
Figure 2. Screenshots of two PhD sessions	10
Figure 3. Screenshots of the opportunities in industry session	10
Figure 4. Screenshots of two tutorial sessions	11
Figure 5. Screenshots of first and second wave of catalyst fund projects	11
Figure 6. Screenshot of the quiz	12
Figure 7. Participants' countries of residence	13
Figure 8. Participants' gender and age profile	14
Figure 9. Zoom participant reporting	15

Executive summary

The second Engage SESAR summer school took place between 21st and 25th September 2020 as a virtual event.

Over 80 participants from 18 countries participated in the summer school. These included ten Engage-funded PhD students, as well as two EUROCONTROL-funded PhD students: each of them presented their PhD topic and the findings obtained thus far. Over five days, seven presentations from industry experts were given, and five tutorials, aligned with needs/requests of Engage PhD students, as well as four Engage catalyst fund projects. Those were presented by lecturers from SWISS International Air Lines, Frequentis, SESAR JU, EUROCONTROL, Skyguide, Innov'ATM, University of Westminster, University of Illinois, Aslogic, ENAC, Nommon and Think Research.

1 Introduction

1.1 Engage support for the summer school

Engage is the SESAR Knowledge Transfer Network (KTN), established to promote and facilitate the development of air traffic management research in Europe. The organisation of the summer school received support and expertise from Engage consortium members (led by the University of Belgrade – Faculty of Transport and Traffic Engineering), from initial planning through to post-summer-school activities.

1.2 Objectives of this document

This document describes the 2020 edition of the Engage SESAR summer school.

1.3 Scope of D5.13

The following sections describe the:

- Summer school programme;
- Participants;
- Participants' feedback;
- Conclusions, lessons learned and outlook.

2 Programme

2.1 Building and publicising the 2020 summer school programme

As envisaged in the GA [1], the Engage summer schools *have the purpose of providing high quality education and training in the field of ATM, gathering together PhD students, experienced researchers and industry representatives.*

The second Engage summer school was originally scheduled to be held in the second week of July at EUROCONTROL's IANS premises in Luxembourg. The programme was designed with a stronger focus on the Engage PhDs' technical progress and outputs, as the candidates were by then nearly half-way through their PhD studies. Consequently, less time was devoted to tutorials on ATM concepts and research methodologies, with more time devoted to PhDs presenting their more mature work and obtaining targeted feedback from both industry and academia, including from their mentors.

Industry involvement was encouraged, particularly as expert speakers, to give insights into the operational context, thus building on the previous edition of the summer school.

Due to the Covid-19 pandemic, IANS had to cancel the Luxembourg event in April 2020. This resulted in alternative hosting options for the summer school being given consideration. The event was initially postponed to September and, following the consultations within the consortium and with the SJU (WebEx 04 June 2020), it was decided and subsequently announced (to Engage PhDs and supervisors on 16 June 2020) that it was to be held as a virtual event during the week 21-25 September 2020.

The programme was designed around the needs of Engage-funded PhD students. A questionnaire was sent to the PhD students and their supervisors in January 2020 asking, among other aspects, for the lecture topic they would most like to have and any unresolved data access/management/modelling needs they had that were necessary to progress their research. The responses received largely shaped the summer school's programme. This was also supplemented by feedback following a technical workshop on data sources organised by UoW (in March 2020) for those PhD students requiring it.

To maximise the interaction and participants' (especially PhD students') involvement during the virtual event, the roles of 'expert discussant' and 'student discussant' were introduced and assigned for each PhD presentation (students were informed of this on 16 July 2020; full details sent on 26 August; link to Google Drive folder sent on 10 September). More specifically, each candidate was allocated approximately 20 minutes to give the presentation, which was followed by 25 minutes for discussions from:

- a) the preassigned expert discussant (who received the presentation and/or some associated materials several days before the event),
- b) one of the other Engage PhD candidates (i.e. each candidate was presenting his/her own research and acting as a discussant of the presentation of another candidate); (who likewise received the presentation and/or some associated materials several days before the event), and
- c) general discussion from the audience (facilitated by the session moderator using Zoom Webinar Q&A panel).

To facilitate time keeping during the PhD sessions the students were asked to pre-record their presentations. A live discussion followed each pre-recorded video.

The summer school was subsequently publicised via the SESAR JU website, SESAR e-newsletter (July 2020 edition), Twitter, LinkedIn and the Engage website [2]. Registration via the Engage website was open from late July, along with a mature draft of the programme.

Attendance at the summer school was free of charge.

2.2 Delivering the 2020 programme

The Zoom Webinar platform was used to facilitate the virtual event. Key features included:

- up to 100 participants per session;
- different participant roles distinguished as ‘panellists’ and ‘attendees’ (roles that could be changed by the Host during the session);
- attendees communicating with panellists via the Q&A panel and the Chat panel.

Each session was chaired by the session moderator, who in the case of PhD sessions was also the assigned expert discussant. During any given session the presenters had ‘panellist’ access rights, meaning that they were (unlike the ‘attendees’) able to share their screen, have their webcam turned on, mute/unmute themselves as desired, etc. There was a 15-minute buffer between each session, to allow for slight overruns and to give the presenters time to join their session before it was scheduled to start. Each session was led by a moderator, who opened the session and gave the floor to presenters and, more importantly, managed questions received during the presentation. Attendee questions were received in writing via the Zoom Q&A panel, and then asked during the Q&A session by the moderator. As the slots were 45 or 60 minutes long, the non-student speakers were advised to leave 10-15 minutes of their slot for the Q&A session (one dedicated to each presentation), which was managed by the session moderator.

The PhD sessions were run as follows: the session moderator (SM) opened the session, then the pre-recorded video of about 20 minutes is run from Belgrade (summer school organiser). After the video, the SM acted as expert discussant to give comments and questions to the candidate (spending at least 5 minutes on this). Candidate answered. The student discussant then gave his/her comments

and questions. Candidate answered. The discussion was then open for questions from the audience ('attendees', see below), that were submitted in writing via the Zoom Q&A panel during the presentation. SM thus had to keep an eye on the Q&A panel, select questions from the lists and ask these to the candidate. Candidate answered. End of session.

Mon 21SEP	1030-1100	1100-1145	1200-1245	Lunch break	1400-1445	1500-1545	1600-1645
	Opening <i>Radosav Jovanović</i> University of Belgrade-FTTE, summer school coordinator <i>Andrew Cook</i> University of Westminster, Engage KTN coordinator	Decision support system for airline operation control hub centre <i>Jonas Langner, TU Braunschweig</i> Expert discussant: <i>Dirk Schaefer</i> Student discussant: <i>J. Evler</i>	Machine learning techniques for seamless traffic demand prediction <i>Manuel Mateos, Nommon / UPC Barcelona</i> Expert discussant: <i>Lorenzo Castelli</i> Student discussant: <i>S. Reyna</i>		Mitigation of GNSS signal degradations by means of machine learning <i>Evgenii Munin, ENAC</i> Expert discussant: <i>Junzi Sun</i> Student discussant: <i>H. Khaledian</i>	Integrating weather prediction models into ATM planning <i>Anastasia Lemetti, Linköping University</i> Expert discussant: <i>Tatjana Bolić</i> Student discussant: <i>E. Andrés</i>	Conflict-free trajectories: a multi agent reinforcement learning approach <i>Alevisos Bastas, University of Piraeus</i> Expert discussant: <i>Fedja Netjasov</i> Student discussant: <i>R. Isufaj</i>
Tue 22SEP	0930-1015	1030-1115	1130-1215	Lunch break	1330-1415	1430-1515	1530-1615
	Automated DCB hotspot detection <i>Sergi Mas Pujol, UPC Barcelona</i> Expert discussant: <i>Gérald Gurtner</i> Evolution of route charging mechanisms <i>Natalia Solčianska, University of Trieste</i> Expert discussant: <i>Radosav Jovanović</i>	Stochastic control of tactical airline operations in hub airport networks <i>Jan Evler, TU Dresden</i> Expert discussant: <i>Andrew Cook</i> Student discussant: <i>J. Langner</i>	Second generation agent-based modelling for improving APOC operations <i>Sashiko Shirai Reyna, Amsterdam UAS / ENAC</i> Expert discussant: <i>Bajana Mirković</i> Student discussant: <i>M. Mateos</i>		Advanced statistical signal processing for next generation trajectory prediction <i>Homeyra Khaledian, UPC Barcelona</i> Expert discussant: <i>Dirk Schaefer</i> Student discussant: <i>E. Munin</i>	A pilot/dispatcher support tool based on the enhanced provision of thunderstorm forecasts <i>Eduardo Andrés, Universidad Carlos III de Madrid</i> Expert discussant: <i>Luis Delgado</i> Student discussant: <i>A. Lemetti</i>	Machine learning applications to extend AGENT's conflict resolution capabilities <i>Ralvi Isufaj, Autonomous University of Barcelona</i> Expert discussant: <i>Fedja Netjasov</i> Student discussant: <i>A. Bastas</i>
Wed 23SEP	0930-1015	1030-1130	1145-1245	Lunch break	1400-1500	1515-1600	1615-1700
	Opportunities in industry Insights into a PhD within an airline <i>Marie Carré, SWISS International Air Lines</i> The Talent Network at Frequentis <i>Georg Trousmuth, Frequentis</i>	Understanding the tactical control of aircraft <i>Olivia Nunez, SESAR JU</i>	Collaborative decision making in the APOC context, with case studies <i>Alan Marsden, EUROCONTROL</i>		EUROCONTROL data sources (Part 1) <i>David Marsh, EUROCONTROL</i>	Airline disruption management - data flows and decision-making processes <i>Marie Carré, SWISS International Air Lines</i>	EUROCONTROL data sources (Part 2) <i>David Marsh, EUROCONTROL</i>
Thu 24SEP	0930-1030	1045-1130	1145-1230	Lunch break	1400-1500	1515-1615	1630-1715
	Delays in European aviation - building passenger cost models <i>Andrew Cook, University of Westminster</i>	An interaction metric for an efficient traffic demand management <i>Juan José Ramos, Aslogic</i> Flight centric ATC with airstreams <i>Georges Mykoniatis, ENAC</i>	Exploring future UDPP concepts through computational behavioural economics <i>David Mochali, Namman</i> Role of Markets in AAS Deployment <i>Maribel Tamás, Think Research</i>		New architectures in ATM, and virtual centre development <i>Ruben Flohr, SESAR JU</i>	Short-term air traffic flow management integrating separation management and ground holding <i>Bo Zou, University of Illinois at Chicago</i>	The Quiz with a Difference
Fri 25SEP	0930-1030	1045-1145	1145-1215	engagektn.com/summer-school-2020 PhD Industry Tutorial Quiz			
	Insights into flow management perspectives <i>Lorna Herda, Skyguide</i>	Applied machine-learning in ATM <i>Laurent Nicolas & Olivier Carron, InnovATM</i>	Wrap up and closing <i>Radosav Jovanović & Andrew Cook</i>				

Figure 1. Final summer school programme

The programme (Figure 1) kicked off on Monday, 21st September 2020, with presentations from five Engage-funded PhDs (see example, Figure 2). The PhD session continued on Tuesday morning with the five remaining summer Engage PhD presentations, as well as two from EUROCONTROL-funded PhDs. Pre-recorded presentations were given to pre-empt possible technical issues and help with time-keeping. Each PhD presentation was followed by a discussion between the pre-assigned expert discussant (most often this was the candidate’s Engage mentor) and student-discussant and a lively general Q&A session, with questions coming both from other PhD students and from senior Engage researchers.

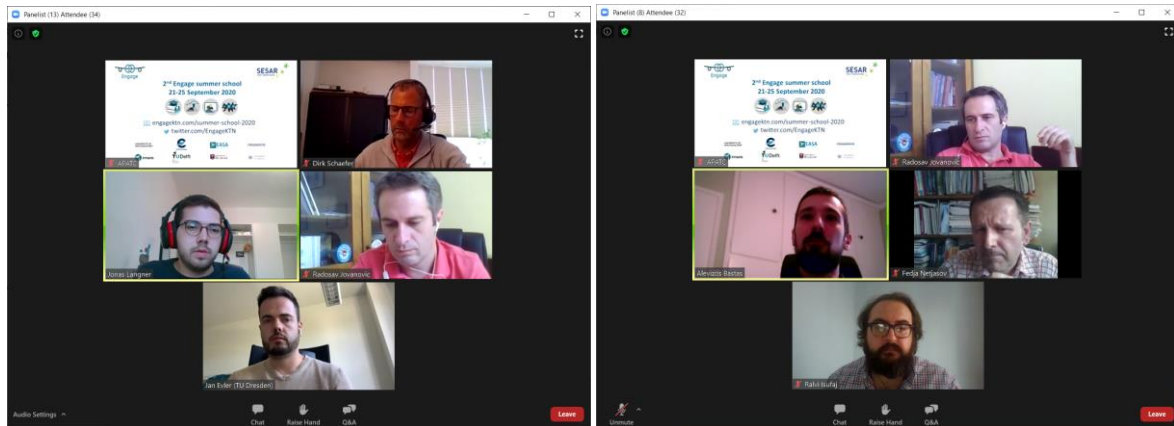


Figure 2. Screenshots of two PhD sessions

The programme continued on Wednesday with the session on opportunities in industry (Frequentis and SWISS, see Figure 3), followed by a mix of tutorials (see Figure 4) and industry presentations, which continued into Thursday and Friday. Four selected Engage catalyst fund projects also gave presentations – two from the first wave of projects with results to present and two from the second wave at an earlier stage (Figure 5). Whilst the virtual format allowed participants to join any number of sessions, there was relatively low fluctuation of participants during any given session (see Section 3).

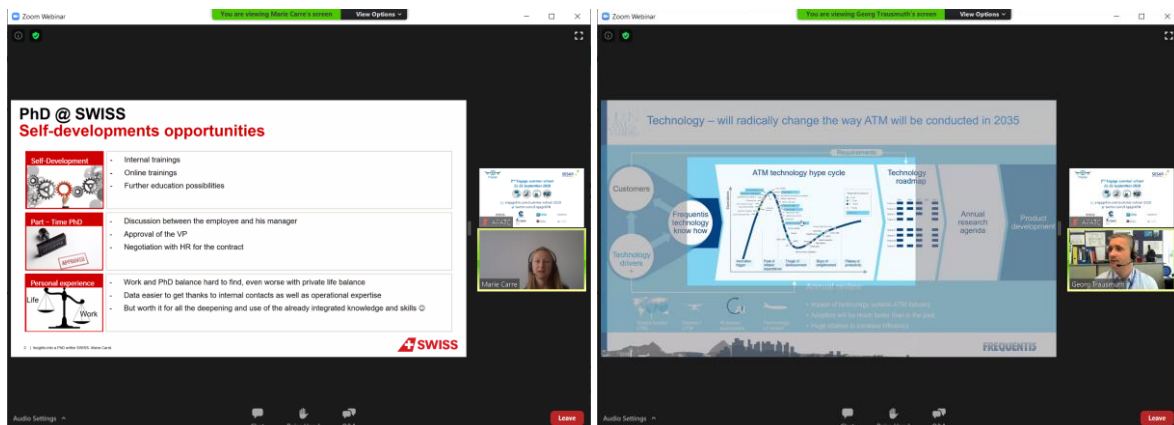


Figure 3. Screenshots of the opportunities in industry session

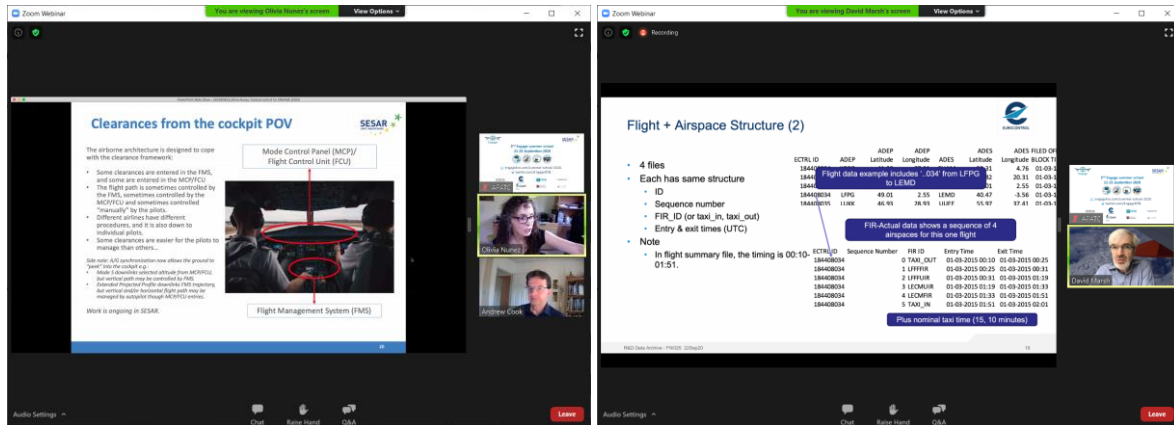


Figure 4. Screenshots of two tutorial sessions

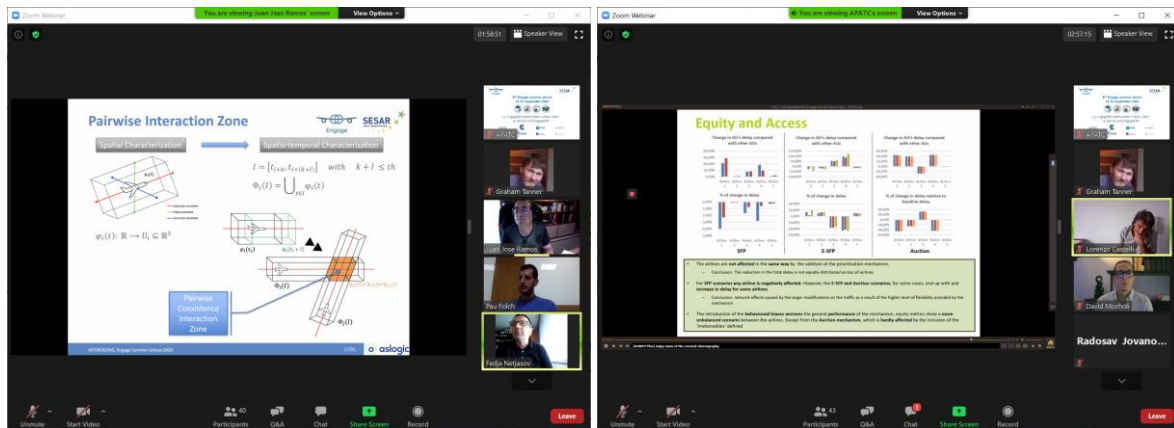


Figure 5. Screenshots of first and second wave of catalyst fund projects

On Thursday afternoon, as a virtual substitute for the social event, a half-hour quiz was organised, and attended by 26 participants (Figure 6). Three gift packs were kindly supplied by the SJU as prizes for the winner and two runners up. The virtual social event was, as shall be detailed in Section 4, well received by the participants who took part in it.

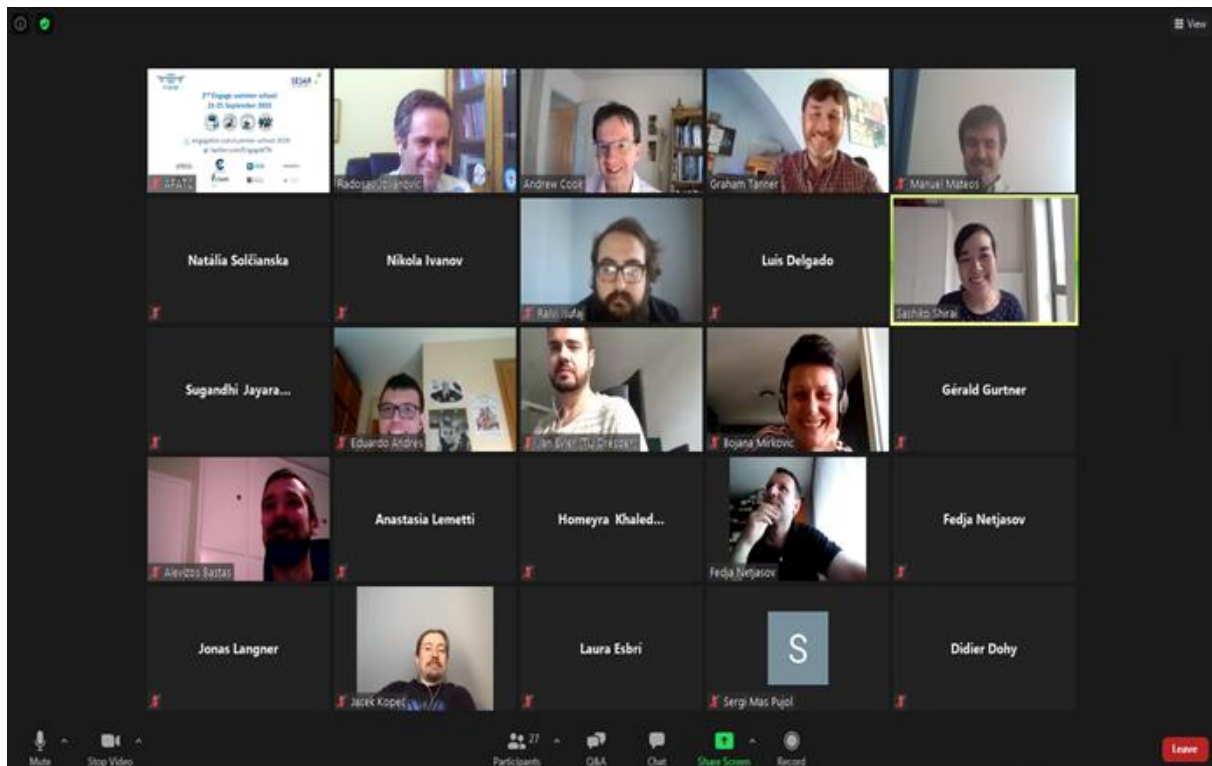


Figure 6. Screenshot of the quiz

Finally, during the opening and closing sessions, but also where relevant throughout the PhD presentations and tutorials, references have been made to relevant Engage thematic challenges and forthcoming workshops, to relevant catalyst-funded projects, as well as to the forthcoming SESAR Innovation Days 2020 conference and specifically promoting the SESAR Young Scientist Award (for 2021).

All summer school tutorial slides were made available to participants on a dedicated password-protected page of the Engage website.

3 Participants

The total number of participants at the summer school was 86. This comprised 59 self-registered attendees, 15 external speakers and 12 Engage consortium members. Note that external speakers, Engage staff and late applicants (requesting access to specific sessions after the registration had closed) were registered by the organiser.

The following summaries relate to the 59 self-registered attendees.

The largest number of registered participants came from Spain (12), followed by the United Kingdom (7), Switzerland (5), China, France, Italy, The Netherlands (4 each), Belgium, Hungary, Serbia (3 each), Germany, Sweden (2 each), with 1 each from Finland, Greece, Poland, Slovakia, USA and Vietnam (Figure 7).

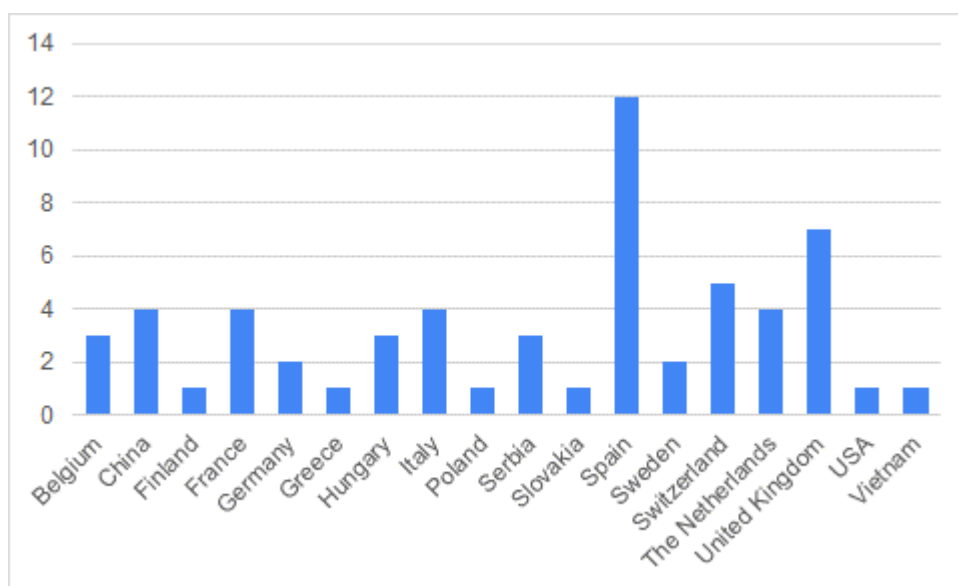


Figure 7. Participants’ countries of residence

Most participants heard about the summer school from someone they knew, with 41 mentioning their supervisor/teacher, a friend/colleague or employer. Other sources of information included the Engage website (12), e-mail announcement (8) and SESAR e-news (7) (multiple responses).

Of the 59, 30 registered as undergraduate/postgraduate/PhD students, 8 as researchers/postdocs and 21 were employed. In summary, approximately half were students. Most participants (50) stated they had, or were studying for, a postgraduate degree (MSc/MA/PhD).

A broad range of PhD subjects could be seen among registered participants with a PhD, or studying for a PhD, including:

- Aerospace engineering
- Air transportation
- Airline networks
- Airport slot allocation
- Atmospheric physics
- Civil aviation policy studies
- Computer science
- Economics of information
- Industrial electronics
- Industrial engineering
- Machine learning and aeronautics
- Transport engineering
- Transport liability

38 of the self-registered attendees were affiliated with a university. Around a third of attendees were from industry and consultancies, including Skysoft-ATM, INECO, HungaroControl and Zurich Airport.

Approximately one-third were female and two-thirds male, which was a similar distribution to the 2019 summer school [3]. Figure 8 also shows the age profile.

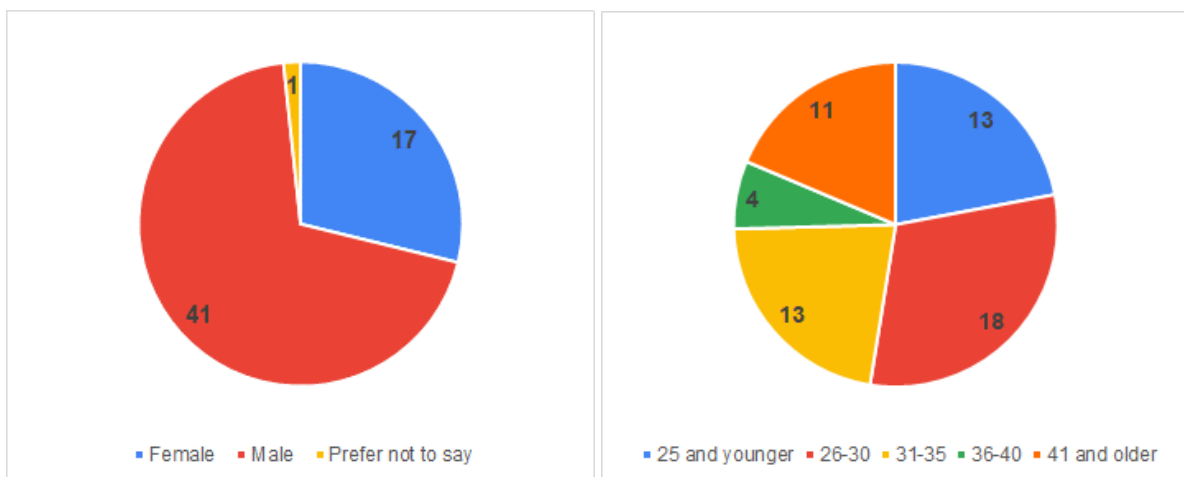


Figure 8. Participants' gender and age profile

Whilst the total number of participants at the summer school was 86, Figure 9 summarises the attendance per day, with between 39 and 52 unique participants joining. The right-hand column shows the maximum number of concurrent ‘attendees’ each day (30-39 at any one time), however this *excludes* ‘panellists’ – on average an extra ten participants per day (see Section 2.2 for the distinction between participant roles).

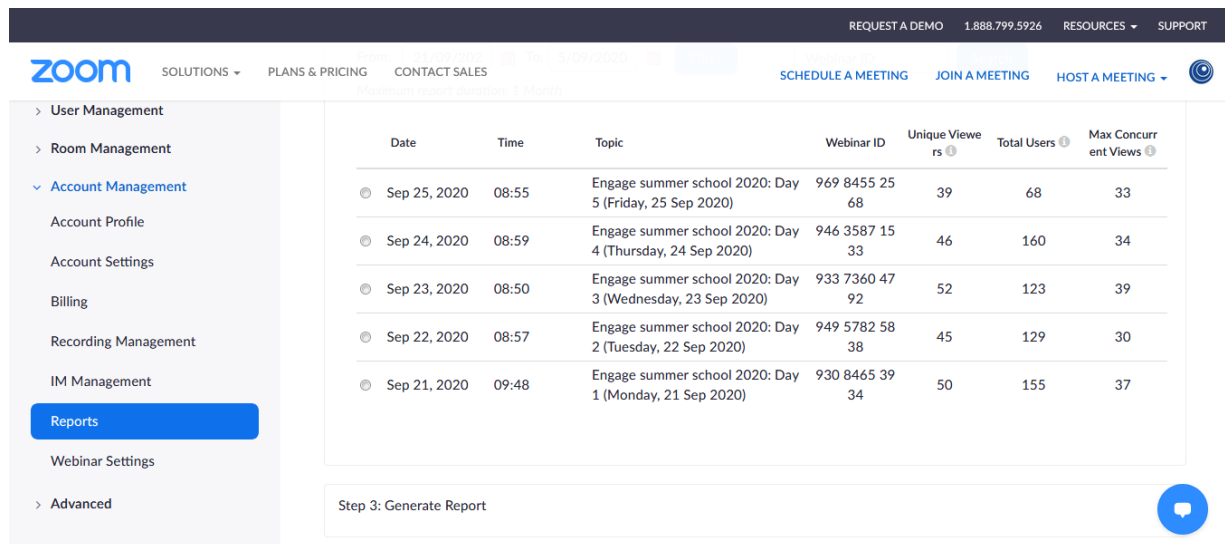


Figure 9. Zoom participant reporting

4 Feedback from participants

Anonymous feedback on the event was sought by e-mail (and one reminder) sent to all participants and external speakers (but not Engage staff). A Google-form questionnaire with open-ended questions, was developed for this purpose.

By 26 October feedback was received from 12 participants.

Q1 [overall organisation of the event]: good x3; very good x2; excellent x3; great x3; perfect x1.

Q2 [technical content]: good-to-excellent:

“Good balance between research (PhDs) and workshops (industry).”

“Appropriate quality, well organized, helpful comments from the seniors.”

With one critical comment:

“Some PhD presentations were a bit underwhelming (but some of the students had only one year to get into the field so still nice), the other presentations were very interesting.” This comment also continued to the effect that a systematic follow-up to the EUROCONTROL data sources session would be of value.

Q3 [length of presentations and time for questions]: the majority found it appropriate; three had some suggestions:

“I liked the system with the student giving questions to each other.”

“Above 45min of presentation, it gets hard to continue focussing on what the speaker is telling ...human brain is not good at that! So maybe better to shorten some presentations, or plan a small break in-between to allow the participant to recover and concentrate again after a 5min break :) Otherwise, for most of the presentations, the timing was perfect, also with questions slots allocated.”

“I would cut most PhDs time in half since many of them did not have enough content to provide interesting talks of such durations. As a result, some of the other talks could be allotted more time which would do them good too.”

Q4 [length of gaps between sessions]: all thought it was ok/good/adequate/reasonable/great.

Q5 [What you liked most]: summaries of comments:

- Presentations from practitioners (airline delay management or ATC) – liked the tutorial-style approach.

- Discussions after PhD presentations seem to be very helpful.
- The interaction possibility with the Q&A sessions that were well moderated, as well as the chat enabling all participants to ask questions (without having to switch on the microphone). This would be a useful feature to use at the next summer school, even if it takes place face-to-face.
- The organisation. It was easy to access the presentations and ask questions. And also the quiz.
- Presentations from the industry (e.g. SWISS), but also the EUROCONTROL presentation.
- The supportive atmosphere.
- The variety of content and insights many of the presentations gave in the realm of airspace. The quiz event provided an unexpected chance to relax in the afternoon.

Q6 [What you liked least]: summaries of comments:

- Topics about airlines.
- That non-presenting participants did not have access to the attendance list.
- The on-line format.
- That the event had to be held virtually and not face-to-face, since the goal of such conferences (including the SIDs) are to gather people, especially during the breaks and evening for networking.
- The lack of interaction between non-presenting participants.
- The networking, as in-person conferences have.
- A concentration of talks by students with no real results to show yet. Shorter slots would allow them to present their approach (which was always interesting) in a dynamic and interesting way.

Q7 [Any suggestions for what we could add to next year's event]: summaries of comments:

- If the event is a physical meeting, it would be great if people could watch on-line too. Retaining the flexibility of this year's on-line event.
- Explaining how to download ADS-B or other data and use it in their own code.
- Add more discussions so that other participants can comment on students' work.
- If held virtually again, it might be a good idea to have a platform on which participants could voluntarily provide their contact details (e.g. LinkedIn/e-mail) to allow the other participants to make contact.
- More interaction between other participants.

- Keep admitting non-students to the event.

Q8 [Any other comments you would like to make.]: summaries of the six comments received:

- Well done / thank you / great job x5.
- The programme was interesting. Keep up the good work.

Q9 [of the 25 sessions how much did you attend approx.]: two-thirds of respondents attended most or all of the sessions:

- $\frac{1}{4}$ of sessions: x4
- $\frac{1}{2}$ of sessions: 0
- $\frac{3}{4}$ of sessions: x4
- All sessions: x4

5 Conclusions and outlook

5.1 Conclusions

This second edition of the Engage summer school was considered successful. A large number of applications from a number of European countries, USA, China and Vietnam were received and accommodated, more than doubling the 2019 edition numbers, enabled by the virtual format. This led to a nicely sized and structured final group of 86 participants, with varied backgrounds and a largely common, strong interest in air traffic management. The programme itself seemed well-tailored to participants' interests and capabilities. Overall, despite the inability to have the planned physical event, valuable support has been provided for the future work with Engage PhDs, and useful lessons learned for the third edition of the Engage summer school and other related Engage activities.

5.2 Lessons learned

The revised, virtual format worked well:

1. Involving Engage PhD candidates and their supervisors in the design of the programme ensured lecture topics were closely aligned with student requirements.
2. Involvement of industry experts presenting relevant topics substantially contributed to the quality and attractiveness of the summer school. Contacts were established between Engage PhD students and relevant industry experts.
3. Although primarily aimed at Engage PhDs, the programme proved to be attractive to other PhD/MSc students and young researchers, as well as to a number of industry participants.
4. The idea with pre-assigned expert discussants and student-discussants worked well and was much appreciated by participants – as clearly reflected in the feedback received.

Lessons learned organising the second summer school:

1. The virtual format worked very well given the circumstances. Valuable lessons were learned for possibly repeating a virtual edition of the third summer school, if required in 2021. However, a great deal of the feedback received clearly suggests that **a physical event is still preferred to the virtual one**, and that networking and physical interaction are highly valued elements of events of this kind. The quiz at the end of the fourth day was much appreciated by the participants as a (limited) virtual substitute for a physical social event.

Follow-up activities:

1. The survey on participant feedback has been carried out and reported in this deliverable.
2. The extended PhD sessions afforded the Engage mentors the opportunity to exchange ideas on how to support some of the common activities (e.g. regarding data provision from airlines) and to organise bilateral follow-up on PhD technical issues. These are now in progress.
3. Engage is investigating the extent to which some of the lecture materials may be released in the Engage wiki, and integrated with SESAR Digital Academy activities, in addition to (already) publishing them on the Engage website.
4. Engage is investigating the best format for a follow-up on the EUROCONTROL data sources sessions, which launched the new EUROCONTROL data portal service. This could include participant-led demonstration requests (for 2021) and hosting useful code repositories (e.g. for common data processing tasks) on the Engage wiki.

5.3 Outlook

The third Engage summer school is currently planned to be held in the summer of 2021, in Trieste. The location is still subject to confirmation, e.g. whether a virtual event might be forced again, or whether we might consider the advantages of being hosted at IANS (e.g. with some co-located (training) activities).

It will continue to focus on the Engage PhDs' technical progress and outputs, as the candidates will by then be in the final stage of their PhD studies. Consequently, less time will be devoted to tutorials on ATM concepts and research methodologies, with more time devoted to PhDs presenting their considerably more mature work and obtaining targeted feedback from both industry and academia, including from their mentors. Supervisors will be strongly encouraged to attend.

Industry involvement will be encouraged, particularly as expert speakers, to give insights into the operational context, thus building on the previous editions of the summer school. In particular, we wish to establish whether take-up of the PhD outputs and findings would be worthwhile to explore further in selected cases.

However, it should be noted that, if the 2021 edition is a physical event, given the target number of approximately 30 participants identified as 2019 lessons learned [3], with a full complement of Engage PhD students and supervisors, plus other (e.g. EUROCONTROL-sponsored PhD) students, there may only be a selected number of additional (physical) places available for industry delegates *per se*. This remains a question of achieving the optimal balance, with priority given to the benefits delivered to the PhD students.

6 References

- [1] Engage project, 2017. Grant Agreement 783287, Ref. Ares(2017)6114946 - 13/12/2017.
- [2] Engage website, 2019. <https://engagektn.com/summer-school-2020/>.
- [3] Engage project, 2019. D5.12 Engage SESAR Summer School 2019, Edition 01.02.00, March 2019.

7 Acronyms

ATC	Air traffic control
ATM	Air traffic management
IANS	EUROCONTROL Institute of Air Navigation Services
KTN	Knowledge Transfer Network
SESAR	Single European Sky ATM research
SIDs	SESAR Innovation Days
SJU	SESAR Joint Undertaking
SM	Session moderator



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Founding Members



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