

**Special Committee 147**

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

The 87<sup>th</sup> meeting of the SC-147 was held on March 8<sup>th</sup>, 2018 at RTCA, Washington, DC. In accordance with the Federal Advisory Committee Act, Ms. Sheila Mariano Federal Aviation Administration (FAA) was the Designated Federal Officer (DFO) for this meeting.

J. Stuart Searight	Co-Chairman, Federal Aviation Administration
Ruy Brandao	Co-Chairman, Honeywell
Donna Froehlich	Secretary, Aurora Innovations
Al Secen	RTCA

**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. – Opening Plenary Session**

- a. Chairmen’s Opening Remarks / Introductions  
Mr. Searight opened the meeting thanking participants on this week’s work  
Highlighted today’s schedule noted that the
- b. DFO Statement by Ms. Sheila Mariano
- c. RTCA Proprietary Policy summarized by Mr. Al Secen
- d. Approval of Minutes from 86<sup>th</sup> meeting of SC-147  
Approved with no changes
- e. Approval of Agenda  
Addition of Op Eval Results presentation  
No additional changes
- f. Future meeting scheduling (deferred to end of meeting)

**Agenda Item 2. – [Report from WG-75](#) – Booth**

As this Plenary was a joint meeting with EUROCAE WG-75, Mr. Bill Booth opened that working group meeting.

This opened the 56th meeting of WG-75, this being joint with SC-147

Mr. Booth addressed the EUROCAE IPR Policy and Participation terms and summarized activities under WG-75. Then he proceeded with more detail on:

**Interoperability MASPS** – received limited number of comments from informal review. Need formal, joint, review and need schedule for that. We recognize people are busy. Mr. Leeper will

take to SC-228 (in San Diego) at end of March and place it on the April agenda for ACAS Xu Face-to-Face. Mr. Searight said that he is presenting the expanded TORs to include this (Interoperability MASPS) scope to PMC in March. Mr. Searight and Mr. Leeper agreed that Our Xu schedule allows allow us to commence the MASPS FRAC in conjunction with the October Xu meeting, and then approve it in December 2018. Mr. Searight asked whether: ACAS Xu can support formal or informal review of MASPS in April. Mr. Carpenter mentioned the need for detailed review of the horizontal coordination description in the draft he saw.

#### **WG-75 Presentation by Mr. Bill Booth**

>**ACAS X Xu Sub-Group** – WG-105 is invited by the WG-75 and they usually attend SESAR PJ11 (CAPITO); CAFÉ encounter modeling

WG-75 ACAS Xu will need Initial OSED (Collision Avoidance Centric) and VALR (Run 3 – Honeywell) Mr. Suchy asked about schedule. Mr. Booth indicated the SMEs are already on-board. Suchy followed up asking about the 2020 milestone; Mr. Booth expects EUROCAE can meet this date. Additional questions on scope of OSED. Leeper/Searight/Suchy indicated they would like to continue schedule/scope conversation with Booth (SESAR and EUROCONTROL) Mr. Booth concurred

Initial Xp studies into TSAA+. GA Encounter model; Work to be split between Situational Awareness and Collision Avoidance. Ms. Mariano asked about Xp. Mr. Suchy indicated the concept it developed and the passive coordination messaging is established in the draft MOP; need to establish agreement on the scope, use.

#### **>ACAS Xa Verification events**

EUROCONTROL has commenced their contractual process to select resources to assist in their planned ACAS Xa/Xo European validation study. While they plan to use SESAR acceptability criteria as guidance it will not be used as absolute metrics on their final findings and recommendations. The study will use existing encounter sets. Estimate 4 months evaluation time. Mr. Suchy asked Mr. Booth if EUROCONTROL would be able to accelerate the schedule if the PO provides them with the Run 15.3 executable. Mr. Booth was not sure if that would help accelerate the schedule since they are also building a complete new simulation environment. Mr. Searight stressed how invaluable it would be if the committee could get Europe's preliminary feedback on the acceptability criteria prior to the MOPS being presented to the PMC in September. Mr. Booth reminded attendees that Europe (EASA, in particular) needs to have its own independent assessment and last year's SESAR feedback on acceptance criteria does not mean that there are insurmountable problems with ACAS X.

### **Agenda Item 3 - Updates on TSO schedule, cert plan and final products – Mariano**

Ms. Mariano reviewed the ACAS X TSO and AC Tracking Schedule toward:

- TSO-Cxxx ACAS Xa/Xo – FAA Review June 2019, Public Review August 2019, Proposed Publication November 2019
- AC 20-xxx FAA Review Aug 2019, Public Review October 2019, Proposed Publication January 2020.

#### Agenda Item 4 – ACAS Xa Operational Evaluation (Flight Test) - Tom Teller

Mr. Teller's presentation addressed results of Acas Xa/Xo OpEval version Run14R3C. Following are key points from that presentation.

- There were a total of 392 flights; 642 hours; 1333 encounters, 67 of which were TA/RA, 4 were multi-threat.
- When we had feedback that pilots received only TA, but wondered whether there should have been RA, these were chased down and looked like the logic got it right.
- Reversals: very few, happened in a very long encounter that included formation flight.
- Mode C intruders: Mode C algorithms are optional, we had 2 different manufacturer implementation, both worked.
- TA/RA Alerting: Mode S intruders. Feedback on one TA/RA was that the TA could have been sooner; RA was correct for geometry. Run15R3 actually improves the timing of alerts when this encounter was re-run.
- Multi-Threat Encounters: Analysis was that the alerts were correct for the given geometry, coordination was successful, possible opportunity for better training on "Weakenings"
- In addition to TCAS/ACAS encounters, we had 5 unscheduled ACAS EE Encounters with (both OpEval participants). Interesting data.  
For OpEval data collection: We define encounters as another aircraft operating in proximity to ACAS X aircraft where a TA was triggered or *should have* been triggered.
- TA/RA Alerting Priority Event some difficulty collecting this data due to TRAMS outage, but data was reconstructed and ACAS X behaved correctly. [That is, the intruder had an issue with their box, of which the (new) aircraft owner was unaware]
- ACAS Xa Performance/Operational Issues – of 1333 encounters only identified 6 potential logic issues. These have all been resolved and followed-up in the pre-FRAC process =>Incorporated in Run15R3 ADD / FRAC MOPS.

There was a comment that the CONCLUSIONS AND RECOMMENDATIONS slide looked good.

Mr. Shafaat confirmed that the Boeing *EcoDemonstrator* is equipped with one of these "X boxes" and flying, in fact scheduled for flights next week.

#### 5. Agenda Item 5 ACAS Xa/Xo MOPS FRAC / Open Consultation (OC)– Searight /Brandao [included: Schedule & Process]

Final joint committee agreement to proceed to FRAC/OC

Mr. Searight thanked everyone for their in-depth briefings and feedback/questions.

- To be FRAC'ed: MOPS Vol 1, ADD (Vol2), Test Suite (Run14R2A – preFRAC version of ADD)
- Materials to support FRAC: Final-Run15R3 Metrics Matrix, RMJM, FAA PO Safety Report  
Note Safety report developed through Safety Group
- Key dates:
  - **March 9:** is the start of the MOPS (and ADD) FRAC process

- **April 20:** Comment Period Closes: 6 week Comment period; Allows 3 weeks for core team to review, organize, prepare and coordinate
- **May 15-18:** F2F meeting Comment Resolution: (may have separate WG sessions) 4 days to allow for constructive review and adjudication of comments, Friday May 18, SC-147/WG75 Joint MOPS Approval (Possibly schedule 2 day Plenary Thurs/Fri with ability to end early if work is complete)
- **May 21-July 20:** Comment resolution: MOPS Finalization, all artifacts finalized (Comment Spreadsheet) MOPS version 1 baseline logic
- **July 23-Aug 3:** Joint committee agreement that all FRAC/WC issues addressed – Electronic concurrence that the agreed upon changes are implemented.
- **By or about August 10:** Delivery of Final MOPS to PMC We can hold a virtual plenary to approve MOPS delivery to Plenary – date TBD – The committee, with RTCA support, will issue a Plenary notice
- **September 20 PMC**

Some commentary followed: Mr. Alex Engel: Currently EUROCAE’s schedule mirrors this; however, European validation must be performed. Council hasn’t ruled on request for approval contingent on successful European validation.

Mr. Engel continued: I would like to refer to the product as ACAS X – (confirm that the Run and Revisions number would not be part of the name of the standard.)

#### **Agenda Item 6 – Lessons learned from Pre-FRAC** - Froehlich

This presentation summarized results of Pre-FRAC comments and then addressed some possible improvements in getting comments submitted. Next Ms. Froehlich walked through submission of comments to the FRAC document

#### **Agenda Item 7– Proposed Terms of Reference Rev 15 03-22-2018 Redlined** (Searight)

Mr. Searight reviewed the proposed changes to Terms of Reference to be presented to PMC later this month.

Accepted by attendees.

Mr. Alex Engel provided a few thoughts on the synchronized FRAC/OC:

EUROCAE will run its Open Consultation in parallel with RTCA targeting the same end date. The OC process is launched automatically and will inform EUROCAE members by e-mail about the active Open Consultation. Although the upload of comment sheets will be done via the EUROCAE Workspace.

Although EUROCAE will run its process in parallel to the RTCA FRAC, it is important to understand that comments shall not be uploaded to both processes.

**Agenda Item 8– Additional Working Group Reports**

**Report from Xu WG** – Leeper

Mr. Leeper talked to the High Level Xu WG schedule. He highlighted Xu activities that are expected to occur at or around the April Xu F2F:

- What elements of SC-228 Phase II scope will be addressed;
- incorporate worksheet process into initial Xu draft MOPS (using the Xa FRAC MOPS);
- Branch-off of Xu MOPS from Xa

Mr. Leeper noted that Run4 ADD for Xu is available on the Workspace. He continued by indicating that there was an SC-228 boot-camp last week (SC228, DO 365 published).

The Xu leadership will be reviewing all new/changed requirements from Phase 1 to Phase 2 – to define our scope. The SC-228 OSED delivered in December is also key for our April scoping activity

Next F2F meetings (all at RTCA Washington DC)

April 17-19, July 24-26, Oct-16-18

(See future meetings, below)

**ACAS Xu Safety Status** (no slides) - Zeitlin

Mr. Andy Zeitlin summarized status of safety analysis being performed for ACAS Xu WG. Mr. Suchy asked: how do we tie-back to Ground Radar and other systems that are in SC-228? Mr. Zeitlin responded: We can talk in general terms about operational things, and we can group radars. Mr. Suchy and Mr. Panken both commented and agreed that: Ground radar may have special concerns since interacts with/affects other ground systems. Mr. Zeitlin indicated: We (Safety Analysis Team) can work that.

**Agenda Item 9– Summary and Adjourn** (1400-1430)

- a. Key review and comment dates were reviewed, most immediate: FRAC – comment submission period ends April 20. (Note: comments were accepted through April 23, to allow for difficulties in submission at/after COB.)
- b. Next Face-to-Face meeting dates below:

Year	Dates	City	Venue	Host Organization	Focus
2018	March 6-8	Washington, DC	RTCA Headquarters	RTCA	ACAS Xa/Xo
2018	May 15-18*	Washington, DC	RTCA Headquarters	RTCA	ACAS Xa/Xo
2018	July 24-26	Washington, DC	RTCA Headquarters	RTCA	ACAS Xu
2018	April17-19	Washington, DC	RTCA Headquarters	RTCA	ACAS Xu

\*May 15-16 WG sessions, May 17-18 Plenary with option to formally approve (or contingent approve) the MOPS on Thursday, May 17.

**Certified** as a true and accurate summary of the meeting.

Co-Chairman

Co-Chairman

-S-

-S-

Mr. Stuart Searight

Mr. Ruy Brandao

FAA

Honeywell

<b>Name</b>	<b>Organization</b>
Adamova, Eva	Honeywell International, Inc.
Alvarez, Luis	MIT Lincoln Laboratory
Aveneau, Christian	DSNA (EUROCAE Member)
Bender, Walter	The Johns Hopkins University
Bess, Peter	Air Line Pilots Association (ALPA)
Booth, Bill	EUROCONTROL
Carino, Joslin	Federal Aviation Administration (FAA)
Carpenter, Ken	QinetiQ (EUROCAE member)
Chen, Zhong	Honeywell International, Inc.
Ciaramella, Kathryn	Federal Aviation Administration (FAA)
Cowen, Emilie	MIT Lincoln Laboratory
deGuzman, Teddyson	Federal Aviation Administration (FAA)
Drozdowski, Stanislaw	EUROCONTROL
Drumm, Ann	MIT Lincoln Laboratory
Engel, Alexander	EUROCAE
Foster, Craig	UK National Air Traffic Services
Froehlich, Donna	Aurora Innovations
Fu, Alex	Federal Aviation Administration (FAA)
Gallo, Wayne	Federal Aviation Administration (FAA)
Graner, Yvonne	DFS GmbH (EUROCAE member)
Grebe, Tim	General Atomics Aeronautical Systems, Inc.
Hahn, Edward	Air Line Pilots Association (ALPA)
Hallworth, Kevin	European Aviation Safety Agency (EASA)
Huck, Volker	EUROCONTROL
Jessen, Ian	MIT Lincoln Laboratory
Joseph, Mischael	Federal Aviation Administration (FAA)
Klaus, Robert	MIT Lincoln Laboratory
Kobzik-Juul, Barbara	The Johns Hopkins University
Law, John	Federal Aviation Administration (FAA)
Mariano, Sheila	Federal Aviation Administration (FAA)
McLain, Cynthia	MIT Lincoln Laboratory
Monk, Walter	CSSI, Inc.
Olson, Wesley	MIT Lincoln Laboratory
Panken, Adam	MIT Lincoln Laboratory
Petri, Michael	Federal Aviation Administration (FAA)
Reguse, Carlow	Hensoldt
Robin, Jean-Luc	Airbus
Rowlan, Stacey	L-3 Communications

<b>Name</b>	<b>Organization</b>
Saunders, Jonathan	Aurora Innovations
Searight, Stuart	Federal Aviation Administration (FAA)
Shafaat, Taji	The Boeing Company
Sigman, Alan	Federal Aviation Administration (FAA)
Silbermann, Josh	The Johns Hopkins University
Steinbach, Dierk	Airbus
Teller, Tom	MIT Lincoln Laboratory
Wilson, Kevin	Honeywell International, Inc.
Zeitlin, Andy	The MITRE Corporation
Zintak, Benjamin	The Johns Hopkins University