RTCA Special Committee 186, Working Group 5

ADS-B UAT MOPS (DO-282), Revision A

Meeting #16

Proposed Changes to DO-282 that may be considered for Change-1 of DO-282

Maintained by Gary Furr

SUMMARY

This Working Paper contains a number of proposed changes to DO-282 for the purpose of considering the publication of a Change-1. Some of the proposed changes in this Working Paper are clearly corrections to typos and errors! Other proposed changes were found by people who were reviewing the document for themselves or their companies, or trying to verify Test Procedures. Still others are a result of the creation of the UAT SARPS and the UAT SARPS Technical Manual by the ICAO ACP WG-C UAT Subgroup. This list of changes will continue to be maintained, and as changes are accepted by WG-5, this document will become a change history for the production of any published change to DO-282. In the following table, those items shaded in yellow are those that I believe will require discussion by the Working Group for approval.

Changes proposed by WG-5 for changes to the UAT MOPS in preparation for DO-282A

Section	DO-282 Page #	Date Accepted	Description
Various Capitalization		WG Telecon 8/6/03	During the review of the proposed UAT SARPS Technical Manual, it has been pointed out that there were inconsistencies in the treatment of capitalization in some Tables in DO-282 that reference the names of Fields versus those of subfields. This comment will affect numerous field names in several Tables and in paragraph text in DO-282A.
§1.3.1 Figure 1-1 §1.3.3	5 6	WG Telecon 8/6/03	The last MSO should be numbered **3951** in: (1) Figure 1-1, (2) as the last number in the paragraph following Figure 1-1, and (3) at the end of the first sentence in the first paragraph of §1.3.3.
§2.2.2.3 Note 2	18	WG Telecon 8/6/03	In the second line of Note 2, change "frequency offset" **to** "frequency deviation"
§2.2.2.4	18	WG Telecon 8/6/03	To address an issue that arose during the discussion of the UAT SARPS Technical Manual, it appears that for the sake of completeness and to rule out some potential anomalous behavior, §2.2.2.4 should be amended to include a requirement for the horizontal dimension of the eye opening as well as the vertical dimension. Working Paper UAT-WP-15-01 discusses this proposed change and suggests changing the beginning of the text in §2.2.2.4 to read: "The minimum *vertical* opening …" Additionally, add a second paragraph reading "*The minimum horizontal opening of the eye diagram of the transmitted signal (measured at 978 MHz)* ***shall*** *be no less than 0.624 microseconds (0.65 symbol periods) when measured over an entire Long ADS-B Message containing pseudorandom payload data.*"
§2.2.2.6 Figure 2-2	20	Wait for Biggs Action Rpt in UAT Subgroup	In order to clarify the "necessary" or "occupied" bandwidth, the UAT SARPS Subgroup suggested adding a dashed line at the 0.65MHz position in Figure 2-2 and labeling it as "Necessary Bandwidth" in order to conform to the change also made in the Note below the table. Additionally add a vertical label on the right side of the plot in Figure 2-2 indicating "250% Boundary."

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§2.2.2.6 Note below Fig 2-2	20	Wait for Biggs Action Rpt in UAT Subgroup	To conform to a proposed change in the UAT SARPS, in the Note following Figure 2-2: (1) add "+/-" in front of the value 250%, (2) change both occurrences of "occupied bandwidth" **to** "necessary bandwidth" (3) after 1.3MHz, add "(+/- 0.65MHz)" and (4) change the word "determined" **to** "measured"
§2.2.3.2.2.1.4	24	WG Telecon 8/6/03	During the review of the proposed UAT SARPS Technical Manual, it was agreed by the UAT SARPS Subgroup that this paragraph should be re-written for clarity as: "The "UTC Coupled" flag is a 1-bit (bit 1 of byte 7) flag used to indicate whether or not the ground station 1 Pulse Per Second timing is valid. An encoding of ONE represents that the Ground Station is UTC-Coupled (§2.2.5.1). An encoding of ZERO represents that the Ground Station is not UTC-Coupled (§2.2.5.2)."
§2.2.4.5.1.2 Table 2-10	29		We can identify an ADS-B and a TIS-B Message, but we have no separate way to indicate ADS-B re-broadcast. It may be important to distinguish ADS-B from ADS-R in order to do range validation properly. And, we may need to distinguish ADS-R from TIS-B (radar) to properly interpret latency and possibly NIC/NAC/SIL. Proposed Resolution: Consider assigning one of the two reserved states in Table 2-10 to "ADS-B Re-broadcast."
§2.2.4.5.1.3.2	29		Requirements interpretation question: Are self-assigned temporary addresses allowed for Surface Vehicles? In my opinion (Tom Mosher), they should be, as certain customers are likely to not wish to maintain their own address assignment database, and there is no forum this is likely to assume responsibility for coordination of assigned addresses. The Call Sign field likely provides sufficient operational identification of surface vehicles in a local area, operating under the domain of a single authority.
§2.2.4.5.2.1	31	WG Telecon 8/6/03	In paragraph (a), second line, change: "encode the latitude of the ADS-B Transmitting System" **to** "encode the latitude provided to the ADS-B Transmitting System"
§2.2.4.5.2.1	32	WG Telecon 8/6/03	In paragraph (b), second line, change: "encode the latitude of the ADS-B Transmitting System" **to** "encode the longitude provided to the ADS-B Transmitting System"

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§2.2.4.5.2.1 Figure 2-5	33	WG Telecon 8/6/03	During the review of the proposed UAT SARPS Technical Manual, it was agreed by the UAT SARPS Subgroup that the following changes would be made to Figure 2-5 for clarity: 1. In the lower half of the figure, change: “270 degrees E = 90 degrees W” to “90 degrees W” 2. In the lower half of the figure, add a label at the center of the globe indicating “N Pole”
§2.2.4.5.2.2	34		When transmission of Pressure Altitude is inhibited (i.e. made not-available), does that force the Altitude Type field to assume the '1' value (i.e. Geometric Altitude becomes Primary)? The question arises due to a lack of clarity in the last sentence of the 3rd paragraph of this section (i.e. "If only one ALTITUDE TYPE is available, then that Altitude shall be indicated in the "ALTITUDE TYPE" field"). But note that the ALTITUDE TYPE field always refers to both types of altitude, by assigning one of them as "primary" (though it doesn't use that word), and the other as the SECONDARY ALTITUDE. Proposed resolution: 1 - Define the term "Primary altitude" to describe the contents of the "Altitude" field. This improves the readability of the altitude reporting requirements, and also matches up with the text of the Test Procedure in §2.4.4.5.2.2, Step 4, which already uses "Primary Altitude". 2 - Change the last sentence of the 3rd paragraph: "If only one type of Altitude is available, the ALTITUDE TYPE field shall be set to the value that allows that altitude to be the Primary altitude. An additional requirements interpretation question: Can the means of "operationally selecting the preferred ALTITUDE TYPE that is reported…" (see 2nd sentence of 3rd paragraph) be the act of providing Pressure Altitude to the UAT transmitting equipment, over a suitable interface? To wit: • If the UAT is supplied a valid pressure altitude, that means for it to be treated as the Primary altitude. Otherwise, the Geometric Altitude is to be treated as the Primary altitude.
§2.2.4.5.2.5.1 Table 2-17	37	WG Telecon 8/6/03	Working Paper UAT-WP-15-02 describes the error that caused the value of 100 feet to be placed into the “Radio Altitude” column. Replace all “100 feet” values with “50 feet”

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§2.2.4.5.2.5.1 Table 2-17	37	Requires further discussion of the WG Mtg 16 17 Sept	Row 2 of the Table requires that LIGHT aircraft must always report the AIRBORNE condition. Because of a misunderstanding of the intent of DO-242A, this is not strictly required by R3.45 of that document. DO-242A contains no requirement to report the Air/Ground state at all. Instead, DO-242A sets requirements for what elements of the State Vector Report must be present (see DO-242A, §3.4.3.1, first paragraph). In the case of participants that do not have an automatic means of determining their Air/Ground state, the intention of R3.45 was to guarantee particularly that the participant Altitude is included in the State Vector (SV) Report. See DO-242A Table 3-6 for a list of the required SV Report elements by Air/Ground state. Since UAT equipped aircraft always include Altitude in all SV reports, there is no reason for forcing special conditions on UAT participants for the LIGHT emitter category. Proposed Resolution (1): In Table 2-17, use the same conditions for LIGHT participants as the SMALL through HEAVY participants. ***Note**: This resolution would allow the Capstone program to continue using a velocity-based Air/Ground switch, as they presently use.* Proposed Resolution (2): For LIGHT participants, add the following Note to the table: ***Note:** When appropriate, LIGHT participants may use a Ground Speed threshold to determine their Air/Ground status. The Ground Speed threshold used should be appropriate for the performance characteristics of the aircraft.*
§2.2.4.5.2.7.2 Table 2-35	45	WG Telecon 8/6/03	Working Paper UAT-WP-15-03 describes the request to simplify the "Length" and "Width" Category columns by eliminating the left side of all of the inequalities.
§2.2.4.5.3 Table 2-38	46	WG Telecon 8/6/03	During the review of the proposed UAT SARPS Technical Manual, it was requested that a "***Note***" be added after Table 2-38, reading: "*Design of the TIS-B Ground Subsystem is in a preliminary phase. The message structure in Table 2-38 may evolve as this design matures.*"

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§2.2.4.5.3.1	46	WG Telecon 8/6/03	During the review of the proposed UAT SARPS Technical Manual, it was requested that the "***Notes***" in this section be revised to be clearer. The proposed Notes would read: "*1. The "UTC" field shown in Table 2-11 for the State Vector Element is not provided for TIS-B transmissions. The "UTC Coupled" status of the ground station transmitting TIS-B information is available in the UAT Ground Uplink Message (§2.2.3.2.2.1.4)"* and *2. The application that uses TIS-B reports is assumed to make appropriate checks for a TIS-B Site ID of value ZERO. If the Address Qualifier shown in Table 2-10 indicates that this is a TIS-B Message, and the TIS-B SITE ID indicates a value of ZERO, an error condition is indicated."*
§2.2.4.5.4.5 Table 2-43	51		The UAT MOPS at present contains no requirements on use of the MOPS Version field by an ADS-B receiver. The only requirement is that it be transmitted, and that it be the value ONE. At a minimum, some guidance on how to use the Version Number would be appropriate. Proposed Resolution: Add Note 2 below Table 2-43 stating: "*It is assumed that future changes to the UAT MOPS will be backward-compatible with previous versions. Given this, the function of the UAT MOPS Version Number is to support forward compatibility with future revisions of these MOPS. For example, future MOPS Version UAT equipment may safely assume that it may ignore any "reserved" data fields in received messages from the earlier versions of the MOPS. Also, future MOPS Version equipment should ignore the content of all reserved fields until the receiving equipment obtains a participant's MOPS Version number. Fields that are defined in a earlier version of the MOPS may be relied upon to remain consistent with later MOPS versions.*"
§2.2.4.5.4.12.2	54	WG Telecon 8/6/03	As per discussion in Working Paper UAT-WP-15-04, there appears to have been an inconsistency between the TCAS equipment interface requirements in the ADS-B MASPS and the UAT MOPS. This analysis is supported by discussion of the UAT SARPS Subgroup and the proposed changes are consistent with changes made to the UAT SARPS Technical Manual. Following the suggested changes in UAT-WP-15-04, the sentence in the ADS-B MASPS §3.4.4.9.1, which contains the requirement R3.102-B, will be inserted prior to the last sentence in the first paragraph of §2.2.4.5.4.12.2. Additionally, in the second existing paragraph, the last word will be changed from "ZERO" to "ONE." Finally, the "*Note*" from the ADS-B MASPS §3.4.4.9.1 will be inserted after the second paragraph.

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§2.2.4.5.4.13.1	55	WG Telecon 8/6/03	As per discussion in Working Paper UAT-WP-15-04, there appears to have been an inconsistency between the TCAS equipment interface requirements in the ADS-B MASPS and the UAT MOPS. This analysis is supported by discussion of the UAT SARPS Subgroup and the proposed changes are consistent with changes made to the UAT SARPS Technical Manual. Following the suggested changes in UAT-WP-15-04, the sentence in the ADS-B MASPS §3.4.4.10.1, which contains the requirement R3.110-B, will be inserted prior to the last sentence in the first paragraph of §2.2.4.5.4.13.1. Additionally, in the second existing paragraph, the last word will be changed from "ZERO" to "ONE."
§2.2.5.1	63	WG Telecon 8/6/03	During the review of the proposed UAT SARPS Technical Manual, it was requested by the UAT SARPS Subgroup that the second sentence of the "***Note***" in this section be re-written as: *"Short term GNSS outages are mitigated by UAT ground infrastructure providing timing information and/or by the ability of UAT avionics to prevent Airborne UAT Transmitting Subsystems from transmitting in the Ground Uplink Segment for a minimum of 20 minutes in the absence of GNSS (§2.2.5.2 [d])."*
§2.2.6.1.2	66	WG Telecon 8/6/03	In Note 2 under Table 2-63, second line change "Trajectory State" **to** "Target State"
§2.2.7.1 Table 2-64	69	WG Telecon 8/6/03	Element #13 (Track Angle) is listed as Mandatory for Class A1L. The requirement in §2.2.4.5.2.6 is that while in the GROUND state, the State Vector data includes Ground Speed and either Heading or Track Angle. It makes little sense for Ground Speed and Heading interfaces to be Optional, but a Track Angle interface to be Mandatory, as shown in Table 2-64. <u>Proposed Resolution:</u> Mark the Track Angle interface as Optional for A1L.
§2.2.8.2.1.1	73	WG Telecon 8/6/03	In the title, change "is desired" **to** "as desired"
§2.2.8.2.1.2	73	WG Telecon 8/6/03	In the title, change "is desired" **to** "as desired"

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§2.2.8.2.1.2	73	WG Telecon 8/6/03	To conform to a proposed addition to the UAT SARPS Technical Manual, insert a new paragraph entitled "Basic UAT ADS-B Message as Desired Signal." Copy the existing text of §2.2.8.2.1.1 for "long" and change the desired signal level to "-94dBm."
§2.2.8.2.1.3 (new)	73	WG Telecon 8/6/03	The existing §2.2.8.2.1.2 will be renumbered to §2.2.8.2.1.3 if the proposal to insert a new paragraph is accepted. However, in the published §2.2.8.2.1.2, in order to have consistency with the ICAO VDL documentation, it is proposed that subparagraph (a) be changed from a value of 600 knots **to a value** of 850 knots, and that a ***Note*** be added under (a) stating that: ***Note:*** *The 850 knot ground station closure rate is derived from a 600 knot true air speed, added to a 250 knot worst-case wind velocity. The 1200 knot air-to-air closure remains valid because both aircraft are assumed to be within the same air mass, so the wind velocity makes no difference to the closure rate.*
§2.2.8.3.3	77	Tom Mosher Action to review with Bachman & Valovage	The requirements for processing ADS-B sync Trigger events do not provide a minimum requirement for the time interval between overlapping message events. (i.e. gives no guidance on the rate of overlapping messages). This implies that all successful messages may be overlapping messages. The test procedure (§2.4.8.3.3, page 252) presents without justification that 100 overlapping messages per second is sufficient to validate this requirement. Proposed Resolution: Review the requirement and test procedure to determine if the requirement is fully specified, and if the test procedure provides appropriate validation. SEE WORKING PAPER UAT-WP-16-02
§2.2.8.3.5	78		During the review of the UAT SARPS Technical Manual, it was agreed by the UAT SARPS Subgroup that in writing this requirement, we forgot about the reference point for the measurement. Therefore, to conform to a proposed change to this requirement in the UAT SARPS Technical Manual, it is proposed to revise subparagraph (c) to read: "*Accuracy of +/- 500 nanoseconds relative to the optimum sample point of the first bit of the synchronization sequence applied at the receiver terminals for UAT equipment using either an internal or external UTC Coupled time source.*"

Section	DO-282 Page #	Date Accepted	Description
§2.2.12	82		During the review of the UAT SARPS Technical Manual, it was agreed by the UAT SARPS Subgroup that the title of this requirement in the Tech Manual would be changed to "Mutual Suppression Pulses," and that the text of this section will be changed to be: a. UAT equipment **shall** provide an output suitable for sending suppression signals. b. UAT equipment **shall not** respond to suppression signals. ***Note:*** *UAT equipment is not to inhibit or delay its transmissions based on suppression signals. There is no need to desensitize the UAT receiver based on suppression signals.*
§2.3.1 Table 2-70	91	WG Telecon 8/6/03	To conform to a proposed addition to the UAT SARPS Technical Manual, it is proposed that we add a new paragraph §2.3.2.12 entitled "Basic UAT ADS-B Message as Desired Signal." Indicate appropriate tests for the new §2.3.2.12. Increase all of the following paragraph numbers in the 2.3.2.13 through 20 range.
§2.3.2.11	95	WG Telecon 8/6/03	In the title, change "Is Desired" **to** "As Desired"
§2.3.2.12	95	WG Telecon 8/6/03	In the title, change "Is Desired" **to** "As Desired"
§2.3.2.12	95	WG Telecon 8/6/03	To conform to a proposed addition to the UAT SARPS Technical Manual, it is proposed that we add a new paragraph entitled "Basic UAT ADS-B Message as Desired Signal." Reference the correct test procedure paragraph.
§2.4.2.1 Table 2-71	98		Working Paper UAT-WP-15-13 raises concerns about using the root raised cosine filter when setting up the Vector Signal Analyzer for this test procedure. Further investigation will be performed by various individuals and reported on during the 17 September 2003 WG Meeting #16 so that a conclusion may be reached on what change, if any, to apply here. Proposed Resolution: (Tom Mosher) For the measurement filter selection, replace "root raised cosine" with "low pass".

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§2.4.2.4	101	WG Telecon 8/6/03	Pursuant to the acceptance of the change suggested in Working Paper UAT-WP-15-01 for §2.2.2.4, update the Purpose/Introduction with the new text from the requirement change in §2.2.2.4, then re-write the test procedure to accommodate the additional requirement.
2.4.4.5.2	125		ALTITUDE TYPE Test Procedure: Steps 1, 3, and 4 says to provide "valid non-zero altitude information". The term "non-zero" is redundant, since sea-level is a perfectly valid altitude. Proposed Resolution: Delete the phrase "non-zero" from the text of Steps 1, 3, and 4. The 2nd sentence of Step 1 says to verify the test procedures for Message Types, but none of the remaining test procedure steps make any mention of Message Types (since the Altitude field is included in the basic State Vector which is common to all messages). Proposed Resolution: Delete the 2nd sentence of Step 1. In the title of Step 3, change the phrase "in Failure Mode" to "not available". In Step 3, 5th paragraph, end of the first sentence, add the phrase "and resume the input of Barometric Pressure Altitude."
§2.4.4.5.4.3.1 Table 2-91	164	WG Telecon 8/6/03	In the “Call Sign Character” column, in the row specific to the “Small – 15,500 to 75,000 lbs” Emitter Category, change the “Call Sign” value from “KG000000” **to** “MG000000”
§2.4.4.5.4.3.2 Table 2-92	165	WG Telecon 8/6/03	Numerous corrections to the “Call Sign Characters” values associated with the Binary Encoding for Bytes 20 and 21. No changes to any of the Binary Encoding values.
§2.4.4.5.4.3.3 Table 2-93	166	WG Telecon 8/6/03	Numerous corrections to the “Call Sign Characters” values associated with the Binary Encoding for Bytes 22 and 23. These changes are the same as applied to Table 2-92 Call Sign Characters. No changes to any of the Binary Encoding values.

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§2.4.4.5.4.12.2	173	WG Telecon 8/6/03	As per changes suggested in Working Paper UAT-WP-15-04, modify the Purpose/Introduction to be consistent with §2.2.4.5.4.12.2. Add an additional Test Procedure step to test the new requirement being added in §2.2.4.5.4.12.2 and alter Step 3 to test for a condition of "ONE" instead of "ZERO."
§2.4.4.5.4.13.1	174	WG Telecon 8/6/03	As per changes suggested in Working Paper UAT-WP-15-04, modify the Purpose/Introduction to be consistent with §2.2.4.5.4.13.1. Add an additional Test Procedure step to test the new requirement being added in §2.2.4.5.4.13.1 and alter Step 3 to test for a condition of "ONE" instead of "ZERO."
§2.4.7.1 Table 2-98	202	WG Telecon 8/6/03	Element #13 (Track Angle) is listed as Mandatory for Class A1L. The requirement in §2.2.4.5.2.6 is that while in the GROUND state, the State Vector data includes Ground Speed and either Heading or Track Angle. It makes little sense for Ground Speed and Heading interfaces to be Optional, but a Track Angle interface to be Mandatory, as shown in Table 2-98. Proposed Resolution: Mark the Track Angle interface as Optional for A1L.
§2.4.8.2.1.1	216	WG Telecon 8/6/03	In the title, change "Is Desired" **to** "As Desired"
§2.4.8.2.1.2	217	WG Telecon 8/6/03	In the title, change "Is Desired" **to** "As Desired"
§2.4.8.2.1.2	217	WG Telecon 8/6/03	To conform to a proposed addition to the UAT SARPS Technical Manual, it is proposed that we add a new paragraph §2.4.8.2.1.2 entitled "Basic UAT ADS-B Message as Desired Signal." Write a new Test Procedure for this new requirement.
§2.4.8.2.1.3 (new)	217 218	WG Telecon 8/6/03	The existing §2.4.8.2.1.2 will be renumbered to §2.4.8.2.1.3. However, in the published §2.4.8.2.1.2, in order to have consistency with the ICAO VDL documentation, it is proposed that in the "Purpose/Introduction" subparagraph "(a)" there be a change from a value of 600 knots to a value of 850 knots. Additional changes would be required to the "Equipment Required" section and possibly to the "Measurement Procedures."
§2.4.8.3.1.2 Table 2-105 Table 2-108	244 247	WG Telecon 8/6/03	Row 2 of Table 2-105 and Row 6 of Table 108 have a font size larger than the other rows causing the columns not to line up with the other rows.

Section	DO-282 Page #	Date Accepted	Description
§2.4.8.3.3	252		The requirements for processing ADS-B sync Trigger events do not provide a minimum requirement for the time interval between overlapping message events. (i.e. gives no guidance on the rate of overlapping messages). This implies that all successful messages may be overlapping messages. This test procedure presents without justification that 100 overlapping messages per second are sufficient to validate this requirement. Proposed Resolution: Review the requirement and test procedure to determine if the requirement is fully specified, and if the test procedure provides appropriate validation.
§2.4.8.3.5	257		If the change is accepted for §2.2.8.3.5 suggested above, then the Test Procedure must be updated to reflect the corrected requirements text for subparagraph (c).
§2.4.10.3	262		The existing test procedure in this section requires the use of an external report interface, which is inconsistent with other requirements in DO-282, as described in Working Paper UAT-WP-15-09. Suggestions are made in the Working Paper for modifying the "Measurement Procedure" text, and Steps 3 and 6. This topic will be further discussed during the 17 September 2003 WG Meeting #16 to ensure WG agreement with the proposal of UAT-WP-15-09.
§2.4.12	265		Because of the proposed change in §2.2.12 --- it will become necessary to write a Test Procedure here, and/or refer to the proposed new Appendix on the Diplexer.
Appendix C Table C-1	C-4		• Payload Type Code is shown as 4 bits, should be 5. (i.e. '00000') • Address Qualifier is shown as 4 bits, should be 3 (i.e. '000') No other changes to Table C-1 are necessary.

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Appendix C Table C-2	C-6		• Payload Type Code "Value" column should be '1', not '0', and should be represented as '00001'. As published, the example represents Payload Type Code 2. • Address Qualifier is shown as 4 bits, should be 3 (i.e. '000') • Data Field label "Participant Category Code" should read "Emitter Category" • For completeness, the description of the Emitter Category should indicate that the "Small" category is represented by the character code '2'. • The phrase "Flight ID" should be replaced by "Call Sign". • The character string **AB** should be represented in quotes, indicating that these characters are members of the radix-40 character set. Similarly, the character strings **CD1** and **234** should be represented in quotes as well.
Appendix C	C-7		Because of the error in the Payload Type in Table C-2, the FEC Parity Bits for this example are incorrect and must be revised. The original author of Appendix C would be the best candidate to provide the corrections.
Appendix H	H-6		In the last sentence of the paragraph under Figure H-2, it is stated that: "*Note that prior to the synchronization sequence (i.e., during ramp up), the waveform is assumed to be modulated with zeroes as specified in the MOPS.*" However, the MOPS contains no such requirement during the ramp-up period. Proposed Resolution: In the interest of clarity, I suggest that we replace the sentence with the following: "Note that prior to the synchronization sequence (i.e., during ramp up), the waveform is assumed to be modulated with zeroes. Although the MOPS do not specify the type of modulation to be applied prior to the synchronization sequence, an input of some kind is required by the Nyquist filter, and the all zero bit pattern is shown as a representative example."