

Minutes of Meeting #13 of RTCA SC-186 Working Group 3
Development of Revision A of the ADS-B 1090 MHz MOPS
<http://adsb.tc.faa.gov/ADS-B/186-subf.htm>

The meeting was called to order by Dr. Vince Orlando at 9am on 20 August 2002, at the RTCA Headquarters in Washington DC. Dr. Orlando welcomed all attendees and asked that each attendee introduce themselves and their organization. The attendees included:

Jerry Anderson, FAA – AIR-130	James Maynard, UPS Aviation Tech.	Mark Schneider, Sensis Corp
Larry Bachman – Johns Hopkins – APL	Vince Orlando, MIT Lincoln Lab	Ron Staab, Trios Associates
Bob Burns, Titan Corp. FAA TC – ACB-410	Azhar Osmanboy, Boeing ATM	David Thomas, Titan Corp. FAA TC – ACB 410
Gary Furr, Titan Corp, FAA TC – ACB-410	Tom Pagano, FAA TC – ACB-410	John Van Dongen, FAA TC, ACB-410
Bill Harman, MIT Lincoln Lab	Bill Petruzel, FAA – AFS-400	
Ron Jones, FAA ASD-140	Bob Saffell, Rockwell Collins	

1. Following the introductions, the following known regrets to attendance were announced:
 - Bob Semar, United Airlines
 - Stacey Rowlan, L-3 Communications
 - Stuart Searight, FAA Technical Center
 - Pio Blankas, Honeywell
2. Following Agenda Item #2, Vince Orlando made a few introductory remarks regarding the fact that Australia is moving ahead with a 1090 demo with a Sensis ground station and ~~L-3~~Honeywell avionics. Early reports indicate that they are able to track planes well beyond 200 miles.
3. Following Agenda Item #4, the Working Group reviewed the Minutes of Meeting #12 held at the conference facilities of MIT Lincoln Laboratory in Washington DC. Hearing no objection or further comment, the Minutes of Meeting #12 were approved as published.
4. Following Agenda Item #5, the Working Group reviewed the locations, dates and times of the next several meetings, which are shown below. WG-3 continued to plan meetings through the expected presentation of DO-260A to RTCA SC-186 Plenary as shown in the table below:

Dates/Time	Meeting Place
Monday, 23 Sept at 9am through 5pm, Friday, 27 Sept. 2002	Fall 2002 RTCA SC-186 Plenary <u>confirmed</u> to be scheduled for Monday & Tuesday, 23-24 September 2002, followed by a three (3) day 1090 meeting 25-27 September at Eurocontrol Headquarters, Brussels Belgium Travel info and lodging details are available on the ADS-B/1090 web site
Wednesday, 13 Nov at 9am through 4pm, Friday, 15 November 2002	<u>MEETING LOCATION CONFIRMED AT RTCA in DC</u> Travel info and lodging details are available on the ADS-B/1090 web site
Tuesday, 10 Dec at 9am through 5pm, Thursday, 12 December 2002	<u>MEETING LOCATION CONFIRMED AT RTCA in DC</u> Travel info and lodging details are available on the ADS-B/1090 web site
Monday, 27 Jan '03 at 9am through 4pm, Friday, 31 January 2003	<u>Confirmed at RTCA - PLENARY DATES ARE CONFIRMED</u> WG-3 meeting on Monday, Tuesday and Wednesday to resolve any comments, and the SC-186 Plenary to approve DO-260A meeting on Thursday and Friday

5. Following Agenda Item #6, the Working Group began discussions on Working Paper WP-13-19, which will be posted to the ADS-B/1090 web site after the meeting. This Working Paper was presented by Larry Bachman of Johns Hopkins University Applied Physics Lab as the initial set of simulation runs using the LA2020 scenario for the 1090 Extended Squitter environment. Following review of the Working Paper and discussion, the Working Group agreed to use 50 Ground Vehicles in future runs of the simulation for the LA2020 scenario. Further, the Working Group agreed to base the simulations on 20,000 and 30,000 ATRBS fruit.
6. Since Stuart Searight was unable to attend this meeting because of a medical emergency, Gary Furr presented Working Paper WP-13-04 in conjunction with Agenda Item 7. WP-13-04 is an examination of 31 Issue Papers that were addressed in Revision A of the ADS-B MASPS (DO-242A), and what corresponding changes are needed in Revision A of the 1090 MHz Extended Squitter MOPS (DO-260A). WG-3 Working Papers and draft MOPS sections that were introduced at meetings of WG-3 prior to Meeting 13 are cited for those Issue Papers whose topics and MASPS changes are already being working on by WG-3 members. The most significant changes specifically addressed in this Working Paper are (1) the removal of the "Turn Indicator" and all references to "Turn Rate Date" as noted in Issue Paper 01, and (2) the modification of Table 2-1 for equipment class C2 regarding simultaneous parallel approach ranges as noted in Issue Paper 36.
7. Gary Furr continued with Agenda Item 7 by presenting Working Paper WP-13-12 on behalf of Stuart Searight. This Working Paper reviews the proposed Issue Paper 66, which outlines the need for and the request for consideration of the "Flight Plan ID." During the final review and comment on the UAT ADS-B MOPS at the June 2002 plenary, a concern was raised by the Alaska ARTCC that they needed a means within ADS-B to correlate ADS-B targets to their filed flight plans. WG-5 has worked with Alaska ARTCC and the Capstone office on a fix that will be a deviation from the UAT MOPS (see Working Paper UAT-WP-14-02). ATC in the lower 48 states have provided feedback on this issue and have stated that the capability to correlate targets with their filed flight plans would be a key to making ADS-B useful to ATC in the present, and be a great help in assisting in the transition to future ATC automation systems. Therefore, it has been requested by ATC that this topic be addressed by RTCA SC-186 now, and not wait until work begins on Revision B of the ADS-B MASPS. After discussion, members of WG-3 indicated that they believed that the term "Flight Plan ID" should not be used and that they preferred to use the term "4096 Code." Further, Dr. Orlando reported that he believes that ICAO has rejected the idea of broadcasting 4096 code from Mode S transponder implementations of extendedsquitter and would not be receptive to including it in any joint ADS-B MASPS. It was agreed that Ron Jones would discuss this issue with Richard Jennings, Co-Chair of Working Group 5 and that there will be more discussion on this topic during the Joint Plenary in Brussels and the WG-3 meeting following.
8. In conjunction with reporting on open action items, Tom Pagano said a few words about his Working Paper WP-13-05 on the topic of "ATCRBS Time Distribution." Tom indicated that he felt that more work needed to be performed on the analysis, which led to WP-13-05, and he accepted **Action Item 13-01** to provide a new Working Paper that would be presented at Meeting 14.
9. Also in conjunction with Agenda Item 8 and open action items, Bill Harman presented Working Paper WP-13-14 regarding his "Analysis of Poisson Models for ATRBS Fruit." This Working Paper addressed Action Item 12-07. Discussion at Meeting #12 brought out a difference between the timing behavior of a Poisson process, which has been used for Extended Squitter performance analysis, and the actual timing behavior. Simulation results were presented showing some significant differences. It was decided to investigate this further by analyzing airborne measurements.

Substantial progress was made. We now have corresponding results derived from airborne measurements in Los Angeles and Frankfurt, which were presented in this paper. The results have been found to be different from the picture presented at the previous meeting, but the non-Poisson behavior still is important.

10. Although not an item on the Agenda, at this point in the discussion, Vince Orlando discussed a reply that he has received from Francis Grimal with respect to Eurocae participation in a joint DO-260A end product. From the email that Vince received, Francis seemed to indicate that there was little interest from the European manufacturers for an updated 1090 MOPS and that resources were a limiting factor. There is continuing input on WG-3 issues from Eurocontrol members. WG-3 and the RTCA SC-186 Leadership have indicated that they will continue to work toward trying to obtain the resources to help support Eurocae involvement in the DO-260A document, even if it is only to review the final product.
11. Switching to the topic of Enhanced Processing in Agenda Item 9, John Van Dongen presented Working Paper WP-13-13. At Meeting #12, Action Item #12-01 was assigned to redraft material for Appendix I to define enhanced preamble detection. It was decided that the new material should focus on a single technique, which should be the technique developed and tested at the FAA Tech Center. Also, given that some of the existing material is repetitious, the new material should be better organized, and avoid being repetitious. The revised draft was provided in this Working Paper. After some WG-3 discussion, it was decided that John would continue work on this revision and submit it again at Meeting 14.
12. Continuing with Agenda Item 9, John Van Dongen presented Working Paper WP-13-16 in which a revision to Appendix I is proposed which places the “multiple sample without table lookup” method for bit and confidence declaration as the first in the discussion of multi-sample techniques. This is in accordance with Action Item 12-5. In addition, the text is also revised to use a 10 MHz default sampling rate with all techniques. This was done to be consistent with the proposed changes to the enhanced preamble detection material in 1090-WP-13-13. During the review of this Working Paper, several changes were discussed and made by the Working Group. These changes were captured in 1090-WP-13-16R1, and the Working Group *agreed* that this material is ready to be integrated into Appendix I. Gary Furr will implement the proposed changes which are reflected in 1090-WP-13-16R1 into Appendix I and will re-post Appendix I onto the ADS-B/1090 web site.
13. With respect to changes to DO-260A for TIS-B, Bill Harman presented Working Paper WP-13-09, which is the 4th draft of the proposed MOPS materials for TIS-B Message Processing and Reporting contained in sections 2.2.17.4 through the end of 2.2.17. This Working Paper addresses Action Item #12-06. In discussions during Meeting #12, it was questioned whether changes might be needed to insure that the TIS-B report contents are the same as for ADS-B in regard to measured and estimated positions and velocities. Bill reported that he has studied the issue and concluded that this material should be changed. This Working Paper presents the corrected version with modifications made in Section 2.2.17.4.6. The Working Group *agreed* that this material is ready to be integrated into DO-260A. Gary Furr will implement the proposed changes, which are reflected in 1090-WP-13-09 into Draft-2 of DO-260A and will re-post it onto the ADS-B/1090 web site.
14. Ron Jones continued with the presentation of Working Paper WP-13-07, which proposes changes to DO-260A for Class A1 Receiver MTL for Improved TIS-B reception. The 1090 MHz receiver MTL values specified in DO-260 for each avionics class appear to have been based on the air-to-air reception range requirements of the ADS-B MASPS. It is not clear that A1 receivers would have sufficient sensitivity to support TIS-B reception at the potential limits of the TIS-B ground station’s service volume. Ron proposed to address this situation by adding a note under Table 2-5 in §2.1.11.2 that would apply to the Class A1 MTL specification. After discussion, and review of this Working

Paper, some edits were performed to produce 1090-WP-13-07R1, which will be posted to the ADS-B/1090 web site after the meeting. Further, the Working Group agreed to change the receiver MTL for A1 class equipment from -74 to -79dBm. Gary Furr will perform edits to Draft-2 of DO-260A for presentation and review at Meeting #14.

15. In conjunction with Agenda Item #11, Ron Jones presented Working Paper WP-13-11 as Draft 6 of the proposed new Appendix M entitled “Extended Range Reception Techniques.” After discussion, and review of this Working Paper, some edits were performed to produce 1090-WP-13-11R1, which will be posted to the ADS-B/1090 web site after the meeting. Further, the Working Group agreed to officially accept this draft as Appendix M, which will be posted to the Draft MOPS Materials section of the ADS-B/1090 web site after the meeting.
16. Beginning with the review of sections of DO-260A in Agenda Item 12, Gary Furr presented Working Paper WP-13-01, which is basically a status matrix of all individual sections of the entire DO-260A document. The purpose of this status matrix was to discuss the current status of each individual section, as well as to attempt to place names of WG-3 members into the responsible writers and reviews columns for each section. This Status Matrix will be reflected in the “Draft MOPS Materials” section of the ADS-B/1090 web site as the document evolves, as well as being distributed as a separate file to WG-3 members. As WG-3 discussed the status of Appendix A, members agreed that a note should be added to reference Document 9688, which contains the table of transition latitudes. . Vince Orlando agreed to take Appendix A and apply edits to it to make it consistent with changes that are being made in the body of DO-260A, Sections 1 through 4, and Vince agreed to add the note referencing Document 9688 as well as a Lincoln technical report on CPR (in preparation) at that time for presentation and review at Meeting 14.
17. Jim Maynard continued discussing potential changes by presenting Working Paper WP-13-02, as his effort to expose implicit requirements, which were not marked by the use of the word “**shall**” in DO-260. This Working Paper proposed text for DO-260A to make those requirements explicit. During review and discussion of this Working Paper, there were changes made and agreed to by the Working Group and captured in 1090-WP-13-02R1. After discussion, the Working Group agreed to accept the revised order of presentation of some sections as proposed by Jim in this Working Paper, rather than to retain the ordering in DO-260. Further changes were made by Jim in a separate file and presented to the Working Group for approval. These changes and the changes made during the review will be consolidated into 1090-WP-13-02R1, which will be posted to the ADS-B/1090 web site after the meeting.
18. Jim Maynard continued by presenting proposed changes to Chapter 1 of DO-260A in Working Paper WP-13-10. Jim proposed to add some text explaining TIS-B in §1.2.1 and adding two figures explaining the scope of the 1090 MHz ADS-B System and the TIS-B System. After some Working Group discussion, Jim agreed to make small changes to the proposed figures. With the insertion of the modified proposed figures, the changes were captured in 1090-WP-13-10R1 and accepted by WG-3 for inclusion into DO-260A. Gary Furr will integrate 1090-WP-13-10R1 into Draft-2 of DO-260A for presentation and review at Meeting 14.
19. Gary Furr then presented Working Paper WP-13-08, which details the removal of the Aircraft Operational Coordination Message from DO-260A. It was pointed out that this Working Paper basically has three sections: (1) those changes that have already been made in Draft-1 of DO-260A, (2) those changes that still need to be made to DO-260A’s main body, sections 1 through 4, and (3) those changes needed to remove the Message from all Appendices. The Working Group agreed that all changes could continue to be made and will be reflected in Draft-2 of DO-260A and Appendices.

20. Ron Jones followed with the presentation of Working Paper WP-13-15, in which he proposed DO-260A changes for Class B2 equipment Transmit Power. After Working Group discussion, it was agreed that Ron's proposal was not ready to be included in DO-260A.
21. Ron Jones continued with the presentation of Working Paper WP-13-03 with his proposal for a new Appendix detailing DO-260A provisions for backward compatibility with DO-260 message formats. After Working Group review, Ron accepted **Action Item 13-06** to revise the proposed Appendix and re-submit it for review at Meeting 14.
22. Ron Jones continued with the presentation of Working Paper WP-13-17 with his proposal for a new Appendix detailing DO-260A accommodation of the Trajectory Change Reporting. After Working Group review, Ron agreed to revise the proposed Appendix and re-submit it for review at Meeting 14.
23. Jim Maynard then presented Working Paper WP-13-18, in which he proposes updates to Appendix B for the definitions of latitude and longitude and the addition of a new section B.3 to show illustrations of geodetic coordinates. During review of this Working Paper, 1090-WP-13-18R1 was created with changes made during review. The Working Group agreed that the changes proposed in 1090-WP-13-18R1 were accepted for inclusion into Appendix B. Gary Furr will integrate these changes into Appendix B and post the new version on the ADS-B/1090 web site for review at Meeting 14.
24. At this point, the Working Group began a page-by-page review of Working Paper WP-13-06, which is Draft-1 of the main sections of DO-260A. Numerous editorial changes were identified and made during the meeting and after the integration of all of the other Working Papers identified above, Gary Furr will post Draft-2 of the main sections of DO-260A as a Working Paper for review at Meeting 14.
25. The following **Action Items** were identified at this, or previous, meetings of this Working Group. The asterisk (*) beside a name or organization indicates that they are the lead for the resolution of that Action Item. Actions shown here are those Action Items that remained OPEN at the end of this meeting.

Action Number	Action Description	Assigned to	Status
8-1	Provide the results from testing with the directional 1090 MHz receive antenna. (Flight Tests scheduled for 24-25 April 2002. LDPU had a problem and this may be delayed until Fall 2002)	Carl Jeziarski	
9-3	Review WP-9-14 (Transition Table for NL [lat] Function) in light of comments raised during Meeting 9. Need table in Appendix A.	Bill Harman James Maynard Ed Bayliss	
9-9	Write a test to verify that the sliding window error correction technique is not used.	Bill Harman Stacey Rowlan	
10-3	Continue work on the Proposed Transmission Rate for the ID Squitter by analyzing the result if the ID Squitter is sent every 5 seconds.	Bill Harman	
12-03	Review the four pulse preamble detection tests to assure pulse width and position tolerances are correct and that the test is stated in a way that is independent of sample rate.	Stacey Rowlan Bob Saffell	

Action Number	Action Description	Assigned to	Status
12-04	Document the signal in space characteristics of the ATRBS Signal Generator and the log video pulse rise time and width. Provide at Meeting 14.	Tom Pagano	
13-01	Redo WP-13-05, and submit again at Meeting 14.	Tom Pagano	
13-02	Analysis is required to complete the number of minimum number of Participant track files for ADS-B Receiving Subsystems	Larry Bachman	
13-03	Obtain the CPR Report from Ed Bayliss that he is currently drafting, and offer it as a Working Paper for Meeting 14	Bill Harman	
13-04	Analyze the probability of report update by an airborne A1 aircraft at 10 miles out, with 30,000 fruit per second, at a 2 second update rate of a B2 surface vehicle in motion. Determine minimum power for B2.	Bill Harman	
13-05	Prepare another “omitted requirement” working paper for class B2 surface vehicles that should only transmit in the movement area. Determine in which section of DO-260A to place this requirement (§2.1 or §3).	Jim Maynard	
13-06	Revise Proposed Appendix N with the objective of only listing changes to messages. Delete subtype 0 Velocity Messages	Ron Jones Jim Maynard	
13-07	Create a new Table for TIS-B Report requirements to go after Table 2-5 for Class A equipment	Jim Maynard	

26. The **Working Papers** shown in the following table are specifically for the Meeting being reported in these Meeting Minutes. Working Papers for all WG-3 Meetings, as well as the Meeting Agendas, Meeting Minutes, Meeting Schedules and modifications to DO-260 for the production of Revision A, will be posted on the ADS-B 1090 MHz web site located at:

<http://adsb.tc.faa.gov/ADS-B/186-subf.htm>

Working Paper	Size	Description	Introduced At:
1090-WP-13-01	12KB	DO-260A Document Status Matrix, presented by Gary Furr	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-02	83KB	Overlooked Requirements and proposed reorganization of some sections of DO-260A, presented by James Maynard	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-03	110KB	Proposed New Appendix N, detailing the Proposed DO-260A Provisions for Backward Compatibility with DO-260 Message Formats, presented by Ron Jones, FAA, ASD-140	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-04R1	40KB	Changes required for DO-260A because of MASPS Issue Papers addressed in DO-242A That Have Not Been Previously Addressed by WG-3, presented by J Stuart Searight	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-05	40KB	ATCRBS Time Distribution Summary, presented by Thomas Pagano	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-06	2,290KB	Draft 1 of Sections 1 through 4 of DO-260A for initial WG-3 review, presented by Gary Furr	Meeting 13, 8/20/02 RTCA, Washington DC

Working Paper	Size	Description	Introduced At:
1090-WP-13-07	13KB	Proposed DO-260A Changes to Class A1 Receiver MTL for Improved TIS-B Reception, presented by Ron Jones, FAA, ASD-140	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-08	9KB	Proposed Removal of the Aircraft Operational Coordination Message from the proposed 1090 MOPS (DO-260A), presented by Gary Furr in response to Action Item 10-2	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-09	19KB	Draft 4 of the MOPS Material for TIS-B Message Processing and Reporting, Sections 2.2.17.4 to the end of 2.2.17, presented by William Harman in response to Action Item 12-06	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-10	26KB	Proposed Changes to Chapter 1 of DO-260A, presented by James Maynard	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-11	23KB	Draft 6 of the Proposed Appendix M: Extended Range Reception Techniques, presented by Ron Jones	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-12	36KB	Potential Change to ADS-B with regard to the proposed Flight Plan ID, presented by J Stuart Searight	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-13	25KB	Proposed new materials for Appendix I: Enhanced Preamble Detection, presented by William Harman and John Van Dongen in response to Action Item 12-01	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-14	20KB	Analysis of Poisson Models for ATCRBS Fruit, presented by William Harman in response to Action Item 12-07	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-15R1	15KB	Revision 1 to the Proposed DO-260A Change for Class B2 Equipment Transmit Power, presented by Ron Jones	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-16	39KB	Proposed Revision to Appendix I.4.2: Enhanced Bit and Confidence Declaration, presented by John Van Dongen in response to Action Item 12-5	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-17	33KB	Proposed New DO-260A Appendix O for Accommodation of the Trajectory Change Reporting, presented by Ron Jones	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-18	31KB	Proposed Updates to Appendix B for geodetic Coordinate Definitions, presented by James Maynard	Meeting 13, 8/20/02 RTCA, Washington DC
1090-WP-13-19	4292KB	Preliminary 1090 Simulation Results for the LA2020 Scenario, presented by Larry Bachman	Meeting 13, 8/20/02 RTCA, Washington DC

27. In previous minutes to WG-3 meetings, a table was maintained of “Orphaned Issues.” After a review of all of those issues, it was found that all could be closed. Therefore, there is currently nothing to report as not being accounted for, or that WG-3 needs to remind itself of later!