

**Minutes of Meeting #02 of RTCA SC-209 Working Group #1  
For The Development & Maintenance of the Mode-S MOPS**

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

Meeting #2 of Working Group #1 of RTCA/SC-209 was called to order by Co-Chair Tom Pagano at 9:00am EDT, 30 May 2007, at the facilities of RTCA in Washington DC. Mr. Pagano offered regrets from Robert Duffer of the FAA and indicated that Richard Jennings would substitute as the Designated Federal official for this meeting. 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 the following:

Raymond Bayh, BAE Systems	Pete Muraca, FAA Tech Center (phone)
David Bowen, Eurocae Technical Secretary	Showkat Osman, Honeywell
Robert Clarke, Alion Sciences	Tom Pagano, FAA Tech Center – AJP-1850
Gary Furr, Engility Corp., FAATC–AJP-1850	Robert Saffell, Rockwell Collins
Richard Jennings, FAA, AIR-130	Todd Smith, DoD AIMS Program Office
Andrew Leone, FAA Tech Center	Bill Thedford, Consultant, USAF (phone)
Brent Locher, L-3 Aviation Systems	Nolan Van Foeken, Garmin International
Hal Moses, RTCA Program Manager	Steve Yeager, Raytheon Electronic Combat Systems

1. Agenda Item #1

- 1.1 Robert Duffer, the Designated Federal Official, was unable to personally attend this meeting and was replaced by Richard Jennings who additionally welcomed all attendees and thanked them for their participation.

2. Agenda Item #2

- 2.1 With the proposed meeting Agenda displayed, Mr. Pagano asked if there were any suggested additions or changes to the Agenda for this meeting. Some discussion was held regarding the timing of the discussions on the TCAS versions. The Working Group will discuss the issue and will then bring Stuart Searight into the discussion via teleconference, if necessary. Mr. Bob Saffell asked that the Working Group discuss the issue raised by the Australian Notice of Final Rule Making, wherein they request the ability to turn ON and OFF the 1090 MHz Extended Squitter broadcasts by the pilot in the cockpit. Andy Leone also asks that we discuss the issue of Strut Switches and Air/Ground determination. These issues will be discussed under the “Other Business” Agenda topic. Mr. Pagano declared that the Agenda was accepted with these changes, and began to progress on the Agenda as offered to the Working Group.

3. Agenda Item #3

- 3.1 Mr. Pagano referred to Agenda Item #3 to discuss the Minutes of SC-209 Working Group #1 Meeting #1, which was held at RTCA Headquarters in Washington 3 – 5 April 2007, and presented to this meeting as Working Paper ModeS-WP02-02. Bob Saffell inquired as to Item 3.3 on the minutes, and asked who was assigned the action item to produce the proposed Appendix “E.” The Working Group will discuss this issue and David Bowen indicated that he and WG-49 have things to say about this issue as well. The Minutes of SC-209 Working Group #1 Meeting #1 were accepted by the Working Group as presented in Working Paper ModeS-WP02-02.

4. Agenda Item #4

- 4.1 Mr. Pagano asked David Bowen to discuss the Status of Eurocae WG-49. David indicated that Antoine Herve has accepted the position of Chairman of WG-49, and the leadership of WG-49 held a meeting several weeks ago at Eurocae headquarters to map out a path going forward. David indicated that one of the issues that was discussed during the leadership meeting was to move the requirements associated with the “Hijack Mode” into an Appendix to match the effort being performed in SC-209. This issue will have to be recommended and accepted by the full WG-49 membership during their meeting starting on 11 June.
- 4.2 Another proposal discussed during the WG-49 leadership meeting was to take the information from their ED-101 document and move it into ED-73C, and to retire ED-101. This effort would be in line with the efforts of SC-209 to separate the requirements for Data Flash and the generic test procedures.
- 4.3 Another proposal discussed during the WG-49 leadership meeting was to take the ADLP information from ED-82 and put it into ED-73C, in the same manner as SC-209 has taken DO-218B and put it into a draft of Appendix B of DO-181D.
- 4.4 Another proposal discussed during the WG-49 leadership meeting was to take approximately 30 major differences between ED-73 and DO-181 from presentations previously presented by Bill Thedford and separate them among several of the leadership and discuss the results during their next WG-49 meeting 11 – 13 June.
- 4.5 Another proposal discussed during the WG-49 leadership meeting was to set a review of the MOPS documents against the actual ICAO SARPs to ensure that all requirements are dealt with.

4.6 Additionally, David asked what the status was of SC-209 Action Item 6-5 which deals with the test procedure of §2.4.2.6, step 7 as discussed during the Melbourne meeting and documented in WG49N8-17. Bob Saffell indicated that he had not performed any analysis on this issue, but would do so and report during the WG-49 meeting 11 June. As a result of this discussion, Bob Saffell reviewed the issues in Working Paper WG49N8-17 and came back to the meeting on Thursday, 31 May and presented what was entered into the meeting as Working Paper ModeS-WP02-17. After review, the Working Group accepted the proposals made by Bob in this Working Paper and Gary agreed to send it to Andrew Rose and Antoine Herve for the WG-49 meeting starting on 11 June.

## 5. Agenda Item #8

5.1 The Committee continued with the Agenda by going on to Agenda Item #8 with a presentation of Working Paper ModeS-WP02-11 and ModeS-WP02-12 for the proposed changes to BDS Code 5,2 to comply with changes to Doc 9871 and future updates to TCP Registers. Don indicates that Working Paper WP-02-11 has been replaced with Working Paper WP02-12 because of some recognized problems with the FOM quantization values in Working Paper WP02-11. Therefore, the Working Group then focused only on Working Paper ModeS-WP02-12. We displayed the current version of the status of BDS Code 4,3 in Appendix B and the proposed changes outlined in WP-02-12. Don explained that data was not available to transmit the data currently required, such as “Bearing to Waypoint,” “Time-to-go,” and “Distance to go.” Therefore he proposes the changes in Register 43<sub>16</sub> as detailed in WP02-12. Don indicated that he has forwarded these papers to Vince Orlando for presentation to the ICAO ASP TSG, but that Vince has indicated that no changes can be made to ICAO Doc 9871 at this time, and that the presentation of these papers should be postponed until the January 2008 ICAO ASP TSG meeting. Tom Pagano indicates that it would not be possible for SC-209 or WG-49 to make similar changes in either MOPS document if the ICAO ASP TSG had not held a discussion and come to an agreement during their 2 – 6 July meeting in Paris. Tom and Gary will hold a discussion with Vince Orlando to see if we can ask the TSG to discuss this issue in July. However, no changes will be made in DO-181D, Appendix B until after the TSG discussion. David Bowen also indicated that WG-49 will review this Working Paper during their 11 – 13 June in Paris.

5.2 The Working Group began review of Working Paper ModeS-WP02-09 for several changes to the proposed Appendix B. With the initial review of WP02-09, the Working Group suggested that we needed to hear from Pete Muraca. With Pete on the teleconference phone, he explained the reason why the term “Application Entity” was introduced in the creation of Appendix B from the original DO-218B for the purpose of separating the terminology from “ADLP.” As a point of discussion, the question was raised whether or not to also change the ADLP terminology to “AE” in the formats for Register 10<sub>16</sub> and 20<sub>16</sub>. Pete suggested that we leave the terminology of ADLP and GDLP in those specific Register formats. Andy Leone was asked to take an Action Item to draft a note to be put into Appendix B to explain the difference between ADLP and AE.

5.3 The Working Group began review of Working Paper ModeS-WP02-16 for several additional proposed changes to Appendix B as provided by Andy Leone. These proposed changes were as a result of an action to ensure that the content of Appendix B was consistent with the content of ICAO Doc 9871. After review, the Working group agreed that the changes should be implemented into Appendix B and Gary Furr was directed to implement them.

6. Agenda Item #9

6.1 The Committee continued with Agenda Item #9, starting with the review of Working Paper ModeS-WP02-13R1 from Stuart Searight, as Chairman of the SC-147 for TCAS. After extensive discussion, and review of the original request from Stuart and the subsequent responses from Ruy Brandao of Honeywell, Paul Prisaznuk of ARINC and Roland Mallwitz of DFS, the Working Group agreed that there needed to be a change in ARINC 735. After review of the options presented by Roland Mallwitz, the Working Group agreed on a modified format for presentation of the TCAS version and drafted a response to Stuart detailing same. After the meeting this document was forwarded back to Stuart Searight as a formal response from SC-209, Working Group #1.

7. Agenda Item #5

7.1 The Committee continued with the Agenda by going on to Agenda Item #5a starting with the review of Working Paper ModeS-WP02-03. This Working Paper is a summary of a change, which was introduced to the ICAO SARPs by Eric Potier and is required to be implemented into both of the drafts for DO-181D and ED-73C. The Working Group reviewed the proposed change and agreed that it was necessary and complete as had been previously presented and accepted by ICAO. Further, Tom Pagano suggested that as a follow-on to a discussion point from David Bowen, that both WG-49 and SC-209 should maintain a “check-list” of SARPs changes that have been implemented into the respective MOPS documents. During the meeting, Gary Furr contacted Vince Orlando and Mikael Ponnau and ask for a list of Change Proposals that they maintain in order to build a list of changes for the transponder MOPS documents. This list of Change Proposals was provided by Mikael Ponnau and will be used as a basis to create a table for a check-list to ensure that all of the appropriate changes have been made in the respective MOPS documents.

- 7.2 The Committee continued with the Agenda by going on to Agenda Item #5e with the review of Working Paper ModeS-WP02-08 as presented by Antoine Herve as a response to Action Item 6-6 accepted during the SC-209 and WG-49 Joint Plenary in Melbourne Florida. As part of Action Item 6-6, Antoine agreed to review the environmental test procedures in ED-73C and make a recommendation to WG-49 during their next meeting for harmonizing the two documents. However, during the discussion of the Working Paper, it still becomes clear that ED-73C does not have a set of reduced capability tests specifically for the environmental changes required for test procedures. For example, the test procedures of ED-73C §5.4.7 specifically relates to DO-181D, §2.4.2.7 instead of relating directly to DO-181D, §2.3.2.7. It was agreed by the Working Group that Bob Saffell would further discuss this issue with WG-49 during their meeting starting 11 June, and that he will use input from Working Paper ModeS-WP02-15R1 from Showkat Osman of Honeywell as input to the discussion.
- 7.3 The Committee continued with the Agenda by going on to Agenda Item #5b with the review of Working Paper ModeS-WP02-05 as presented by Bill Thedford as a continuing effort of comparing the two transponder MOPS documents. After Bill gave a brief explanation of his method of creating the actual document, the Working Group began stepping through the set of comparisons where there were specific differences in the specific requirements. With the review of specific differences, the Working Group looked at the differences that were specifically identified for the “Reply Rate Capability” paragraphs (DO-181D, §2.2.3.4.1 and ED-73C, §3.4.1). During this discussion, Bob Saffell recalled that the reason why these two requirements are different is because there was a change initiated in Change 2 of the original DO-181 as a result of the insertion of TCAS into the system. At that time, there was no comparable change introduced into ED-73 because there was no ACAS at that time. By the time ED-73 was revised again, this particular change was overlooked, or forgotten, and hence has never been made in the current version of ED-73. Review of all of the differences in the two documents in the categories of “Summary of Different Shalls” and “Summary of Uncertain Shalls” continued with resolutions being entered into the “comments” section of each difference table. Working Paper ModeS-WP02-05R1 was then posted to the WG#1, Meeting #2 web page after the meeting and will be used to update the basic comparison report for presentation to Eurocae WG-49 for their 11 June meeting.

## 8. Agenda Item #12

- 8.1 The Committee continued with the Agenda by going on to Item #12 to cover several items that had been brought up as suggested topics of discussion. Tom Pagano began with the discussion of the collection of data at the Atlanta airport. Analysis of this data leads us to believe that when an aircraft is on the ground they are incorrectly transmitting information since the air/ground determination may be strapped incorrectly on the transponder.

ARINC-718-4 and ARINC-718-4 identify Pin Top Plug – 5K (TP-5K) as Air / Ground Discrete Input #1 and TP-5J as Air / Ground Discrete Input #2. As per ARINC-718A Attachment 2C Note [14], Air / Ground Discrete Input #2 is to be used when it is desired that the transponder automatically inhibit replies per ICAO Annex 10 when the

aircraft is on the ground. Air / Ground Discrete Input #1 is to be used when replies are not to be inhibited when the aircraft is on the ground.

ARINC-718-4 (December 15, 1989) Attachment 2B Note 5 is even more specific and provides:

“Pin TP-5J is assigned to Air/Ground Discrete input #2. This discrete input should be used when it is desired that the transponder automatically inhibit ATCRBS replies when the aircraft is on the ground. Otherwise pin TP5K should be connected to the Air/Ground switch. The transponder should interpret a “ground” at the Air/Ground Discrete input #2 as an indication that the aircraft is on the ground. An “open” should be assumed to indicate that the aircraft is airborne. Pin TP-5K is assigned to Air/Ground Discrete input #1. This discrete input should be used when it is desired that the transponder not inhibit ATCRBS replies when the aircraft is on the ground. The input will be used to activate other functions such as identifying the flight phase for BITE. The transponder should interpret a “ground” at the Air/Ground Discrete input #1 as an indication that the aircraft is on the ground. An “open” should be assumed to indicate that the aircraft is airborne. Mode S replies and squitter should not be inhibited when the aircraft is on the ground.”

Both of the ARINC documents provide for the appropriate interface in order to implement or not implement the requirements detailed in RTCA DO-181X section 2.1.7.b.

As such, the transponder interface specifications have provided appropriately to enable implementation of DO-181X section 2.1.7.b. However, a significant number of aircraft installations continue to use Air / Ground Discrete Input #1 which results in the aircraft transponders continuing to reply to ATCRBS and Mode-S All-Call interrogations while on the ground.

Rich Jennings is proposing to set up an internal FAA team to resolve this issue and make recommendations.

- 8.2 Continuing with additional topics, Tom Pagano started to discuss the flight test data collection effort that occurred in January 2006 with respect to excess DF11s. Measurements made during a flight test on an aircraft configured with a 1090 MHz receiver observed DF 11 with IIS=0 more than once per second per aircraft. On average, 3 to 4 per second were measured per aircraft instead of the expected once per second (Acquisition Squitter rate). Since no interrogators are currently using ATCRBS/Mode S All-Call interrogations and Ground Mode S interrogators utilize the multisite lockout protocol, the measured rate was not expected. It was also indicated that a high rate of DF11s with IIS=0 was also observed in other data collections. Additional data and analysis was suggested to determine the source of the problem.
- 8.3 Another topic of discussion was the Australian Notice of Final Rule Making (NFRM) that calls for a switch inside the aircraft that requires that ADS-B be turned OFF while not affecting the operation of the transponder. Bob Saffell indicates that there has never been a requirement in SARPs or MOPS to perform such a requirement and that there must be numerous changes to numerous requirements documents in order to comply with this requirement. Further, this topic has previously been discussed in both

ICAO Working Group meetings and RTCA Working Group meetings and has been rejected in each of those meetings as a potential severe safety hazard.

## 9. Agenda Item #9

9.1 The list of open Action Items was not reviewed by the Working Group during the meeting, so the summary of Action Items that remained open, or were newly recorded as being assigned and accepted during this Meeting were reviewed by Gary Furr separately, and the results of that review 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) SARPs Annex 10, Vol-IV, §3.1.1.7.9 <a href="#">Changes started coming into DO-181 at the original DO-181, change 2.</a>	Doug Guetter Bob Saffell	ModeS-WP01-10 thru ModeS-WP01-15
3-3	Approach Kevin Hallworth at EASA with the points of discussion regarding all differences in DO-181D and ED-73C and the SARPs.	Rob Duffer	Ongoing
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	
5-1	Modify the draft of DO-181D to include references to Appendix B and capture MSP processing in the Transponder.	Tom Pagano Showkat Osman	
5-2	Review all of Section 1 for revisions/additions	Tom Pagano	
6-1	Open a discussion with Eurocae Technical Secretary regarding what to do with respect to the Hijack Mode, which remains in the draft of ED-73C, but has been left out of the draft of DO-181D.	Roland Mallwitz	To be discussed at WG-49 Mtg 10 11-13 June
6-8	Review the difference in §5.4.2.2.2.b in ED-73C with §2.4.2.2.2, Step 2 in DO-181D, and resolve the differences identified in SC209-WP06-09.	Bob Saffell	
6-9	Review the difference in §5.4.7.2, steps 5 and 6 in ED-73C with §2.4.2.7, which has steps 1 through 4, but is missing the equivalent to steps 5 and 6 from ED-73C.	H/W Vendors	
6-10	Review and edit Step 5 of §2.4.2.12.1 (Fixed Data) and in §2.4.2.12.2 (Variable data) for Invalid Addresses. Note that perhaps the test for variable data is not appropriate.	Bob Saffell	
6-11	Review the test procedure in §5.4.12.2.2, of ED-73C and verify that it should remain in that section or be moved to another section.	WG-49	
6-12	In §5.4.12.3.2 in ED-73C, in step #2, the difference includes the exclusion of UF=24. Review why this is different from §2.4.2.12.3, Step 2 in DO-181D.	WG-49	
6-13	Review step sections "d" and "e" in the draft of ED-73C, §5.5.8.34 to determine if they are valid.	WG-49	
6-14	With respect to Procedure #9 in §2.5.4.8 of DO-181D and §5.5.8.8 of ED-73C, WG-49 will review why the text was written as it is presented.	WG-49	

Action Number	Open Action Item Descriptions	Assigned to	Status
6-15	With regard to the Validation of On-The-Ground Status, both DO-181D and ED-73C text needs to be checked for consistency with the changes to the Air/Ground Determination and Validation of On-Ground Determination that were accepted in the ADS-B MASPS, 1090ES and UAT MOPS, and UAT and 1090ES SARPs. Additionally, there is a difference in the way ED-73C and DO-181D handle the On-Ground status, with respect to relating to “1090ES only” or to “everything.” This will require further discussion at our next Joint Plenary Session. Gary Furr will make this review and provide a Working Paper summarizing the required changes, if any.	Gary Furr	
WG1-1-1	All Manufacturers will review Working Papers ModeS-WP01-05 and ModeS-WP01-06 in detail in an effort to ensure that the proposed changes to the test procedures and to Figure 2-19 are well reviewed.	Rockwell, Honeywell, L-3/ACSS, Garmin, BAE Systems, Raytheon	
WG1-1-2	Have a discussion with Kevin Hallworth regarding the differences in Reply Rate Capability that exists between ICAO Annex 10, ED-73C and DO-181D.	Jennings, Duffer Pagano	
WG1-1-3	Complete a detailed review of the proposed Appendix C to DO-181D which is a copy of the Dataflash Application information from the latest draft of ED-101.	All SC-209 & WG-49	

10. The Dates and locations of future meetings were discussed under Agenda Item #10. David Bowen had indicated in his earlier presentation that the WG-49 leadership had proposed that a Joint Plenary Session take place in Europe the week of 20 August 2007. David indicated that this proposal would be brought before the WG-49 membership attending the meeting on 11 – 13 June in Paris. The Working Group agreed that if this proposed Joint meeting date were approved by WG-49, that RTCA SC-209 would agree to a Joint Plenary Session at Eurocontrol Headquarters in Brussels the entire week of 20 August 2007. The Working Group also agreed that a meeting to finalize the document(s) would be set for 2 – 4 October in the Washington DC area, exact location TBD.

11. 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