

**Special Committee 147**

**MINIMUM OPERATIONAL PERFORMANCE STANDARDS FOR TRAFFIC ALERT AND  
COLLISION AVOIDANCE SYSTEMS AIRBORNE EQUIPMENT**

The 104<sup>th</sup> meeting of RTCA SC-147 and 73<sup>rd</sup> meeting of EUROCAE WG-75 was held on 15 November 2022; this Plenary was a virtual-only meeting with WebEx provided by RTCA.

The following Leadership was present:

J. Stuart Searight	Co-Chair, Federal Aviation Administration
Ruy Brandao	Co-Chair, Honeywell International
Garfield Dean	Co-Chair, EUROCAE WG-75, acting
<i>vacant</i>	SC-147 Recording Secretary
Matt Haskin	Government Authorized Representative
Brandi Teel	Program Director RTCA
Alex Engel	Tech PM EUROCAE

1. Chairmen's Opening Remarks / Introductions

Mr. Stuart Searight opened the session, welcoming Committee Members to the 104<sup>th</sup> meeting of SC-147 and 73<sup>rd</sup> meeting of WG-75. Mr. Searight confirmed that Mr. Garfield Dean is acting chair for WG-75 and that Matt Haskin was present to serve as the SC-147 Government Authorized Representative (GAR). Mr. Searight mentioned that this meeting's sole purpose was to finalize agreement of the scope of Revision A of the ACAS Xa/Xo MOPS (DO-385/ED-256) and to hopefully agree to enter FRAC/OC for that document. Mr. Searight referred everyone to the agenda for how it was planned to walk through these decisions and stated the agenda will be looked at more closely for Agenda Item 4.

Mr. Searight concluded his opening remarks by informing everyone that Mr. Al Secen had retired from RTCA at the end of September. Stuart thanked Al for all of his support over the years since he had joined RTCA and served as the committee's Program Manager, noting all the invaluable help Mr. Secen provided in working through RTCA processes and careful coordination between SC-147 and other Special Committees, EUROCAE, and the PMC.

Mr. Searight then asked Ms. Brandi Teel and Mr. Alexander Engel to review the Anti-Trust Statement and participation policy for the joint meeting.

## 2. Anti-Trust Statement & RTCA/EUROCAE Policies

Ms. Brandi Teel greeted everyone and presented the Anti-Trust and Proprietary Information Policy; Mr. Alex Engel indicated EUROCAE had same policy on proprietary information giving a quick review of those items. Ms. Teel reviewed RTCA Membership Policy. Mr. Engel indicated that at joint Plenary meeting they allow non-members to attend per RTCA policy. Both indicated that proprietary information should not be included in RTCA or in EUROCAE products. If it is discovered there is a need to include proprietary information, then the Special Committee/Working Group must follow the process for getting release of rights to the proprietary information which assigns a paid-up non-exclusive, world-wide license to RTCA and/or EUROCAE.

Ms. Teel shared instructions on how to record meeting attendance on the AerOpus workspace and thanked everyone for their support of the important work here.

## 3. Approval Of [Minutes from 9 September SC-147/WG-75 Joint Plenary](#)

Mr. Searight asked for approval of minutes from the September Plenary that focused on agreeing to add the Active Surveillance MOPS supporting ACAS Xr and Revision A for DO-385/ED-256 to the work plans and Terms of Reference for both committees. . Stuart reminded everyone that these were the last minutes authored by Ms. Donna Froehlich who will now be supporting our MOPS development from a more internal Program Office role. Stuart again thanked Donna for her years of support for the committee as Secretary and reminded everyone there is an important need to fill that position for the committee. A motion was made, and the Minutes were approved without comment.

## 4. Approval Of [Agenda](#)

Mr. Searight then turned attention back to the agenda, again stating the objectives for this important Plenary was to look at the decisions required before determining the final scope of DO-385A/ED-256 MOPS and to consider moving towards a Final Review and Comment (FRAC) / Open Consultation (OC) process. To do this presentations were planned on the following topics:

- a revisit of the list of Change Proposals collected during ACAS Xu and ACAS sXu development;
- the most recent V&V analysis results of ACAS Xa performance and the Change Proposals under consideration for Revision A by EUROCONTROL;
- complementary analysis by the FAA Program Office Team; and
- the current plans for European Rulemaking to recognize ACAS Xa/Xo, and how their potential schedule will be impacted by our efforts to approve and publish Revision A.

This approach was agreed to without comment. Mr. Searight then asked if anyone had any other topics that they wanted addressed during the meeting. Receiving now such requests for additional agenda topics, Stuart concluded the opening session by saying he hoped the meeting would be less than three hours and announced there will not be any official breaks called during the proceedings. After receiving a motion to approve the agenda and proceed, and having no objections the agenda was approved by consensus.

5. Revision A of ACAS Xa/Xo MOPS (DO-385/ED-256)

Mr. Searight introduced this topic by reminding everyone that in September, EASA had asked RTCA and EUROCAE to complete a draft Revision A for the ACAS Xa/Xo MOPS as quickly as possible so that planned rulemaking in Europe could reference a “clean” standard. The requested scope was to include – at a minimum any Change Proposals and other errata corrections/changes documented in the Change 1 document for DO-385/ED-256 and/or in Appendix A of the current FAA TSO C219. Stuart went on to share his appreciation and admiration for the Program Office Team for developing the draft so quickly but deliberately.

a. Overview and Review of DRAFT DO-385A/ED256A

Mr. Searight introduced this topic by reminding everyone that the committee has already had two reviews of all of the Change Proposals considered for inclusion in DO-385A/ED-256A, and that there were no major objections raised to the inclusion of most of them. Ms. Maggie Groll gave a quick overview of the work done to prepare the Draft Revision A MOPS since the September agreement to add this to the committees’ work plan, and summarized those efforts announcing the draft was all but complete pending the final walk-through of all Change Proposals considered for Rev. A.

Ms. Groll then presented the table of all considered Change Proposals ([DO-385 Rev A CP Status Tracker 15Nov](#)), and noted that while these have been previously reviewed at the September Plenary and examined in more detail in Working Group meetings, if there were any questions or concerns about any of these proposed changes, now was the time to bring those up. Mr. Searight noted that this walk through of CPs would not include CP002, as discussion on CP002 performance and a decision on whether or not to include it would be handled separately after this discussion. Ms. Groll then walked through the spread sheet of all Change Proposals and their status with respect to having a validated result, and it being incorporated into the draft Revision A. It was shown that all CPs - excluding CP002 - had been completed and implemented with the exception of three (3). CPs 015, 016, and 019 were all proposed to be deferred and not included in Revision A. Reasoning for not including the CPs were as follows: CP015 is an extremely rare situation which might not even be able to be replicated in the real world; CP016 is also extremely rare and the impact is low; and CP019 has no functional impact. Further details can be found in the [Status Tracker spreadsheet](#).

After very little discussion, it was agreed to defer the three CPs 015, 016, and 019 and to include all others in the draft Revision A.

b. EUROCONTROL ACAS Xa Validation Effort

i. CP002 Analysis, Findings, and Validation

Mr. Garfield Dean then presented the most recent findings from EUROCONTROL's safety assessment of CP002. ([European Safety Results on ACAS Xa CP2 to RTCA V1](#))

Mr. Dean presented a series of graphs showing comparisons in performance and risk between TCAS II and ACAS Xa with CP002 included as well and a set of more incremental comparisons between ACAS Xa with only CP001 implemented and ACAS Xa with both CP001 and CP002. (Please refer to the presentation for specific results.)

After looking at many of the specific results, Mr. Dean concluded by stating that CP002 does indeed reduce the risk of induced near mid-air collisions (NMACs) in high vertical rate encounters at relatively low altitudes as requested; however, CP002 also appears to increase induced NMACs in SA01-type encounters, especially when one aircraft does not respond to its RA. Garfield stated that the new SA01 Encounter model developed by EUROCONTROL still needed a robust validation, so these results in performance are not conclusive. He estimated it would likely take at least one year to collect surveillance data needed to further validate their SA01 encounter model and assess its relative importance in the overall airspace. Mr. Dean concluded that, given the schedule requirements from EASA which will be presented next, neither EUROCONTROL nor WG75 could propose inclusion of CP002 at this time.

Mr. Volker Huck, EUROCONTROL, then gave a brief summation of the operational suitability performance of ACAS Xa. ([CP1 vs CP2 ops accept](#)) Mr. Huck reported that CP002 does a very good job of reducing the "crossing level off" encounters observed during the CP001 validation efforts, reducing them by about 50%. However, Volker agreed that further work was still needed on the safety analysis for CP002. He concluded by reiterating EUROCONTROL's position that implementing CP001 will meet minimum safety metrics, and that while including CP002 may bring incremental improvements, there was insufficient certainty of other potential effects of CP002 to include it in Revision A at this time.

Ms. Groll then presented results from a comparative analysis for ACAS Xa with and without CP002 conducted by the FAA Program Office Team at MIT Lincoln Laboratory. ([221115 CP-002 Slides for RTCA](#)) Ms. Groll started with an overview of the intended objectives, and logic changes developed for CP002 as well as a walk-through of a few representative encounters for which CP002 was designed to improve upon. The analysis showed that with either the use of ADS-B surveillance data or with only active surveillance, ACAS Xa brings overall safety improvements over TCAS II in both instances in which only CP001 is implemented or when both CP001 and CP002 are included. The analysis findings were generally, but not completely, in agreement with the EUROCONTROL study, with the primary difference being that the safety improvements provided by CP002 in European Layer 2 encounters with Active Surveillance were markedly greater than the small-to-negligible degradation seen in some of the encounter sets considered, including the SA01 set. Ms. Groll's closing statement on the analysis was as written on the final slide presented: "Overall both CP001 and

CP002 are safer than TCAS. CP002 reduces induced risk in the encounters of interest at a small cost in SA01 encounters.”

Mr. Neal Suchy, FAA Program Manager for ACAS X, reminded everyone that CP002 was specifically designed to address a desired improvement that came directly from the initial European validation of ACAS Xa, and without CP002 that performance will still exist. Mr. Dean agreed, but stated that given 1) the chance this increase in induced risk for SA01 exists and 2) the overall improvement in safety with ACAS Xa without CP002 as compared to TCAS II, it was important to move forward with ACAS Xa without CP002. Mr. Suchy then also reminded everyone that overall ACAS Xa, as originally published in DO-385/ED-256 was deemed to have met all required safety and operational suitability metrics to be permitted by FAA in TSO C119, so the Program Office will abide by whatever decisions the two committees agree to with respect to Revision A.

ii. European Rulemaking Status and Schedule

Next, Mr. Dominique Guillerm from European Union Safety Agency (EASA), provided an overview of the process being initiated in Europe for rulemaking ACAS Xa and TCAS II V7.1 with hybrid surveillance in the European airspace (Rule Making Task 0682). A new draft CS ACNS Subpart D section 5 ‘ACAS II (V7.1 with HS, ACAS Xa)’ and a new draft ETSO-C219 ‘ACAS Xa/Xo’ will be part of the RMT0682 and can be commented through an Advisory Bodies consultation planned to be launched in late 2022 with the publication of the Notice of Proposed Amendment (NPA). Compositions of Advisory Bodies are available on the EASA website via this [link](#) and members of Joint SC-147/WG-75 Plenary can use the formal channels of Advisory Bodies to provide comments on the RMT0682. Although this is not the formal process, Mr. Guillerm will inform by email the Joint SC-147/WG-75 Plenary as soon as the NPA is publicly released. To follow the process he was about to outline, Mr. Guillerm stated EASA would need a “clean” version of the ACAS Xa/Xo MOPS to cite, and shared his appreciation to SC-147 and WG-75 to accommodate this request with the plans to develop, approve, and publish Revision A for DO-385/ED-256. Mr. Guillerm stated that if the draft DO-385A/ED-256A was formally out for FRAC/OC and available, EASA would be able to launch their Notice of Proposed Amendment (NPA) for ACAS Xa recognition prior to the end of 2022. Mr. Guillerm also stated the need to have the final ED-256A published no later than July 2023 and that to ensure a successful NPA process and issuance of the corresponding updates for ETSO C219, there would need to be no sustainable or fundamental changes to the MOPS from the FRAC/OC process. This meant that a decision was needed during this meeting as to whether CP002 would be included or not. Dominique concluded his presentation by stating EASA, on the basis of the presentation provided by EUROCONTROL on CP002, does not believe CP002 is fully validated and ready to be implemented and therefore should not be included in Revision A.

c. Decision on Final Scope of Revision A for DO-385/ED-256

Mr. Searight then moved the conversation towards reaching consensus on the final scope of what was to be included in the draft Revision A MOPS that will be released for FRAC/OC.

He stated his disappointment that the analysis on CP002 was not completely validated, but understood the work that is still needed in Europe. Mr. Searight continued with his belief that what is most important is to see regulatory action recognizing the acceptance of ACAS Xa/Xo as an international standard and worried further delay in European rulemaking would ripple into ICAO proceedings and potentially delay any ACAS Xa/Xo systems from being built, certified, and fielded by multiple years. Mr. Ruy Brandao concurred with this assessment, and asked if examination of CP002 performance and validation of encounter models would continue within EUROCONTROL regardless of the decision made on inclusion in Revision A at this time. Mr. Dean acknowledged that work will certainly continue, and that his recommendation is to defer CP002, not reject it.

After some discussion, Mr. Searight summarized where he believed things stood. While the Plenary could discuss and try to weigh the tradeoffs between including CP002 or not, it was currently being recommended by the same stakeholders who requested development of CP002 that it not be included in Revision A, so it seemed most constructive to ask if there were any strong objections to not including it. Mr. Dean then formally moved that SC-147 and WG-75 move forward with Revision A without CP002, and Mr. Guillerm seconded the motion.

Mr. Suchy reiterated that it was the position of the FAA that ACAS Xa/Xo vastly exceeds all safety metrics whether or not Revision A is published, and whether that Revision included CP002. Mr. Suchy continued that he stood by the analysis and finding presented by the Program Office and that FAA would abstain from the final decision and develop a final MOPS based on whatever consensus was reached. Mr. Searight asked if there were any objections to moving forward as proposed. With no objections raised, it was agreed to proceed on finalizing the draft DO-385A/ED-256A and move the document into an extended FRAC/OC cycle.

Mr. Searight then proposed the following [schedule to FRAC](#), approve, and publish Revision A:

- November 21: Release final draft and commence FRAC/OC process;
- February 22, 2023: Close comment period. Have working group meetings to review final system performance or major comments if needed;
- March 15-16, 2023: Comment Resolution face-to-face meetings and joint Plenary to approve revised MOPS;
- April/May 2023: Off-cycle approval from RTCA PMC in coordination with EUROCAE TAC approval.

Ms. Brandi Teal and Mr. Alex Engel indicated this schedule was achievable from an RTCA/EUROCAE perspective, and Mr. Guillerm stated this would meet the schedule requirements for European regulatory activities. The proposed schedule was thereby approved.

## 6. Future Meeting Scheduling

Mr. Searight then quickly noted that the ACAS Xr Working Groups will be meeting the week following the now scheduled March meetings to adjudicate FRAC/OC comments and seek approval of DO-385A/ED256A. Currently these are the scheduled SC-147/WG-75 Meetings, all of which will be [held at RTCA](#) and via WebEx:

- March 15-16, 2023: DO-385A/ED-256A FRAC/OC Comment adjudication and document approval
- March 21-23, 2023: ACAS Xr Working Groups, focusing on preliminary V3 results
- June 13-15, 2023: ACAS Xr Working Groups, focusing on analysis of V3 output/feedback

## 7. Action Items Summary

- Mr. Garfield Dean and Mr. Alex Engel will make sure Mr. Dominique Guillerm and EASA have all Revision A MOPS materials as soon as they are released for FRAC/OC.

## 8. Close

Mr. Searight, along with Mr. Brandao and Mr. Dean then thanked the presenters for their preparation for this meeting, and everyone for participating and closed the meeting.

### Attendees:

Last Name	First Name	Company Name
Akari	Nadine	The Boeing Company
Bender	Walter	Johns Hopkins University Applied Physics Laboratory
Brandao	Ruy	Honeywell International, Inc.
Carino	Joslin	Federal Aviation Administration (FAA)
Ciaramella	Kathryn	Federal Aviation Administration (FAA)
Chen	David	Federal Aviation Administration (FAA)
Cohen	Moshe	Ciconia North America Inc.
De Abreu Barriga	Armando	National Institute for Aviation Research (NIAR) at Wichita State University
Dean	Garfield	EUROCONTROL
Doerr	Jennifer	L3 Harris Corporation
Drumm	Ann	MIT Lincoln Laboratory
Edwards	Matt	MIT Lincoln Laboratory
Engel	Alexander	EUROCAE

Last Name	First Name	Company Name
Froehlich	Donna	Aurora Innovations
Groll	Margarete	MIT Lincoln Laboratory
Guendel	Randal	MIT Lincoln Laboratory
Guillerm	Dominique	European Union Safety Agency (EASA)
Hahn	Ed	Air Lines Pilot Association (ALPA)
Harris-Aguirre	Heather	Northrop Grumman
Harrison	Austin "AK"	Garmin Ltd.
Haskin	Matt	Federal Aviation Administration (FAA)
Hirt	Ruth	Federal Aviation Administration (FAA)
Huck	Volker	EUROCONTROL
Jacobson	Randy	Collins Aerospace
Jessen	Ian	MIT Lincoln Laboratory
Kearney-Fischer	Martin	The Boeing Company
Klang	Pavel	Honeywell International, Inc.
Kobzik-Juul	Barbara	Johns Hopkins University Applied Physics Laboratory
Kuffner	Maria	MIT Lincoln Laboratory
Kuhlman	Kyle	Garmin Ltd.
Leeper	Charles	Johns Hopkins University Applied Physics Laboratory
Long	Anthony	Federal Aviation Administration (FAA)
Lorenzo	Edwin	Johns Hopkins University Applied Physics Laboratory
Maggard	Patrick	Federal Aviation Administration (FAA)
Monk	Walter	Constellation Aviation Solutions, LLC
Nassif	Christopher	Federal Aviation Administration (FAA)
Nguyen	Lee	NUAIR, Inc.
Olson	Wesley	MIT Lincoln Laboratory
Panken	Adam	MIT Lincoln Laboratory
Piątkowska	Paulina	Airbus
Potier	Eric	EUROCONTROL
Rahman	Mohammed	Federal Aviation Administration (FAA)
Reed	Mark	Air Lines Pilot Association (ALPA)
Rowlan	Stacey	Sagotech Corporation
Searight	Stuart	Federal Aviation Administration (FAA)
Shea	Byom	Air Lines Pilot Association (ALPA)
Sigman	Alan	Federal Aviation Administration (FAA)
Silbermann	Josh	Johns Hopkins University Applied Physics Laboratory
Smearcheck	Samantha	Johns Hopkins University Applied Physics Laboratory
Spinks	Brian	L3 Harris Corporation
Suchy	Neal	Federal Aviation Administration (FAA)
Teel	Brandi	RTCA, Inc.
Wu	Katherine	Johns Hopkins University Applied Physics Laboratory
Wu	Sam	MIT Lincoln Laboratory
Young	Tyler	Johns Hopkins University Applied Physics Laboratory
Zintak	Ben	Johns Hopkins University Applied Physics Laboratory