

Minutes of Meeting #8 of SC-186 Working Group 3 in Joint Session with EUROCAE WG-51 for 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 3 December 2001, at the offices of NATS in London, England, hosted by Steve Barber and Bev Nichols. Dr. Orlando welcomed all attendees to the first joint meeting of RTCA SC-186 Working Group #3 and members of EUROCAE WG-51 to review progress on Revision A of the 1090 MHz MOPS. Dr. Orlando asked that each attendee introduce themselves and their organization. The attendees included:

Steve Barber, NATS LTD, UK	Ron Jones, FAA HQ, ASD-140	Azhar Osmanbhoy, Boeing, Air Traffic Mgt
Phillippe Brun, Eurocontrol, Bretigny CNS	James Maynard, UPS Aviation Tech.	Enrico Pupillo, Marconi Mobile
Gary Furr, Titan Corp. (FAA TC - ACT-350)	Bev Nichols, C-BEV LTD	Jean-Claude Richard, Thales & Eurocae
Bill Harman, MIT Lincoln Labratory	Vince Orlando, MIT Lincoln Laboratory	Pierre Ruault, Eurocontrol HQ

1. Following the introductions, the following known regrets to attendance were announced:
 - Jerry Anderson, FAA Certification
 - Bob Semar, United Airlines
 - John Van Dongen, FAA Technical Center
 - Tom Pagano, FAA Technical Center
 - Stuart Searight, FAA Technical Center
 - Ronald Staab, Trios Associates
 - Bob Saffell, Rockwell Collins

2. Our host, Steve Barber of NATS LTD, UK welcomed all attendees and introduced attendees to the particulars of the facilities.

3. Dr. Orlando then asked that we briefly review the Overview of the meeting which detailed the briefings that were to be given during the first two days of the meeting for the review of activities of WG-3 to date for the benefit of WG-51 attendees.

4. We then began the series of presentations designed to introduce members of WG-51 to the efforts of WG-3 during the production of Revision A of the 1090 MHz MOPS up to this point in time. Each of these presentations is available for review on the 1090 MHz web site whose location is noted at the top of these Minutes.
 - a) Squitter_Lon.ppt – Overview of Mode S Extended Squitter by Dr. Vincent Orlando
 - b) Frankfurt.ppt – Overview and Summary of Frankfurt Measurements by Dr. William Harman
 - c) 260A_Lon.ppt – A quick Review of RTCA DO-260, Revision A by Dr. Vincent Orlando
 - d) Enh_Rep_Lon.ppt – An Overview of Enhanced Reception Techniques by Dr. Vincent Orlando
 - e) RMFEnhancedDec.ppt – Details of Enhanced Processing Techniques as prepared by John Van Dongen and presented by Dr. William Harman
 - f) Enh_Test_Proc.ppt – A review of the approach taken to produce the Enhanced Processing Technique Test Procedures by Dr. Vincent Orlando
 - g) BenchData.ppt – A review of Enhanced Processing Bench Testing thus far as prepared by John Van Dongen and presented by Dr. William Harman
 - h) TIS-B – An Overview of Traffic Information Services – Broadcast by Dr. Vincent Orlando
 - i) FIS-B – An Overview of Flight Information Services – Broadcast by Dr. Vincent Orlando
 - j) 1090-WP-8-09.ppt – A Review by James Maynard of the proposed changes to the ADS-B MASPS (RTCA DO-242) in the specific area affecting the separating of NUC_P into Integrity (NIC) and Accuracy (NAC) components.

- k) MASPS-Changes.ppt – A review by Gary Furr of a document prepared by Stuart Searight detailing all of the major changes which will be proposed by RTCA SC-186 Working Group 6 to revise the ADS-B MASPS (RTCA DO-242) to produce Revision A. These proposed changes will be presented to the RTCA SC-186 Plenary meeting that is scheduled to be held on 12 – 13 December 2001 at RTCA in Washington DC. Also discussed was how, or whether, these proposed changes would affect the 1090 MHz MOPS as changes to be made for DO-260A.

During discussions of proposed MASPS changes, it was agreed by the Working Group that their position, to be relayed to RTCA SC-186 during the upcoming Plenary, would be that no changes should be made to the ADS-B MASPS until data has been shown to indicate that the change will add benefit. If no such benefit can be shown, then no change should be approved. A presentation was prepared and agreed to by all meeting attendees at the end of this meeting for presentation to the SC-186 Plenary. A copy of this position paper will be available on the Web site after presentation to the Plenary.

It was also specifically agreed by the Working Group that the change proposed by WG-6 to Note 7 of Table 3-4 in the ADS-B MASPS (RTCA DO-242) should not be made. It was agreed that the Working Group's position is that Note 7 should be deleted altogether. This Working Group position will be relayed to the RTCA SC-186 Plenary session during discussion of these changes.

- l) 1090-Changes.pdf – A Summary presentation by Gary Furr of all changes to RTCA DO-260 that have been approved by Working Group 3 toward the production of DO-260A, up to this point in time.

During the discussion of changes previously made to Section 2.2.3.2.7.1 to add a Note explaining the status of Intent and TCP in DO-260A, it was further agreed by the Working Group to add a new paragraph after the newly proposed Note to say that “Equipment conformant to Revision A of this MOPS shall not broadcast the Intent Message.” An additional statement will be added to Section 2.4.3.2.7.1 indicating that no testing of the requirements in the Intent Message section would be necessary for equipment conformant to Revision A of this MOPS.

- m) Air2Air-Ext.ppt – A review by Ronnie Jones of a Proposed new Appendix M for DO-260A detailing Techniques for possibly Extending Air-to-Air Range. This presentation ended the part of Meeting #8 during which we reviewed the status of work affecting DO-260A up to this point in time.

5. Dr. Orlando then declared that the Working Group would focus on the published Agenda for the remainder of the Joint Meeting.
6. Therefore, following Agenda Item #4, the Working Group reviewed the Minutes of Meeting #7 held at the MIT Lincoln Laboratory Liaison Office in Washington DC. Gary Furr indicated that the Minutes as originally distributed after Meeting #7 had incorrectly stated that Meeting #6 was held at the FAA Technical Center, when in fact Meeting #6 had been held at the Honeywell Training Center in Redmond WA, hosted by Pio Blankas. With apologies to Honeywell and Pio, the Minutes of Meeting #7 have since been corrected. Hearing no further objection or further comment, the Minutes of Meeting #7 were approved as revised.
7. Following Agenda Item #5, the Working Group reviewed the locations, dates and times of the next meetings, which are scheduled. The following table indicates the currently agreed upon meeting dates and places for proposed future meetings of Working Group #3 for the production of Revision A of the 1090 MHz MOPS (RTCA/DO-260).

Dates/Time	Meeting Place
Wednesday, 9 January at 9am through 5pm, Friday, 11 January 2002	Confirmed at Best Western Oceanside Inn, 1180 Seabreeze Blvd (A1A), Ft. Lauderdale, FL, hosted by MIT. 10 rooms set aside by MIT at \$110 More Lodging and travel information will be made available soon.
Tuesday, 12 February at 9am through 5pm, Wednesday, 13 February	Confirmed in Phoenix AZ, hosted by L3 Communications Actual meeting location TBD Lodging and travel information will be made available soon.
Tuesday, 26 March at 9am through 5pm, Thursday, 28 March	Meeting location at the FAA Tech Center, Atlantic City, NJ Travel info and lodging details are available on the ADS-B/1090 web site
Tuesday, 23 April at 9am through 5pm, Thursday, 25 April	Meeting location at the FAA Tech Center, Atlantic City, NJ Travel info and lodging details are available on the ADS-B/1090 web site
Tuesday, 18 June at 9am through 5pm, Friday, 21 June	Tentatively planned for June 18 and 19 at MIT/Lincoln Laboratory Aviation Liaison Office prior to SC-186 Plenary that is tentatively scheduled for 20-21 June at RTCA

8. The Working Group then reviewed the entire list of Open Action Items from Meeting #7. Ron Jones reported that an antenna that the FAA Technical Center had agreed to order for testing of possible additional gain in the forward direction, had been shipped from the manufacturer this week. Therefore, the Working Group agreed to Close Action Item 4-12, and Open **Action Item 8-1** and assign it to Carl Jezierski to report on testing of the new antenna after it has been installed on the FAA airplane and flight tested. Action Item 7-1 was also closed based on Dr. William Harman providing to Mike Culver FIS-B weather encoding.

Dr. William Harman then gave a status briefing on Action Item 7-7, which came about because of an Issue Paper proposed by Rannoch to WG-6 for a proposed change to the ADS-B MASPS related to broadcasting Surface Position Messages at the “high rate” at all times while on the ground. Dr. Harman has investigated the possibility of reducing the measure of 10 meters that was used in Section 2.2.3.3.2.3 of DO-260 to trigger the change from low rate to high rate, based on the possible changes to GPS drift since the removal of SA from GPS. The Working Group *agreed* that further investigation was required prior to making a recommendation to WG-6 on the Rannoch Issue Paper. **Action Item 8-2** was accepted by Azhar Osmanbhoy to gather GPS position data for at least a 24 hour period. Carl Jezierski was added to Action Item 8-2 and will be requested to independently provide the same type of recorded GPS position data from FAA Technical Center equipment. This GPS position data will be analyzed by Dr. William Harman as a response to **Action Item 8-3** and reported together with a paper that provides a theoretical justification for reduction in the 10 meter threshold as a response to **Action Item 8-4**. Further, it was agreed that Action Item 7-7 be closed.

9. In conjunction with Agenda Item 8, Dr. Vincent Orlando began the review of Working Paper WP-8-03 as the 6th review of the Test Procedures for Enhanced Surveillance Processing. Dr. Orlando discussed changes that had been incorporated into this version of the Test Procedures based on issues detailed in Action Item 7-4. During discussion of the Test Procedures, Ron Jones indicated that the proposed title of Section 2.2.4.4 as “Optional Enhanced Squitter Reception Techniques” was no longer accurate since the Working Group had previously agreed to add the equipment classes of A2E and A3E to Table 2-5. Dr. Orlando agreed that the next version of these proposed Test Procedures will incorporate this revision.
10. Following with Agenda Item 7, Gary Furr began the review of Working Paper WP-8-02 as a revision of changes to DO-260 made necessary because of the inclusion of a Version Number. WP-8-02 is basically the second revision of the set of changes which were originally reviewed in Working Paper

- WP-7-03. With the review of WP-8-02, the Working Group again agreed to several changes to the proposed text and therefore another revision of this document will be produced for Meeting 9. Action Item 7-5 will remain open until presentation of these revisions during Meeting 9.
11. Dr. William Harman then began a brief review of Working Paper WP-8-06, which had been prepared by John Van Dongen as a revision of Extended Squitter Interference Test Data made necessary since the finding of errors with FAA Technical Center software as well as MIT Lincoln Laboratory simulations. As a by-product of the discovery and correction of errors, John Van Dongen has presented an improved multiple sample technique. **Action Item 8-6** will be assigned to John Van Dongen to document the new technique for inclusion in Appendix I. Additionally, **Action Item 8-7** was assigned to John Van Dongen to explain the effect of different sampling rates (8 MHz versus 10 MHz) on the new “improved multiple sample technique” introduced in WP-8-06.
 12. Dr. Vincent Orlando began a review of WP-8-01 as the proposed TIS-B MOPS material for consideration for inclusion in Sections 2.2 and 2.4 of DO-260A. Although there were no major changes to this document since the last review of Draft 2, Dr. Orlando stepped through the document for the benefit of WG-51 members who have not heard a presentation of the material before. During discussions on WP-8-01 Dr. Orlando accepted **Action Item 8-9** to add NIC Supplement, plus NAC & SIL to the TIS-B Formats.
 13. Dr. Orlando continued with information on TIS-B with the review of Working Paper WP-8-04, as an initial draft of a proposed TIS-B Management Message Format. After Working Group discussion, it was agreed that WG-3 will not provide explicit TIS-B Management Messages since they are not believed to be required by the TIS-B MASPS. WG-3 will reserve DF=18, CF=3 as a for possible future use if a TIS-B Management Message is required in the future. It was further agreed that the airborne processing of TIS-B messages by a 1090 MHz receiving system will be the minimum amount required to receive, decode, recognize as a TIS-B Message, and pass through the data to an application user. **Action Item 8-10** was accepted by Dr. William Harman to draft the airborne surveillance processing requirements for TIS-B. This will be the minimum processing necessary to meet link specific characteristics (including global decoding and pass-through of future management messages).
 14. Dr. Orlando continued on with TIS-B issues with the review of Working Paper WP-8-07 for a proposed TIS-B Ground Architecture in response to Action Item 7-3. This Working Paper presented a briefing that identifies ground processing requirements that should be included in DO-260A.
 15. Dr. Orlando concluded the “TIS-B” portion of the meeting with a review of Working Paper WP-8-08 as a proposed revision to Appendix D to include TIS-B Ground Architecture. This proposed change to Appendix D will basically break the Appendix into the original text, which deals with ATC Surveillance in Section D.2 and a new section dealing with TIS-B as Section D.3. In this Working Paper, Dr. Orlando proposed an outline of Section D.3. Dr. Orlando will continue to update Section D.3 in future versions of this Working Paper.
 16. Although the Working Group had reviewed the briefing “Air2Air-Ext.ppt” earlier in this meeting, we briefly reviewed Working Paper WP-8-05 as the second draft of a proposed Appendix M to define possible techniques to extended range reception.
 17. With the completion of the presentation portion of the Joint Working Group 3 and Eurocae WG-51 Meeting, the members began formulating a response to be presented during the RTCA SC-186 Plenary session to be held 12-13 December at RTCA in Washington DC. A brief presentation will also be prepared relating the status of WG-3 toward the production of DO-260A, as well as the schedule to which we are currently working toward completion and presentation to a future Plenary.

18. 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 will remain OPEN.

Action Number	Action Description	Assigned to	Status
1-7	Compare performance of their non real-time test sets.	MIT/FAATC	Deferred to later meeting
2-17	Review the NL equation at A.7.2.d and possibly reword for latitudes at 87.	Jim Maynard	
4-11	Add material on dynamic bandwidth control for the proposed Appendix M.	Bob Saffell	
5-4	Incorporate any modifications to WP-5-10A as necessary based on the MASPS meeting discussion, any changes in the Report Assembly Function, and resubmit at future meeting.	James Maynard	
7-2	Estimate the data rate required for current versus XML encoding.	Mike Culver	
7-5	Make changes discussed during review of WP-7-03 for all changes in 2.2 and 2.4 caused by the insertion of the Version Number field. Implement changes discussed in Meeting 8.	Gary Furr	Addressed by WP-8-02
7-6	Make changes to Appendix A for changing all DO-260 subparagraphs to A.1, since TIS-B is going to be inserted as A.2. This also includes making changes to the entirety of DO-260 to change all references to Appendix A subparagraphs.	Gary Furr	
8-1	Provide the results from testing with the directional 1090 MHz receive antenna.	Carl Jezierski	
8-2	Provide at least 24 hours worth of recorded GPS position data using a stationary antenna.	Carl Jezierski Azhar Osmanbhoy	
8-3	Analyze the GPS data from Action Item 8-2 and report on the percent of time a stationary aircraft would be in the high transmission rate mode for thresholds of 5, 4 and 3 meters and recommend a threshold for DO-260A.	Bill Harman	
8-4	Provide analysis of GPS characteristics in support of reduced threshold for transition to high rate mode.	Bill Harman	
8-5	Examine the effect of a smaller preamble threshold window on reception performance with Mode S and Mode A/C fruit, specifically +/- 2dB and +/- 1dB.	Bill Harman John Van Dongen	
8-6	Prepare text to be included into Appendix I to describe the “improved multiple sample technique” which was introduced in WP-8-06.	John Van Dongen	
8-7	Explain the effect of different sampling rates (8 vs 10 MHz) on the new “improved multiple sample technique” introduced in WP-8-06	John Van Dongen	
8-8	Re-run 5-fruit case of the Enhanced Test Procedures with the desired signal level at 12 dB above MTL.	John Van Dongen Bill Harman	

Action Number	Action Description	Assigned to	Status
8-9	Add NIC Supplement, plus NAC & SIL to the TIS-B Formats.	Vince Orlando	
8-10	Draft the airborne surveillance processing requirements for TIS-B. This will be the minimum processing necessary to meet link specific characteristics (including global decoding and pass-through of future management messages)	Bill Harman	
8-11	Make revisions to Appendix D in light of decisions on TIS-B.	Vince Orlando	

19. 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-8-01	40KB	Draft 3 of TIS-B MOPS Materials for Section 2.2.17 and initial drafts of Sections in 2.4.17, presented by Vince Orlando in response to Action Item 7-10	Meeting 8, 12/03/2001 NATS, London England
1090-WP-8-02	93KB	REVISED Proposed Changes to Section 2.2, 2.4 and Appendix A required by the addition of a Version Number, presented by Gary Furr in response to Action Item 7-5	Meeting 8, 12/03/2001 NATS, London England
1090-WP-8-03	52KB	Draft 6 of the Enhanced Surveillance Processing Test Procedures, presented by Vince Orlando in response to Action Item 7-4	Meeting 8, 12/03/2001 NATS, London England
1090-WP-8-04	22KB	Proposed TIS-B Management Message Format, as presented by Vince Orlando in response to Action Item 2-16	Meeting 8, 12/03/2001 NATS, London England
1090-WP-8-05	20KB	Draft 2 of proposed Appendix M to define Extended Range Reception Techniques, presented by Ron Jones	Meeting 8, 12/03/2001 NATS, London England
1090-WP-8-06	45KB	Extended Squitter Interference Test Data Revised, as prepared by John Van Dongen and presented by William Harman	Meeting 8, 12/03/2001 NATS, London England
1090-WP-8-07	21KB	Proposed TIS-B Ground Architecture, presented by Vince Orlando in response to Action Item 7-3	Meeting 8, 12/03/2001 NATS, London England
1090-WP-8-08	162KB	Proposed Revision to Appendix D to Include TIS-B Ground Architecture, presented by Vince Orlando in response to Action Item 7-3	Meeting 8, 12/03/2001 NATS, London England
1090-WP-8-09	121KB	Proposed Changes in the ADS-B MASPS (DO-242A) related to NIC/NAC/SIL, presented by James Maynard	Meeting 8, 12/03/2001 NATS, London England

20. As per Action Item 4-7, a review of DO-260 was accomplished and the following table of open, or unresolved, issues was generated, along with two issues defined during Meeting #4. WG-3 members should review this list and ensure that there are not other issues known to them that should be on this list. This list will be review at each future meeting for addition or deletion of items.

Issue #	Issue/Question Description	Raised by	Date Raised	Status
1	DO-260 Table 2-11 in Section 2.2.3.2.3.1, NUC _P code for Type Code=22 is still shown as TBD	Gary Furr	15 May 01	
2	DO-260 Table 2-30 in Section 2.2.3.2.6.1.13, “Turn Indicator” coding is still TBD and the implementer is directed to set the code to ZERO until further notice. If this requirement is deleted, then sections 2.2.3.2.6.2.13, 2.2.3.2.6.3.13, 2.2.3.2.6.4.13, 2.2.5.1.10, 2.2.5.1.15 and 2.2.8.1.19 must also be addressed, along with all of their section 2.4 mates. Also Appendix F, MASPS Ref #R.2.26.	Gary Furr	15 May 01	
3	DO-260 Table 2-43 in Section 2.2.3.2.7.1.4, the “TCP/TCP+1 Data Valid Subfield” was declared not to be useful during the June 2000 Plenary and the field was declared to be “reserved” and set to ZERO in the initial version of the MOPS. Section 2.4.3.2.7.1.4 only tests for the case where the code is set to ZERO. Until this field has validity, no TCP data will be considered valid! All sections relating to TCP/TCP+1 were left as written in the initial DO-260.	Gary Furr	15 May 01	A Note is being added to 2.2.3.2.7.1 to state the status of TCP in DO-260A assuming no changes.
4	Sections 2.2.3.2.7.3.3.1 through 2.2.3.2.7.3.4.4 defining both the “Capability Classes” and the “Operational Mode” of the Aircraft Operational Status Message, including Tables 2-54 through 2-61 are full of TBDs . Also affects Appendix F, MASPS Ref R2.31 and R2.32.			
5	DO-260 Table 2-67 in Section 2.2.8.1.5, the “NUC _P Coding Requirements” contains numerous TBDs .	Gary Furr	15 May 01	
6	DO-260 Table A-2 in Section A.4.1, NUC _P code for Type Code=22 is still shown as TBD	Gary Furr	15 May 01	
7	DO-260 Section A.4.9.4 was never altered after the June 2000 Plenary which declared the “TCP Data Valid” subfield to be ‘reserved’ and hard wired to ZERO in the initial DO-260.	Gary Furr	15 May 01	
8	Sections A.4.11.3 through A.4.11.10 defining the CC_4, CC_3, CC_2, CC_1, OM_4, OM_3, OM_2 and OM_1 Operational Capabilities and Statuses are full of TBDs	Gary Furr	15 May 01	
9	Appendix F, Ref. #R2.38, the effective coverage of the ground receiver is still TBD .	Gary Furr	15 May 01	
10	Implementation of the Working Papers WP-4-03 and WP-4-06 for TCAS RA, are pending a decision by the Ad Hoc MASPS Working Group on the requirement.	WG-3	15 May 01	
11	Address the issue of whether or not to write a requirement into Section 2.2 of DO-260A for using the “Conservative Error Correction Technique.”	WG-3	15 May 01	
12	Clarify the need to transmit current TCP/TCP+1. In particular the need to comply in the Test Procedures, in view of the fact that the Data Valid Flag is currently set to zero (0) in DO-260	WG-3	21 Aug 01	

Issue #	Issue/Question Description	Raised by	Date Raised	Status
13	Additional changes will need to be made to Tables 2-3, 2-4 and 2-5, and potentially other places in DO-260, if SC-186 approves changes suggested by WG-6 to DO-242A to eliminate the Partial Mode Status Report (MS-P), only produce a standard MS Report, and to put all TCP information into a newly defined "On-Condition" Report.	WG-3	18 Oct 01	