

RTCA DO-242A ADS-B MASPS
 Ad Hoc Working Group
 Minutes of 3rd Meeting held at RTCA, Inc.
 February 26-28, 2001

The attendees included:

Tom Foster, Rockwell Collins, Inc.	Dan Castleberry, Rockwell Collins, Inc	Gary Livack, FAA / AFS-400
J. Stuart Searight, FAA Tech. Center	John Gonda, HQUSAF / DOD	James Maynard, UPS AT
Jerry Anderson, FAA / AIR-130	Jonathan Hammer, Mitre/CAASD	Ken Staub, ARINC, Trios Assoc.
Richard Barhydt, NASA Langley	Steve Heppe, ADSI	Tony Warren, Boeing

Monday February 26, 2001

1. Prior to the meeting officially convening, Ken Staub informally briefed on SC-193's planned activities in Brussels the week of our scheduled meeting there. He said on Monday, April 2, the plenary will be presented the User Requirements for Aerodrome Mapping Databases. It was suggested that Thursday, April 5 will probably be the best day for our joint session.
2. Tom Foster began the meeting with a few opening remarks, and an outline of his goals for this week's meeting.
3. The minutes from the January meeting were accepted without comment.
4. Tom reported on his briefing that he gave to plenary last month in Phoenix. (See 242A-WP-3-01 and 242A-WP-3-03.)
 - One point of discussion from Tom's briefing was to what length does DO-242A need to go to address non-ADS-B link requirements and services. Tom reported on the related discussion that took place at plenary and stated that we need to consider TIS, since this has been deemed a mature, short-term application. TIS-B will also have a MASPS document developed to parallel the ADS-B MASPS. Dan Castleberry felt these shared links are already sufficiently addressed in Section 3.5.2.1.4.
 - Tony Warren cautioned that if we address only some aspects on Intent Information in DO-242A, we must be very careful to do so in a way as to make backwards compatibility as easily attained as possible.
 - Do we need to formally task SC-181 to address RNP outputs in DO-236 for input into ADS-B to facilitate NIC/NAC determination?? What about other data source requirements?? **AI 3-1:** Tony Warren will formulate proper wording of questions/requests we might consider of SC-181.
 - Security and Spoofing Issues: Tom informed the group that the plenary decided we should NOT address spoofing at this time. At plenary's direction, we are to examine the anonymity issue and whether or not this needs clarification or expansion within the ADS-B MASPS. This began a discussion about the impact of going beyond the 24-bit ICAO address within the 1090 MOPS. Tom stopped the discussion, not wanting to work the problem at this time.

- Work Plan / Schedule: Tom reported that it was agreed to schedule release of DO-242A to be in synch with the ASA MASPS. This now puts us on target to present DO-242A to plenary in December, 2001. (SC-186 is currently scheduled to meet December 10-14, 2001.)
5. Next, the group began to review previously assigned action items. (The current status of all Action Items can be found in item 21 of these minutes.)
- Action Item 2-4: Stuart reported on his conversation with WG3 on the reason's for the 1.7 TCP update rate being a simple case of budget allocation. Tony Warren felt this requirement should be better defined in the MASPS so that room could be cleared to send other TCP and intent information. The group examined 2.1.2.3.3.1 and 3.4.3.2 of DO-242. Tony felt the last sentence in 3.4.3.2 was an implicit requirement that TCP's need only be broadcast once every 10 seconds. Tony stated his desire to insert a more stringent explicit requirement. Jim Maynard suggested that perhaps the TCP update rate should be proportional to Time-To-Go (TTG). Tom proposed that perhaps we need to have a TBD on the explicit requirement stating that this operational requirement needs to be explicit, but work needs to be done to determine its proper value. **AI 3-2:** Based on current MOPS activities, an Issue Paper is needed to document the need for clarification or an explicit operational requirement in the MASPS for TCP and TCP+1 update rates, which Tony Warren will write and submit.
 - Action Item 2-10: Tony brought IP14 ("certified navigation center") up to WG4 and Jonathan accepted the responsibility to examine this further and issue addendums to IP14 or submit new Issue Papers as necessary. This ad hoc group might still address clarifying the language and concepts regarding "certified navigation center." Tony expressed his strong feeling that we need to correct the situation where an implicit definition of navigation center that can't really be attained is contained within a non-normative appendix.
 - The group adjourned for the day and will pick up the review of action items beginning with AI 2-11 later in the week.

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6. From an informal discussion about ambiguity in reading Table 3-5 on page 93, which began before the meeting was officially convened, it was noted by Dan Castlebury that Element #14, "(True / Mag Heading)" is a typo and should only read "(True / Mag)". The discussion concluded with it being agreed that clarification of this table will be addressed by Jim Maynard in the Issue Paper he is developing per **Action Item 2-5**.
7. The above discussion lead into Richard Barhydt's presentation on the benefits of including heading and airspeed in the State Vector Report (242A-WP-3-05), which corresponds to Issue Paper 27.
- Steve Heppe questioned the accuracy and reliability of obtaining wind field information from aircraft and downlinking this information to the ground for applications such as paired approaches.
 - Dan Castlebury reminded the group that heading and airspeed were included in the SVR to provide continuity of track in the receiving system in the event of disruption of navigation services.
 - There was a debate as to whether the inclusion of air-referenced data is a clarification, as the discussion on Table 3-5 would indicate, or if it is adding a new requirement since it is not found anywhere within Section 2.

- Steve Heppe stated his opinion that if air-referenced data is to be broadcast, it must come from the current transmission budget allotted to ground-referenced data, otherwise we will run out of bandwidth.
 - Steve also stated that there is the apparent problem that some parties believe all ADS-B data is to be ground-based, while others believe there is to be both ground and air-based.
 - Steve finally pledged that he supports the transmission of wind information and air-referenced data, but that he can not support it being sent continuously in every SV, or even a specified percentage of SVs. He requested we find a flexible way to provide this information when this information is needed, useful, or requested by other users. Tony suggested this might be accomplished by removing this data from the SV and putting it in an On-Condition Report (and/or perhaps using the a Mode Status Report).
 - It was questioned whether moving this information to an On-Condition Report was a “clarification”, or if we would be removing current state vector elements, which might be out of our current charter and therefore need plenary approval.
 - Tom suggested that some of these requirements will probably need to be placed within the ASA MASPS, and we will need to bring these issues to WG4 for consideration. Do we have the requirement to provide air-reference data for continuity when GPS or other navigation systems are disrupted?? Tom Foster will make a formal request to WG4.
 - **AI 3-3:** Steve Heppe will develop an Issue Paper on air-referenced parameters. This IP will question the need for transmitting this information all of the time, note the ambiguity of inclusion of this information in the State Vector in the MASPS, propose that On-Condition Reports be used to drive these transmissions, identify some useful applications, and examine if Table 2-2 needs correction.
 - It was agreed that section 2.1.2.4 “Class Codes” was too specific and needs to be addressed in DO-242A. **AI 3-4:** Jim Maynard will write an Issue paper addressing section 2.1.2.4.
8. After lunch Tony Warren gave a brief recap of the 2/14 telcon on TCP types and parameters. (See 242A-WP-3-02 and IP21.)
- After some discussion on multiple TCP’s, path prediction, and using that information with the various turn types, Tony proposed that if we are not going to address TCP’s to the extent it needs to be addressed, it would be better to take it out of the MASPS, rather than have something in the document that is not fully developed and will need changing in future revisions. (*This suggestion was not discussed fully, and no agreement was reached.*)
 - Tom had to cut off the detailed discussion on the implementation of this material. He suggested that this discussion be tabled until we here from EUROCONTROL at our next meeting regarding their work and future plans with TCP and intent information.
 - It was suggested that the ACM subgroup of WG1 and NLR might be interested parties in how we address TCPs in the MASPS. Tom will see that attempts are made to contact NLR to see if they are interested in presenting a briefing during our Brussels meeting in April.
9. Richard Barhydt gave another briefing (242A-WP-3-04) on Issue Paper 26, and potential methodologies for incorporating short and long-term intent information.
- The briefing explained two basic methods of transmitting intended flight paths. Method 1 would have the transmitting aircraft perform the trajectory generation, while method 2 would have the receiving aircraft generate the trajectory from the received MCP and FMS intent parameters.

- Jim Maynard reported that the UAT MOPS is planning to incorporate (apparently per EUROCONTROL plans) the following parameters: airspeed, airspeed type (indicated or true), magnetic heading, associated validity flag, and selected altitude.
10. John Gonda gave a briefing on the military perspective of ADS-B activities, requirements, and applications. (242A-WP-3-06)

Wednesday February 28, 2001

11. Tony Warren presented his recommendations on NIC/NAC categories (242A-WP-2-04). AdHoc Group has received inputs that both suggest the need for more categories for NAC and suggestions for fewer. Tony's proposed categories currently align with the RNP levels being considered for airspace planning. Tony had an earlier action item to coordinate with SC-181 and SC-159 regarding surveillance issues relative to their navigation standards. **AI 3-5:** Jim Maynard to propose changes to Section 2.1.2.2.4 of the MASPS. His draft is to be reviewed via telecon on 16 March 11AM EST. It was agreed by the group to delete all references to NUC from the MASPS other than adding a statement as to why it has been removed. Other sections also contain NUC references that will need to be addressed at a later time. It was agreed to accommodate support for 16 levels of capability for both NIC and NAC for future growth. Tony will overview this NIC/NAC topic at the Brussels meeting in April. It was also discussed about the need for NAC_v to address velocity accuracy. NIC will only apply to position.
12. Related to backward compatibility issue, the 1090 MOPS will use version designation identification to address configuration of 1090MHz equipment. The MASPS should require all MOPS to support version designation or other methods to deal with fundamental surveillance interoperability changes. Mode Status message could contain the version information. **AI 3-6:** Tom Foster to write White Paper on backward compatibility subject.
13. Need to add a normative appendix to DO-242A to define the report data elements and comments on candidate sources to coordination standardization in the MOPS and implementations. **AI 3-7:** Dan Castleberry to develop an initial draft of a normative appendix defining report data elements.
14. Issue Paper Review:
 - IP2 (Altitude rate required ADS-B message element): Status: Open. May be a confusion between message content versus report requirements. If derived on the receiving side, the rate tracker will need adequate received position update rate to meet report requirements for vertical velocity. **AI 3-8:** Jonathan Hammer/Tony Warren to draft a response to IP2.
 - IP15 (consider altitude differential when determining effective received update rate): Status: Reject. A generic broadcast ADS-B system does not have position awareness of potential listeners and therefore cannot adjust its transmission characteristics. Even though this could be done in some ADS-B implementations, it cannot be imposed on the generic ADS-B transmitter. This could be addressed on the reception side as reports are assembled for passage to applications. Need to request clarification if the IP is addressing the transmit side or the receive side. **AI 3-9:** Dan Castleberry to write comments to be added to IP15 to explain rationale for rejecting.

- IP16 (State Vector reporting rate requirements for users transmitting TCPs): Status: Deferred. Until TCP definition is better developed, cannot address this item. Could be included in a list of potential new capabilities.
 - IP17 (use of TIS-B for integrity enhancement): Status: Rejected. Needs to be addressed by WG4. Not a ADS-B MASPS issue.
 - IP18 (broadcasting of own aircraft's heading at Vstop): Status: Open. This Issue Paper was originally IP4b
 - IP19 (broadcasting of own aircraft's brake position.): Status: Open. This Issue Paper was originally IP4c.
 - IP20 (ambiguity of velocity subtypes): Status: Closed The items included in this IP were discussed at January Ad Hoc meeting and closed.
 - IP21 (TCP types and parameters to represent trajectory Change segments): Status: Open. See Item 8 above. This will also be agenda item in subsequent meetings.
 - IP22 (means needed to support backwards compatibility between ADS-B versions): Status: Open. See Item 12 above.
 - IP23 (ability to broadcast capability to perform specific applications): Status: Open. To be addressed in Jim Maynard's Action Item on Capability Class Codes. (AI 3-4)
 - IP24 (NAC specificity requirements for surface applications): Status: Open. Related to this and other NRC, type/model, etc. issues to be addressed by SC-193 in April meeting.
 - IP25 (military formation flying message set): Status: Open. Needs means defined to support military use provisions via Capability Class Codes and On-Condition Messages.
 - IP26 (format for incorporating short and long-term intent information): Status: Open. See Item 9 above.
 - IP27 (benefits of including Heading and Airspeed in State Vector Report.): Status: Open. See Item 7 above.
15. Issues needing to be coordinated with WG4 will need to be addressed in our May meeting so that it can be delivered to the WG4 June meeting. One open item is the Navigation Center of Reference.
16. The schedule for upcoming meetings was discussed. Although there was some desire to synchronize our meetings with WG4, it was decided that this would not best serve our needs. To manage the development of the Revision A document and editorial processes, it was concluded that we should establish a freeze on new changes of any significance by the June SC-186 Plenary meeting. We would try to have a 1st draft of Rev A by our August meeting and plan to deliver a final draft to RTCA on November 5th for distribution to RTCA SC186 membership review prior to the December 10-14 Plenary review/approval meeting. The proposed meeting schedule to accomplish this found in item 18 of these minutes.
17. Meeting was adjourned.

18. **Key Dates in DO-242A Development Schedule:**

June 7th : RTCA SC186 Plenary Meeting - West Coast
June 7th : Rev A Change List Freeze
September 10th: 1st Draft of Rev A
October 4th: RTCA SC186 Plenary Meeting - West Coast
November 5th: Deliver Final Draft Rev A to RTCA
December 10-14: RTCA SC186 Plenary Meeting - RTCA

19. **Upcoming Meetings/Dates:**

April 3-6: ADS-B MASPS AdHoc Meeting -EUROCONTROL HQ, Brussels, Belgium

Tentative Agenda Items (9:00AM Tuesday– 3:00 Friday):

- Briefing from SC-193 on surface mapping requirements for ADS-B. (IP 4, 14, 18, 19, 24, obstructions & obstacles, and AT 2-13 & AI 2-14)
- Briefing from ODIAC on cooperative ATC concepts and on intent based ATM.
- Briefing from EUROCONTROL on operational concepts expanding the number of TCPs and look-ahead times and related requirements for Controller Access Parameters (CAPs).
- Briefing from EUROCONTROL on European surveillance activities, such as ARTAS, surveillance networks, ASTRIX, sensor fusion, etc..
- Briefing on NIC/NAC proposal (Tony Warren)
- Briefing on Intent/TCPs proposal (Tony Warren)

May 21-23: ADS-B MASPS AdHoc Meeting - Washington DC Area

July 17-19: ADS-B MASPS AdHoc Meeting - Seattle

August 28-30: ADS-B MASPS AdHoc Meeting - Washington DC Area

September 25-27: ADS-B MASPS AdHoc Meeting - Washington DC Area

October 23-26: ADS-B MASPS AdHoc Meeting - Washington DC Area

20. **Telecons Scheduled:**

March 16 11AM EST: Review Jim Maynard's draft of Section 2.1.2.2.4 of the MASPS (NIC/NAC changes) (AI 3-5)

April (TBD): Review Jim Maynard's clarifications and proposed changes to Section 3.4.3.1 SV report (AI 2-5, AI 2-18)

21. Action Items:

Action Number	Action Item Description	Assigned to	Status
1-1	Develop template for "Issue Paper" form to be used for submitted issues to be addressed by MASPS	Steve Heppe	Completed
1-2	Transcribe all submitted issues into our Issue Tracking Matrix and Change Issue Forms (where necessary)	Stuart Searight	Issue Papers: Done. Tracking Matrix: Pending
1-3	Give a preliminary evaluation on submitted comments as to whether those comments should be included in DO-242A or be deferred to later revisions of the MASPS.	Jim Maynard	Completed
2-1	Ask plenary for guidance regarding to what degree the ASA and/or ADS-B MASPS needs to address security /spoofing issues.	Tom Foster	Completed
2-2	Request WG1 to address Ops Concept on the use of Intent information. Result: WG1 Chair reported he did not foresee this activity in near-term.	Tom Foster	Completed
2-3	Produce Issue Papers that address four major conclusions of Intent briefing. (242A-WP-2-02)	Tony Warren	IP26 & IP27, More pending
2-4	Ask WG#3 to provide analysis for which 1.7 sec TCP update rate was based.	Stuart Searight	Completed (see above minutes)
2-5	Produce an Issue Paper proposing specific clarifications on the material in Section 3.4.3.1 regarding the Air Reference State Vector and required information in the SV	Jim Maynard	Review in telecon in April
2-6	Break Issue Paper #4 into four separate Issue Papers	Stuart Searight	Completed
2-7	Propose MASPS Change to address IP18. (Previously numbered IP4b.)	Jim Maynard	
2-8	Report on the military's stance on IP 14 (center of navigation)	John Gonda	
2-9	Report on SC-193's stance on IP 14 (center of navigation)	Gary Livack	
2-10	Bring IP14 up during WG4 telcon on 1/29 and report back to our group on that discussion (center of navigation)	Tony Warren	Completed (see above minutes)
2-11	Provide further detail on information sources and specific requirements to better focus IP19. (Previously numbered IP4c.)	Gary Livack	
2-12	Review and assess if section 2.1.2.1.2 of the MASPS needs clarification. (IP5)	Dan Castleberry	
2-13	Propose editorial clarifications for Table 3-9 (Class B messages).	Gary Livack	
2-14	Provide specific proposal on what clarifications or changes in requirements is needed in the MASPS to address item #2 of IP6. (centenary and other continuous obstacles)	Gary Livack	
2-15	Produce IP on protecting ADS-B services from other services provided by a shared data link	Dan Castleberry	
2-16	Write ad hoc group's response to issue #3 (back-up nav) of IP7 that will put issue in broader context and serve as proposal to WG#4 for consideration in the ASA MASPS.	Dan Castleberry	
2-17	Write proposals specific MASPS changes to split Integrity and Accuracy into separate components.	Jim Maynard, Tony Warren, Jonathan Hammer	Completed. Proposal accepted. See AI 3-5
2-18	Draft initial recommendations on IP9 (velocity subtypes).	Jim Maynard Christos Rekkas	Review in telecon in April. See AI 2-5

Action Number	Action Item Description	Assigned to	Status
2-19	Prepare briefing on trajectory leg types for ad hoc group consideration	Tony Warren	Completed
2-20	Request more specificity from Capt. Hilb on IP 12 (TCAS RA information)	Jerry Anderson	Due May mtg.
2-21	Write and Issue Paper on items 11 (Operational Mode Specific Data) and 12 (Flight Mode Specific Data) from Table 3-6 of DO-242	Dan Castleberry	
2-22	Propose language that clarifies MASPS regarding update rates and stationary/movement thresholds. (IP13)	Steve Heppe	Completed. Distributed 3/6/01.
2-23	Combine Gary Livack's comments on certified navigation center into IP14.	Stuart Searight	Completed
2-24	Provide comments and preliminary recommendations from FAA Certification on IP10 (IFR/VFR data sources).	Jerry Anderson	
2-25	Determine if there are strong feelings in Europe about having Turn Indicators (IP01) and altitude rate (IP02) as required message elements.	Christos Rekkas	
2-26	Provide expertise/thoughts/concerns regarding the necessity of requiring altitude rate as message elements.	Jonathan Hammer	Completed. See AI 3-8
2-27	Communicate newly proposed requirement specified in IP3 (reporting rates) to WG4.	Tony Warren	
3-1	Formulate proposed requests of SC-181 regarding placing requirements on DO-236 (RNP) to provide inputs for ADS-B as it relates to NIC/NAC.	Tony Warren	
3-2	Submit Issue Paper that proposes explicit operational requirements for TCP and TCP+1 update rates (even if TBDs must be used in DO-242A).	Tony Warren	
3-3	Write an Issue Paper discussing the use of air-reference data, how often must it be transmitted and when, and perhaps suggesting this can be On-Condition data.	Steve Heppe	
3-4	Write an Issue Paper to rework section 2.1.2.4, "Class Codes", in particularly making it less specific.	Jim Maynard	
3-5	Propose changes to Section 2.1.2.2.4 of the MASPS and coordinate telecon to review	Jim Maynard	Telecon review on 16 March 11AM EST
3-6	Write White Paper on backward compatibility subject.	Tom Foster	
3-7	Develop an initial draft of a normative appendix defining report data elements.	Dan Castleberry	
3-8	Draft a response to IP2 (altitude rate issue)	Jonathan Hammer/Tony Warren	
3-9	Write comments to IP15 explaining rationale for rejecting	Dan Castleberry	

Handouts from
DO-242A ADS-B MASPS
Ad Hoc Working Group Meeting
26-28 February 2001

1. Agenda
2. 242A-WP-3-01: Tom Foster's briefing given to SC-186 plenary in January.
3. 242A-WP-3-02: Presentation on intent TCP's distributed by Tony Warren prior to February 14 telcon.
4. 242A-WP-3-03: Tom Foster's report on results of January plenary briefing. (see 242A-WP-3-01)
5. 242A-WP-3-04: Briefing by Richard Barhydt, supporting IP 26 on proposed format for incorporating Short and Long-Term Intent Information.
6. 242A-WP-3-05: Briefing by Richard Barhydt, supporting IP 27 explaining benefits of including Heading and Airspeed in State Vector Report.
7. Issue Papers 21-27, which were all submitted the week prior to the February meeting.
8. 242A-WP-3-06: Briefing from John Gonda on military ADS-B activities, requirements, and applications.