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Radijska oprema za VHF podatkovno povezavo zrak-tla, 4. način - Tehnične karakteristike in merilne metode za talno opremo - 2. del: Splošni opis in plast podatkovnih povezav

VHF air-ground Digital Link (VDL) Mode 4 radio equipment - Technical characteristics and methods of measurement for ground-based equipment - Part 2: General description and data link layer

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VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 2: General description and data link layer

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Contents

Intellectual Property Rights	8
Foreword.....	8
Introduction	9
1 Scope	10
2 References	12
2.1 Normative references	12
2.2 Informative references.....	13
3 Definitions and abbreviations.....	13
3.1 General definitions	13
3.2 Definition of bit order.....	16
3.3 Abbreviations	16
4 General description of VDL Mode 4 ground station link layer.....	18
4.1 General	18
4.1.1 Overview of VDL Mode 4.....	18
4.1.2 Relationship to OSI reference model.....	18
4.1.3 VDL Mode 4 services	20
4.1.4 ADS-B Function	20
4.1.5 Operational scenarios.....	21
4.1.6 VDL Mode 4 fundamentals.....	21
4.1.7 Possible configuration of ground equipment	22
4.1.8 Overall structure of specifications for VDL Mode 4	22
4.1.9 Equipment performance verification	24
4.2 Ground quarantine	25
4.3 System timing.....	25
4.4 Net entry	25
4.5 Autotune capability	25
4.6 Autonomous and fixed access	26
5 Minimum performance specification under standard test conditions.....	26
5.1 MAC sublayer	26
5.1.1 Services.....	26
5.1.2 MAC sublayer services	26
5.1.3 MAC sublayer parameters	26
5.1.3.1 General.....	26
5.1.3.2 Parameter M1 (number of slots per superframe).....	27
5.1.4 Time synchronization	27
5.1.4.1 Primary.....	27
5.1.4.2 Secondary.....	27
5.1.4.3 Alignment to UTC second	27
5.1.4.4 Data quality level	27
5.1.5 Slot idle/busy notification.....	28
5.1.5.1 Slot idle detection.....	28
5.1.5.2 Slot busy detection	28
5.1.5.3 Slot occupied detection	28
5.1.5.4 Signal level indication.....	28
5.1.6 Transmission processing	28
5.1.7 Received transmission processing	28
5.2 VSS sublayer	29
5.2.1 Services.....	29
5.2.1.1 Error detection.....	29
5.2.1.2 Channel congestion	29
5.2.2 Burst format	29
5.2.2.1 VSS burst structure	29
5.2.2.2 Version number.....	30

5.2.2.3	Source address.....	30
5.2.2.4	Message ID	30
5.2.2.5	Information field	31
5.2.2.6	Reservation fields.....	31
5.2.2.7	Autonomous/directed flag	32
5.2.3	VSS sublayer parameters	32
5.2.3.1	General	32
5.2.3.2	Parameter VS1 (number of ground quarantined slots).....	33
5.2.3.3	Parameter VS2 (minimum CCI performance).....	33
5.2.3.4	Parameter VS4 (quarantine slot re-use range).....	33
5.2.3.5	Parameter VS5 (maximum burst length).....	34
5.2.4	VSS quality of service parameters	34
5.2.4.1	General	34
5.2.4.2	Parameter Q1 (priority)	34
5.2.4.3	Parameters Q2a to Q2d (slot selection range constraint for level n)	35
5.2.4.4	Parameter Q3 (replace queued data)	36
5.2.4.5	Parameter Q4 (number of available slots).....	36
5.2.5	Received transmission processing	37
5.2.6	Reserved access protocol specification.....	37
5.2.6.1	Reservation table	37
5.2.6.2	Selecting slots for transmission or reservation.....	38
5.2.6.3	Reserved transmissions	39
5.2.6.4	Reservation conflicts	40
5.2.7	Random access protocol specification	41
5.2.7.1	General	41
5.2.7.2	Random access parameters.....	41
5.2.7.3	Random access procedures.....	42
5.2.8	Fixed access protocol specification	42
5.2.8.1	General	42
5.2.8.2	Recommendation	43
5.2.9	Null reservation protocol specification	43
5.2.9.1	Null reservation burst format	43
5.2.10	Periodic broadcast protocol specification.....	43
5.2.10.1	Periodic broadcast reservation burst format	43
5.2.10.2	Periodic broadcast timers	44
5.2.10.3	Periodic broadcast parameters.....	44
5.2.10.4	Periodic broadcast reception procedures	46
5.2.10.5	Periodic broadcast transmission procedures.....	47
5.2.11	Incremental broadcast protocol specification	49
5.2.11.1	Incremental broadcast reservation burst format	49
5.2.11.2	Incremental broadcast parameters	50
5.2.11.3	Incremental broadcast reception procedures	51
5.2.11.4	Incremental broadcast transmission procedures	51
5.2.12	Combined periodic broadcast and incremental broadcast protocol specification	51
5.2.12.1	Combined periodic broadcast and incremental broadcast reservation burst.....	51
5.2.13	Big Negative Dither (BND) broadcast protocol specifications.....	52
5.2.13.1	BND reservation burst format	52
5.2.13.2	BND broadcast parameters.....	52
5.2.13.3	BND broadcast reception procedures	52
5.2.14	Unicast request protocol specification	53
5.2.14.1	Unicast request reservation burst format	53
5.2.14.1a	Unicast request parameters.....	54
5.2.14.2	Unicast request reception procedures	54
5.2.14.3	Unicast request transmission procedures	55
5.2.15	Information transfer request protocol specification	55
5.2.15.1	Information transfer request reservation burst format	55
5.2.15.2	Information transfer request reception procedures	56
5.2.16	Directed request protocol specification.....	57
5.2.16.1	Directed request reservation burst format	57
5.2.16.2	Directed request parameters	60
5.2.16.3	Directed request reception procedures	61
5.2.16.4	Directed request transmission procedures	62

5.2.17	Block reservation protocols specification	63
5.2.17.1	Superframe block reservation burst format	63
5.2.17.2	Second frame block reservation burst format.....	64
5.2.17.3	Superframe block reservation parameters	65
5.2.17.4	Superframe block reservation reception procedures	65
5.2.17.5	Second frame block reservation parameters.....	66
5.2.17.6	Second frame block reservation reception procedures	66
5.2.17.7	Superframe block reservation transmission procedures	67
5.2.17.8	Second frame block reservation transmission procedures.....	67
5.2.18	Response protocol specification	68
5.2.18.1	Response burst format.....	68
5.2.19	General request protocol specification.....	68
5.2.19.1	General request burst format	68
5.2.19.2	General request procedures	69
5.2.20	General response protocol specification	69
5.2.20.1	General response burst format.....	69
5.2.20.2	General response procedures.....	71
5.2.21	Retransmission procedures	71
5.3	DLS sublayer	72
5.3.1	Services	72
5.3.1.1	General	72
5.3.1.2	Data transfer	72
5.3.1.3	Station address encoding	72
5.3.1.4	DLS burst formats	73
5.3.2	DLS system parameters	74
5.3.2.1	Parameter ND4 (maximum length of a UDATA burst)	75
5.3.3	DLS procedures	75
5.3.3.1	Broadcast.....	75
5.3.3.2	DLS not supported	75
5.3.3.3	User data packet reception	75
5.4	Link Management Entity sublayer	75
5.4.1	Services	75
5.4.2	Synchronization burst format.....	76
5.4.2.1	General	76
5.4.2.2	Fixed and variable data fields.....	76
5.4.2.3	Fixed data field format	76
5.4.2.4	Variable data field format	80
5.4.2.5	Synchronization burst request	80
5.4.2.6	Link management burst.....	80
5.4.3	Control (CTRL) parameter formats	81
5.4.3.1	Encoding	81
5.4.3.2	VDL Mode 4 parameter identification	81
5.4.3.3	Ground-initiated modification parameters	81
5.4.3.4	Ground-initiated information parameters	84
5.4.3a	LME timers and parameters	87
5.4.3a.1	General	87
5.4.3a.2	Counter L1 (maximum number of missed reservations) and Timer TL3 (inter miss timer)	88
5.4.4	LME procedures	88
5.4.4.1	Synchronization burst procedures	88
5.4.4.2	Peer Entity Contact Table (PECT)	90
5.4.4.3	Network entry protocol specifications	90
5.4.5	Additional material for ADS-B applications	91
5.4.5.1	Information field formats	91
5.4.5.2	ADS-B request format.....	91
5.5	Additional requirements for ground stations	92
5.5.1	System timing requirements	92
5.5.1.1	Maintenance of Primary time	92
5.5.2	Ground station interface requirements	92
5.5.2.1	Ground station coordination.....	92
5.5.2.2	Network timing requirements.....	92
5.5.2.3	Application interface requirements	93
5.5.2.4	Transmission control requirements	93

5.5.2.5	Superframe block reservation rebroadcast procedures.....	93
5.5.2.6	Fixed transmission parameters	93
5.5.2.7	Protection of fixed access protocol transmissions by ground quarantine	94
5.5.2.8	Protection of fixed access protocol transmissions by use of appropriate reservation protocols.....	94
5.5.2.9	Restriction of autotune reservations	94
5.5.2.10	Transmission time for autotune reservations.....	94
5.5.2.11	Reporting of channel usage	95
5.6	Definitions for compact position reporting	95
5.6.1	Introduction.....	95
5.6.2	Parameter symbols, data types, constants and variables	95
5.6.2.1	Parameter symbols	95
5.6.2.2	Data types.....	95
5.6.2.3	Constants.....	95
5.6.2.4	Variables	95
5.6.2.5	Functions.....	96
5.6.2.6	Patch constants	96
5.6.3	Fixed data field position encoding.....	96
5.6.4	Fixed data field position local decoding	96
5.6.5	Fixed data field position global decoding	96
5.6.6	Position report processing.....	96
6	General design requirements	96
6.1	Controls and indicators.....	96
6.2	Operation of controls.....	96
6.3	Warm up.....	96
6.4	Effects of tests	96
6.5	Software management	97
6.6	Recovery from failure	97
6.6.1	Failure of the VDL equipment.....	97
6.7	Monitoring of proper operation	97
7	Protocol test procedures	97
7.1	General	97
7.1.1	Input voltage	97
7.1.2	Power input frequency	97
7.1.3	Adjustment of equipment.....	98
7.1.4	Equipment configuration	98
7.1.5	Test equipment.....	98
7.1.6	Test equipment precautions	98
7.1.7	Ambient conditions.....	98
7.1.8	Connected loads.....	98
7.1.9	Warm-up period.....	98
7.2	Required test rig	98
7.3	Protocol test-suite description methodology	101
7.4	Detailed protocol test procedures	101
7.4.1	Test-suite overview	101
7.4.2	Declarations	105
7.4.3	Constraints	106
7.4.3.1	Abbreviations	106
7.4.3.1.1	Subfield mnemonics	106
7.4.3.1.2	Special characters used in the subfield definitions	107
7.4.3.1.3	Station addresses and positions	107
7.4.3.1.4	Tables of values for use in CPR test cases	108
7.4.3.1.5	Tables of values for use in content checking test cases	119
7.4.3.1.6	VDL4 burst formats.....	122
7.4.3.2	Test cases	140
7.4.3.2.1	Test case macros	140
7.4.3.2.2	Test case descriptions	142
Annex A (informative):	Cross reference matrix	301
Annex B (informative):	Description of ISO/IEC 9646 Test Methodology.....	317

B.1	Overview of the structure of the ISO/IEC 9646 Test Suites	317
B.2	Test case description	317
B.3	Queue action.....	319
B.4	Repeat construct	319
B.5	Macro definitions	320
B.6	Test case naming	320
Annex C (informative):	Bibliography	321
History		326

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[SIST EN 301 842-2 V1.6.1:2011](#)
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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Aeronautics (AERO).

The present document is part 2 of a multi-part deliverable covering the VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment, as identified below:

- Part 1: "EN for ground equipment";
- Part 2: "General description and data link layer";**
- Part 3: "Additional broadcast aspects";
- Part 4: "Point-to-point functions"; **(standards.iteh.ai)**
- Part 5: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".

The present document is accompanied by an equivalent airborne standard, EN 302-842-10, [11], [12] and [13].parts 1 to 4, covering the VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for airborne equipment.

NOTE: Following the decision taken at the ICAO Aeronautical Communication Panel's WG/M (Bangkok, February 2011), it remains to be seen if ICAO Annex 10 Vol III will be amended changing the recommended tuning frequency range from 108-117,975 MHz to 112-117,975 MHz. The present document will be updated accordingly if the amendment is accepted and made publicly available.

National transposition dates	
Date of adoption of this EN:	19 September 2011
Date of latest announcement of this EN (doa):	31 December 2011
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2012
Date of withdrawal of any conflicting National Standard (dow):	30 June 2012

Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive [i.5]. The modular structure is shown in EG 201 399 [i.7].

The present document states the technical specifications for Very High Frequency (VHF) Digital Link (VDL) Mode 4 ground-based radio transmitters, transceivers and receivers for air-ground communications operating in the VHF band, using Gaussian-filtered Frequency Shift Keying (GFSK) Modulation with 25 kHz channel spacing and capable of tuning to any of the 25 kHz channels from 118,000 MHz to 136,975 MHz as defined in ICAO VHF Digital Link (VDL) Standards and Recommended Practices (SARPs) [i.4].

The present document may be used to produce tests for the assessment of the performance of the equipment. The performance of the equipment submitted for type testing should be representative of the performance of the corresponding production model.

The present document has been written on the assumption that:

- the type test measurements will be performed only once, in an accredited test laboratory and the measurements accepted by the various authorities in order to grant type approval;
- if equipment available on the market is required to be checked it will be tested in accordance with the methods of measurement specified in the present document or a documented alternative approved by the certifying authority;
- equipment comply with EN 301 489-22 [1] and EN 301 842-1 [3].

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1 Scope

The present document applies to the following radio equipment types:

- Very High Frequency (VHF) Digital Link (VDL) Mode 4 ground-based radio transmitters and receivers for air-ground communications operating in the VHF band, using Gaussian-filtered Frequency Shift Keying (GFSK) Modulation with 25 kHz channel spacing and capable of tuning to any of the 25 kHz channels from 118,000 MHz to 136,975 MHz as defined in ICAO VHF Digital Link (VDL) Standards and Recommended Practices (SARPs) [i.4].

The present document provides part 2 of the technical specifications.

The present document is designed to ensure that equipment certified to it will be compatible with the relevant ICAO VDL SARPs [i.4] and ICAO VDL4 Technical Manual [i.1].

Manufacturers should note that in future the tuning range for the ground transceivers may also cover any 25 kHz channel from 108,000 MHz to 117,975 MHz.

The scope of the present document is limited to ground stations. The equivalent specification for airborne stations is EN 302 842 [10], [11], [12] and [13].

The VDL Mode 4 system provides data communication exchanges between aircraft and ground based systems supporting surveillance and communication applications. The supported modes of communication include:

- broadcast and point-to-point communication;
- broadcast services including Automatic Dependent Surveillance-Broadcast (ADS-B), Traffic Information Service-Broadcast (TIS-B) and Flight Information Service-Broadcast (FIS-B) capabilities;
- air-to-air, air-to-ground, ground-to-air and ground mobile services;
- operation without ground infrastructure.

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VDL Mode 4 is designed to be an Air/Ground subsystem of the Aeronautical Telecommunication Network (ATN) [i.2] using the AM(R)S band and it is organized according to the Open Systems Interconnection (OSI) model (defined by ISO). It provides reliable sub network services to the ATN system. Other networks can also be supported but these have not been focussed on in the present document.

The present document specifies functional specifications of VHF communication ground station equipment intended to be used for air-ground and air-air data communications. The present document is derived from the standards and specifications in:

- VDL Mode 4 standards produced under the auspices of the International Civil Aviation Organization (ICAO) [i.1].
- Other relevant standards as defined in clause 2.

It is envisaged that manufacturers may provide equipment supporting:

- broadcast services only;
- point-to-point services only;
- both broadcast and point-to-point services.

EN 301 842-1 [3] deals with tests of the physical layer. The present document defines the core link layer requirements for the VDL Mode 4 ground station necessary to support all types of equipment. This includes a simple position broadcast functionality.

The present document deals with tests of the link layer sufficient to support core link layer functionality, and it also includes requirements and tests sufficient to recognize and respond to transmissions associated with point-to-point communication. The present document does not address requirements for the full ADS-B message set, or for other broadcast applications that can be supported by the VDL Mode 4 equipment. These are covered by EN 301 842-3 [7]. Detailed requirements for point-to-point communication are beyond the scope of the present document, but can be found in EN 301 842-4 [8]. EN 301 842-4 [8] also includes the interface to the Aeronautical Telecommunication Network (ATN) as defined in ATN SARPs [i.2].

As the measured values of equipment performance may be a function of the method of measurement, standard test conditions and methods of test are recommended in the present document.

The present document is organized as follows:

- clause 2 provides references to relevant documents;
- clause 3 provides general definitions and abbreviations used;
- clause 4 describes the VDL Mode 4 ground station link layer;
- clause 5 provides performance specifications for the VDL Mode 4 ground station and ground station co-ordination;
- clause 6 provides general design requirements;
- clause 7 provides protocol tests for core link layer functions;
- annex A provides a detailed cross-reference to the relevant requirements contained in reference [i.1];
- annex B provides a description of the ISO/IEC 9646 [6] Test Methodology;
- annex C provides a Bibliography; (standards.iteh.ai)
- a document history.

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Note that the system can support a very wide range of functions. It is not practical to provide specific tests for all aspects of its functionality. The approach used is to provide detailed tests for the core link layer functionality and to provide tests of those remaining requirements which, if wrongly implemented, could cause a deterioration in the service offered by other VDL Mode 4 stations. Therefore:

- a detailed set of protocol tests are provided for the core link layer functionality necessary to support broadcast functions;
- a detailed test of position encoding and decoding is provided because of the importance of position in the management of the VDL Mode 4 link specifically and the need to support ADS-B applications in general.

Mandating and Recommendation Phrases

- a) "Shall":

the use of the word "Shall" indicates a mandated criterion; i.e. compliance with the particular procedure or specification is mandatory and no alternative may be applied.

- b) "Should":

the use of the word "Should" (and phrases such as "It is recommended that...", etc.) indicates that though the procedure or criterion is regarded as the preferred option, alternative procedures, specifications or criteria may be applied, provided that the manufacturer, installer or tester can provide information or data to adequately support and justify the alternative.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 301 489-22 (V1.3.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 22: Specific conditions for ground based VHF aeronautical mobile and fixed radio equipment".
- [2] ISO/IEC 13239 (2002): "Information technology - Telecommunications and information exchange between systems - High-level Data Link Control (HDLC) procedures".
- [3] ETSI EN 301 842-1 (V1.3.3): "VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 1: EN for ground equipment".
- [4] Void.
- [5] Void.
- [6] ISO/IEC 9646 (all parts): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework".
- [7] ETSI EN 301 842-3 (V1.3.1): "VHF air-ground digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 3: Additional broadcast aspects".
- [8] ETSI EN 301 842-4 (V1.2.2): "VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 4: Point-to-point functions".
- [9] ETSI EN 300 676 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Ground-based VHF hand-held, mobile and fixed radio transmitters, receivers and transceivers for the VHF aeronautical mobile service using amplitude modulation".
- [10] ETSI EN 302 842-1 (V1.2.3): "VHF air-ground and air-air Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for aeronautical mobile (airborne) equipment; Part 1: Physical layer".
- [11] ETSI EN 302 842-2 (V1.3.1): "VHF air-ground and air-air Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for aeronautical mobile (airborne) equipment; Part 2: General description and data link layer".
- [12] ETSI EN 302 842-3 (V1.3.1): "VHF air-ground and air-air Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for aeronautical mobile (airborne) equipment; Part 3: Additional broadcast aspects".
- [13] ETSI EN 302 842-4 (V1.2.2): "VHF air-ground and air-air Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for aeronautical mobile (airborne) equipment; Part 4: Point-to-point functions".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ICAO Doc 9816 AN/448 (First Edition 2004): "Manual on VHF Digital Link (VDL) Mode 4, Part 2: Detailed Technical Specifications".
 - [i.2] ICAO Doc 9705 - AN/956 (Edition 3 - 2002): "Manual of Technical Provisions for the Aeronautical Telecommunications Network (ATN)".
- NOTE: See http://www.icao.int/icao/en/cd_pub_list.htm.
- [i.3] Eurocontrol ESARR 6 (2003): "Software in ATM Systems".
 - [i.4] ICAO Annex 10 to the Convention on International Civil Aviation: "Aeronautical Telecommunications, Volume III: Communication Systems, Part I: Digital Data Communication Systems, Chapter 6".
 - [i.5] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
 - [i.6] Void.
 - [i.7] ETSI EG 201 399: "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of Harmonized Standards for application under the R&TTE Directive".

iTeh STANDARD PREVIEW

3 Definitions and abbreviations (standard.html.ai)

3.1 General definitions

SIST EN 301 842-2 V1.6.1:2011
<http://standards.etsi.org/catalog/standards/sist/ce97aac4-8623-4e7d-abdb-920a3adae730/sist-en-301-842-2-v1-6-1-2011>

For the purposes of the present document, the terms and definitions given in EN 301 842-1 [3], clause 3.1.3 and the following apply:

Automatic Dependent Surveillance-Broadcast (ADS-B): surveillance application transmitting parameters, such as position, track, ground speed and time via a broadcast mode data link for use by any air and ground users requiring it

NOTE: ADS-B is a surveillance service based on aircraft self-determination of position/velocity/time and automatic, periodic, broadcast of this information along with auxiliary data such as aircraft identity (ID), intent information and communications control parameters, etc. ADS-B is intended to support multiple high-level applications and associated services such as cockpit display of traffic information, traffic alert and collision avoidance functionality, enhanced traffic management in the air and on the ground, search and rescue support and others.

Aeronautical Mobile Service (AMS): mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate

Aeronautical Telecommunications Network (ATN): internetwork architecture that allows ground, air/ground, and aircraft data sub networks to interoperate by adopting common interface services and protocols based on the International Organization for Standardization Open Systems Interconnection Reference Model

aircraft address: unique combination of 24 bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance

NOTE: An aircraft may choose not to use this unique address and can use instead a non-unique address.

autotune: procedure by which a VDL Mode 4 ground station may direct a mobile VDL Mode 4 station to transmit on a specified frequency, and with certain characteristics, by sending an uplink burst containing an autotune reservation

burst length: number of slots across which the VDL Mode 4 burst is transmitted