

ADS-B MASPS Changes

Overview of WG6 Activities

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WG6 Overview

- ◆ WG6 chartered to develop revision A of the ADS-B MASPS (DO-242)
- ◆ Had first meeting December, 2000.
- ◆ Have had monthly meetings since.
- ◆ Goal is to have final draft for Ballot at April SC-186 plenary.
- ◆ All WG6 materials can be found at <http://adsb.tc.faa.gov>



MASPS Changes Process

- ◆ Criteria Defined for Considering Changes for Inclusion in Rev A
 - MASPS issues that need to be addressed to support near-term MASPS/MOPS development
 - Address application related change items only for applications that have well defined concepts of operation
 - Address items needed for harmonization with international requirements
 - Address items identified during recent ADS-B development activities and operational evaluations
 - MASPS document clarifications and corrections
 - Validation/modification of questioned MASPS requirements
 - For new requirements to be considered, they should be needed to support surveillance for traffic separation assurance
 - Military use provisions
- ◆ Use of Change Issue Papers (IP) to Document Issues and Considerations



Issue Paper Summary

- ◆ 50 Issue Papers submitted to date
 - 11 IP's closed by consolidating with - or being superceded by - other IP's.
 - 6 IP's rejected as out of scope of WG6 charter
 - 5 IP's deferred for consideration until later MASPS revision
 - 2 IP's withdrawn by author after WG6 review
 - 3 IP's yet to be reviewed by WG6
 - 23 IP's still being considered for inclusion in DO-242A (not all will be addressed in DO-242A)



Major MASPS Changes

- ◆ Separating Integrity and Accuracy components of NUC_p (NIC/NAC) (IPs 8, 24, 39)
 - Change needed to allow receiving equipment to place an integrity bound and an accuracy bound around received surveillance data.
 - Navigation Integrity Category (NIC) will be in State Vector reports
 - Navigation Accuracy Category (NAC) will be in the Mode Status reports
 - Surveillance Integrity Level (SIL) will be in Mode Status reports
 - Will be discussed in more detail as with 1090-WP-8-09. Also refer to the White Paper prepared by WG6 for plenary review (242A-WP-10-02).



Major MASPS Changes

- ◆ TCP clarification and expanding use of Intent Information (IP's 26, 11, 21, 31, 45)
 - Use of TCP's and Intent information will be expanded in DO-242A.
 - TCP definition will be expanded to include 2-D RNAV waypoints, 3-D and 4-D TCPS, and level-offs
 - Target State Reports (TSR's) will be used for Short term intent (i.e. target altitude, target heading/track angle)
 - Trajectory Change Reports (TCR's) will be used for multiple flight segment parameters and TCP's
 - For more information refer to white paper prepared for SC-186 plenary (242A-WP-10-03)
 - Debate as to whether this material should be in MASPS body or an appendix
 - ◆ WG6 recommends inclusion in body and seeks plenary decision at December SC-186 meeting.



Major MASPS Changes

- ◆ Reorganization of State Vector and Mode Status Reports (IP 33)
 - NIC/NAC and Intent proposals necessitated some reorganization of these ADS-B reports
 - WG6 determined that since some reorganization was being done, other items should be reevaluated also.
 - Potential major impact on DO-260A
 - Work will be more “grunt” work than analytical (tests reordered, elements renumbered, etc.)



Other Key MASPS Changes

- ◆ Air-referenced velocity vector (IPs 37, 9, 27, 28)
 - Potentially benefits separation assurance, flight path deconfliction and flight planning applications
 - Will aid in derivation of local wind-field information

- ◆ Requirements will stress range of acquisition and operation, not potential applications. (IP 47)
 - Tables 3-3 and 3-4 will be reworked to clarify that requirements are range dependant and not application dependant
 - Actual requirements won't change, but will be less ambiguous



Other Key MASPS Changes

◆ Runway Incursion Alerting

- 4-bit aircraft size characteristic will be broadcast (IP 4)
- Own position data will be relative to “certified navigation center” (IP 14)
- Clarification of criteria for determination of airborne and on-ground states. (IP 38)

◆ Note 7 for Table 3-4 (IP 35)

- Was interpreted by some as “alternative requirement” for 95% reception probability.
- Final resolution to replace note with following:

“These standards represent best engineering judgment at the time of publication. Deviation from these standards may be acceptable provided that the applicant demonstrate that all required applications are supported. These requirements will receive additional validation during development of the ASA MASPS.”



Other Key MASPS Changes

- ◆ Capability Class Codes (IP 32)
 - TCAS and CDTI capabilities to be broadcast (IP 12)
 - Other CC codes will be equipment capability based, and not aircraft or aircrew application certification.

- ◆ Anonymous mode for ADS-B operations (IP 5)
 - An address qualifier will be used to signify if 24-bit address is ICAO, anonymous, or other.



Other Issues affecting WG3

- ◆ ADS-B Transmission Rates while on airport surface (IP 13)
 - Request was for continuous 1 second update rate for moving and stationary aircraft to assist in runway incursion applications
 - WG6 decided to defer this IP until sufficient data is presented that shows need for high transmission rate for all aircraft.
 - This allows DO-260 to update reports on static data of stationary aircraft.
 - “Blind-taxi” operations were also mentioned in discussions of IP13.
 - ◆ This discussion led to creation of IP 50 which states need to clarify requirements of acquisition times and coast intervals
 - ◆ DO-260A will probably not be able to comply with these requirements for stationary aircraft effecting blind-taxi applications. (Taxiing aircraft might not acquire stationary aircraft quickly enough if blocked by buildings or other aircraft until in close range.)



Conclusions

- ◆ ADS-B MASPS Changes will be extensive.
- ◆ WG6 plans on delivering final draft of ADS-B MASPS to SC-186 membership in Early March and ballot DO-242A at April plenary.
- ◆ WG6 is briefing plenary December 12 & 13 in Washington, DC on all proposed changes.
 - Goal is to alert link MOPS working groups and get plenary consensus on more controversial MASPS proposals.
- ◆ For DO-260A to fully comply with DO-242A, much work will be needed.
- ◆ Can DO-260A comply with DO-242A and be ready for June plenary??



<u>IP#</u>	<u>Status</u>	<u>Last Action</u>	<u>Author</u>	<u>Description</u>
01	Rev. A	7/13/01	Stephen Heppe, ADSI, Inc	Turn indication is problematic and should be deleted as a required ADS-B message element
02	Rev. A	10/26/01	Stephen Heppe, ADSI, Inc	Altitude rate is problematic and should be deleted as a required ADS-B message element.
03	CLOSED (IP46)	8/30/01	Stephen Heppe, ADSI, Inc	Effective received reporting rates should be adjusted to match operational requirements.
04	Rev. A	8/30/01	Gary Livack, FAA	Request that ownship's aircraft size characteristic be broadcast.
05	Rev. A	8/30/01	Gary Livack, FAA	Requirements Needed to Provide Anonymity Protection for GA aircraft.
06	Rev. A (completed)	8/30/01	Gary Livack, FAA	Broadcasting of information from moving and stationary obstacles in and around airports.
07	Rejected	1/25/01	Gary Livack, FAA	Request to broadcast additional information for future use not currently specified in ADS-B MASPS message set
08	Rev. A	8/30/01	James Maynard, UPS-AT	The current NUC definition is insufficient. Accuracy and Integrity need to be separate components. (NIC / NAC)
09	CLOSED (IP37)	5/24/01	Chris Moody. Mitre/CAASD	Use of velocity subtypes 3 and 4.
10	Rejected	5/24/01	Chris Moody. Mitre/CAASD	Are VFR/IFR distinctions on data source requirements proper?
11	CLOSED (IP21)	5/24/01	Bob Hilb, UPS	Requests for clarification on "TCP types" and the use of the "TCP Data Valid" subfield.
12	Rev. A	8/30/01	Bob Hilb, UPS	Request that an aircraft's CDTI and TCAS/ACAS capabilities and TCAS/ACAS RA information be broadcast as part of the ADS-B message Mode Status reports.
13	Deferred	10/26/01	Rick Cassell, Rannoch Corp.	ADS-B transmission rates while on Airport Surface.
14	Rev. A	10/26/01	Rick Cassell, Rannoch Corp.	Use of "Certified Navigation Center" with own position.
15	Rejected	2/28/01	Stephen Heppe, ADSI, Inc	Proposal to consider altitude differential when determining effective received update rate.
16	Deferred	2/28/01	Stephen Heppe, ADSI, Inc	State Vector reporting rate requirements for users transmitting TCPs
17	Rejected	2/28/01	Stephen Heppe, ADSI, Inc	Use of TIS-B for integrity enhancement
18	Rev. A	5/24/01	Gary Livack, FAA	Request to broadcast own aircraft's heading at Vstop.
19	Deferred	8/30/01	Gary Livack, FAA	Runway Incursion Alerting.
20	Closed	2/13/01	Chris Moody, Mitre/CAASD	Ambiguity of Velocity Subtypes.
21	CLOSED (IP26)	10/26/01	Tony Warren, Boeing	TCP Types and parameters to represent trajectory Change segments.
22	Rev. A	2/20/01	Gary Livack, FAA	Means needed to support backwards compatibility between ADS-B versions.
23	CLOSED (IP32)	5/24/01	Gary Livack, FAA	Ability to broadcast capability to perform specific applications.
24	CLOSED (IP8)	5/24/01	Gary Livack, FAA	NAC specificity requirements for surface applications
25	Deferred	5/24/01	Gary Livack, FAA	Military formation flying message set.



<u>IP#</u>	<u>Status</u>	<u>Last Action</u>	<u>Author</u>	<u>Description</u>
26	Rev. A	10/26/01	Richard Barhydt, NASA	Format for incorporating Short and Long-Term Intent Information.
27	CLOSED (IP37)	5/24/01	Richard Barhydt, NASA	Benefits of including Heading and Airspeed in State Vector Report.
28	CLOSED (IP37)	5/24/01	Stephen Heppe, ADSI, Inc	Air-referenced parameters should be excluded from normal/default State Vector transmissions.
29	Rejected (IP42)	8/30/01	Stephen Heppe, ADSI, Inc	The MASPS should not require geometric altitude in all SV reports.
30	Deferred	7/19/01	Stephen Heppe, ADSI, Inc	Proposed clarification for definition of ADS-B
31	CLOSED (IP21)	5/24/01	Tony Warren, Boeing	Proposed requirements for TCP update rates.
32	Rev. A	8/30/01	James Maynard, UPS-AT	Proposal to revise capability code definition.
33	Rev. A	10/26/01	James Maynard, UPS-AT	Proposal to re-organize the SV and MS report elements.
34	Rev. A	5/24/01	James Maynard, UPS-AT	Provide standard, data-link-independent, report structure format in the MASPS.
35	Rev. A (completed)	10/26/01	Bill Harman, Lincoln Laboratory	Delete or change note 7 of Table 3-4 to assure that this note does not change or supercede the requirements defined in Table 3-4.
36	Rev. A	10/18/01	Gene Wong, FAA	Simultaneous Parallel Approaches.
37	Rev. A	9/27/01	Richard Barhydt, NASA	Air Reference Velocity Vector.
38	Rev. A	10/26/01	Gary Livack, FAA	Criteria for determination of airborne and on-ground states.
39	Rev. A	7/19/01	Gary Livack, FAA	Vertical height integrity (NIC).
40	Rejected	5/24/01	Gary Livack, FAA	Notion that ADS-B application enabling software can be treated as discrete, modular software.
41	Rev. A (completed)	10/26/01	Bill Flathers, AOPA	Emergency Locator Transmitter Functionality.
42	Withdrawn	8/30/01	Bill Flathers, AOPA	Altitude encoder and altimetry self-test feature
43	Withdrawn	8/30/01	Bill Flathers, AOPA	The Need for "Aircraft Address" in Very Dense Environments
44	Rev. A	7/19/01	Tony Warren, Boeing	Source data requirements for ADS-B Broadcast should be explicitly documented.
45	Closed (IP26)	8/16/01	Richard Barhydt, NASA	Short-term Intent Parameters
46	Rev. A (completed)	8/30/01	Jonathan Hammer, Mitre/CAASD	Proposal to revise tables 3-3 and 3-4 to reflect range dependency of requirements rather than application dependency.
47	Rev. A (completed)	8/30/01	Jonathan Hammer, Mitre/CAASD	Request to add example to Appendix M for approach spacing intent information.
48	TBD	None	Tom Foster, Rockwell Collins	Shared Services Links
49	TBD	None	Stuart Searight, FAA	Proposal for On-Condition Request for Information Report
50	TBD	None	Stuart Searight, FAA	Request for clarification on coast time intervals and update rates for ADS-B reports AND transmitted State Vector information needed for target acquisition.