| **Page** | **Section** | **Line** | **Type** | **Comment/ Rationale** | **Source of Comment (Name/Agency)** | **Suggested Disposition** | **Disposition**  **(Completed by Principal Editor)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1-1 | 1.1.2 | 3 | ed/te | The word "may" is "privileged" in the CCSDS and is not generally allowed in non-normative sections of the document. NOTE: This restriction was not rigidly enforced when the ADM was originally written. | David S. Berry / NASA | From: "may"  To: "can" |  |
| 1-1 | 1.2.1 | 3 | ed/te | The word "may" is "privileged" in the CCSDS and is not generally allowed in non-normative sections of the document. | David S. Berry / NASA | From: "... and may help..."  To: "... and can help..." |  |
| 1-1 | 1.2.1 | 7 | ed/te | The word "should" is "privileged" in the CCSDS and is not generally allowed in non-normative sections of the document. NOTE: This restriction was not rigidly enforced when the ADM was originally written. | David S. Berry / NASA | From: "... should be specified..."  To: "... can be specified..."  Alternatively:  From: "...should be specified via Interface Control Document (ICD) between ..."  To: "... is subject to agreement between... " |  |
| 1-1 | 1.2.2 | 3 | ed/te | The word "should" is "privileged" in the CCSDS and is not generally allowed in non-normative sections of the document. | David S. Berry / NASA | End statement after "...outside the scope  of this document". Then remove reference to ICD in Annex G, list item 2, section 1.2.2 |  |
| 1-1 | 1.2.3 | 2-3 | ed/te | The word "should" is "privileged" in the CCSDS and is not generally allowed in non-normative sections of the document. | David S. Berry / NASA | From: Agencies should specify, via ICD, the ASCII file format to be exchanged (Keyword Value Notation [KVN] or XML).  To: "The format to be exchanged (Keyword Value Notation (KVN) or XML) is subject to agreement between exchange partners." |  |
| 1-2 | 1.4.14 | 2-3 | ed/te | The word "should" is "privileged" in the CCSDS and is not generally allowed in non-normative sections of the document. | David S. Berry / NASA | From: "...should be covered..."  To: "...to cover..." |  |
| 2-2 | 2.5.1 | 1 | ed/te | The word "may" is "privileged" in the CCSDS and is not generally allowed in non-normative sections of the document. | David S. Berry / NASA | From: "... may be provided..."  To: "... can be provided..." |  |
| 2-2 | 2.5.1 | 3 | ed/te | The word "must" is "privileged" in the CCSDS and is not generally allowed in non-normative sections of the document. NOTE: This restriction was not rigidly enforced when the ADM was originally written. | David S. Berry / NASA | From: "... must be used."  To: "... are necessary." |  |
| 3-3 | 3.1.4 | 3 | ed/te | Contains a "shall" regarding file transmission. We don't have a way to enforce this requirement. We've changed in other documents to "should". | David S. Berry / NASA | From: The method of exchanging APMs  shall be decided...  To: The method of exchanging APMs  should be decided...  Also consider wording in 5.1.4 to remove reference to ICD. |  |
| 3-6 | Table 3-2 |  | te | CENTER\_NAME: it seems erroneous to refer to this as "and origin of the reference frame" since none of the other \*FRAME\* keywords in the ADM necessarily are referenced to a frame associated with the orbit center. | David S. Berry / NASA | Remove the phrase "and origin of the reference frame" |  |
| 3-6 | Table 3-2 |  | ed | TIME\_SYSTEM: Uses a different method to point to the SANA Registry than the CENTER\_NAME keyword that immediately precedes it. | David S. Berry / NASA | Recommend that a consistent approach be used. |  |
| 3-7 | 3.2.4.5 |  | ed | Awkward wording. | David S. Berry / NASA | From: "All data, except for the maneuver ones shall..."  To: "All data, except for maneuver data, shall... |  |
| 3-9  3-10 | Table 3-3 |  | ed | MANEUVER\_START and MANEUVER\_STOP | David S. Berry / NASA | You may want to consider using the MAN\_START and MAN\_STOP that are used for the ACM. |  |
| 3-10 | 3.2.5 |  | te | Somewhere in this section there should be an indication that example APMs can be found in Annex D. | David S. Berry / NASA | Consider adding a statement indicating where users can find examples. Maybe a section "3.2.5.3 Examples"? |  |
| 4-11 | 4.1.2 | 3 | ed/te | Contains a "shall" regarding file transmission. We don't have a way to enforce this requirement. We've changed in other documents to "should". | David S. Berry / NASA | From: The method of exchanging AEMs  shall be decided...  To: The method of exchanging AEMs  should be agreed to... |  |
| 4-11 | 4.1.2 |  | ed/te | Contains 2 references to using an ICD. | David S. Berry / NASA | Consider wording to remove reference to ICD. It may be sufficient to end each sentence after "... participating agencies." We can let the exchange partners decide if they want to document the agreement. |  |
| 4-15 | Table 4-3 |  | te | CENTER\_NAME: it seems erroneous to refer to this as "and origin of the reference frame" since none of the other \*FRAME\* keywords in the ADM necessarily are referenced to a frame associated with the orbit center. | David S. Berry / NASA | Remove the phrase "and origin of the reference frame" |  |
| 4-16 | Table 4-3 |  | te | ANGVEL\_FRAME: specifies that this keyword is "applicable only if ATTITUDE\_TYPE specifies the use of rates in conjunction with either quaternions or Euler angles." It seems that "rates" is ambiguous here because the EULER\_ANGLE/DERIVATIVE and \*/ANGVEL values include rates that have the same rate-based units. | David S. Berry / NASA | Should "rates" be replaced by "angular velocities"? As written, the ANGVEL\_FRAME definition implies that it should be included for EULER\_ANGLE/DERIVATIVE data |  |
| 4-17 | 4.2.5 |  | te | Somewhere in this section there should be an indication that example AEMs can be found in Annex D. | David S. Berry / NASA | Consider adding a statement indicating where users can find examples. Maybe a section "4.2.6.3 Examples"? |  |
| 4-19 | 4.2.6.1 | 3 | ed/te | Readers may not know (or recall) what an OEM is. | David S. Berry / NASA | Maybe add (reference [6]) after "OEM". |  |
| 5-22 | 5.2.2.3 | 4 | ed | Refers reader to section 7.5.10 for epoch formatting, but that section isn't present. | David S. Berry / NASA | From: 7.5.10  To: 7.7.9 (or 7.7, as is used in most other references to time in this document. |  |
| 5-22 | 5.2.2.3 |  | ed | The sentence without the parenthesized portion is a bit redundant. | David S. Berry / NASA | From: "or an absolute time (e.g., ... 7.5.10) epoch time."  To: or an absolute time (e.g., ...7.7). |  |
| 5-22 | 5.2.2.4 |  | ed/te | "It is not permitted..." doesn't meet CCSDS terminology convention. | David S. Berry / NASA | From: "It is not permitted to mix..."  To: "An ACM must not mix.." |  |
| 5-22 | 5.2.3.2 | 4 | ed | Refers reader to Table 4-2, but that is an AEM table | David S. Berry / NASA | From: "table 4-2"  To: "table 5-2" |  |
| 5-23 | 5.2.4.6 |  | ed | This requirement seems like it should be moved and re-numbered 5.2.4.1... it's a very definitive statement, but it currently is situated after a reqiurement about a particular value in the metadata. | David S. Berry / NASA | Consider placement of this requirement earlier in the section. |  |
| 5-24 to  5-25 | Table 5-3 |  | ed/te | I don't think the column "Any ACM sections relying upon this field?" serves a useful purpose. Presumably any/all of the sections rely to some extent on the metadata ("data about data") section. For example, "START\_TIME" and "STOP\_TIME" explicitly refer to other sections of the ACM. Dan appears to have removed this column from the OCM (I recall making a similar statement about the OCM). It is also potentially confusing for the user because it is right next to the "Mandatory" column which has similar value contents (i.e., "Yes", "No"). It would be easy to mix them up. | David S. Berry / NASA | Consider removing this column from Table 5-3. |  |
| 5-24  5-25 | Table 5-3 |  | te | META\_START and META\_STOP have "Mandatory" set to "n/a". These should be mandatory, consistent with all other ACM section delimiters. | David S. Berry / NASA | From: "n/a"  To: "Yes" |  |
| 5-24 | Table 5-3 |  | ed | Starting with "INTERNATIONAL\_DESIGNATOR" and ending with "OBJECT\_DESIGNATOR" it looks like example values are placed in the "Mandatory" column. | David S. Berry / NASA | Move the example values one column to the left and populate the "Mandatory" column, probably with "No" values. |  |
| 5-24 | Table 5-3 |  | ed | CATALOG\_NAME has an extra closing parenthesis at the end | David S. Berry / NASA | From: "... obtained)."  To: "... obtained." |  |
| 5-24 | Table 5-3 |  | te | OBJECT\_DESIGNATOR: I don't know why this is characterized as "unique". Maybe it should be described as the designator in the catalog listed in the catalog specified by "CATALOG\_NAME". | David S. Berry / NASA | Consider rewording description. |  |
| 5-25 | Table 5-3 |  | te | CENTER\_NAME: it seems erroneous to refer to this as "and origin of the reference frame" since none of the other \*FRAME\* keywords in the ADM necessarily are referenced to a frame associated with the orbit center. | David S. Berry / NASA | Remove the phrase "and origin of the reference frame" |  |
| 5-25 | Table 5-3 |  | te | Note that "CENTER\_NAME" and "TIME\_SYSTEM" use different methods to refer the user to where they can find acceptable values. | David S. Berry / NASA | Use consistent method throughout document. |  |
| 5-25 | Table 5-3 |  | ed | ACM\_DATA\_ELEMENTS: The example value has an "[H2]" after "COVARIANCE" that doesn't make sense. | David S. Berry / NASA | Remove "[H2]" |  |
| 5-25 | Table 5-3 |  | te | START\_TIME and STOP\_TIME examples only show relative values. | David S. Berry / NASA | Consider showing an absolute epoch in eithe START\_TIME or STOP\_TIME. |  |
| 5-25 | 5.2.5.2 |  | te | Indicates that "Keyword values shall be provided in the units specified in the Units column of Table 5-4". However, every keyword has a "Units" setting of "n/a". | David S. Berry / NASA | I think the requirement is superfluous and should be deleted. Given the conventions Dan has chosen for the OCM, it may be desirable to add a keyword "ATT\_UNITS" right before the "Insert attitude lines here" line. The value for this new keyword will indicate item by item the units for the specified attitude lines that follow. |  |
| 5-26 | 5.2.5.8 |  | te | This requirement seems to contradict the statement in 5.2.2.3 | David S. Berry / NASA | Consider which is desired: either relative only or choice of relative/absolute. Depending on the decision, 5.2.2.4 may need to be changed also. |  |
| 5-26 | 5.2.5.9 |  | te | In the latest issue of ODM/OCM, Dan has moved away from duplicate time tags (decided during Spring Meetings). | David S. Berry / NASA | Consider moving away from duplicate time tags in the data. |  |
| 5-27 | Table 5-4 |  | ed | Change "Simulated" to "SIMULATED" | David S. Berry / NASA | Per 7.7.6 could also use "simulated" |  |
| 5-28 | 5.2.6.7 |  | ed | Refers to [H2]. I think this is supposed to be [I2] | David S. Berry / NASA | From: [H2]  To: [I2] |  |
| 5-28 | Table 5-5 |  | te | Given the definition of I\*\* and CP keywords, it seems like this section would be a good place to specify exactly which frame is the spacecraft's primary body frame. | David S. Berry / NASA | Consider adding a keyword for identifying the spacecraft's primary body frame. |  |
| 5-28 | Table 5-5 |  | ed | Should "MASS" and "FUEL\_MASS" be closer together in the table? | David S. Berry / NASA | Consider |  |
| 5-28 | Table 5-5 |  | te | "MASS" specifies that it is at EPOCH\_TZERO; it is only implied for FUEL\_MASS. | David S. Berry / NASA | Should FUEL\_MASS be specifically referenced to EPOCH\_TZERO? Or should there be a general statement in Section 5.2.6 that all values in the Table 5-5 are taken at EPOCH\_TZERO? |  |
| 5-29 | 5.2.7.5 |  | te | This requirement seems to contradict the statement in 5.2.2.3 | David S. Berry / NASA | Consider which is desired: either relative only or choice of relative/absolute. Depending on the decision, 5.2.2.4 may need to be changed also. |  |
| 5-30 | Table 5-6 |  | ed/te | ATT\_BASIS: Should this be COV\_BASIS? COV\_BASIS would be symmetric with the OCM. Additionally, since the keyword ATT\_BASIS is used here, and presumably the covariance data is related to the attitude data, is it reasonable to assume that the attitude ATT\_BASIS and covariance ATT\_BASIS should always be the same? If so, then maybe a "BASIS" keyword is not necessary in the COV section, | David S. Berry / NASA | Consider. |  |
| 5-30 | Table 5-6 |  | ed | Change "Simulated" to "SIMULATED" | David S. Berry / NASA | Per 7.7.6 could also use "simulated" |  |
| 5-30 | Table 5-6 |  | te | Consider adding a "COV\_UNITS" keyword | David S. Berry / NASA | Given the conventions Dan has chosen for the OCM, it may be desirable to add a keyword "COV\_UNITS" right before the "Insert covariance data here" line. The value for this new keyword will indicate item by item the units for the specified covariance lines that follow. |  |
| 5-30 | 5.2.8.5 |  | ed/te | Says "The ‘MAN\_PURPOSE’ keyword must appear before the first line of any maneuver  time history data.", however, this keyword is shown as optional in the "Mandatory" column. | David S. Berry / NASA | Resolve the inconsistency. |  |
| 5-30 | 5.2.8.6 |  | te | This requirement seems to contradict the statement in 5.2.2.3 | David S. Berry / NASA | Consider which is desired: either relative only or choice of relative/absolute. Depending on the decision, 5.2.2.4 may need to be changed also. |  |
| 5-31 | Table 5-7 |  | ed | Minor typo in MAN\_PREV\_ID line 4 | David S. Berry / NASA | From: "maneuver s"  To: "maneuvers" |  |
| 5-31 | Table 5-7 |  | te | Should MAN\_BEGIN be mandatory? Should either MAN\_END or MAN\_DURATION be mandatory? | David S. Berry / NASA | It's difficult to see how the maneuver section might be useful without some information like this. |  |
| 5-31 | Table 5-7 |  | ed/te | Based on 7.8.1.1(c) the units for TARGET\_MOMENTUM should N\*m\*s | David S. Berry / NASA | From: "N m s"  To: "N\*m\*s" |  |
| 5-33 | Table 5-9 |  | ed/te | Seems like at least one user defined keyword would be mandatory if the section is included... it wouldn't make sense to define a user defined parameter section and not have at least one user defined keyword/parameter. | David S. Berry / NASA | Consider making mandatory "Yes". |  |
| 6-35 | 6-45 |  | ed/te | This section needs to be rewritten to ensure compliance with the KVN sections 3-5 and add the ACM/XML. | David S. Berry / NASA | I will provide a new Section 6. |  |
| 7-1 | 7.5.1  7.5.2 |  | te | 7.5.1 says line length of ACM is 254, 7.5.2 says it is of arbitrary length. | David S. Berry / NASA | Probably remove the ACM from section 7.5.1 statement. |  |
| 7-2 | 7.6.9 |  | ed/te | The use of '\*\_START (where \* is different from "MANEUVER\_EPOCH")' is a bit awkward. | David S. Berry / NASA | Consider replacing this with "section delimiters \*\_START" |  |
| 7-2 | 7.6.9 |  | te | Mentions that AEM data lines are non-KVN, but doesn't mention that some ACM lines are also non-KVN | David S. Berry / NASA | From: "and AEM data lines are exceptions..."  To: "AEM data lines, and some ACM data lines are exceptions..." |  |
| 7-2 | 7.7.4 |  | ed | Missing Oxford comma | David S. Berry / NASA | From: APM, AEM or ACM  To: APM, AEM**,** or ACM |  |
| 7-5 | 7.9.3.1 |  | te | Statement mentions Table 4-4 with respect to placement of comments, but I don't think that statement applies to this table. | David S. Berry / NASA | Remove "Table 4-4" from the list of tables in this statement. |  |
| 8-1 thru  8-2 |  |  | ed/te | Per your suggestion in the document we can remove this section (we need the information, but can consolidate into other sections) | David S. Berry / NASA | I will move this material into either section 6 or section 7 as applicable. |  |
| 8-2 AnnexA | A1.1 | 2 | ed | Document title refers to more than one message. | David S. Berry / NASA | From: for an implementation of the Attitude Data Message  To: for an implementation of the Attitude Data Messages |  |
| B-1 | B1 | 2 | ed | ACM not mentioned | David S. Berry / NASA | From: "an APM or AEM message"  To: "an APM, AEM, or ACM message" |  |
| B-1 | B2 | 1 | ed/te | The statement is a "must", but I don't think we can enforce that. | David S. Berry / NASA | From: "The value ... must be selected"  To: "The value ... should be selected. |  |
| B-1 | B3 | 2 | ed | Oxford comma missing | David S. Berry / NASA | From: "APM, AEM and ACM"  To: "APM, AEM**,** and ACM |  |
| B-1 | B3 | 4 | ed/te | The statement is a "must", but I don't think we can enforce that. | David S. Berry / NASA | From: "The value associated with these keywords must be selected"  To: "The value associated with these keywords should be selected" |  |
| B-1 thru B-3 | B4, B5, B6 |  | te | For some of these we may want to create SANA registries as has been done for many OCM and some ACM values | David S. Berry / NASA | Consider |  |
| B-3 | B6 |  | ed/te | Last thre rows of the table contain dQ\_4 representing an error value, which may be ambiguous | David S. Berry / NASA | Since we are using "QC" as the notation for the 4th quaternion value, should we use "Q\_C" in the covariance matrix notation for the 4th error value? |  |
| C-5 | C5 | 8 |  | There is a line: "Nutation\_phase describes the initial orientation of the spin axis in his motion..." that contains an odd anthropomorphism. | David S. Berry / NASA | From: "...his motion..."  To: "... its motion..." |  |
| C-5 | C5 | 13 |  | Does the "offset angle" need to be defined? | David S. Berry / NASA | Consider. |  |
| D-9 | D1, Figure D-3 |  | ed/te | Examples aren't necessarily reqired to be accurate, but the object name and object ID don't correspond. | David S. Berry / NASA | Consider making object name and object ID consistent (or totally made up) |  |
| D9 | D1, Figure D-3 |  | ed/te | The Inertia section doesn't contain mandatory keyword INERTIA\_REF\_FRAME. | David S. Berry / NASA | Add missing keyword |  |
| D-14 | D3, Figure D-8 |  | ed/te | ORIGINATOR\_POC keyword appears in the Header, but should be in the Metadata | David S. Berry / NASA | Move ORIGINATOR\_POC into Metadata section |  |
| D-14 | D3, Figure D-8 |  | ed/te | CP value in Table 5-5 shows brackets around the vector. I'm not sure which notation is intended. | David S. Berry / NASA | Make example in Table 5-5 and Figure D-8 consistent. |  |
| D-15 | D3, Figure D-9 |  | et/te | This comment is based on lack of experience with attitude determination. In the AD section, I can see how ATTITUDE\_STATES=QUATERNION with RATE\_STATES=GYRO\_BIAS gives NUMBER\_STATES=7, but I don't understand how the 6 row covariance matrix applies. | David S. Berry / NASA | Apologies for ignorance... this may be correct and just fine but I don't know. |  |
| E-16 | Annex E |  | ed | Clarify list item 9 description (the data blocks are there in version 1, but just delimited i an implied fashion rather than explicit fashion). | David S. Berry / NASA | From: "Data blocks have been added"  To: "Data block delimiters have been added" |  |
| E-16 | Annex E |  | ed/te | Consider adding a change that applies to all messages, specifically, the ADM Version 1 used the words "Obligatory and Optional" to classify keywords. ADM Version 2 uses the words "Mandatory and Optional" because the Implementation Conformance Specification (annex A) uses that wording, which is set by the CCSDS. | David S. Berry / NASA | Consider adding. |  |
| E-17 | Annex E |  | ed/te | AEM changes rows 1, 2, 4, 5, 7 say "Consistency with ADM" but it seems it should be "Consistency with APM". | David S. Berry / NASA | Consider changing "Consistency with ADM" to "Consistency with APM". |  |
| E-17 | Annex E |  | te | For AEM changes row 3, the rationale "More Consistency between KVN and XML formats" is not correct (Note that the XML formulation allows the quaternion components to be specified in ANY order (24 different orders)). | David S. Berry / NASA | I think "Simplicity of the standard" was the reason you told the WG for the change, so that would be a more accurate rationale for the change described in this row. |  |
| E-17 | Annex E |  | te | For AEM changes row 6, I think a better rationale would be "More Consistency between APM and AEM. Also simplicity of the standard." | David S. Berry / NASA | Consider change to rationale. |  |
| E-16  E-17 | Annex E |  | ed | The "See Section" column is empty. | David S. Berry / NASA | Fill in the sections associated with each row in the table. |  |
| F-2 | F2 |  | te | Table F-1, list item #6, "Identification of the center of attitude motion..." | David S. Berry / NASA | Since this requirement is not accepted for APM, AEM, or ACM, maybe it should be moved to "Desirable Characteristics". |  |
| F-2 | Annex F |  |  | It's difficult to refer to a specific requirement in this Annex (see previous comment). | David S. Berry / NASA | Consider numbering the requirements. |  |
| F-4 | F4 | 1-2 | ed | Refers to "Both attitude data messages", but now there are 3 messages | David S. Berry / NASA | From: "Both"  To: "All" or "All three" or "All of the" |  |
| G-1 | Annex G |  |  | List item 2: Should add statement regarding method of transmission in Section 5 to make it symmetric with Sections 3, 4. | David S. Berry / NASA | Add statement regarding method of transmission in Section 5, and list the paragraph reference in list item 2. |  |
| G-1 | Annex G |  |  | List Item 4: Starts with "ADM", but should be "APM" | David S. Berry / NASA | From: ADM, AEM, and ACM  To: APM, AEM, and ACM |  |
| G-1 | Annex G |  |  | List Item 4: Missing citation to section 5.1.3 in Section Trace column | David S. Berry / NASA | From: 3.1.4, 4.1.2  To: 3.1.4, 4.1.2, 5.1.3 |  |
| H-1 | Annex H |  |  | Suggested acronyms to add | David S. Berry / NASA | COSPAR, ICS, IEEE, NDM, OCM, RL |  |
| I-1 | Annex I | I2 | ed/te | Ref I2 has been updated | David S. Berry / NASA | From: G-3, Issue 3, May 2010  To: G-4, Issue 4, November 2019 |  |
| J-3 | Annex J, J2 | 6 | te | Says that we will provide a transformation from the XML version to the KVN version. This is something that should probably be done by users if they want it. | David S. Berry / NASA | I think we should remove this transform unless multiple users specifically requests it. Such a transform was not provided for the recent TDM update. |  |
| J-4 | Annex J, J2 |  |  | We may want to consider adding the material in Annex B4 (Attitude and Rate Types) and Annex B6 (covariance matrices) to a SANA registry. This would parallel the similar registries used for the OCM. | David S. Berry / NASA | Consider. |  |