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Minimum Aviation System Performance Standards for Automatic Dependent Surveillance Broadcast (ADS-B)

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FOREWORD

This report was prepared by Special Committee 186 (SC-186) and approved by the RTCA Program Management Committee (PMC) on June 25, 2002. This document (RTCA/DO-242A) supersedes and replaces its first edition (RTCA/DO-242, dated February 19, 1998).

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Table of Contents

1 PURPOSE AND SCOPE 1

1.1 Introduction 1
1.2 System Overview 3
1.2.1 Definition of Automatic Dependent Surveillance Broadcast 3
1.2.1.1 Relationship to Primary and Secondary Surveillance Radar 4
1.2.1.2 Relationship to Addressed ADS 5
1.2.1.3 Relationship to Other Broadcast Services 5
1.2.2 Operational Goals, Limitations and Considerations 6
1.2.2.1 Operational Performance Considerations 6
1.2.2.2 Safety Goals 7
1.2.2.3 Economic Goals 7
1.2.2.3.1 Economic Goals—Air Traffic Service Provider 7
1.2.2.3.2 Economic Goals—Airspace Users 8
1.2.2.4 System Operational Limitations 8
1.2.3 Assumptions 9
1.2.3.1 Aircraft/Vehicle Equipage 9
1.2.3.2 ATS Service Provider Equipage 9
1.2.3.3 Standardization 9
1.2.4 Operational Environment 10
1.2.4.1 Levels of Functional Capability 10
1.2.4.2 Levels of Operational Service Supported by ADS-B 11
1.2.5 Benefits Enabled by ADS-B from other A/Vs 11
1.2.6 Aircraft Equipment Overview 12
1.2.7 Ground Equipment Overview 13
1.2.8 Transition from the Current Surveillance Architecture 13
1.2.8.1 Surveillance Architecture Transition 15
1.2.8.2 Airspace User Transition 17
1.3 Operational Applications 18
1.3.1 Cockpit Display of Traffic Information 18
1.3.2 Airborne Collision Avoidance 19
1.3.2.1 Improvements to Existing Collision Avoidance Systems 19
1.3.2.2 ACAS Based on ADS-B 20
1.3.3 Conflict Management and Airspace Deconfliction 20
1.3.3.1 On-board Conflict Management and Airspace Deconfliction 20
1.3.3.2 ATS Surveillance and Conflict Management 21
1.3.4 ATS Conformance Monitoring 22
1.3.4.1 Simultaneous Approaches 22
1.3.4.2 Incursion Processing 22
1.3.5 Other Applications 23
1.4 Verification Procedures 23

2 OPERATIONAL REQUIREMENTS 25

2.1 General Requirements 25
2.1.1 General Performance 26
2.1.1.1 Consistent Quantization of Data 26
2.1.1.2 ADS-B Reports Characteristics 26
2.1.1.3 Expandability 26
2.1.2 Information Transfer Requirements 27
2.1.2.1 Time of Applicability (TOA) 27
2.1.2.2 Identification 27

2.1.2.2.1 Call Sign 27
2.1.2.2.2 Participant Address and Address Qualifier 27
2.1.2.2.2.1 Participant Address 28
2.1.2.2.2.2 Address Qualifier 28
2.1.2.2.3 ADS-B Emitter Category 28
2.1.2.3 A/V Length and Width Codes 30
2.1.2.4 Position 30
2.1.2.5 ADS-B Position Reference Point 31
2.1.2.6 Altitude 34
2.1.2.6.1 Pressure Altitude 34
2.1.2.6.2 Geometric Altitude 34
2.1.2.7 Horizontal Velocity 34
2.1.2.8 Vertical Rate 35
2.1.2.9 Heading 35
2.1.2.10 Capability Class (CC) Codes 36
2.1.2.11 Operational Mode (OM) Codes 36
2.1.2.12 Navigation Integrity Category 36
2.1.2.13 Navigation Accuracy Category for Position (NAC_P) 38
2.1.2.14 Navigation Accuracy Category for Velocity (NAC_V) 40
2.1.2.15 Surveillance Integrity Level (SIL) 41
2.1.2.16 Barometric Altitude Quality Code (BAQ) 41
2.1.2.17 Barometric Altitude Integrity Code (NIC_{baro}) 42
2.1.2.18 Emergency/Priority Status 42
2.1.2.19 Intent Information 42
2.1.2.19.1 Short Term Intent 43
2.1.2.19.2 Long-Term Intent 44
2.1.2.20 Other Information 48
2.2 System Performance – Standard Operational Conditions 48
2.2.1 ADS-B System-Level Performance 48
2.2.2 ADS-B System-Level Performance—Aircraft Needs 53
2.2.2.1 Aircraft Needs While Performing Aid to Visual Acquisition 54
2.2.2.2 Aircraft Needs for Conflict Avoidance and Collision Avoidance 54
2.2.2.3 Aircraft Needs for Future Collision Avoidance 55
2.2.2.3.1 Environment 56
2.2.2.3.2 Operational Scenario 56
2.2.2.4 Aircraft Needs While Performing Station-Keeping 56
2.2.2.4.1 Environment 57
2.2.2.4.2 Operational Scenario 57
2.2.2.5 Aircraft Needs for Separation Assurance and Sequencing (Cooperative-Separation for Free Flight) 58
2.2.2.5.1 Environment 58
2.2.2.5.2 Operational Scenario 59
2.2.2.6 Aircraft Needs for Flight Path Deconfliction Planning (Cooperative Separation in Oceanic / Low Density En Route Airspace) 59
2.2.2.6.1 Environment 59
2.2.2.6.2 Operational Scenarios 60
2.2.2.7 Aircraft Needs While Performing Simultaneous Approaches 60
2.2.2.7.1 Environment 60
2.2.2.7.2 Operational Scenarios 61
2.2.2.8 Aircraft Needs While Operating on the Airport Surface 61
2.2.2.8.1 Environment 61
2.2.2.8.2 Operational Scenarios 62

2.2.3 ADS-B System-Level Performance—ATS Provider Needs for Separation and Conflict Management 62
2.2.3.1 ATS Provider Needs for Separation and Conflict Management in En Route and Terminal Airspace 65
2.2.3.2 ATS Provider Needs for Separation and Conflict Management on the Airport Surface 65
2.2.3.2.1 Environment 66
2.2.3.2.2 Operational Scenario 66
2.2.3.2.3 Requirements 66
2.2.3.3 ATS Conformance Monitoring Needs 67
2.2.3.3.1 Operational Scenario (Parallel Runway Monitoring) 67
2.2.3.3.2 Requirements 67

3 ADS-B SYSTEM DEFINITION AND FUNCTIONAL REQUIREMENTS 69

3.1 System Scope and Definition of Terms 69
3.2 ADS-B System Description 72
3.2.1 Context Level Description 72
3.2.1.1 System Level 72
3.2.1.2 Subsystem Level 73
3.2.1.3 Functional Level 77
3.2.2 Participant Architecture Examples 77
3.2.3 Equipage Classifications 78
3.2.3.1 Interactive Aircraft/Vehicle ADS-B Subsystems (Class A) 79
3.2.3.2 Broadcast-Only Subsystems (Class B) 80
3.2.3.3 Ground Receive-Only Subsystems (Class C) 82
3.3 System Requirements 82
3.3.1 Surveillance Coverage 82
3.3.2 Information Exchange Requirements By Equipage Class 84
3.3.3 ADS-B Data Exchange Requirements 88
3.3.3.1 Report Accuracy, Update Period, and Acquisition Range 88
3.3.3.1.1 State Vector Report Acquisition, Update Interval, and Acquisition Range 88
3.3.3.1.2 Mode-Status Acquisition, Update Interval, and Acquisition Range 93
3.3.3.1.3 Air Referenced Velocity Acquisition, Update Interval, and Acquisition Range 94
3.3.3.1.4 Target State and Trajectory Change Report Acquisition, Update Interval, and Acquisition Range 96
3.3.3.2 State Vector Report Latency and Report Time Error Requirements 98
3.3.3.2.1 Latency Definitions 99
3.3.3.2.2 State Vector Latency Requirements 100
3.3.4 ADS-B Network Capacity 100
3.3.4.1 High Density 101
3.3.4.2 Low Density 102
3.3.5 ADS-B Medium 103
3.3.6 ADS-B System Quality of Service 103
3.3.6.1 Required Monitoring Performance 103
3.3.6.2 Failure Mode and Availability Considerations 104
3.3.6.3 ADS-B Availability Requirements 105
3.3.6.4 ADS-B Continuity of Service 106
3.3.6.5 ADS-B Integrity 107
3.4 ADS-B Messages And Reports 107
3.4.1 Report Assembly Design Considerations 107
3.4.2 ADS-B Message Exchange Technology Considerations in Report Assembly 108
3.4.3 State Vector Report 109
3.4.3.1 Air/Ground State 110
3.4.3.1.1 Determination of Air/Ground State 110

3.4.3.1.2 Effect of Air/Ground State 112
3.4.3.2 SV Report Update Requirements 112
3.4.3.3 Time of Applicability (TOA) Field for SV Report 113
3.4.3.4 Horizontal Position 114
3.4.3.5 Horizontal Position Valid Field 114
3.4.3.6 Geometric Altitude Field 114
3.4.3.7 Geometric Altitude Valid Field 114
3.4.3.8 Geometric Horizontal Velocity 115
3.4.3.9 Airborne Horizontal Velocity Valid Field 115
3.4.3.10 Ground Speed While On the Surface Field 115
3.4.3.11 Surface Ground Speed Valid Field 115
3.4.3.12 Heading While On the Surface Field 116
3.4.3.13 Heading Valid Field 116
3.4.3.14 Pressure Altitude Field 116
3.4.3.15 Pressure Altitude Valid Field 116
3.4.3.16 Vertical Rate Field 117
3.4.3.17 Vertical Rate Valid Field 117
3.4.3.18 Navigation Integrity Category (NIC) Field 117
3.4.3.19 Report Mode Field 117
3.4.4 Mode Status Report 118
3.4.4.1 MS Report Update Requirements 120
3.4.4.2 Time of Applicability (TOA) Field for MS Report 120
3.4.4.3 ADS-B Version Number 120
3.4.4.4 Call Sign Field 120
3.4.4.5 Emitter Category Field 121
3.4.4.6 A/V Length and Width Codes 121
3.4.4.7 Mode-Status Data Available Field 122
3.4.4.8 Emergency/Priority Status Field 122
3.4.4.9 Capability Class (CC) Codes Field 122
3.4.4.9.1 TCAS/ACAS Installed and Operational 123
3.4.4.9.2 CDTI Traffic Display Capability 123
3.4.4.9.3 Service Level of Transmitting A/V 123
3.4.4.9.4 ARV Report Capability Flag 124
3.4.4.9.5 TS Report Capability Flag 124
3.4.4.9.6 TC Report Capability Level 124
3.4.4.9.7 Reporting ADS-B Reference Position Flag 124
3.4.4.9.8 Other Capability Codes 124
3.4.4.10 Operational Mode (OM) Parameters 125
3.4.4.10.1 TCAS/ACAS Resolution Advisory Active Flag 125
3.4.4.10.2 IDENT Switch Active Flag 125
3.4.4.10.3 Receiving ATC Services Flag 125
3.4.4.10.4 Other Operational Mode Codes 125
3.4.4.11 Navigation Accuracy Category for Position (NAC_P) Field 125
3.4.4.12 Navigation Accuracy Category for Velocity (NAC_V) Field 126
3.4.4.13 Surveillance Integrity Level (SIL) Field 126
3.4.4.14 (Reserved for) BAQ Field 126
3.4.4.15 NIC_{baro} Field 126
3.4.4.16 True/Magnetic Heading Flag 127
3.4.4.17 Vertical Rate Type Field 127
3.4.4.18 (Reserved for) Flight Mode Specific Data Field 127
3.4.5 On-Condition Reports 127
3.4.6 Air Referenced Velocity (ARV) Report 128
3.4.6.1 Conditions for Transmitting ARV Report Elements 128

3.4.6.2 ARV Report Update Requirements 129
3.4.6.3 Time of Applicability (TOA) Field for ARV Report 129
3.4.6.4 Airspeed Field 129
3.4.6.5 Airspeed Type and Validity 129
3.4.6.6 Heading While Airborne Field 129
3.4.6.7 Heading Valid Field 129
3.4.7 Target State (TS) Report 130
3.4.7.1 Conditions for Transmitting TS Report Information 130
3.4.7.2 TS Report Update Requirements 131
3.4.7.3 Time of Applicability (TOA) field for TS Report 131
3.4.7.4 Horizontal Data Available and Horizontal Target Source Indicator Field 131
3.4.7.5 Target Heading Or Track Angle Field 131
3.4.7.6 Target Heading/Track Indicator Field 132
3.4.7.7 (Reserved for) Heading/Track Capability Field 132
3.4.7.8 Horizontal Mode Indicator 132
3.4.7.9 (Reserved for) Horizontal Conformance 132
3.4.7.10 Vertical Data Available and Vertical Target Source Indicator Field 133
3.4.7.11 Target Altitude Field 133
3.4.7.12 Target Altitude Type Field 134
3.4.7.13 Target Altitude Capability Field 134
3.4.7.14 Vertical Mode Indicator 134
3.4.7.15 (Reserved for) Vertical Conformance Field 134
3.4.8 Trajectory Change (TC+0, TC+n) Reports 135
3.4.8.1 Conditions for Transmitting Trajectory Change Report Information 137
3.4.8.2 TC Report Update Requirements 138
3.4.8.3 Time of Applicability (TOA) Field for TC Report 138
3.4.8.4 TC Report Sequence Number 139
3.4.8.5 TC Report Cycle Number 139
3.4.8.6 (Reserved for) Trajectory Change Management Indicator (TCMI) 140
3.4.8.7 Time To Go (TTG) Field in TC Reports 140
3.4.8.8 Horizontal Data Available and Horizontal TC Type 140
3.4.8.9 TC Latitude 144
3.4.8.10 TC Longitude 144
3.4.8.11 Turn Radius 145
3.4.8.12 Track to TCP 145
3.4.8.13 Track from TCP 145
3.4.8.14 (Reserved for) Horizontal Conformance 145
3.4.8.15 Horizontal Command/Planned Flag 146
3.4.8.16 Vertical Data Available and Vertical TC Type 146
3.4.8.17 TC Altitude 147
3.4.8.18 TC Altitude Type 147
3.4.8.19 (Reserved for) Altitude Constraint Type 147
3.4.8.20 (Reserved for) Able/Unable Altitude Constraint 147
3.4.8.21 (Reserved for) Vertical Conformance 147
3.4.8.22 Vertical Command/Planned Flag 148
3.4.8.23 TC Report Management 148
3.4.8.23.1 Transmit Subsystem TC Report Management 149
3.4.8.23.2 Receive Subsystem TC Report Management 149
3.5 ADS-B Subsystem Requirements 150
3.5.1 Aircraft/Vehicle Interactive Subsystem Requirements 150
3.5.1.1 Onboard Required Data Sources 150
3.5.1.1.1 Air Data Source 150
3.5.1.1.2 Geometric Navigation System 151

3.5.1.1.3 Flight Mode Status Data Input Devices 152
3.5.1.1.4 Subsystem Control Logic 152
3.5.1.2 Required Data Sources 152
3.5.1.3 Onboard Data Sinks 153
3.5.1.3.1 ADS-B Operational Applications 153
3.5.1.3.2 TCAS Enhancements 153
3.5.1.4 External Data Sinks 153
3.5.1.5 Levels of Service 153
3.5.1.6 Co-Site Interference Considerations 154
3.5.1.7 Environmental Considerations 154
3.5.1.8 Subsystem Reliability 154
3.5.2 Broadcast-Only Subsystem Requirements 154
3.5.2.1 Onboard Required Data Sources 155
3.5.2.1.1 Air Frame Reference Data Source 155
3.5.2.1.2 Geometric Navigation System 155
3.5.2.1.3 Mode Status Data Input Devices 156
3.5.2.1.4 Subsystem Control Logic 156
3.5.2.2 Aircraft Onboard Data Sinks 157
3.5.2.3 Levels of Service 157
3.5.2.4 Co-Site Interference Considerations 157
3.5.2.5 Environmental Considerations 157
3.5.2.6 Subsystem Reliability 157
3.5.3 Ground Receive-Only Subsystem Requirements 158
3.6 ADS-B Functional Level Requirements 158
3.6.1 Required Message Generation Function 158
3.6.1.1 Input Interface Sub-function 159
3.6.1.2 Input Interface Control/Processing Sub-function 159
3.6.2 Required Message Exchange Function 159
3.6.2.1 Modulator/Transmitter Sub-function 160
3.6.2.2 Transmit/Receive Antenna Sub-functions 160
3.6.2.3 Receiver/Demodulator Sub-function 160
3.6.3 Required Report Assembler Function 160
3.6.3.1 Decoder/Message Processor Sub-function 161
3.6.3.2 Report Assembly Sub-function 161
3.6.3.3 Output Interface Sub-function 162
3.6.4 Required Report Output Control Function 162

4 PROCEDURES FOR REQUIREMENT VERIFICATION 163

MEMBERSHIP 189

Appendices

Appendix A	Acronyms
Appendix B	Definition of Terms
Appendix C	Bibliography and References
Appendix D	Near-Term ADS-B Applications
Appendix E	Other Applications
Appendix F	Efficient Spectrum Utilization
Appendix G	Design Tradeoff Considerations
Appendix H	Receive Antenna Coverage Constraints
Appendix I	Integrity Considerations for ADS-B Applications
Appendix J	Accuracy and Update Period Analysis
Appendix K	Latency and Report Time Error Data
Appendix L	Track Acquisition and Maintenance Requirements
Appendix M	Examples of On-Condition Report Formats
Appendix N	Intent Guidance Material for Future ADS-B Intent Broadcast
Appendix O	Determination of Intent Information Exchange Requirements for Air-Air Encounter Alerting and De-confliction
Appendix P	4-bit Coding for Make and model in ADS-B
Appendix Q	Future Air-Referenced Velocity (ARV) Broadcast Conditions
Appendix R	Determining the Navigation Accuracy Category for Velocity (NAC_V)

Table of Figures

Figure 1-1: Relationship Between ADS-B MASPS And Other SC-186 Documents 1
Figure 1-2: Functional Relationship between ADS-B and Surveillance Applications 4
Figure 1-3: ATS Ground Surveillance Transition Configuration 14
Figure 1-4: Potential ATS Ground Surveillance Configuration 16
Figure 2-1: Position Reference Point Definition..... 33
Figure 2-2(a): Current TCP Information, As Conveyed With SV and TS Reports. 45
Figure 2-2(b): Current TCP, As Conveyed With SV and TC+0 Reports. 46
Figure 2-3: Air-To-Air Capabilities Enabled By ADS-B Equipage Classes 54
Figure 3-1: Relationship of MASPS Operational Requirements to ADS-B System Requirements 70
Figure 3-2: Illustrative ADS-B System Level Context Diagram 74
Figure 3-3: ADS-B Subsystem Level Context Diagram for ADS-B System 75
Figure 3-4: ADS-B Functional Level Context Diagram for Aircraft Interactive Subsystem 76
Figure 3-5: Example of A/C Pair Supporting Aid to Visual Acquisition and Conflict Avoidance Applications 77
Figure 3-6: Example of A/C Pair Capable of Supporting Free Flight Applications 78
Figure 3-7: Example of ADS-B Support of Ground ATS Applications 79
Figure 3-8: Peak Traffic Based on Los Angeles Basin 2020 Scenario And Assumed Surface Traffic 102
Figure 3-9 GNSS/ADS-B Surveillance/Navigation Failure Recovery Modes 106
Figure 3-10(a): Meaning of Fields for Horizontal TC Types 1 and 2..... 142
Figure 3-10(b): Meaning of Fields for Horizontal TC Types 3 and 4. 143
Figure 3-10(c): Meaning of Fields for Horizontal TC Type 5. 144

Figure D-1 Functional Relationship between ADS-B and the CDTI D-2
Figure D-2 The ITC Concept as Currently Authorized D-6
Figure D-3 Illustration of the "Establish Interval" Procedure D-8
Figure G-1 Latitude Standard Deviation Vs. Number of Bits in Report for Expected NAV Accuracies. G-3
Figure G-2 Incremental Increase in Uncertainty of Along Track Position Due to Total Time Uncertainty, σ_t = 280 ms..... G-4
Figure G-3 Implications of Full Vs. Segmented State Vector Reports..... G-5
Figure G-4 Multipath Relationships G-10
Figure G-5a Smooth Earth Reflection Co-efficient G-10
Figure G-5b Typical Aircraft Antenna Pattern G-10
Figure G-6 Air-Ground Relative Multipath Levels for a Smooth and a Rough Surface G-11
Figure G-7 Air-Air Multipath Level (Specular) G-12
Figure G-8 Air-Air Multipath Level Relative to Direct Level for a Rough Surface G-12
Figure G-9 Air-Air Multipath Delay..... G-14
Figure H-1 Encounter Dynamic Relationships H-2
Figure H-2 Crossing Encounter with 45 Degree Target Bearing Angle..... H-3
Figure H-3 Crossing Encounter with 90 Degree Target Bearing Angle..... H-3
Figure H-4 Constant Alert Coverage for a) v = 600, u = 600 (solid curve), and b) v = 300, u= 600 kts (dotted curve)..... H-5
Figure H-5 Normalized Comparison of Range Squared Variation for a) v = 600 (solid curve), u = 600 and b) v = 300 and u = 600 kts (dotted curve)..... H-6
Figure H-6 Comparison of Composite and Forward Only Constant Alert Time Antenna Patterns in dB (No Normalization of Peak Gain)..... H-6
Figure H-7 Half Beamwidth Variation with Normalized Speed of Potential Threat..... H-9
Figure H-8 Relative Gain of Matched Antenna as a Function of Normalized Threat Speed..... H-9
Figure J-1 Limitations..... J-3

Figure J-2 Barometric vs. Geometric Altitude: Summary J-4
Figure J-3 Barometric Pressure Error Gradient Example 2/8/94, Akron, CO 18:00 GMT (Temperature Inversion) J-5
Figure J-4: Altitude Conflict Scenario Sample Path J-6
Figure J-5: Monte Carlo Simulation Results J-6
Figure J-6 Profile of Typical Bank Angles During Turn J-8
Figure J-7 Use of Bank Angle/Turn Rate: Effect on Conflict Prediction for a Maneuvering Intruder J-9
Figure J-8 Use of Bank Angle/Turn Rate: Effect on False Alarms for Linear, Head-On Encounter J-10
Figure J-9 Latency and latency error J-11
Figure J-10 Example of the Effect of Random Report Time Error on Warning Time for a Maneuvering Intruder J-12
Figure J-11 Acceptable Surveillance Delays as a Function of Warning Time J-15
Figure J-12 Future Collision Avoidance Scenario Altitude = 2,000 ft (Both Aircraft) J-16
Figure J-13 Collision Avoidance Sensitivity to Position, Velocity Errors J-16
Figure J-14 Collision Avoidance: Sensitivity to Report Update Period, Receipt Probability J-17
Figure J-15 Update Period Requirements Analysis J-18
Figure J-16 Altitude Conflict Scenario J-19
Figure J-17 Altitude Conflict: Warning Time Sensitivity to Altitude, Altitude Rate Errors J-19
Figure J-18. Scenarios Used to Assess Alarm Rate J-20
Figure J-19 Sensitivity to Errors In Position and Velocity J-21
Figure J-20 Advisory Rate, US Database, Altitude Layer 3 ..... J-23
Figure J-21 Delayed Alert Rate, Simulated Collision Database, Altitude Layer 3 ..... J-24
Figure J-22 Free Flight Conflict Scenario J-26
Figure J-23 Free Flight Conflict Sensitivity to Position and Velocity Errors J-26
Figure J-24 Free Flight Conflict Sensitivity to Report Update Period, Probability of Receipt J-27
Figure J-25 Free Flight–False Alarm Scenario J-27
Figure J-26 Free Flight–False Alarms with Perfect Data (T=1s) J-28
Figure J-27 Free Flight False Alarm Sensitivity to Position and Velocity Errors J-28
Figure J-28 Update Period Requirements, Free Flight J-30
Figure J-29 1,000 ft Independent Parallel Runway Blunder Scenario J-31
Figure J-30 1,000 ft Independent Parallel Runway: Warning Time Sensitivity to Position, Velocity Errors J-31
Figure J-31 1,000 ft Independent Parallel Runway Warning Time Sensitivity to Update Period, Probability of Receipt J-32
Figure J-32 1,000 ft Independent Parallel Approach False Alarm Geometry J-33
Figure J-33 1k ft Independent Parallel Approach False Alarm Rate J-34
Figure J-34 2,500 ft Independent Parallel Runway: Sensitivity to Position, Velocity Errors J-35
Figure J-35 2,500 ft Independent Parallel Runway: Sensitivity to Report Update Period, Pr(r) J-36
Figure J-36 2,500 ft Independent Runway False Alarm Scenario: Sensitivity to Position, Velocity Errors J-36
Figure J-37 Update Period Requirements, 1000 ft Independent Parallel Runways J-38
Figure J-38 Update Period Requirements, 2500 ft Independent Parallel Runways J-38
Figure J-39 Scenario for Analysis of PRM J-39
Figure J-40 Simulation Results for Fixed Alert Threshold (10 Sec) J-42
Figure J-41 Simulation Results for Constant False Alert Rate (Different Thresholds) J-43
Figure J-42 Surface Scenario 2—Blind Taxi J-44
Figure J-43 Accordion Concept J-45
Figure J-44 Separation vs. Time with 100 m Rolling Separation, 2 s Total Data Latency J-46
Figure J-45 Range at Which Braking Detected, 125 m Rolling Separation, as a Function of Position, Velocity Error J-47
Figure J-46 False Alarm Rates, 125 m Rolling Separation J-48
Figure J-47 Required Received Report Update Period,125 m Rolling Separation J-48
Figure J-48 Runway Incursion Warning Time Sensitivity to Update Period (95%) J-50

Figure J-49 Relationship between Table 2-7 and Table 3-2 ..... J-51
Figure J-50 Example: Horizontal Position Error J-51
Figure L-1 Probability of Update Within 3 Sec Interval vs. Single Message Reception Probability for Several Broadcast Intervals L-9
Figure L-2 Required Probability of Message Decode vs. Twice the Required Update Interval for 99% Confidence Track is Updated Within Twice the Update Interval L-10
Figure L-3 Probability of Acquiring Multiple Message Types for Segmented State Vector Design with t_s=0.25s and Augmenting Messages Interleaved on a T_s= 5 sec Basis L-11
Figure L-4 Probability of Acquiring Augmenting Message for Full State Vector Plus Mode Status Design for t_f=3 sec and 1 sec with Augmenting Message Interleaved on a T_s= 6 sec Basis L-13
Figure N-1 TS Report and TC Report Information N-4
Figure N-2 Aircraft Control States N-5
Figure N-3 Constant Vertical Speed Climb at Constant Heading to MCP/FCU Selected Altitude N-9
Figure N-4 Intercept Course to FMS Flight Plan at Constant Altitude N-10
Figure N-5(a) FMS Descent with Intermediate MCP/FCU Selected Altitude N-12
Figure N-5(b) FMS Descent with MCP/FCU Selected Altitude = FMS Target Altitude N-13
Figure N-6 Radius to Fix Turn N-16
Figure N-7 Fly-by Turn N-16
Figure N-8 Constant Vertical Speed Climb and Constant Heading to Intercept an FMS Flight Plan N-20
Figure N-9 Geodesic Path to Fix Lateral Transition N-23
Figure N-10 Fly-By Turn Transition with Turn Start and Turn Endpoints shown N-24
Figure N-11 Direct to ABC Lateral Transition Example N-25
Figure N-12 Direct to Fly-By Lateral Turn Transition N-26
Figure N-13 Example Scenario for TCMI Intent Resequencing N-35
Figure N-14 RNP Lateral Conformance Monitoring For Intent Validation N-37
Figure N-15 Vertical Path Conformance Region for Descent Example N-38
Figure O-1 Required 95th percentile update intervals for State Vector (SV) and intent (TS & TC) reports. O-3
Figure O-2 Encounter Parameters for Worst Case Closure Geometry O-5
Figure O-3 Encounter Parameters for Less Severe Closure Geometry O-5
Figure P-1 Passing Parked Aircraft P-1
Figure P-2 Runway Line-up P-1
Figure P-3 Passing Taxiing Aircraft P-1
Figure P-4 Sample synthetic Vision View P-1
Figure Q-1 Wind Effects on Heading-Referenced Flight Modes Q-2
Figure Q-2 Drift Due to Ramp Cross Wind Q-3

Table of Tables

Table 2-1: Dimensions of Defining Rectangle for Position Reference Point. 32
Table 2-2: Navigation Integrity Categories (NIC). 37
Table 2-3: Navigation Accuracy Categories for Position (NAC_P). 39
Table 2-4: Navigation Accuracy Categories for Velocity (NAC_V). 40
Table 2-5: Surveillance Integrity Level (SIL) Encoding. 41
Table 2-6: Possible Future Encoding for Barometric Altitude Quality. 41
Table 2-7: Expected Information Needed to Support Selected ADS-B Applications 50
Table 2-8: Summary of A/V-to-A/V Performance Assumptions for Support of Indicated Applications. 51
Table 2-9(a): Summary of Expected ATS Provider Surveillance and Conflict Management Current Capabilities for Sample Scenarios 63
Table 2-9(b): Additional Expected Capabilities Appropriate for ADS-B Supported Sample Scenarios.. 63
Table 3-1: Subsystem Classes and Their Features 81
Table 3-2(a): Operational Range and Normalized Transmit/Receive Parameters by Interactive Aircraft Equipage Class 84
Table 3-2(b) Interoperability Ranges in NM for Aircraft Equipage Class Parameters Given in Table 3-2(a) 84
Table 3-3(a): Interactive Aircraft/Vehicle Equipage Type Operational Capabilities 86
Table 3-3(b): Broadcast and Receive Only Equipage Type Operational Capabilities 87
Table 3-4(a): SV Accuracy, Update Interval, and Acquisition Range Requirements 90
Table 3-4(b): MS Accuracy and Acquisition Range Requirements 93
Table 3-4(c) Summary of Air Referenced Velocity Report Acquisition Range and Update Interval Requirements 95
Table 3-4(d): Summary of TS Report Acquisition Range and Update Interval Requirements…..……..97

Table 3-4(e): Summary of TC Report Acquisition Range and Update Intreval Requirements 98
Table 3-5: Number of A/V and Range Distribution. 102
Table 3-6: State Vector Report Definition. 109
Table 3-7: SV Report Mode Values. 117
Table 3-8: Mode-Status (MS) Report Definition. 119
Table 3-9: ADS-B Version Number 120
Table 3-10: Aircraft Size (Length and Width) Codes 122
Table 3-11: Emergency/Priority Status Encoding 122
Table 3-12: ARV Report Capability Flag 124
Table 3-13: TS Report Capability Flag 124
Table 3-14: TC Report Capability Levels 124
Table 3-15: Air Referenced Velocity (ARV) Report Definition. 128
Table 3-16: Airspeed Type Encoding 129
Table 3-17: Target State (TS) Report Definition. 130
Table 3-18: Horizontal Data Available and Horizontal Target Source Indicator Field Values 131
Table 3-19: Horizontal Mode Indicator Values 132
Table 3-20: Vertical Data Available and Vertical Target Source Indicator Field Values 133
Table 3-21: Target Altitude Type Values. 134
Table 3-22: Target Altitude Capability Field Values 134
Table 3-23: Vertical Mode Indicator Values 134
Table 3-24: Trajectory Change (TC) Report Definition. 136
Table 3-25: Horizontal TC Type Encoding and Horizontal TC Report Elements Required For Each Horizontal TC Type 141
Table 3-26: Vertical TC Report Elements For Each Vertical TC Type. 146
Table 3-27: TCP Altitude Type Encoding. 147

Table D-1 Potential Near-Term ADS-B Cockpit Applications D-3
Table D-2 Potential Near-Term ADS-B ATS Surveillance Applications..... D-14
Table E-1 Other ADS-B Applications E-5
Table J-1 Effects of Latency J-13
Table J-2 Report Update Period, Update Probability Values Which Achieve Desired Warning Time for Future Collision Avoidance J-17
Table J-3 Report Update Period and Report Update Probability Simulation Values for Free Flight J-29
Table J-4 Simulation Update Period, Update Probability Combinations, Independent Parallel Approach..... J-37
Table J-5 Required Range At Alert..... J-46
Table K-1 Latency Budget..... K-1
Table L-1 Summary of Message Probabilities of Correct Decode Required for Each Design Alternative in Support of Desired Operational Capabilities L-13
Table M-1 AILS On-Condition Report Definition M-1
Table M-2 Advanced Operations On-Condition Report Definition M-1
Table M-3 Advanced Approach Spacing On-Condition Report Definition M-2
Table N-1 Target State Report N-7
Table N-2 Target State Report Elements for Figure N-3 ..... N-9
Table N-3 Target State Report Elements for Figure N-4 ..... N-10
Table N-4 Trajectory Change Report..... N-14
Table N-5 Trajectory Change Report Elements for Figure N-4 ..... N-18
Table N-6 Trajectory Change Report Elements for Figure N-5a..... N-19
Table N-7(a) Trajectory Change Report Elements for Figure N-8 (Fully Equipped Aircraft) N-21
Table N-7(b) Trajectory Change Report Elements for Figure N-8 (Partially Equipped Aircraft)..... N-22
Table N-8 ADS-B Update Requirements for Intent Reporting..... N-30
Table N-9 Trajectory Change Management Indicator (TCMI) Values..... N-33
Table P-1 Design of Data Classes..... P-4
Table P-2 Size Code Bit Allocation..... P-4
Table P-3 Code Definition P-4
Table P-4 Makes and Modes Considered P-5
Table R-1 Determining NAC_V If $HFOM_R$ and $VFOM_R$ Are Provided..... R-1
Table R-2 Determining NAC_V From a GNSS Receiver Operating in LAAS or WAAS Mode..... R-2
Table R-3: Determining NAC_V When Differential GNSS Corrections Are Not Available..... R-2
Table R-4: Scale Parameter Determination..... R-3
Table R-5: NAC_V Determination, LAAS and WAAS Modes R-4
Table R-6: NAC_V Determination, Autonomous GPS Mode..... R-5

1 Purpose and Scope

1.1 Introduction

This document contains Minimum Aviation System Performance Standards (MASPS) for Automatic Dependent Surveillance-Broadcast (ADS-B). These standards specify operational characteristics that should be useful to designers, manufacturers, installers, service providers and users of an ADS-B system intended for operational use on an international basis. This document provides a view of the system-wide operational use of ADS-B, but does not describe a specific technical implementation or design architecture meeting the operational and technical characteristics defined herein.

The diagram in Figure 1-1 shows the relationships between the ADS-B MASPS and other SC-186 documents, such as the ASA MASPS and the 1090 MHz extended squitter (1090ES) Link Minimum Operational Performance Standards (MOPS). Figure 1-1 also shows the functions under the auspices of SC-186 and those functions outside the scope of SC-186. The ADS-B MASPS accepts system level requirements allocated to the ADS-B link function and derives lower level link specific requirements allocated to the various link subsystems MOPS documents.

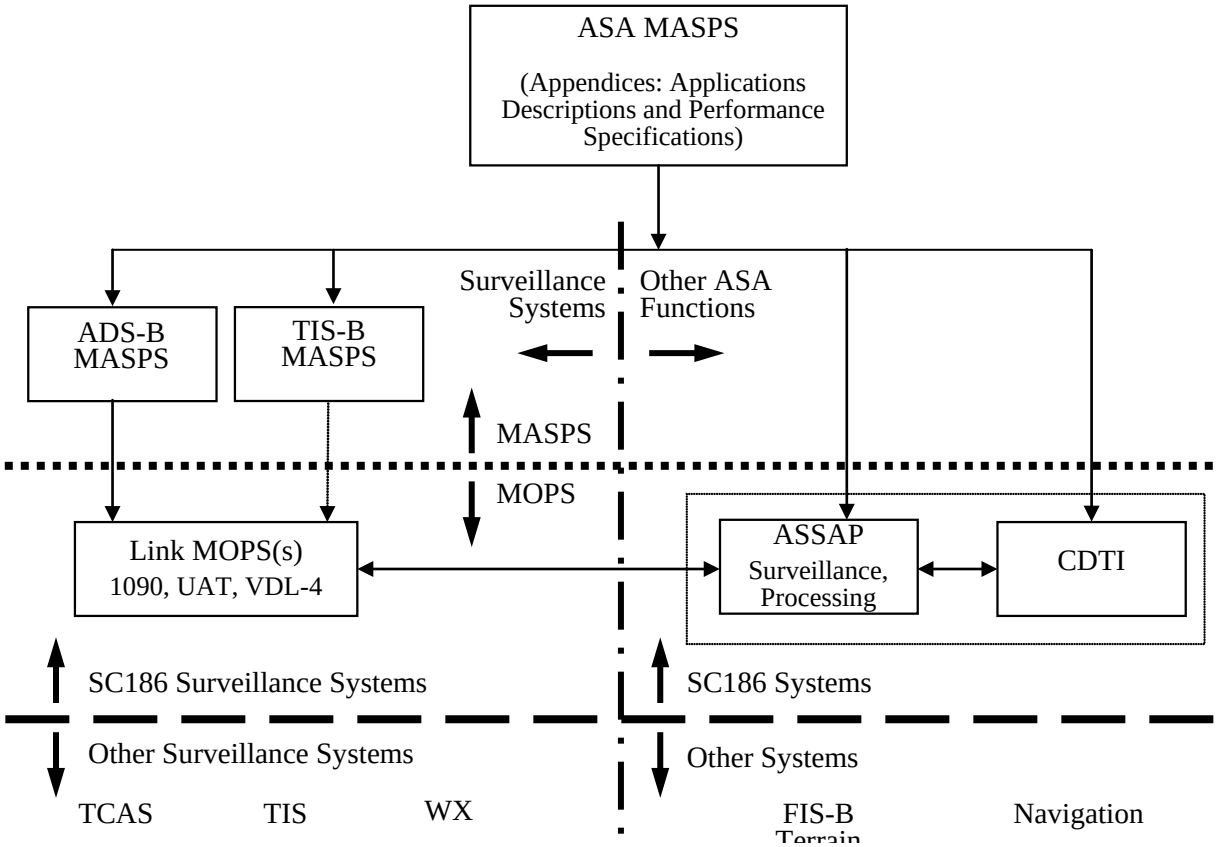


Figure 1-1: Relationship Between ADS-B MASPS And Other SC-186 Documents

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Compliance with these standards is recommended as one means of assuring that the ADS-B system, a component of an end-to-end surveillance system, will perform its intended function satisfactorily. Analyses of proposed applications of ADS-B have focused on ADS-B system performance rather than end-to-end surveillance system requirements. The MASPS may be implemented by one or more regulatory documents and/or advisory documents (e.g., certifications, authorizations, approvals, commissionings, advisory circulars, notices, etc.) and may be implemented in part or in total. Any regulatory application of this document is the sole responsibility of appropriate governmental agencies.

The Long Term Intent material (§2.1.2.19.2 and §3.4.8) in this document represents best engineering judgment at the time of publication of this MASPS. This material is therefore necessarily subject to further validation and refinement. It is not intended that ADS-B link MOPS implement requirements for the broadcast of Long Term Intent based on this version of the ADS-B MASPS. However, this material is intended to be used:

- in link design considerations,
- to assess system capacity and performance, and
- as a basis for application development efforts.

ADS-B does not, by itself, guarantee the viability of the applications envisioned in this document. To support operational use of ADS-B, applications may require that appropriate additional systems be installed on aircraft and that appropriate operational procedures be in place.

Note: ADS-B is a function on an aircraft or surface vehicle that periodically broadcasts its state vector and other information. (ADS-B functional requirements and scope are defined in Section 3.) ADS-B is not to be confused with the applications that it supports, some of which are identified and described conceptually within this MASPS. Specific requirements concerning individual applications will be found in other documents. The reader is advised to contact RTCA for the status and availability of those other documents.

Section 1 of this document describes the ADS-B system and provides information needed to understand the rationale for system characteristics and requirements. It describes typical applications and operational goals, and establishes the basis for the standards stated in Sections 2 through 4. Definitions and assumptions essential to proper understanding of this document are also provided in Section 1.

Section 2 describes operational requirements. It provides specific scenarios for more detailed analysis based on the applications introduced in Section 1 and also sets forth the information exchange requirements for those applications. Beginning in Section 2 each testable requirement is given a number for reference purposes.

Section 3 defines system level performance requirements, defines subsystems, and allocates these requirements to subsystems. Interfaces and equipage classes are defined as well as specific ADS-B requirements, for example, information exchange content, exchange rates, coverage and capacity.

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Section 4 describes the minimum system test procedures to verify that performance meets the system level performance requirements in Section 3. Section 4 lists by reference number each testable requirement contained in the preceding sections.

Acronyms and Definition of Terms are provided in Appendices A and B, respectively. Bibliography and References are provided in Appendix C.

1.2 System Overview

1.2.1 Definition of Automatic Dependent Surveillance Broadcast

ADS-B is a function on an aircraft or a surface vehicle operating within the surface movement area that periodically broadcasts its state vector (horizontal and vertical position, horizontal and vertical velocity) and other information. ADS-B supports improved use of airspace, reduced ceiling/visibility restrictions, improved surface surveillance, and enhanced safety such as conflict management.

When compared to ADS as currently employed in some oceanic regions, the key distinction of ADS-B is that it is a one-way *broadcast* in nature. Under ADS-B, an aircraft periodically broadcasts its own state vector and other information without knowing, a priori, what other aircraft or entities may be receiving it. In addition, the broadcast is made without the expectation of an acknowledgement or reply. With oceanic ADS, on the other hand, provision of such information is usually patterned after two-way Datalink protocols where the end participants are identified and acknowledgments are issued. Further rounding out the definition of ADS-B, it is *automatic* in the sense no pilot or controller action is required for the information to be issued. It is *dependent surveillance* in the sense that the surveillance-type information so obtained depends on the suitable navigation and broadcast capability in the source aircraft.

For the purpose of this document, the term aircraft/vehicle (A/V) will refer to either 1) a machine or device capable of atmospheric flight, or 2) a vehicle on the airport surface movement area (i.e., runways and taxiways). For simplicity, the word *aircraft* is used to refer to aircraft and vehicles, where appropriate. In addition to A/Vs, ADS-B service may be extended to identify obstacles (e.g., an uncharted tower not identified by a current NOTAM). The full set of A/V categories, in the context of ADS-B, is provided in §2.1.2.3. While this section focuses on aviation applications, interoperability between different applications is desirable; for example, search and rescue operations.

ADS-B consists of the following components: a transmitting subsystem that includes a message generation and transmission functions at the source A/V, the propagation medium, and a receiving subsystem that includes message reception and report assembly functions at the receiving A/V or ground systems (Figure 1-2). As described later, some ADS-B participants may be able to transmit but not receive. In addition, some ground-based users may be able to receive but not transmit.

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