

RTCA Paper No. 241-06/SC209-008
Minutes of Meeting #04 of RTCA SC-209
For The Maintenance of the ATCRBS & Mode-S MOPS
<http://adsb.tc.faa.gov/SC209.htm>

SC-209 Meeting #4 was called to order by Co-Chair Thomas Pagano of the FAA Technical Center at 9:00am CDT, 18 October 2006, at the facilities of Honeywell International in Olathe Kansas. Mr. Pagano then welcomed all attendees and asked that each attendee introduce themselves and their organization. The attendees for all or part of the meeting included:

Raymond Bayh, BAE Systems	Scott Moore, Northern Airborne Technology (phone)
John Berglund, Consultant, U.S. Navy	Peter Muraca, FAA Tech Center
Lt. Col. Thomas Conklin, U.S. Air Force	Tom Pagano, FAA Tech Center – AJP-1850
Rob Duffer, FAA, AIR-130	Robert Saffell, Rockwell Collins
John Fisher, Consultant, US Air Force	William Thedford, Consultant, U.S. Air Force
Gary Furr, L-3/Titan, FAATC–AJP-1850	John Van Dongen, FAA TC – AJP-1850
Doug Guetter, L-3 / ACSS (phone)	Nolan Van Foeken, Garmin International
Richard Jennings, FAA, AIR-130	Don Walker, Honeywell
Andrew Leone, FAA Tech Center	Leo Wapelhorst, L-3/Titan, FAATC-AJP-1850

1. Agenda Item #1

1.1 Robert Duffer, the Designated Federal Official, also welcomed all attendees and thanked the Committee for the hard work performed during and in between the meetings. Rich Jennings briefly discussed the reason for this Committee being initiated, which is for the harmonization of the TSOs in USA and Europe for transponders, and the harmonization of the updating of the respective MOPS documents.

2. Agenda Item #2

2.1 With the proposed Agenda displayed, Tom Pagano asked if there were any suggested additions or changes to the Agenda for this meeting. There were no suggested changes, so Mr. Pagano declared the Agenda accepted and began to progress on the Agenda as published.

3. Agenda Item #3

- 3.1 Tom Pagano referred to Agenda Item #3 to discuss the Minutes of Meeting #3, which were presented to this Meeting as Working Paper WP04-02. There was a comment that Don Walker had submitted to Gary Furr via email shortly after Meeting #3 regarding the conclusion reached and expressed in bullet #8 in the Meeting #3 Minutes. Don disagreed with the conclusion of the second paragraph of bullet #8. After discussion of the Committee, the conclusion expressed in the second paragraph of bullet #8 of the Minutes of Meeting #3 were revised to take Don Walker's comments into account. The revised text in the second paragraph of bullet #8 was highlighted in yellow, and the revised Minutes for Meeting #3 were accepted by the Committee, and will be posted on the SC-209 web site after the end of this meeting.

4. Agenda Item #11

- 4.1 The Committee then reviewed the dates and locations of the upcoming Committee meetings. It was agreed by the Committee that as the agenda was a very full one for this meeting, and with more detailed document review to be accomplished as we get closer to finalizing the documents, that meetings longer than two days would be required. The meeting dates of the December meeting were therefore extended to include Thursday, December 7th at RTCA. The following dates and locations were approved, even though the actual meeting location of Meeting #6 was to be determined by Bob Saffell and provided later. It was agreed by the Committee that meeting dates and places beyond Meeting #6 would be discussed further at Meeting #5 at RTCA in December. It was also discussed that it is possible that another Joint RTCA / Eurocae WG-49 meeting would be required prior to either ED-73C or DO-181D being submitted to their respective authorities for Final Review and Comment.

Meeting	Dates/Time	Meeting Location
#5	5 – 7 December 2006 9:00am – 5:00pm EST	RTCA, Washington DC
#6	29 Jan – 2 Feb 2007 9:00am until 5:00pm Ending @ 2:00pm 2/2/07	Joint meeting between RTCA SC-209 and Eurocae WG-49 in or near Melbourne Florida, hosted by Rockwell Collins at a physical location TBD

5. Agenda Item #4

- 5.1 The Committee continued with the Agenda by going on to item #4 with the review of the draft of the proposed Appendix B for the Mode-S Specific Services. Pete Muraca presented Working Paper WP04-19 as a summary of the latest actions with respect to the draft of Appendix B, which was presented in Working Paper WP04-05. After Meeting #3, the draft of Appendix B was revised according to the resolution of several comments which were identified in Working Paper WP03-04R1 during Meeting #3, and was then submitted to Eurocae WG-49 during the last week of August with a request for a formal review prior to their meeting in October. The document was not distributed to the members of WG-49 until the week prior to their meeting on 4 – 6 October, so no formal comments were submitted by WG-49 as a result of the SC-209 request. Bob Saffell indicated that there were discussions during the WG-49 meeting

with regard to several issues in WP03-04R1 related to the Appendix B which he would discuss during the presentation of his Working Paper WP04-18. Pete Muraca continued with his presentation and indicated that future work on the Appendix would be to draft test procedures. Pete agreed that the draft of these test procedures would be presented to SC-209 for review prior to the December meeting.

- 5.2 With respect to comments that were contained in Working Paper WP03-04R1 and that were used as the basis for comments back to WG-49, Bob Saffell will report in WP04-18 on the status of those agreements. However, Bob Saffell reports that for those comments in WP03-04R1 that were highlighted in yellow for items 12 through 18, further work will need to be done by SC-209 to prepare Working Papers on those issues for submittal to ICAO ASP Technical Subgroup at their meeting in January 2007. In conjunction with the continuing of efforts under Action Item 3-1, Don Walker accepted the action to prepare a Working Paper for presentation during SC-209 Meeting #5 related to comments 12 through 18, with the objective of having a Working Paper ready for presentation to the ICAO ASP TSG during their meeting in Fort Lauderdale in January 2007.

6. Agenda Item #5

- 6.1 The Committee continued with the Agenda by going on to item #5 with the review of the Working Papers that will deal with issues related to the restructuring of sections within the draft of DO-181D. In order to begin the discussion, the current draft version 0.5 of DO-181D was displayed, along with the comparison matrix that had previously been presented in Working Paper WP03-09. The Committee discussed again the need for the restructuring that had previously been agreed to originally during Meeting #2, held in May. The manufacturers expressed concern over all of the paperwork that they would have to generate because of sections of the document being moved and references being changed. The manufacturers finally agreed that the restructuring of the document was necessary and that the comparison matrix would need to be maintained and made into an Appendix of the final DO-181D document.
- 6.2 Bob Saffell began with the presentation of Working Paper WP04-08, which was also presented to WG-49 during their Meeting #8. This Working Paper was offered to both WG-49 and SC-209 as an example of detailed requirements for Elementary (ELS) and Enhanced (EHS) Surveillance that could be placed into both MOPS documents. Bob reported that during the review of this Working Paper at WG-49, they agreed that detailed requirements were needed. Bob continued to page through the Working Paper giving a high level explanation of the requirements and the outline presented. After the presentation of the Working Paper, the Committee agreed that SC-209 would implement ELS and EHS requirements according to what was presented in the Working Paper. The Committee further agreed that we would relay back to WG-49 that we would implement the ELS and EHS requirements in the manner presented in this Working Paper, and then go forward with writing the required test procedures. Bob Saffell accepted **Action Item 4-1** to begin with WP04-08 and draft requirements for sections 2.2.24 and 2.2.25 of the draft of DO-181D prior to the December meeting.

- 6.3 Bob Saffell began the presentation of Working Paper WP04-10, which was also presented to WG-49 during their recent meeting. This Working Paper was originated by Mikael Ponnau and the Working Paper that was presented to WG-49 and SC-209 contained annotated comments from Bob Saffell, showing what he disagrees with, or where he believes that there are errors in numbers that should be corrected. After the presentation of this Working Paper, SC-209 agreed that we would implement ELS and EHS requirements according to the details presented in WP04-08 and that most of the data items in WP04-10 would be used in a set of more detailed test procedures, based on the detailed requirements presented in WP04-08. Bob Saffell accepted **Action Item 4-2** to begin drafting test procedures for sections 2.4.24 and 2.4.25 of the draft of DO-181D prior to the December meeting, using data items contained in WP04-10.
- 6.4 Gary Furr began the presentation of two Working Papers, WP04-09 and WP04-13 which dealt with the questions related to some of the Figures in DO-181D that have been converted into Microsoft Visio for future ease in maintenance. Working Paper WP04-09 lists a number of questions presented by John Fisher, who initially created the Figures in Visio. Working Paper WP04-13 lists a number of issues with Figure 2-19 raised by Bob Granville as he reviewed the original WP04-09 posted prior to Meeting #4. Each question was addressed by the Committee and all Figures were modified in Visio by John Fisher during the meeting and given to Gary Furr to port back into the next draft of DO-181D.
- 6.5 Andy Leone began the presentation of Working Paper WP04-11, which presents a change proposal to the draft DO-181D MOPS to modify the description of the operation of the Temporary Alert Timer. Andy points out that there have been occurrences of Mode S ground interrogators observing Mode S transponders that fail to announce the temporary alert for a full 18 seconds after Mode A identity code changes. This creates occasional ATCRBS-Mode S track splits due to differing Mode A codes reported for a given Mode S target. This Working Paper proposes changes to the draft DO-181D section 2.2.18.2.7 to correct this issue and ensure that the alert bit stays active for the full 18 seconds after the last digit is changed. The Committee approved the change proposal and directed Gary Furr to implement the change into the draft of DO-181D.
- 6.6 Andy Leone began the presentation of Working Paper WP04-12, which presents a change proposal to the draft DO-181D MOPS in order to clarify the data link limitations that apply when Surveillance Identifier (SI) codes are employed. Andy points out that there has been some confusion on the part of some interrogator manufacturers regarding the limitations applied to data link functions when SI codes are employed. The wording in the MOPS, SARPs and the ICAO Doc 9684 Manual of the Secondary Surveillance Radar (SSR) Systems are not consistent. The proposed wording in the change proposal in this Working Paper is consistent with the latter document, which is the most concise. This Working Paper proposes changes to the draft DO-181D section 2.2.14.4.36 to correct this issue. Committee members noted that the proposed change is to a section containing only definitions and that there should not be any requirement statements in these sections. Therefore, during the meeting, this Working Paper was revised to replace the word “shall” with other, more appropriate, phrases to create Working Paper WP04-12R1. The Committee approved

the change proposal as revised during the meeting and directed Gary Furr to implement the change into the draft of DO-181D.

7. Agenda Item #6.

- 7.1 The Committee continued with the Agenda by going on to item #6 with the review of the Working Papers that will deal with proposed changes to the test procedures in the draft DO-181D. John Van Dongen began the presentation of Working Paper WP04-14, which is a set of proposals to potentially increase the number of test points in several test procedures throughout the draft DO-181D MOPS. As part of the revised test procedures to be included in the updated transponder MOPS, it was decided during Meeting #2 to increase the number of test points for certain test procedures in order to set the conditions for a more comprehensive evaluation of transponder performance. The draft MOPS DO-181D version 0.5 already includes some of these changes. The purpose of this Working Paper was to identify additional test procedures that are candidates for similar changes. Each proposed change was reviewed by the Committee and was either approved for change, or the Committee agreed to leave the text as written. These agreements were reflected in a revision to the Working Paper during the meeting to create Working Paper WP04-14R1, with annotations showing the resulting agreement. Most of the changes in WP04-14R1 were implemented during the meeting, but several were extensive enough to be delayed until after the meeting, when they were implemented into the draft of DO-181D version 0.5 by Gary Furr.
- 7.2 John Van Dongen then began the presentation of Working Paper WP04-15, which is a continuation of recommended corrections and improvements to the draft DO-181D MOPS test procedures that were initially addressed in Working Paper WP02-05. Working Paper WP04-15 includes recommended changes after reviewing the first 17 test procedures in section 2.5. Each proposed change was reviewed by the Committee and was either approved for change or the Committee agreed to leave the text as written. These agreements were reflected in a revision to the Working Paper during the meeting to create Working Paper WP04-15R1, with annotations showing the resulting agreement. Most of the changes in WP04-15R1 were implemented during the meeting, but several were extensive enough to be delayed until after the meeting, when they were implemented into the draft of DO-181D version 0.5 by Gary Furr.
- 7.3 John Van Dongen then began the presentation of Working Paper WP04-16. Working Paper SC209-WP02-05 contained proposed changes to the Reply Rate Capability test procedures in the Environmental Test Procedures §2.3.2.2.3 and Detailed Test Procedures §2.4.2.2.4. These proposed changes were not accepted during Meeting #2 as they were proposed but initiated discussion on whether or not to consolidate the Reply Rate Capability test procedures with the measurement of RF Output Power and Reply Transmission Frequency. There was an action item assigned to submit a new proposal addressing these test procedures. The purpose of this Working Paper was to propose a solution to the open issue. Each proposed change was reviewed by the Committee and all proposed changes were accepted and implemented into the draft of DO-181D during the meeting.

8. Agenda Item #8

- 8.1 Bill Thedford began with the discussion of coordination issues with Eurocae WG-49 by discussing the two Working Papers, WP04-03 and WP04-04, which were offered to SC-209 simply as reference materials. Bill indicated that materials related to Extended Squitter in WP04-04 would need to be updated at the appropriate time in the future.
- 8.2 Bob Saffell began the presentation of Working Paper WP04-18, which is his summary of items discussed during Meeting #8 of Eurocae WG-49 on 4 – 6 October in Cologne. Bob indicated that several Working Papers that he had submitted on behalf of actions from SC-209 were reviewed by WG-49 during their Meeting #8. Bob indicates that WG-49 unanimously agreed that full A/B capability is required for Level 2 Transponders. WG-49 agreed to change ED-73C section 3.9.2 to remove “trailing edge” terminology, which now makes ED-73C and DO-181D consistent. With respect to the Action regarding Bit 25 in BDS 1,0, WG-49 agreed that the definition should remain the same as it is currently defined in the draft of ICAO Doc 9871. With respect to the Action regarding the setting of the Mode-S Sub-network Version Number, after discussion, WG-49 agreed that there was no clear traceability for the Version Number being set to three (3), and that there needed to be an update to the draft of ICAO Doc 9871 to provide a clear definition and traceability. Bob pointed out to WG-49 that there appears to be an error in ARINC-429 and ARINC-718A wherein they specify the Track Angle Rate as a “+” only parameter. Bob Saffell took an Action Item from WG-49 to clarify this and propose a correction to the ARINC standards. To close out the discussion on items related to the SC-209 draft of Appendix B, Bob indicates that WG-49 members agreed that there was no mandate to implement BDS 5,F, but that they agreed that the definition should be retained since it may be required in a few years. The review of Working Paper WP04-18 continued with the itemization of several other discussion points and a summary of Action Items accepted by Bob Saffell during the WG-49 meeting.
- 8.3 In conjunction with discussions which occurred several times during SC-209 Meeting #4 related to Working Paper WP04-18, and issues that were discussed during the WG-49 Meeting #8, late in the last day of the meeting, the Committee agreed to pursue the reclassification of the Level 2 transponders to be more consistent with what is actually currently needed in the industry. Specifically, it was discussed and proposed that the Level 2 transponder should break down into three levels; Level 2A, 2B & 2C.

It was agreed that this proposal was a very important issue that needs to be further discussed and agreed to since it deals directly with removing the requirements to implement Comm A/B and the associated ADLP interface. The reclassification of Level 2 would further allow the Committee to do so without having to remove all of the actual requirements and force a full restructure of the DO-181D document. Tom Pagano accepted **Action Item 4-3** to create text to be considered for section 1 of the draft DO-181D for the purpose of explaining the above proposed breakdown of Level 2. Bob Saffell accepted **Action Item 4-4** to create a Working Paper that would be initially presented during the WG-49 Meeting #9, 9 - 11 January 2007, and later during the ICAO ASP TSG meeting in Fort Lauderdale, 22 - 26 January 2007. The exact nature of the contents of the three sublevels was not specifically agreed to by the

Committee. It was agreed that those specifics would need to be discussed with WG-49 and the ICAO ASP TSG prior to finalizing the details of the breakdown.

- 8.4 During Meeting #4, Bill Thedford submitted what was identified as Working Paper WP04-21 for the purpose of updating SC-209 on an Action Item related to how transponders should handle Invalid Announced Addresses. Bill identified the sequence of events that are explained in the Working Paper from the initial submission of a working paper by Mikael Ponnau during WG-49 Meeting #7, through the SC-209 Meeting #3, and on to the WG-49 Meeting #8, held 4 – 6 October, and now to the proposed text of a requirement that is presented in Working Paper WP04-21. Basically, WG-49 agreed that transponders shall not be operated as Mode-S transponders when the address is all zeros or all ones. The text of the proposed requirement now states in WP04-21 that: “If the transponder 24-bit discrete address is set to all ONEs or all ZEROs at startup then this error condition shall be indicated to the pilot and the transponder shall either transition to Standby State, Power Off Condition, or operate as a pure Mode A/C transponder.” After discussion, SC-209 agreed that Bill Thedford would return to WG-49 and indicate that the position of SC-209 is that SC-209 agrees with the suggested changes, as long as there is no effort on the part of regulatory authorities to require modification of units that are already in the field. Additionally SC-209 agreed to request that Bill inform WG-49 that adequate test procedures should be written to test a transponder that is allowed to operate as a pure Mode A/C transponder.

9. Agenda Item #9:

- 9.1 Gary Furr began a short briefing on the status of the draft of the DO-144A MOPS document that is presented in Working Paper WP04-17. Gary indicated that this Working Paper represents an effort by mostly FAA Technical Center individuals to take the basic DO-144 as published by RTCA in hardcopy only and convert it to the standard RTCA MOPS format, while inserting paragraphs that are believed to be required in the revised document. In WP04-17, all of the text has been taken directly from the original DO-144 and placed into the appropriate sections of an outline that somewhat follows the major section headings of DO-181D. After discussion, it was agreed that Rich Jennings and Rob Duffer would continue working under Action Item 3-2 to contact manufacturers in an effort to gain participation in the effort to continue maturing the draft of DO-144A. It was agreed that a teleconference would be established to discuss the current state of WP04-17, and the future plans and assignments that are required to publish a revised DO-144A MOPS document.

10. Don Walker was then requested to present Working Paper WP04-20, in which he proposes to test for TCAS whisper-shout compatibility. Don indicated that the TCAS MOPS defines Whisper-Shout steps for the purpose of de-cluttering ATCRBS replies. The assumption of the TCAS specification is that the transponder will not be able to detect a pulse if it is below the MTL of the receiver. There is no requirement or test in DO-181C that enforces this assumption. Don indicated that his Working Paper proposes adding a requirement and test to close this hole between the TCAS and Transponder MOPS. After explaining the proposed requirement and discussing the testing thereof, SC-209 agreed with Don in the spirit of the proposed new requirement, but indicated that the language of the requirement needs to be

changed in order to put it into DO-181D. Noting that the proposed new requirement applies to transponders that are operating only in the ATCRBS mode, e.g., Mode A/C, SC-209 further indicated that a similar requirement should be prepared for the draft of DO-144A.

11. Bob Saffell indicated that the contents of Working Papers WP04-06 and WP04-07 have been discussed during the presentation of other Working Papers and that there would be no need to discuss the contents of these Working Papers further.
12. Gary Furr agreed to make the updates to the draft of DO-181D as agreed to during the meeting and to send out the draft for review of SC-209 members along with a Comments Form for the purpose of recording any specific comments. These comments will be required to be returned to Gary not later than Close of Business on Monday, 27 November 2006, for assembly into a set of consolidated comments to be presented to Meeting #5 of SC-209 at RTCA in December, for the purpose of initiating a page-by-page review of the draft DO-181D.
13. The list of open Action Items was not reviewed during SC-209 Meeting #4, however the summary of Action Items that remained open, or were newly recorded as being assigned and accepted during Meeting #4 are as follows:

Action Number	Open Action Item Descriptions	Assigned to	Status
1-3	Coordinate with Stuart Searight to make sure that all of the TCAS issues are accounted for.	Tom Pagano Gary Furr	Ongoing
2-2	Resolve the differences in the "Reply Rate" requirements in the following sections: (1) DO-181C, §2.2.3.4.1, (2) ED-73B, §3.4.1, (3) SARP Annex 10, Vol-IV, §3.1.1.7.9	Doug Guetter Bob Saffell	
2-6	Further the restructuring section §2.2 of DO-181 for Meeting #3	Bayh, Saffell, Annee, Guetter	Ongoing
3-1	Create a Working Paper which will be submitted to the ICAO ASP TSG which identifies those proposed changes that have been discussed in the revised set of comments. Saffell created WP04-06 and WP04-07 and presented them to WG-49, but more needs to be done with respect to comments 12 through 18 in WP03-04R1. For Meeting #5 Don Walker will prepare a Working Paper for SC-209 to review prior to submitting it to the ICAO ASP TSG in January 2007.	Don Walker Bob Saffell John Berglund Doug Guetter	Ongoing
3-2	Call manufacturers to try to get more participation in the effort to revise DO-144	Rob Duffer Rich Jennings	
3-3	Approach Kevin Hallworth at EASA with the points of discussion regarding the differences in DO-181D and ED-73C and the SARPs on the P4 issue	Rob Duffer	
3-4	Review the proposed changes to the test procedures in §2.4.2.7 with his transponder and DME experts to see what they think about the proposed changes	Bob Saffell	
4-1	Begin with WP04-08 and draft requirements for sections 2.2.24 and 2.2.25 of the draft of DO-181D prior to Meeting #5.	Bob Saffell	
4-2	Begin drafting test procedures for sections 2.4.24 and 2.4.25 of the draft of DO-181D prior to Meeting #5, using data items contained in WP04-10.	Bob Saffell	

Action Number	Open Action Item Descriptions	Assigned to	Status
4-3	Draft text for Section 1 of DO-181D detailing the agreed upon breakdown of transponder Level 2 into categories of 2a, 2b & 2c.	Tom Pagano	
4-4	Prepare a Working Paper to be presented during the WG-49 Meeting #9 in January 2007 regarding the agreed upon breakdown of transponder Level 2 into categories of 2a, 2b & 2c in preparation for additional presentation to the ICAO ASP TSG meeting in Fort Lauderdale.	Bob Saffell	

14. The **Working Papers** for all SC-209 Meetings, as well as the Meeting Agendas, Meeting Minutes, Meeting Schedules and proposed modifications to the ATCRBS and Mode-S MOPS will be posted on the web site maintained by Gary Furr at the FAA William J Hughes Technical Center, located at:

<http://adsb.tc.faa.gov/SC209.htm>

As reported in the Meeting Summary of Eurocae WG-49, Meeting #6, members of SC-209 may access the WG-49 workspace through the Eurocae web site located at:

<http://www.eurocae.org/> Login: WG49 and password: MODE-S

Also, the workspace of Eurocae WG-51 can be accessed by SC-209 members through the same Eurocae web site with: Login: WG51 and password: ADSB