

Special Committee 147

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

The 82nd meeting of the SC-147 was held on September 24th, 2015 at the EUROCONTROL headquarters in Brussels, Belgium. In accordance with the Federal Advisory Committee Act, Mr. Steve Plummer, Federal Aviation Administration (FAA) was the Designated Federal Officer (DFO) for this meeting.

J. Stuart Searight	Co-Chairman, Federal Aviation Administration
Dan Tillotson	Co-Chairman, Rockwell Collins
Tom Troast	Secretary, Regulus Group
Sophie Bousquet	RTCA, Inc.

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.a-1.c – Opening Business

Ken Carpenter started the meeting by welcoming participants. The EUROCONTROL Director of ATM, Philippe Merlo, introduced himself to the committee and acknowledged the importance of the ACAS X project. He discussed some of the goals of SESAR and highlighted the need for a faster turn-around with TCAS development cycles, and he acknowledged that ACAS X has the potential to help with faster turn-around with logic changes. Philippe was also joined at the meeting by Nicolas Gautier, the Head of the Air Traffic Services Unit at EUROCONTROL.

Ken opened the 43rd meeting of WG-75 as well as the 82nd meeting of SC-147. SC-147 co-chairs Stuart Searight and Dan Tillotson thanked the attendees for participating in the meeting. Steve Plummer, the Designated Federal Officer, read the public service announcement for the plenary meeting.

Dan asked the attendees if they had any comments regarding the minutes for SC-147 Meeting 81. No comments were offered, and the minutes from Meeting 81 were approved. Stu presented the agenda and explained some of the changes to the agenda that would be required in order to accommodate the briefings.

Comparison of Airspace/ATC Between Europe and USA (Airspace comparison (Europe vs USA).pdf)

Volker Huck presented a briefing which explained the differences between member states of the European Union, EASA and EUROCONTROL. He explained the differences between the U.S. NAS and European airspace. Volker noted that due to more frequent vertical separations in some areas of core Europe the performance of ACAS X (in both, en-route and TMA airspace) must be as good as, if not better than, that of TCAS II.

ACAS Xu Discussion

Stu announced that the PMC had approved the inclusion of ACAS Xu in the SC-147 Terms of Reference (TORs). Stu said that the SC-147 leads are working on ways to schedule the ACAS Xu subgroup meetings in a way that is non-disruptive toward ACAS Xa/Xo MOPS development activities and schedule. Stu added that there are two major areas for ACAS Xu: (1) the NASA/flight test work, which will be soon briefed to the SC-147 community, and (2) the ACAS Xu specification, which is what may need to be modified.

Agenda Item 2 – Report from WG-75 (WG-75 activities Sept 2015.pptx)

Ken Carpenter presented a briefing on WG-75 activities and status. Regarding the ALIAS slides, Volker Huck noted that ADS-B-only tracks may be more likely in EUROPE than in the US. Ken added that there is still consideration underway with regard to how low powered ADS-B transmitters (LPAT) will be handled.

Agenda Item 3a – SESAR Work & Progress in ACAS X Validation (European contribution to ACAS Xa validation_RTCA-SC147_September2015_Plenary_v1.0.pdf)

Christian Aveneau presented a briefing on SESAR ACAS X activities. Stu asked what the primary objective of the SESAR human factors analysis was. Christian explained that the human factors analysis will obtain feedback from pilots regarding whether a given RA (a) seemed appropriate and (b) seemed natural. Christian added that the analysis will provide a simulation and also show what TCAS II would do in a similar situation.

Wes Olson cautioned that care must be taken when interpreting the results of such analysis since the simulations don't show the field of view (FOV) that a pilot would have, and so the simulated information doesn't always portray the kind of perspective a pilot would have from the cockpit. Wes added that, from a tuning perspective, Lincoln Laboratory is concerned about what behaviors the pilots consider acceptable or unacceptable.

Christian said that he hopes that the analyses can be more focused in the next phase of SESAR. Christian also said that Europe can benefit from the input/feedback from the OWG. He noted that there was a strong desire to have an ACAS Xa flight trial in Europe, but, while that may happen during the SESAR 2020 schedule, the current tests will be limited to a rooftop test of an Xa prototype from a fixed location.

Agenda Item 3b – European Acceptability Criteria (SESAR vision of European acceptability criteria for ACAS Xa development_RTCA-SC147_Sept2015-V3.pdf)

Christian presented a summary of the criteria for the acceptance of ACAS X in Europe. The full briefing had previously been presented to the joint Working group meeting the day before. In response to a question from Dan, Christian said that the acceptability document will be made available to EASA, EUROCAE WG-75, and SC-147.

After much discussion, it was agreed that it is highly desirable to develop a single set of acceptability criteria, including definitions for key metrics, what types of encounter sets should be used, and to what degree should large sets of results be broken down into subsets. Stuart recommended that the discussion be tabled so that a deliberately worded action on this topic could be produced and presented at the end of the meeting. (See Agenda item 11b.)

Agenda Item 4a – Software Development Plan (SDP - Brussels SC-147 092415.pptx)

Walter Bender presented a briefing on the ACAS X Software Development Plan (SDP). Kevin Hallworth asked about the extent to which the ACAS Xo requirements are frozen. Neal stated that the ACAS Xo requirements are only as fixed as the ACAS Xa requirements are at the moment; they will change as the MOPS development proceeds. Stu said that while the ACAS Xo concept is fairly mature and stable, the requirements are subject to change all the way until the FRAC for the ACAS Xa/Xo MOPS begins. Neal added that the ACAS Xo requirements document is out and that feedback from the community is welcome and appreciated.

Agenda Item 4c – EASA Rulemaking Process (ACAS X Rulemaking Programme.pdf)

In response to a question on one of his slides, Kevin explained that RAG meant “Rulemaking Advisory Group”, and TAG meant “thematic advisory group”. Regarding the timeline slide from Kevin’s briefing, Steve said that the FAA intends to have the TSO and advisory circular issued around 2 years after the release and approval of the ACAS Xa/Xo MOPS, and that sequence should align well with the equivalent European timeline.

Kevin presented a slide with two key suggestions for ACAS Xa/Xo. Ken asked for reactions to Kevin’s suggestions. Someone said that they hope that there will be few updates to the tables; Ken replied that changes to the ACAS X logic tables should correspond to updates to the MOPS as well as validation – this would, by nature, be a slow process. Ruy said that regarding the announcement of the SW version, there may be ways to correlate it otherwise, such as part # or in the aircraft maintenance display; that is something that could be included in the Advisory Circular. Steve Plummer said that an Advisory Circular is an advisory document and cannot require anything; the way that the ACAS X software version is stored may depend upon the aircraft configuration. Ken recommended posing the two suggestions from Kevin’s slide to the TWG in a separate TWG meeting.

Agenda Item 6bi – Safety Sub-group Report (Safety Subgroup Report 9.15.pptx)

Andy Zeitlin presented a report on the work that the safety subgroup has been doing. Stu said that the safety subgroup is putting out material and needs a wide participation from the greater TCAS community; Stu then invited the attendees to talk to Andy Zeitlin if they were interested in participating in the Safety Subgroup in SC-147.

Agenda Item 5 – ADS-B Only TAs (AOTO_24Sep2015.pdf)

Thomas Elder presented the current work being done to examine the use of ADS-B-only tracks for generating TAs. Charles Leeper asked if the algorithms will have a problem if the ADS-B input is absent. Tomas replied by saying that the STM algorithms will be written so that there won’t be a problem when

there is no ADS-B input. Ruy added that ADS-B In is not a new feature for ACAS X per-se since TCAS II with Hybrid Surveillance used it.

There was some discussion about ADS-B Messages received under Downlink Format 18 (DF=18). Ken said that if ACAS X receives a DF=18 ADS-B message and the quality metrics meet the thresholds, then the ACAS X traffic display will display those targets. Ken then added that if DF=18 ADS-B tracks will be displayed, it follows that Low Power ADS-B Transmitter (LPAT) tracks will be displayed; Tomas agreed with Ken.

Ruy Brandao noted that DF=18 messages can include ADS-B, ADS-R, and TIS-B messages; the system will need to be designed to make the appropriate distinctions between the three message types.

Tomas stated that previously the MOPS (specifically, the DO-300A MOPS) explicitly prohibited the use of ADS-R; some changes will need to be made to the ACAS Xa/Xo MOPS [which is based on precedent in DO-300A] so that the use of ADS-R is not prohibited. Volker Huck asked whether UAT-channel ADS-B messages would be used; Tomas said that while UAT ADS-B messages will not be prohibited, more work would be required for its use.

Agenda Item 7 – Document Approval for Change documents to DO-300A/DO-300 (Comment Summary for DO-300A Change 1, ED-221A, and DO-300 Change 2.pptx)

It was noted that the next meeting of the RTCA PMC will take place on December 15th. Stu said that once the revisions have been made to the DO-300 and DO-300A change documents, they should be distributed to the SC-147 community one more time to ensure that there are no further objections to the document. Alexander Engle said that the documents will need to be given to the PMC in the beginning of November in order to allow time for review and approval.

A motion was made to agree that the FRAC process is complete for the two change documents. The motion was approved by the committee.

Agenda Item 6a – SWG Briefing (SWG Report Out.pptx)

Walter Bender gave a briefing which reviewed the status of SWG activities. In regard to the Downlink slide, Garfield said that there is still a need to have a separate coordination message; Neal cautioned that new or modified messages will need to be set up so that there is no adverse effect on existing ground systems.

Agenda Item 6b – TWG Briefing (TWG 2015.09.24 Plenary Report .pdf)

Stacey gave a briefing that reviewed the status of TWG activities. Ruy Brandao emphasized the need for end-to-end system tests.

Agenda Item 6c – CSG Briefing (SC-147_CSG_ProgressUpdate_Sept2015.pptx)

Adam Panken presented the status of the work being done by the Coordination Subgroup in response to the ISRA with SC228 and development of interoperability requirements for Collision Avoidance Systems. Adam announced that the CSG had determined that the interoperability requirements would be best published as a MASPS document (Minimum Aviation System Performance Specification). Stu

noted that he has proposed that any other collision avoidance system that is put into a MOPS should show traceability to that MASPS and be interoperable with all other collision avoidance systems. The alternative to a MASPS would be to have an addendum to the MOPS of each individual collision avoidance system, but that may prove to be a more cumbersome solution.

Neal expressed a concern regarding the remaining work on ISRA/interoperability-related tasks; if the CSG continues to focus on the ISRA, it is likely that the other important CSG tasks will not be addressed within an acceptable time frame. Neal suggested that ISRA tasks be allocated to the ACAS Xu subgroup in the near future. Ken expressed concurrence with the idea of putting ISRA-related work into the ACAS Xu subgroup. Neal recommended that the CSG create a plan for expediting the schedule for non-ISRA activities in order to conform to the timeline.

John Law noted that it is important to realize that there already are systems under development that need to take the requirements in the interoperability document into account.

Agenda Item 8 – Mitigations for Transponder Failures (Mitigation of Certain Transponder and Altitude Failure Modes 20150924.pptx)

Anna Klyestova explained that in regions where the air is very cold, there will be many cases where the altitude reading will go below 1000' and multiple aircraft within the area of cold air will have inactive transponders.

Ruy Brandao presented the options seen as viable from the team looking at ways that TCAS might best handle transponder failures. Slide 6 of Ruy's briefing presented a recommendation for a special annunciation to provide the flight crew with an aural indication when TCAS transitions to the Standby mode. Wes said that he was concerned that pilots who are not sufficiently well-trained on ACAS X would try to adjust or fix ACAS X and not realize that underlying problem is the result of transponder failure. Dan Tillotson noted that he has seen instances where the transponder failure was intermittent; in those cases, an aural annunciation for transition to Standby mode could be very distracting to the flight crew. Dan added that if an aural annunciation will be made to the flight crew, it should tell the pilot what, specifically, needs to be fixed. John Law opined that having a specific indication of a degraded condition could help the flight crew; if they are unaware of an abnormal condition, it may take longer for them to correct the abnormal condition. Ruy conceded that the problem should ultimately be answered by the OWG.

The OWG accepted an action item to consider the the two basic proposals:

- Degraded mode where Traffic Advisories still provided in the case of loss of altitude or transponder (because of transponder failure or transponder placed into standby).
- Use of an audio which alerts crew that TCAS has been placed into standby mode.

Ruy will share briefings with OWG to support their discussions.

Agenda Item 11a - Upcoming SC-147 Face-to-Face Meetings

Stu initiated a discussion on the dates, times, and locations for upcoming SC-147 meetings. The upcoming face-to-face meetings are as follows:

- December 8-10, 2015, Melbourne, Florida – hosted by Rockwell Collins
- March 15th-17th, 2016, Phoenix, Arizona – hosted by ACSS
- June 21-23, 2016, Location TBD (U.S. Location)
- September 20-22, 2016, Location TBD

Agenda Item 11b - SC-147 Action Item Review

Stu reemphasized the importance of having an agreement on the criteria for the acceptability of ACAS X in Europe by December 2015 so that Lincoln Laboratory can take those criteria into consideration during the development of Run 15 of the ACAS Xa/Xo logic; if agreement cannot be reached by December then Run 15 may not adequately reflect the European goals for acceptability. Stu said that if the European acceptability criteria report is delivered in mid-October of 2015, then the committee can set up more frequent interactions with Europe during November to help settle any areas that are controversial. Neal expressed his desire to make sure ACAS X is deemed acceptable by all stakeholders, including those in Europe. The final wording for the formation of an ad hoc group that will work on reaching an agreement on acceptability criteria was agreed to and reflected in “Acceptability Criteria SC147-WG75 Action.pdf” and included as an Appendix to these minutes.

Tom Troast was given an action to reach out to the SC-147 Working Group chairs to obtain the content that they need to provide in time for the January 2016 draft of the MOPS. In response to a question from Ken, Tom explained that the ACAS Xa/Xo MOPS draft would be “frozen” from January until the end of the review in early 2016. After the committee has had a chance to review and comment on the January 2016 MOPS draft, changes will be made using a more careful configuration control process.

Agenda Item 11c – Closing Remarks

Ken Carpenter closed WG-75 Meeting 43.

Stuart Searight once again thanked Stan and Eurocontrol for hosting SC-147. Noting that the meeting in Europe Stu closed SC-147 Meeting 82.

Certified as a true and accurate summary of the meeting.

Co-Chairman	Co-Chairman
-S-	-S-
Mr. Stuart Searight	Mr. Dan Tillotson
FAA	Rockwell Collins

Attachment 1
Meeting Attendance for SC-147 Plenary on September 24th, 2015

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