

Special Committee 147

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

The 90th meeting of RTCA SC-147 and 59th meeting of EUROCAE WG-75 was held on 7 March 2019 at the Riverview Conference Room at Best Western Plus, Hood River, OR.

The following Leadership was present:

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|--------------------|---|
| J. Stuart Searight | Co-Chairman, Federal Aviation Administration |
| Ruy Brandao | Co-Chairman, Honeywell, SWG Co-Chairman |
| Garfield Dean | Representing Bill Booth Co-Chairman & EUROCAE WG-75 |
| Jessica Lopez | Co-Chairman SWG |
| Brian Ulm | Co-Chairman SWG |
| Charles Leeper | Co-Chairman TWG |
| Sheila Mariano | Government Authorized Representative |
| Donna Froehlich | Secretary, Aurora Innovations |

Agenda

90th Plenary of SC-147

1. Chairmen's Opening Remarks / Introductions
2. Anti-Trust Statement & RTCA/EUROCAE Policies
3. Approval of Minutes from 89th (13 Aug 2018) Meeting of SC-147
4. Approval of Agenda
5. Future Meeting Scheduling
6. Out-Brief Of SC-147 Working Groups
 - a. Surveillance (SWG)
 - b. Threat (TWG)
 - c. Coordination (CSG)
7. Approval of Draft MASPs to Enter FRAC/OR
8. Review of ACAS Xa/Xo Change Proposals
9. Action Items Summary

Note: All presentations from the agenda items summarized below can be found on the RTCA Workspace (<http://workspace.rtca.org/kws>) in the SC-147 Traffic Alert & Collision Avoidance System area.

Agenda Item 1-5. – Opening Plenary Session

- a. Mr. Stuart Searight opened the meeting thanking our host organizations SageTech and Insitu and noting that the view was quite inspirational. He continued by presenting the [agenda](#) (or see above)
- b. [Mr. Al Secen welcomed all participants to this Plenary](#). He noted attendance to the Plenary is open to the public, however participation in any of the working groups or voting rights to a committee requires current and appropriate RTCA or EUROCAE membership. Then Mr. Secen summarized the RTCA Proprietary Policy. He noted that RTCA oversight and EUROCAE Council need to approve any proprietary information included in an RTCA/EUROCAE standard. He also noted that any exclusionary discussion is prohibited in this forum and would be suspended to review the policy and ensure adherence to the policy. Mr. Al Secen provided segue to Mr. Garfield Dean who noted EUROCAE’s proprietary information policy mirrors that of RTCA and welcomed the participants to EUROCAE WG-75 (Meeting #59).
- c. Mr. Searight asked for comments/acceptance of [Minutes of the 89th Plenary](#) in which we accepted the FRAC MOPS and referred the document for PMC Approval. Mr. Leeper moved we approve; the motion was seconded, vote held and the minutes were approved.
- d. Mr. Searight referred back to the agenda for this meeting; indicated that he would talk about TORs at end of meeting – asked if there were any additions. There were none.
- e. Discussion of future meetings:

| Year | Dates | City | Venue | Host Organization | Focus |
|------|-----------------|----------------|-----------------------------------|-------------------|--|
| 2019 | June 11-13 | Washington, DC | RTCA Headquarters (WGs w Plenary) | RTCA | ACAS Xu Technical Requirements in MOPS. FRAC Comment Resolution and approval of Change 1 for ACAS X MOPS |
| 2019 | September 17-19 | Washington, DC | RTCA Headquarters (WGs w Plenary) | RTCA | ACAS Xu Technical Requirements in MOPS. FRAC Comment Resolution and approval of Interoperability MASPS |
| 2019 | December 3-5 | Washington, DC | RTCA Headquarters (WGs w Plenary) | RTCA | ACAS Xu Pre-FRAC |
| 2020 | March 10-12 | Washington, DC | RTCA Headquarters (WGs w Plenary) | RTCA | ACAS Xu |

Agenda Item 6. Out-brief by Working Group Leads
Item 6a Surveillance Working Group (SWG)

Ms. Jessica Lopez and Mr. Ruy Brandao provided brief overview of SWG key discussion areas from the SWG breakout meetings on Wednesday 6 March.

Surveillance Working Group Agenda Wednesday 6 March

- Correlation Analysis (0900-1030)
- MOPS Review – (1030-1200)
 - o What is prescriptive? (correlation, mostly)
 - o STM Overview Section
 - o Tracked Input/Lag Analyses (ATAR) – 1300
- ADD Review – 1400
 - o Walk-through Run 5.0 ADD
 - o Example Algorithm
 - o Assign sections for review

& in the afternoon, SWG met jointly SC-228 WG-1 Radar/Tracker subgroups and discussed the following topics

- ATAR Requirements
- ‘Close Range’ issue
- Update: ARCON/Tech Center analysis
- Update: RDRTec analysis
- Discussion: path forward

The Correlation Analysis summary elicited some discussion. One participant asked: How will correlation performance be specified?

One of the Xu leads asserted we (SC-147) need to characterize false track rate in our MOPS for safety analysis. (Even though SC-228 doesn't need this requirement)

Mr. Panken added: We have to do some level of assessment, we are trying to find a minimal effort to get to here; already working bottom-up assessing correlation performance for surveillance we have.

Mr. Brandao suggested working top down to specify performance for all sources we have.

Regarding the draft ACAS Xu MOPS review, Ms. Lopez indicated that this work was on surveillance related systems and added that this week the group focused on section 2.2.5.1.

RADAR Accuracy requirements presentations:

In summary, Ms. Lopez noted SWG had identified the need to have better characterization of error (numbers) for the ownship model. Mr. Don Walker offered to provide some ownship error numbers that he has been using.

Mr. Adam Panken offered to look at system performance regarding Mode C and ADS-B correlation failure and see if it made sense to propose an extension of that approach to ATAR.

Mr. Ruy Brandao summarized Xu concern with what Xa referred to as a “zinger” during ACAS Xa analysis effort: a short bit of false track that can throw off tracking and correlation. Mr. Brandao indicated that the Xa solution may be insufficient in ACAS Xu encounters; discarding the zinger part of track (about 6 seconds in sample) could be a critical time segment when only have 120 seconds or less

Item 6b Threat Working Group (TWG)

Mr. Charles Leeper opened the TWG presentation by discussing the Wednesday morning [presentation at the Joint session with the Display/Alerting/Guidance \(DAG\) and Automation groups](#).

- NASA HITL Update
 - CAL/NASA Analysis results on ACAS Xu 4.2 vs DAIDALUS (CAL)
 - Automation Related RAC & comments adjudication
 - Overview of requirements status
 - Mapping to ACAS Xu MOPS
 - DAG Review Discussion
 - Use Case Development Discussion
- The discussion included automation and human factors.

Afternoon Meeting Summary

Maneuver Performance Appendix discussion (Charles Leeper)

Reviewed Run 5 Meeting Metrics (Luis Alvarez)

Reviewed Horizontal Coordination updates (Edwin Lorenzo)

Decision not to cap Horizontal reversals It is rare that there are more than four reversals, even rarer more than five and these reversals improve safety metrics.

Wes Olson presented summary of ACAS Xo in Xu – Do Not Alert DNA code and interface information will be retained in MOPS – ONLY for flexibility and future implementations of alternate alerting, not approved for operational suitability or usage at this time. – Can’t leave in dead code, will have to test it. – Note: This refers to DO-317B ASA processor or equivalent.

Manufacturers and vendors should review this MOPS section 2.2.8 and provide feedback.

Olson: Probably need to add notes regarding how/when this could be implemented. – e.g., discussion on regulatory steps. ALSO would like to note the STATE Scaling would not be an Xo function so is not covered in this section.

Manufacturers have approach for handling the “optional” Xo functionality in Xa – they will be able to use the same approach for the Xo modes in Xu.

Ms. Sheila Mariano: Would like manufacturers’ feedback on developing and testing this Xo functionality for/in Xu.

Brandao: I prefer to have Xu as close to Xa/Xo as possible. – There was no comment including no objection from Randy or other participants.

BKJ asked a question about state scaling. Response: That is not an operating mode (not Xo) will be driven by a parameter set.

ADD posted, draft 0.04 MOPS will be posted next week. mini-JSON test suite in about 2 months.

Mr. Leeper noted that there was a request for Mr. Alvarez to present the ACAS Xu Run 4.2 Metrics Matrix results to the larger group since not all interested were able to attend the Wednesday afternoon portion of the TWG Breakout session.

Item 6c Coordination (Sub)Working Group (CSG)

Mr. Garfield dean presented a [summary of the Coordination Sub-Group](#) progress this week.

The committee reviewed all outstanding pre-FRAC comments including a Non-Concur that remained. Mr. Dean indicated that CSG leadership would coordinate further with the comment originator and his technical team to discuss the CSG consideration and response to the comment. Mr. Dean also noted that the committee may FRAC the document even with this type of comment outstanding.

Mr. Dean then introduced some of the technical analysis behind the MASPS. The first item he introduced was a “lego chart” where all the anticipated types of CAS systems are listed across the top of the chart, as well as down the left label-column. Each cell (“lego block”) at the intersection of two types of CAS systems is assessed for ability to inter-operate with each other and are color-coded to the degree of interoperability.. Mr. Dean noted that the chart presented today was a simplified chart based on some assumptions that the CSG was able to confirm. The chart is used in conjunction with the HAZOP effort to as a completeness check that all potential hazards are identified including addressing some known mitigations.

Mr. Dean continued: Our HAZOPS effort is a systematic check of all things that could go wrong in coordination. Many hazards are mitigated by the MASPS. We pay particular attention to new hazards, may need a mitigation in the MASPS. This is a 2-way complementary effort between MASPS and HAZOPS. We want to coordinate MASPS so we are reasonably sure that HAZOPS is also reasonably mature. The HAZOP target date is mid-July, so we could be ready with MASPS end of July

Mr. Walker noted: SC-228 would like a MASPS document number to use as a reference by the end of Oct 2019. *[Note: Interoperability MASPS document numbers will be RTCA DO-376 / EUROCAE ED-264]*

Mr. Dean discussed a revised deadline for the Inter-Operability MASPS; he recommend that we commit to a MASPS delivery September 2019 – He clarified that he anticipates an early August delivery to PMC, for PMC approval and publication in September.

Mr. Searight asked: Can we have MASPS ready for or shortly after the June plenary meeting for committee review in July and August; allocating FRAC/OR across July and August should give everyone an opportunity to review? Regarding the timing of the Inter-Operability MASPS FRAC, Mr Searight added: Anything found in the last weeks of HAZOP effort could be reflected in MASPS FRAC comments, as necessary.

Mr. Dean responded: Yes, and we would want to reserve ability to have a special Plenary at end of September or in Mid-October for the FRAC Closure to provide time to finalize any other items identified by HAZOP, SC-147, or SC-228 or others.

Agenda Item 7. Approval of Draft MASPs to Enter FRAC/OR

As discussed above, the committee deferred decision on Final Review and Comment (FRAC, aka OR) of the InterOperability MASPS until the June SC-147/WG-75 Plenary.

Agenda Item 8. Review of ACAS Xa/Xo Change Proposals

Ms. Donna Froehlich presented a few slides regarding the [Change Proposals that have been submitted by FAA TCAS/ACAS team members](#). She noted that they have been reviewed internally, and that they have been posted on the SC-147 workspace for review and comment. The folder with those Change Proposals and a tracking sheet is on the workspace in https://workspace.rtca.org/apps/org/workgroup/sc-147_tcas/documents.php?folder_id=6752 ACAS Xa/Xo CPs. Ms. Froehlich noted that the intent is to hold a meeting to review and approve these Change Proposals. If approved, the recommended changes would be included in some sort of document update, likely a Change document. Discussion included Stu Searight, indicating desire to limit changes to the ACAS Xa/Xo MOPS to specific changes submitted, reviewed and approved by committee members.

Ms. Froehlich presented some examples of the type of changes that have been proposed. The largest category of changes are those related to Bench Test Timing. Ms. Barbara Kobzik-Juul assisted in the presentation by describing where timing of specific messages may be different in a bench test integrating disparate hardware components that are exchanging messages, compared to simulations within a single system. Slide 5 elicited some discussion about changing a test: removing a check for a certain value vs. providing test script changes of the expected values for certain message fields. One contributor noted in older version of TCAS MOPS, there had been specific requirements for certain values, but the values were removed; this generated some discussion from Mr. Panken and Mr. Jessen about whether providing the anticipated value is useful. The discussion was settled when it was explained that the values were likely removed from the TCAS tests because those values were not explicitly required in the message at that time.

The goal is to correct and clarify items in order to make the DO-385 MOPS a better (cleaner, clearer) document. Although the change process would not actively reject needed changes to functionality (such as items related to Operational Suitability or Safety) the committee concurred that this is not the time to open up the MOPS for scope changes. There was some discussion about how the changes would be captured and published; Mr. Al Secen indicated that a Change document is for errata or editorial changes; it was decided that this approach for documentation and publication fits with the anticipated purpose and scope of the Change Proposals.

The committee concurred that the Change Proposals should be reviewed. Ms. Froehlich noted that the briefing contains a link to the Change Proposals, and took an Action Item to schedule a meeting for the committee to review changes, and prepare for a Change 1 FRAC effort.

Agenda Item 9. Action Items Summary

Mr. Searight summarized the [proposed changes to the SC-147 TORs, the slides](#) provide a good summary of the updates (dates and status) to the deliverable documents captured in our TORs and described the evolving concepts of ACAS X for small UAS (ACAS sXu) and ACAS X for Rotorcraft (ACAS Xr) and the anticipated role with RTCA. Mr. Searight then displayed the [proposed updates to the TORs](#) for the Committee review. Projected dates were compared to earlier discussion. No objections; no changes were proposed.

CSG to continue with updating the Inter-Operability MASPS effort and coordinating with HAZOP Analysis effort as well as the Communications and Surveillance Community (CSC) effort to update ADS-B, Transponder and other MOPS.

SWG and TWG to continue working the Action Items as well as MOPS review and update effort.

Ms. Froehlich with SC-147 Leadership to prepare for a committee level Change Board for the DO-385, ACAS Xa/Xo, MOPS in order to authorize development and FRAC of DO-385 Change 1 document.

Certified as a true and accurate summary of the meeting.

Co-Chairman

Co-Chairman

-S-

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Mr. Stuart Searight

Mr. Ruy Brandao

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