| **Page** | **Section** | **Line** | **Type** | **Comment/ Rationale** | **Source of Comment (Name/Agency)** | **Suggested Disposition** | **Disposition****(Completed by Principal Editor)** |
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| N/A | N/A | N/A | N/A | ALL PAGE/SECTION/LINE NUMBERS RELATIVE TO "CHANGES ACCEPTED" VERSION | David S. Berry / NASA | N/A |  |
| 7-3 | 7.6.1.1 |  | ed | The section explicitly mentions OPM and OMM, but also includes OCM sections. | David S. Berry / NASA | From: "OPM and OMM" To: "OPM, OMM, and OCM". | Agree, and to discuss. What was the logic for banning n/a ? should the user just not put an entry there? If so, shouldn’t we state that? |
| 6-39 thru 6-41 | Table 6-11 |  | ed/te | From FIXED\_GEOMAG\_KP to end of table: It strikes me as odd that there is a need for so many keywords to override the measurements obtained from SW\_SOURCE. | David S. Berry / NASA | Consider... are the measurements received from SW\_SOURCE that bad? What is the basis for overriding these values? What is the alternative SW\_SOURCE for the overrides? How does adding a fixed value improve the accuracy? | To discuss. The Orbit Lifetime Standard, ISO 27852, is predicated on the concept of an quivalent Kp/Ap, and F10.7 or other solar proxies. So It’s not a question of accuracy, but the ability to pick a fixed value consistent with other ISO standards directives. |
| 6-38 | Table 6-11 |  | ed/te | GRAVITY\_MODEL, GRAVITY\_MODEL\_DEGREE, GRAVITY\_MODEL\_ORDER: For no apparent reason, the much more compact notation used in the CDM and RDM has been changed in this version of the OCM. | David S. Berry / NASA | Per Nav WG Guideline 05, please make the GRAVITY\_MODEL keyword valued consistent with what has been used in the CDM and RDM. Note: it was consistent in P2.38... see Figure G-3. | To discuss. The reason is that the gravity model has been supplied to SANA for standardized reference naming, whereas the degree and order are separate user choices. |
| 6-34 | Table 6-10 |  | te | DC\_MIN\_CYCLES: I'm not a maneuver analyst, so this may be a dumb question... I'm not understanding the meaning of "may override DC\_EXEC\_STOP". In this case, does this mean if the minimum number of cycles is set too high, the maneuver will continue past the time that it was actually supposed to end? If this is true, I wonder what the value of such a design parameter is. | David S. Berry / NASA | Consider. | To discuss. |
| 6-34 | Table 6-10 |  | te | DC\_MAX\_CYCLES: I'm not a maneuver analyst, so this may be a dumb question... I'm not understanding the meaning of "may override DC\_EXEC\_STOP". In this case, does this mean if the maximum number of cycles is set too low, the maneuver will end before the time that it was actually supposed to end? If this is true, I wonder what the value of such a design parameter is. | David S. Berry / NASA | Consider. | To discuss. |
| 6-21 | Table 6-6 |  | te | COV\_TYPE: for ORB\_TYPE, a default of "CARTPV" is indicated, and "Mandatory" is "No". For COV\_TYPE, the default is also "CARTPV" (makes sense given the default ORB\_TYPE­) but the Mandatory is "Yes". It seems that the "Mandatory" attribute should be the same for these 2 keywords. | David S. Berry / NASA | Make ORB\_TYPE mandatory or COV\_TYPE optional. There are a few other places where a keyword is shown as "Mandatory = Yes" but there is a default shown. If a keyword is mandatory, then perhaps there should be no default? And if there is a default, then perhaps mandatory should be "No"? (Note: In the XML schema, the validation is very different if Mandatory=yes or Manadtory=no.) | Let’s discuss. I propose that values that have defaults are not mandatory, but I want to confirm with the group. |
| 820 | 8.11 | 8.10.25 | te | Having the COM data lines as just strings delimite by <orbitLine>, etc, tags would not take advantage of XML functionality (eg quick reading in programming languages supporting reflection) and would be extremely inelegant. It would also be inconsistent with the OEM data lines, which used tags for X, Y, etc. I am strongly in favor of having tags specified in the SANA registry for each orbital elements, covariance, etc values. We already need to specify units anyway. | A. Mancas/ESA | To be discussed. | David has action to prototype using both methods. |
| 8-9 | 8 | 0 | te | I have just reviewed the NDM/XML document. There are comments for that document, which if taken, should also be implemented in this section. | FMF/GMV/ESA | Implement agreements from NDM/XML as required | Awaiting input from David. |
| All | 8.48.4.28.4.38.5.18.5.2… | All | te | In this and the following sections I have tried to get rid of <x></x> pairs. Strictly speaking this would mean that an empty element is required whereas an actual section with structure and children is actually intended. I am trying to come up with a term better than ‘section’; something more XML like. | FMF/GMV/ESA | Review references to XML implementation to identify terminal elements with the term ‘element’ and complex type constructs with the term ‘section’ (or a better one thereof) | Awaiting input from David. |
| 8-19 | All | All | te | XML description for OCM missing | FMF/GMV/ESA | Add description | Awaiting input from David |
| n/a | 6.2.46.2.66.2.76.2.8 | n/a | te | In the OCM data blocks allowing data lines (orbit state time history, covariance, state transition matrix, maneuver) there is a keyword specifying what each line contains:* ORB\_TYPE (just one value from SANA)
* COV\_TYPE (just one value from SANA)
* STM\_TYPE (just one value from SANA)
* MAN\_COMPOSITION (comma-separated list of values from SANA)

As these keywords specify what is encoded in a non-KVN data line, would it not make sense for these keywords to also encode whether absolute or relative times are used? This would make reading the messages with ‘legacy’ programming languages easier. For the MAN\_COMPOSITION this is easily achieved, EPOCH or DT just need to be added to the list and required to be first. Maybe we can have something like CARTPV\_EPOCH and CARTPV\_DT for the others? | A. Mancas/ESA | Strongly consider. | I think we’ve settled upon the current SANA registries, but I’m open to other thoughts. |
| A-5 | A2.5 |  | te | The table is blank. | David S. Berry / NASA | Eventually we need to fill this out. I agree it can be left until the content solidifies, though it should be fairly easy to fill out for the OPM, OMM, OEM. | Fixed. |
| E-1 | E1 |  | te | In the various equations, rTarget does not appear to be used. | David S. Berry / NASA | If it is not used, it should be removed from the "Definitions". | Fixed. |
| E-1 | E1 |  | te | In the equation of Etarget , the angle $θ$(in $τ$Atmosphere($θ$)) is not defined; it's not mentioned in the definition of $τ$Atmosphere | David S. Berry / NASA | Provide definition if it's used, or remove from equation if it's not. | Fixed. |
| E-2 | E1 |  | ed/te | In the paragraph starting with "From the above equations...", it's not clear how the substitutions into the equation for VMabsolute are correct. The equation for VMabsolute is not provided. | David S. Berry / NASA | Provide equation for VM absolute based on the Definitions provided in this section. | Fixed. |
| Annex M | M-4 |  | Ed | Verify link to document. I was not able to reach it.  | Patrick Zimmerman / NASA | Verify and update link if necessary | Fixed. |
| D-8 | Annex D | 6-7 | ed | These 2 lines should probably be removed because they refer to a Silver Book (ODM 2.0) | David S. Berry / NASA | Remove. It's possible that I at some point suggested these lines be added, but now I think we should just go with the "3.0" for OPM version. I apologize for the re-work. | Fixed. |
| F-1 | Annex F | 4-5 | ed | The lines which refer to a Silver book (ODM 2.0) should probably be removed. | David S. Berry / NASA | Remove from "Annex Fig. F-2... must be specified." It's possible that I at some point suggested this sentence be added, but now I think we should just go with the "3.0" for the OEM version. I apologize for the re-work. | Fixed. |
| 6-8 | 6.2.3 |  |  | the default value for ORB\_REF\_FRAME is ITRF2000 which is a non-inertial reference frame not suitable for many orbit definitions (except Cartesian), which changes every few years and has already been superseded several times (we have already seen ITRF2005, ITRF2008 and ITRF2014). I think the intent was to put EME2000 for the default. If the default is changed, the caption in figure G-1 should also be changed accordingly. | Luc Maisonobe (Orekit) |  | The choice of ITRF was intentional, to circumvent the largely-ground-based operator community not having synchronized EOP files. |
| 4-4 | 4.2.3.2 Table 4-2 | 1 | ed | The text for the Description of the OMM CENTER\_NAME reads “Origin of the STM reference frame...” This may be a cut and paste error. It should say “Origin of the orbit reference frame...” (STM not yet defined in document.) | C. Gramling/NASA-GSFC | Change from “STM” to “orbit” | Fixed. |
| 5-5 | 5.2.3.3, Table 5-3 | 1 | ed | The text for the Description of the OEM CENTER\_NAME reads “Origin of the STM reference frame...” This may be a cut and paste error. It should say “Origin of the orbit reference frame...” | C. Gramling/NASA-GSFC | Change from “STM” to “orbit” | Fixed. |
| 3-2 | 3.2.2.2, Table 3-1, Table 3-2 |  | ge | The OPM Header table is missing the Keyword “MESSAGE\_ID” with associated description. BUT, the OPM Metadata table, 3-2, does still have MESSAGE\_ID. The feature is listed in the Annex A RL for OPM as item 6, under the Header and not under Metadata. | C. Gramling/NASA-GSFC | Update the OPM Header in Sec 3 to include the MESSAGE\_ID field as optional. Remove MESSAGE\_ID from OPM Metadata in Sec 3. | Fixed. |
| A-5 | A2.6, OPM RL Table, missing items |  | ed | In the RL Table for the OPM, under Position/velocity Covariance Matrix logical block, need to insert item 42 COMMENT and item 43 COV\_REF\_FRAME | C. Gramling/NASA-GSFC | Update the OPM RL Table in Annex A to include COMMENT and COV\_REF\_FRAME under Position/velocity Covariance Matrix logical block. | Fixed. |
| A-6 | A2.6, OPM RL Table |  | ge | In the RL Table for the OPM, the “Feature” in current items 69-71 specify cartesian components for velocity change, X, Y, Z; however, the reference frame may not be Cartesian. Suggest the “Feature” be changed from X, Y, Z, to 1st, 2nd, 3rd to correspond to the descriptive text for the respective Keywords | C. Gramling/NASA-GSFC | Consider updating Annex A RL Table Feature colum listing for the OPM Maneuver Parameters logical block items 69-71 from X,Y, Z, to 1st, 2nd, 3rd. | Fixed |
| A-7 | A2.7, OMM RL Table  |  | ge | The wrong table has been included in the section; it looks to be a copy/paste of the OPM instead of an OMM-specific RL Table. | C. Gramling/NASA-GSFC | Perhaps this aligns with the first comment in this CRM and is already in work.  | Fixed. |
| B-1 | B1 | 2 | Ed | Reference [10] should be reference [11] (SANA registry of organizations. | C. Gramling/NASA-GSFC | Please update the reference. | Fixed. |
| B-1 | B2 | 2 | ed | CCSDS rules indicate use of Oxford comma. ☺. From “...OPM, OEM, OMM and OCM...” to “...OPM, OEM, OMM, and OCM...” | C. Gramling/NASA-GSFC | Please insert a comma after ‘OMM’ and before the word ‘and’. | Fixed. |
| B-1 | B2 | 8 | ge | Para 2, sentence 2 refers to “by ICD (as noted above)”, but there is no longer a reference to an ICD anywhere above. By Nav WG agreement, wording in the intro para of Annex B states “mutually agreed and properly documented”. Perhaps similar wording is needed here. Suggest from: “by ICD (as noted above)” to “by mutually agreed upon document (as noted above)”. | C. Gramling/NASA-GSFC | Please consider a change from referring to an ICD to referring to a mutually agreed upon document. | Fixed. |
| B-2 | B3 | 1 | ed | References are no longer in the Annex. From “provided in ANNEX Bnormative reference [13].” To: “provided in normative reference [13].” | C. Gramling/NASA-GSFC | Please remove the phrase “ANNEX B” from the text. | Fixed. |
| B-2 | B6 | 3 | Ge | The statement refers to an ICD. Should it instead refer to a “mutually agreed upon document” or similar? | C. Gramling/NASA-GSFC | Reconsider the use of the term “ICD” | Fixed. |
| B-2 | B7 | 3 | te | The second paragraph of the section states that orbit elements “may be specified in the following multiple element sets.”, but there is no relevant follow-on information provided. The orbit elements are contained in ref [17]. Either info is missing from the section, or the sentence needs to be reworded. Perhaps “Unique to the Orbit Comprehensive Message (OCM), orbit element states and/or time histories.” would be adequate. | C. Gramling/NASA-GSFC | Please adjust the information to either provide the OCM orb elem intended, refer to Ref [17], or remove the portion of the statement that mentions follow-on info. | Fixed. |
| C-2 | C1 | 9 | ed | Suggest the nomenclature be changed to align with the SANA entries for quaternions and w the Green Book (Defn & Convention) by changing little q to Capital Q. | C. Gramling/NASA-GSFC | Please consider changing from q to Q in the matrix of equations. | Fixed. |
| C-5 | C3 | 6, 8 | ed | Oxford comma. From “the actualexecution interval and “ON” and “OFF” intervals,” TO: “the actualexecution interval. and “ON” and “OFF” intervals,”  | C. Gramling/NASA-GSFC | Please add a comma between “interval” and “and”. | Fixed. |
| D, E | D, E | na | ge | None of the example OPM or OMM messages include the optional MESSAGE\_ID. Other optional keywords are included in the examples. | C. Gramling/NASA-GSFC | Please consider inserting a MESSAGE\_ID into one of the example OPMs and OMMs. | Fixed. |
| E-4 | Fig E-5 | Na | Ge | Interesting choices for covariance values. | C. Gramling/NASA-GSFC | NA | N/A |
| 1-3 | 1 | n/a | ge | Section 1 does not contain a units subsection. | A. Mancas/ESA | Consider adding a units subsection, which other NDMs (eg CDM and RDM) have. The larger number of units used in the OCM, including some more unusual ones (eg jansky), make this subsection needed. | Fixed. |
| 6-2 | 6.2.1 | 6.2.13 | te | The paragraph readsAll time-tags may be specified by either a relative time (e.g., 20157.26) measured in seconds with respect to the specified epoch time (e.g., the overarching default value EPOCH\_TZERO) or an absolute time (e.g., 2018-11-13T11:13:20.5Z as formatted in Section 7.5.10) epoch time.Maybe I missed this is the document, and I do remember discussing this during some meetings, but shouldn’t this state ‘SI seconds’ instead of just ‘seconds’? The length of a second differs between, say UT1 and UTC. There should be either a fixed requirement for SI/UTC/TAI seconds (which I think are all the same) or some way of specifying which second is used for relative time. | A. Mancas/ESA | Change toAll time-tags may be specified by either a relative time (e.g., 20157.26) measured in SI seconds with respect to the specified epoch time (e.g., the overarching default value EPOCH\_TZERO) or an absolute time (e.g., 2018-11-13T11:13:20.5Z as formatted in Section 7.5.10) epoch time. | Fixed. |
| 6-16-2 | 6.2.1 | n/atble 6-1 | te | I think the requirements on structure for the OCM are not clear enough and table 6-1 should be modified to fix this. Multiple OCM sections (orbit data, covariance, STM, maneuver) are structure like an OEM segment, and some sections can repeat, so the table should reflect that. Some terminology to distinguish between the pure KVN content in the sections and the non-KVN data lines (as discussed in further comments is also needed). | A. Mancas/ESA | Updated table 6-1 as in the attached example to the email (the structure there matches what is proposed in the 2.39 Pink Book). | Fixed. |
| 6-56-9 | 6.2.3 | tble 6-3 | te | Multiple keywords in table 6-3 have units and the examples sometimes have units (eg TIME\_SPAN, UT1MUTC\_AT\_TZERO). A units column should be added to the table, to keep track of them. | A. Mancas/ESA | Add a units column. | Disagree. In looking at it, there really aren’t that many to justify the real estate required for a separate column (which we already had but deleted), and they are clearly notated with “in seconds” |
| 6-37 | 6.2.9 | 6.2.9.2 | te | Only one OCM Perturbations Specification section shall appear in an OCM.Is there a particular reason for restricting perturbation blocks to only 1? My understanding is that the perturbations block should provide information on the propagation of the orbit state time history (ie how that data was generated). What if there are two orbit time history blocks (say one predicted, one determined from OD), and different perturbations models were used in producing them? What if different perturbation models associated with the same keyword have to be used (maybe two atmospheric models were used for different altitudes – I think we went for allowing a list of models in the RDM – or it is an interplanetary trajectory with multiple fly-bys)?There are two issues to be clarified:1. How to associate orbit state time history blocks with perturbation block if there are more than one of each.
2. How to deal with different perturbations blocks being associated with different parts of the same orbit state time history block.
 | A. Mancas/ESA | I would suggest adding a ORB\_PERT\_ID keyword to Table 6-4, to point to a PERT\_ID keyword added to Table 6-11. This does mean that a trajectory that “switches” perturbation models needs to be split in different blocks (hence no interpolation across the blocks), but this seems acceptable (to me, at least). | Decision from Plenary meeting: At this stage, user can make multiple messages; in the future we can possibly address. |
| 6-42 | 6.2.10 | 6.2.10.2 | te | The paragraph states:*At most, only one Orbit Determination Data section shall appear in an OCM.*Is there a reason for this limitation? Most other blocks can be present multiple times. I can see a situation where a user would want to exchange two orbit solutions for one spacecraft, based on two different OD runs (maybe different input data, eg see what happens when a sensor track is added or removed) | A. Mancas/ESA | Consider removing and allowing multiple blocks. | Decision from Plenary meeting: At this stage, user can make multiple messages; in the future we can possibly address. |
| 6-12 |  | tble 6-4 | te | The description of ORB\_BASIS\_ID reads:Optional alphanumeric free-text string containing the identification number for the orbit determination, navigation solution, or simulation upon which this orbit state time history block is basedGiven that the OCM can contain an OD block, should this not point to the OD\_ID value of said block. | A. Mancas/ESA | Addthe value should be value of the OD\_ID keyword in the matching orbit determination block.or something similar to the end. | Fixed. |
| 6-20 |  | tble 6-6 | te | The description of COV\_BASIS\_ID reads:Optional alphanumeric free-text string containing the identification number for the orbit determination, navigation solution, or simulation upon which this orbit state time history block is based.Given that the OCM can contain an OD block, should this not point to the OD\_ID value of said block. | A. Mancas/ESA | Addthe value should be value of the OD\_ID keyword in the matching orbit determination block.or something similar to the end. | Fixed. |
| ge | n/a | n/a | ge | Mandatory/optional keywords: The OCM seems to use the “mandatory in the table means the keyword is mandatory if the block is present” (there are 3 or 4 keywords marked as mandatory in the maneuver section), which is not how other NDMs work (eg CDM and RDM) and some user find confusing. | A. Mancas/ESA | I recall discussing this in previous meetings, but I do not remember the conclusion we reached and do not want to go looking through minutes. On the one hand, consistency and user feedback, but on the other hand, if any message could benefit from the “mandatory in the table means the keyword is mandatory if the block is present” approach, it’s the OCM. | Agree – leaving this as is because our goal is to dramatically shrink the size of the OCM as compared to other messages via optional content.But this approach looks to be consistent with how Annex A is laid out. |
| 6-26 | 6.2.8 | 6.2.8.1 | ed | Only those keywords shown in Table 6-10 shall be used as Key Value Notation keywords in the OCM maneuver specification.The wording seems a bit inelegant. | A. Mancas/ESA | Consider changing to:Only those keywords shown in Table 6-10 shall appear in the OCM maneuver specification. | Fixed. |
| 6-26 | 6.2.8 | 6.2.8.3 | ed/te | Maneuver data in the OCM shall be indicated by two keywords: MAN\_START and MAN\_STOP.This does not seem like a good way to phrase this requirement | A. Mancas/ESA | Consider changing to:Maneuver data in the OCM shall be contained between the MAN\_START and MAN\_STOP keywords.or changing 6.2.8.3 to something similar to:Each maneuver block shall be contained between one pair of MAN\_START and MAN\_STOP keywords.and 6.2.8.4 to something similar to:Multiple maneuver data blocks may appear in an OCM. Each maneuver block shall be delimited by a separate pair of MAN\_START and MAN\_STOP keywords. | Fixed. |
| 6-266-27 | 6.2.8 | 6.2.8.4 to6.2.8.12 | ed/te | There are a lot of normative paragraphs pertaining to having multiple maneuver blocks in the same OCM, including the rather long 6.2.8.11 on uniqueness. Shouldn’t the MAN\_ID keyword become mandatory as well? It may help clarify things if multiple maneuver blocks are present. | A. Mancas/ESA | Think about making MAN\_ID mandatory. | Fixed. |
| 6-26 | 6.2.8 | 6.2.8.7 | ed/te | Each maneuver data block shall only specify a single maneuver device ID (MAN\_DEVICE\_ID) value.I don’t think this requirement is needed, as the keyword only appears once in the table. Since the value is free text, a value of “THURSTER\_1, THRUSTER\_2” is ok, with or without this requirement. | A. Mancas/ESA | Think about removing 6.2.8.7. | Fixed. |
| 6-266-27 | 6.2.8 | 6.2.8.9 | ed/te | Is there a specific meaning associated with the values? I assume DETERMINED\_TLM means determined from telemetry the maneuver happened? | A. Mancas/ESA | Think about adding a short description text to each value. Think about changing DETERMINED\_TLM to DETERMINED\_TELEMETRY | Disagree. We had decided last time to add the word “Candidate” to this already long Keyword value |
| 6-27 | 6.2.8 | 6.2.8.10and6.2.8.10.1 | te | The message recipient should exercise caution whenever maneuvers are additive (MAN\_IS\_ADDITIVE=YES), to prevent the unintentional accumulation of maneuver contributions, for example across disparate orbit determination solutions (MAN\_OD\_ID).I think this will raise major alarm flags during AD or Agency Review. Would it not make more sense to add MAN\_OD\_ID (and any other relevant keyword) to the bolded text in 6.2.8.10, then remove this admonition? | A. Mancas/ESA | Think about. | Clarified. |
| 6-27 | 6.2.8 | 6.2.8.12 | te | In the event that the only difference between multiple maneuver time history data blocks is the selected maneuver composition (MAN\_COMPOSITION), reference frame (MAN\_REF\_FRAME) and/or maneuver orbit center (MAN\_CENTER\_NAME), the top-most depiction (i.e., the time history occurring first in the OCM) shall be adopted as the true or master depiction, and those subsequent data blocks shall be treated as containing derivative depictions provided purely for informational purposes.I was confused by this paragraph for two reasons:1. I was not sure how to interpret the ‘and/or’. What if MAN\_COMPOSITION and MAN\_REF\_FRAME are the same, but MAN\_CENTER\_NAME differs? It should be either ‘and’ or ‘or’ in the paragraph.
2. I was not sure how this was supposed to work in practice. If an OCM provider is allowed to give the same maneuver three times in different reference frames, should the three specifications not be equivalent? I’m guessing the number of significant figures used might make them all slightly different, but in that case why even provide it more than once? If a reader of the message can only interpret one reference frame anyway, they would select the maneuver block in their preferred frame, regardless if it is the first one or not.
 | A. Mancas/ESA | Think about. | Fixed the and/or.As for the second part of the question, this statement was introduced upon request because in our experience, when multiple renditions of numerical content are provided, they can at times not precisely match. This can also happen because of the use of different physical constants, approximations, etc.I was asked to address this by instructing the user on what version they should adopt, should there be more than one.This means that the subsequent versions are provided as information, which is very useful. |
| 6-276-28 | 6.2.8 | 6.2.8.13 and 6.2.8.14 | ed | Maybe I have not read the two paragraphs closely enough, but it seems to me 6.2.8.14 includes 6.2.8.13, so 6.2.8.13 can be deleted | A. Mancas/ESA | Think about a clearer way of doing it, eg:6.2.8.w. The MAN\_COMPOSITION keyword shall specify the maneuver time history elements.6.2.8.x. The value of the MAN\_COMPOSITION keyword shall be a comma-separated list of keywords from either table 6-8 or 6-8.6.2.8.y. The keywords in the value of the MAN\_COMPOSITION keyword shall appear in the order fixed in table[s] […].6.2.8.z. Only keywords from either table […] or table […] shall appear in […]etc | Fixed. |
| 6-276-28 | 6.2.8 | 6.2.8.13 and 6.2.8.14 | ed/te | These two normative paragraphs are rather long and should be either re-written in a more compact, easy-to-read form, or broken down into multiple normative paragraphs. | A. Mancas/ESA |  | Fixed per above. |
| 6-286-29 | 6.2.8 | T 6-8andT 6-9 | ed | As these table specify what goes in the “time history” lines (and the values of the MAN\_COMPOSITION keyword), I think they should be after Table 6-10. This would be consistent with similar messages/Blue Books, eg TDM and OEM. | A. Mancas/ESA | Think about | Fixed. |
| 6-28 | 6.2.8 | T 6-8 | ed | The ‘Examples of Values’ column for ACC\_X, ACC\_Y, and ACC\_Z have the values ‘.01’, ‘.02’, and ‘.03’ respectively. This is inconsistent with the double precision values used in all other NDMs. | A. Mancas/ESA | Change to 0.01, 0.02, and 0.03. | Fixed. |
| 6-28 | 6.2.8 | T 6-8 | ed | The description of DV\_MASS reads:The mass change to the host (where a NEGATIVE VALUE denotes a mass decrement/loss) associated with this ΔV event.The use of the term ‘host’ seems more appropriate for the next table, on deployment-related terms. | A. Mancas/ESA | Consider changing ‘host’ to ‘spacecraft’. | Fixed. |
| 6-28 | 6.2.8 | T 6-8 | te | There are multiple keywords associated with mass change (ACC\_DMASS, DV\_DMASS, THR\_DMASS). Why not a single one? | A. Mancas/ESA | Think about. | Fixed. |
| 6-28 | 6.2.8 | T 6-8 | te | The description of THR\_DMASS reads:Additional mass change (where a negative number denotes a mass decrement/loss to the host) associated with this thrust interval, beyond the mass change already prescribed by the rocket equationAll the other mass change keywords are just mass change, without having to account for anything else. Why specifically exclude mass change due to the rocket equation? This also requires specific impulse to be given, and extra assumptions to be made (constant thrust, Isp and mass flowrate during the MAN\_DURA).  | A. Mancas/ESA | Think about removing the bold text. It seems to me that if you are going to give all the maneuver parameters, you might as well compute the mass change and not ask the recipient to have some very basic rocket equation implementation. | Fixed. |
| 6-28 | 6.2.8 | T 6-8 | te | How are \*\_INTERP keywords to be interpreted? I am not sure I saw a normative paragraph addressing them. If the value is OFF, should the ACC\_\* and THR\_\* values be treated as constants over MAN\_DURA? If the value is ON, should they be assumed to be at the epoch, the epoch + MAN\_DURA/2, somewhere else, and then interpolated? | A. Mancas/ESA | Think about adding some clarification. It was not clear to me how these keywords we supposed to work. | Added a new informative annex. |
| 6-29 | 6.2.8 | T 6-9 | ed | The identified of the “child” object is called DEPLOY\_ID. Should it not be DEPLOYED\_ID? | A. Mancas/ESA | Think about changing to DEPLOY\_ID. | It also represents the act of deployment (present tense), so it should be fine as is. |
| 6-29 | 6.2.8 | 6.2.8.15 | te | TIME\_SYSTEM in table 6-3 only applies to EPOCH\_TZERO.The first element of each maneuver line is time, either absolute or relative. Should absolute and relative time not be added to either table 6-8 or 6-9? That would also let the code reading the maneuver information ‘know’ what to expect (a long string or a double precision value). Since mixing the two is not allowed (I vaguely recall this being the decision in some previous meetings), why not put TIME/RELATIVE\_TIME as the first element in the MAN\_COMPOSITION value?Is the time system of the absolute time specified anywhere? The TIME\_SYSTEM keyword in the metadata applies only to EPOCH\_TZERO and I could not find a TIME\_SYSTEM keyword in the maneuver section. | A. Mancas/ESA | Think about. | Fixed. |
| 6-30 | 6.2.8 | 6.2.8.15.1 | te | NOTE 3: Specification of a time history of acceleration parameters ACC\_X, ACC\_Y, and ACC\_Z allows modeling of both individual and aggregate maneuvers and any additional non-conservative perturbations that are not already specified in the “OCM Perturbations Specification” section or other maneuver time histories (including thrust/ΔV/acceleration alternate portrayals). This allows the OCM originator to model and share the effects of maneuver and perturbations information without the OCM recipient needing to do such modeling.Allowing the maneuver section to be used for perturbations seems extremely inelegant to me, especially when a perturbations block exists. Why not have data lines in the perturbation block for “empirical accelerations” or similar? | A. Mancas/ESA | Think about | Fixed – I removed all references to perturbations in this maneuver entry. |
| 6-30 | 6.2.8 | 6.2.8.16 | ed | This seems like a duplicate of 6.2.8.15.1 and NOTE 1 below said paragraph. | A. Mancas/ESA | remove one of them | Fixed. |
| 6-30 | 6.2.8 | 6.2.8.16.1 | ed | This normative paragraph contains non-normative language. | A. Mancas/ESA | remove or re-word | Fixed. |
| 6-30 | 6.2.8 | 6.2.8.16.3and6.2.8.16.4 | ed/te | Thrust for any propulsive device shall be presumed to be “OFF” until explicitly turned “ON” by setting one or more of that thruster’s maneuver thrust components (THR\_X, THR\_Y, and/or THR\_Z) to a non-zero value.Thrusters shall be “OFF” after the time surpasses [ Tstart + MAN\_DURA ]. Thrusters may also be subsequently turned “OFF” by setting all of that thruster’s maneuver thrust components to zero (i.e., THR\_X = THR\_Y = THR\_Z = 0.0).I think there are a few issues with this:1. Is this normative statement needed? Is it expected that users would provide OCMs with just part of a maneuver?
2. What if the users provides DV\_\* or ACC\_\*, rather than THR\_\*? Since DV\_\* are supposed to work at Tstart + MAN\_DURA/2, how will this work?
3. Reading this paragraph, I would think the thruster comes on at the epoch in first position of the row (Tstart), but the paragraph below makes some different statements wrt thrusters being shut down.
 | A. Mancas/ESA | Think about what the requirements were intended to do and re-word or maybe remove entirely. Are these normative paragraphs also somehow tied to the DUTY\_CYCLE\* keywords? | Fixed wording. |
| 6-30 | 6.2.8 | 6.2.8.16.5 | ed/te | Thruster duty cycles may be specified using the thrusting maneuver specification (DUTY\_CYCLE\_TYPE ≠ CONTINUOUS) based on either a reference direction or reference time. This duty cycle specification imposes cut-outs of non-thrusting periods onto the thrusting (finite burn) parameters to reflect the periods of duty cycle inactivity.I am not sure this is a normative paragraph. | A. Mancas/ESA | Consider removing. | Fixed. |
| 6-30 | 6.2.8 | 6.2.8.16.6 | ed/te | When a duty cycle is invoked, specification of the reference direction, reference time and any/all other duty cycle parameters relevant to that duty cycle type is mandatory.This normative paragraph is not in requirements language. | A. Mancas/ESA | Consider changing to something similar to:If the value of the DUTY\_CYCLE\_TYPE keyword is not CONTINUOUS, all duty cycle parameters shall be present:* If the value is TIME, a, b, and shall be present
* If the value is PHASE\_ANGLE, x, y, and z shall be present

or splitting into two different requirements (one for TIME, one for PHASE\_ANGLE). | Fixed. |
| 6-32 | 6.2.8 | Tble6-10 | ed/te | The description of the MAN\_IS\_ADDITIVE keyword reads:Specifies (by either YES or NO) whether this maneuver is additive with other specified time-overlapping maneuvers when they share the same maneuver basis (MAN\_BASIS). If “YES”, then this maneuver is combined with all other maneuvers where MAN\_IS\_ADDITIVE is set to “YES”. Note that if “NO” is selected, such time- overlapping maneuvers are to be interpreted as being multiple approaches to characterize the same composite (total) maneuver profile.There are also two normative paragraphs specifying the use, and the two descriptions are slightly inconsistent. 6.2.8.10.1 also states that if MAN\_OD\_ID are different, they should not be added, even if MAN\_IS\_ADDITIVE is set to YES. | A. Mancas/ESA | Make the description in the table consistent with the normative paragraphs. | Fixed. |
| 6-32 | 6.2.8 | Tble6-10 | ed/te | The Mandatory column of the MAN\_IS\_ADDITIVE keyword reads:Yes (defaults to “NO”)If the keyword is mandatory, it “shall appear” in all OCMs, so it does not need a default value.  | A. Mancas/ESA | Remove (defaults to “NO”). | Fixed. |
| 6-32 | 6.2.8 | Tble6-10 | ed/te | There are two keywords, called MAN\_PREV\_TIME and MAN\_NEXT\_TIME. For consistency with other NDMs, it might make sense to go with MAN\_PREV/NEXT\_EPOCH. | A. Mancas/ESA | Consider changing the two keywords to MAN\_PREV\_EPOCH and MAN\_NEXT\_EPOCH respectively. | Fixed. |
| 6-32 |  |  | ed | The descriptions of epoch-value keywords allowing both absolute and relative time (MAN\_PREV\_TIME, MAN\_NEXT\_TIME, DC\_WIN\_OPEN, DC\_WIN\_CLOSE, DC\_EXEC\_START, DC\_EXEC\_STOP, and DC\_REF\_TIME) read as:This time may be specified as either “YYY”, where “YYY” contains relative time in seconds (relative to EPOCH\_TZERO), or “<epoch>” (see 7.5.10 for formatting rules.). |  | I think it might be better to re-word this to:The time may be specified as either (signed) double precision relative time, or as a CCSDS Time String A or B (see x.y.z for formatting rules).for all epoch-value keywords allowing both relative and absolute time values (not just in the maneuver section). | Fixed. |
| 6-32 | 6.2.8 | Tble 6-10 | ed | There is a long list of values (to go into a comma-separated list) for the MAN\_PURPOSE keyword. I think it might make sense to move to an annex. | A. Mancas/ESA | Think about moving to an annex to streamline the document. | Perhaps in future. |
| 6-33 | 6.2.8 | Tble 6-10 | ed/te | For the MAN\_COMPOSTION keyword: in line with a previous comment, I think the first element in the value should be either T/EPOCH/TIME/etc or DT/RELATIVE\_TIME/etc. This would make parsing the message with dumb FORTRAN readers easier. Without it, the program has to rely one other ways to figure out which time type it is. The program could search for ‘T’ on the 10/11th position (for a time string), but what if there is a ‘T’ there due to the DEPLOY\_ID value? | A. Mancas/ESA | Add time and relative time to table 6-8/6-9. Change the example to:T, THR\_X, THR\_Y, […]orRELATIVE\_TIME, DV\_X, […]or similar. It would make parsing with FORTRAN readers much, much easier. | Fixed. |
| 6-33 | 6.2.8 | Tble 6-10 | ed | For the GRAV\_ASSIST\_NAME keyword, the document points to an annex for values. We have a SANA registry for orbit centers (<https://sanaregistry.org/r/orbit_centers>) and we should point to it. | A. Mancas/ESA | Remove the reference to the annex, add the SANA registry for orbit centers to the reference in section 1, and point to it for GRAV\_ASSIST\_NAME values. | Fixed. |
| 6-34 | 6.2.8 | Tble 6-10 | ed | The keyword for duty cycle type is DUTY\_CYCLE\_TYPE, but all other duty cycle related keywords are DC\_\*. | A. Mancas/ESA | Consider changing either DUTY\_CYCLE\_TYPE to DC\_TYPE, or DC\_\* to DUTY\_CYCLE\_\*. | Fixed. |
| 6-34 | 6.2.8 | Tble 6-10 | ed/te | The description of DC\_MAX\_CYCLES reads:*Maximum number of “ON” duty cycles (may override DC\_EXEC\_STOP). A value of zero disables this limit.*and the default is listed as *(unlimited)*.I think having the value of 0 (zero) mean unlimited is a bit inelegant, especially as the default value (ie the keyword is not present) is unlimited. | A. Mancas/ESA | Consider removing the second sentence: *A value of zero disables this limit.* | Fixed. |
| 6-36 | 6.2.8 | Tble 6-10 | te | The value for the DC\_REF\_DIR keyword is a triple of double precision values. The example in the table is “1.0 0.0 0.0”. This is inconsistent with the other strict KVN NDM implementations and could make coding an OCM reader in legacy programming languages more challenging than it needs to be and potentially less robust. | A. Mancas/ESA | Change from DC\_REF\_DIR with a triple value to 3 separate keywords: DC\_REF\_DIR\_X, DC\_REF\_DIR\_Y, and DC\_REF\_DIR\_Z. Since this is supposed to be a unit vector, having a normative statement that the sum of the squares should be 1 might also make sense. | As discussed in our meeting, we are proceeding with a “tripartite” list of entries in a single keyword value. |
| 6-36 | 6.2.8 | Tble 6-10 | te | The value for the DC\_BODY\_TRIGGER keyword is a triple of double precision values. The example in the table is “.707 0.0 .707”. This is inconsistent with the other strict KVN NDM implementations and could make coding an OCM reader in legacy programming languages more challenging than it needs to be and potentially less robust. | A. Mancas/ESA | Change from DC\_BODY\_TRIGGER with a triple value to 3 separate keywords: DC\_ BODY\_TRIGGER \_X, DC\_ BODY\_TRIGGER \_Y, and DC\_ BODY\_TRIGGER \_Z. Since this is supposed to be a unit vector, having a normative statement that the sum of the squares should be 1 might also make sense. | As discussed in our meeting, we are proceeding with a “tripartite” list of entries in a single keyword value. |
| 6-37 | 6.2.9 | Tble 6-11 | ed | The description of ORBIT\_CENTRE\_NAME has the following text for the source of values:*Natural bodies shall be selected from the accepted set of values indicated in ANNEX B, Section B2.*We have a SANA registry for orbit centers (<https://sanaregistry.org/r/orbit_centers>) and we should point to it. | A. Mancas/ESA | Remove the reference to the annex, add the SANA registry for orbit centers to the reference in section 1, and point to it for ORBIT\_CENTER\_NAME values. | We do, as agreed in this week’s discussion of Annex B. |
| 6-376-38 | 6.2.9 | 6.2.9.4Tble 6-11 | ed/te | There is a normative paragraph on degree and order, which reads:*The gravity model (GRAVITY\_MODEL) degree (D) and order (O) of the spherical harmonic coefficients applied should be given along with the name of the model. Note that specifying a zero value for “order” (i.e. 2 0) denotes zonals (J2 ... JD) only.*and three gravity model-related keywords (GRAVITY\_MODEL, GRAVITY\_MODEL\_DEGREE, GRAVITY\_MODEL\_ORDER).This approach is different from other NDMs, where the GRAVITY\_MODEL keyword value indicates model, degree, and order. This is not an issue per se, but the wording of paragraph 6.2.9.4 should be changed to make the usage clearer, as D and O are used inside the value in other NDMs to specify degree and order. | A. Mancas/ESA | Re-word 6.2.9.4 to:*If the GRAVITY\_MODEL keyword is present, the GRAVITY\_MODEL\_DEGREE and GRAVITY\_MODEL\_ORDER keyword should be present, to specify the degree and order respectively.*Add *value shall be an integer* to the description of the GRAVITY\_MODEL\_DEGREE and \_ORDER keywords. | Fixed. |
| 6-38 | 6.2.9 | Tble 6-11 | ed | The keyword for the albedo model is just ALBEDO. The keywords for all other models (eg atmosphere, SRP) end in \_MODEL. | A. Mancas/ESA | Change the keyword from ALBEDO to ALBEDO\_MODEL. | Fixed. |
| 6-38 | 6.2.9 | Tble 6-11 | ed | The keyword SHADOW\_BODIES has the following sentence for the source of values:*Comma-separated list of planetary bodies for which SRP shadowing is modeled. See ANNEX B for acceptable ORBIT\_CENTER\_NAME values (and the procedure to propose new values).*We have a SANA registry for orbit centers (<https://sanaregistry.org/r/orbit_centers>) and we should point to it for values (restricted to actual bodies, no barycenters or Lagrange points). | A. Mancas/ESA | Remove the reference to the annex, add the SANA registry for orbit centers to the reference in section 1, and point to it for SHADOW\_BODIES values. | As agreed this week for Annex B |
| 6-38 | 6.2.9 | Tble 6-11 | ed | The example values for the SHADOW\_BODIES keyword are in mixed case. | A. Mancas/ESA | Change examples to all caps: EARTH, MOON. | Fixed. |
| 6-39 | 6.2.9 | Tble 6-11 | ed/te | The example provided for the SW\_SOURCE keyword is inelegant:*e.g., “CelesTrak space weather file downloaded from http://celestrak.com/SpaceData/SW-Last5Years.txt at 2001-11-08T00:00:00”*and a bad example for users. | A. Mancas/ESA | 1. Change the SW\_SOURCE keyword to SW\_DATA\_SOURCE
2. Change the example to just CELESTRAK
3. Add a SW\_DATA\_EPOCH (with absolute time values) for the date at which the data was either produced or downloaded
 | Fixed. |
| 6-39 | 6.2.9 | Tble 6-11 | ed/te | The name of the keyword for the interpolation method used for space weather data is INTERP\_METHOD\_SPWX. This is inconsistent with the rest of the section in multiple ways: SPW(X) instead of SW for Space Weather and the keyword not starting with SW. | A. Mancas/ESA | Change the keyword to SW\_INTERP\_METHOD or SW\_INTERPOLATION\_METHOD | Fixed. |
| 6-396-41 | 6.2.9 | Tble 6-11 | ed | The descriptions of the FIXED\_GEOMAG\_\* and solar flux keywords are quite long and perhaps too descriptive. For example, the FIXED\_S10P7 keyword descriptions has this as its second paragraph:*S10.7 is the integrated 26–34 nm solar irradiance measured by the Solar Extreme Ultraviolet Monitor (SEM) instrument on the NASA/ESA Solar and Heliospheric Observatory (SOHO) research satellite*To me this breaks the recommendation in the *Introduction to the CCSDS NAV WG* slides, that we are not writing flight dynamics textbooks. | A. Mancas/ESA | Remove the second paragraphs in the FIXED\_\* keywords’ descriptions. Shorten the first paragraphs as well, on a case-by-case basis. | Fixed. |
| 6-406-41 | 6.2.9 | Tble 6-11 | te | The units given for most of the FIXED\_\* keywords are problematic/inconsistent with the other NDMs. The FIXED\_GEOMAG\_\* are in nanotesla, which is fine. For the others, the units column reads*Solar Flux Units = 10\*\*4 Jansky = 10\*\*(-22) W/(m\*\*2\*Hz)*or just the last row above.The units column should say either *SFU* (for Solar Flux Units), *Jy* (jansky – SI unit names are always lowercase, eg kelvin, newton, hertz; the abbreviation starts with an uppercase letter if the unit is named after a person, so K, N, Hz), or *W/(m\*\*2\*Hz)*. There were no KVN examples in the annex for this section, only one in XML, where all the units were missing:*<FIXED\_GEOMAG\_KP>12.0</FIXED\_GEOMAG\_KP>**<FIXED\_F10P7>105.0</FIXED\_F10P7>**<FIXED\_F10P7\_MEAN>120.0</FIXED\_F10P7\_MEAN>* | A. Mancas/ESA | Pick **only one** of SFU, Jy, or W/(m2⋅Hz). Add said unit to the list of units in section 1, which seems to be missing from the ODM Blue Book. Have only the agreed symbol (eg Jy) in the units column in table 6-11, so in an OCM the line would look something like:FIXED\_S10P7 = 13425.4[Jy] | Fixed. |
| 6-42 | 6.2.10 | note | te | There is a NOTE just below the section title:*NOTE: THIS SECTION APPLIES TO ALL ORBIT AND COVARIANCE DATA BASED UPON “DETERMINED” ORBIT SOLUTIONS*I am not sure if this is supposed to be a note or normative paragraph, but:* The maneuver block has a MAN\_OD\_ID keyword that could be used to point to the value of the OD\_ID keyword in the matching OD block.
* The orbit state time history block has a ORB\_OD\_ID keyword that could be used to point to the value of the OD\_ID keyword in the matching OD block.

which I think make the note not needed for information. It could be replaced with a normative paragraph, stating the above (ie that ORB\_OD\_ID keyword should …) | A. Mancas/ESA | consider removing the note and adding a normative paragraph (either here or in the orbit, covariance, and maneuver blocks). | Fixed. |
| 6-42 | 6.2.10 | 6.2.10.3 | ed | The paragraph states:*All orbit determination event times shall be specified relative to the orbit determination epoch specified via the OD\_EPOCH keyword (in days, each consisting of 86400 seconds) as a double precision number. Event times may be negative, zero or positive.*I think this applies to the DAYS\_SINCE\_FIRST\_OBS and DAYS\_SINCE\_LAST\_OBS. RECOMMENDED\_OD\_SPAN and ACTUAL\_OD\_SPAN are timespans, rather than ‘event times’. There is another time-related keyword, INTEG\_STEP\_SIZE to which this should not apply. The *days, each consisting of 86400 seconds* should not be necessary if the unit of days is defined in section 1 (it was not in ODM v2). | A. Mancas/ESA | I think it would be best to rephrase this to:*The values of the DAYS\_SINCE\_FIRST\_OBS, and DAYS\_SINCE\_LAST\_OBS keywords shall be specified as relative time, in days, to the value of the OD\_EPOCH keyword.*or something similar.A units sub-section should be added to section 1. | Fixed. |
| 6-42 | 6.2.10 | 6.2.10.5 | ed | The paragraph reads:*A “Sensor Track” is defined above in Section 1.5.*This does not seem as a normative paragraph and should be removed. | A. Mancas/ESA | Remove paragraph. Consider adding a reference to section 1.5 in the description of the TRACKS\_\* keywords. | Fixed. |
| 6-42 | 6.2.10 | 6.2.10.6and6.2.10.8 | te | The two paragraphs read:*This orbit determination parameters section should reflect the orbit determination settings used to generate all orbit, covariance and state transition matrix sections of the message that are based upon “determined” orbit solutions.*and:*The Orbit Determination specification shall apply to all OCM orbit and covariance time history data sections that are based upon “determined” orbit solutions*Paragraph 6.2.10.6 (top) seems like a less requirements language way of stating 6.2.10.8, and therefore could be removed. 6.2.10.8 also imposed the one OD block on ALL orbit/covariance blocks with “determined” solutions, but since they have a keyword that can point to one OD block that should not be the case. | A. Mancas/ESA | 1. Remove 6.2.10.6.
2. Re-word 6.2.10.8 to something similar to:

*The Orbit Determination specification in one block shall apply to the OCM orbit, covariance time history, and maneuver data sections based upon “determined” orbit solutions* *and with the \*\_OD\_ID keyword value equal to the OD\_OD value of the block.*It might need some wordsmithing. | Fixed. |
| 6-42 | 6.2.10 | tble 6-12 | ed/te | The OD\_ID keyword is optional. If there is only one OD block, as there is in the current version, as this is imposed on all “determined” orbit, cov, etc blocks, then this keyword is not really needed. However, if more blocks are allowed, this keyword should be mandatory. | A. Mancas/ESA | Consider making mandatory? I am not sure it is needed, as \*\_ID are not needed in some cases. | Fixed. |
| 6-42 | 6.2.10 | tble 6-12 | te | The OD\_EPOCH keyword is listed as an UTC epoch. Is there a reason why:* The epoch cannot be given in another time system, if specified in the OCM metadata (eg TAI or GPS)?
* Relative time cannot be used here? Seems inconsistent, given the emphasis on allowing relative time.
 | A. Mancas/ESA | Think about removing UTC and maybe allowing relative time. | Fixed. |
| 6-43 | 6.2.10 | tble 6-12 | ed | All keywords with values of days (DAYS\_SINCE\_FIRST/LAST\_OBS, RECOMMENDED/ACTUAL\_OD\_SPAN, MAXIMUM\_OBS\_GAP) have *days (in SI days, with one day = 86400.0 s)* as part of their description. This could be avoided with a units subsection in section 1. | A. Mancas/ESA | Think about adding a units subsection in section 1 and remove all the extra descriptions of what an SI day is. | Fixed. |
| 6-43 | 6.2.10 | tble 6-12 | ed | The unit of OD\_CONFIDENCE is listed as ‘Percent’. | A. Mancas/ESA | The unit should be ‘%’. | Fixed. |
| 6-44 | 6.2.10 | tble 6-12 | te | INTEG\_STEP\_SIZE is one of the keywords, but there are many more settings (especially for batch OD) that would affect the results more (eg sigma multipliers for accepted/rejected observations, sigma values used, etc). Was there a reason for adding integration stepsize to the message? | A. Mancas/ESA | Think whether or not it is necessary.  | Fixed. |
| 6-46 | 6.2.10 | tble 6-12 | ed | The examples for DATA\_TYPES say ‘n/a’.  | A. Mancas/ESA | Surely an example of ‘ANGLE\_1, ANGLE\_2’ can be added. | Fixed. |
| 6-46 | 6.3 | n/a | ed | is this section really needed? | A. Mancas/ESA | consider removing | Yes – this is the only reference to examples, and is consistent with all other message types. |
| 7-0 | 7.3 | 7.3.3 | ed/te | *OCM lines may be of arbitrary length. If exchange between the two parties requires a maximum line length, that limit should be negotiated and specified in an ICD.*While the content of the ICD must be agreed by both parties and some negotiations normally take place, I’m not sure this should be stated in a normative paragraph in this way. | A. Mancas/ESA | Consider re-phrasing to*OCM lines may be of arbitrary length. If exchange between the two parties requires a maximum line length, that limit should mutually agreed by the exchange participants.*This would also drop the requirement for an ICD. | Fixed. |
| 7-1 | 7.4 | section title | ed | The section title is*KEYWORD = VALUE NOTATION (I.E., NON-XML) AND ORDER OF ASSIGNMENT STATEMENTS*This seems extremely clunky and should be changed to something shorter. | A. Mancas/ESA | Change to*The ODMs in KVN*or something similar. | Fixed. |
| 7-1 | 7.4 | 7.4.1.1 and7.4.1.4 | ed/te | These two requirements should be combined into one. | A. Mancas/ESA | Change 7.4.1.1 to*All OEM and OCM header and metadata elements shall use KVN notation.*or something similar. |  |
| 7-1 | 7.4 | 7.4.1.5 through7.4.1.8 | ed/te | These requirements state that OCM orbit state time history, covariance, state transition matrix, and maneuver data lines respectively are not in KVN. This is not true, as the data blocks contain plenty of KVN lines. The only mention of non-KVN lines is 7.4.1.6 (covariance), which is taken from the OEM requirement and does not mention all KVN lines in a covariance block.The OCM is breaking new ground in NDM development, as it allows both KVN and non-KVN **data** lines. Some terminology and normative paragraphs are needed to properly specify this. I am not sure what the correct terminology would be. OCM data block metadata sub-section (KVN lines are *de facto* metadata for their block) and OCM data block data subsection (for the non-KVN lines) would be one idea. This would make one OCM block an analog of one OEM segment. | A. Mancas/ESA | Add some clear OCM KVN structure requirements, both in section 6 and section 7. | This is no different than the OEM. Per agreement at our Plenary NAV WG mtg, okay to leave as is.We agreed at the Plenary meeting to research the implementation conformance statement. |
| 7-1 | 7.4 | 7.4.2 | ed | The paragraph reads*The keywords ‘COMMENT’, [wild card]‘\_START’ and [wild card]‘\_STOP’ are exceptions to the KVN syntax assignment.**[wild card]* should be replaced by *\**. | A. Mancas/ESA | Replace *[wild card]* with *\**. | Fixed. |
| 7-2 | 7.5 | 7.5.1 | ed | The paragraph reads*A non-empty value field must be specified for each mandatory keyword except as noted in §7.4.2 above.*There are two issues:1. the § character should be removed, it is not used in other NDM Blue Books (at least to my knowledge).
2. 7.4.2 referes which keywords are exempt from the KVN rule and includes comments, for which a value (but no ‘=’ is needed).
 | A. Mancas/ESA | Remove *§*.Think about whether or not 7.4.2 should be referenced, or another paragraph. | Fixed. |
| 7-3 | 7.5 | 7.5.10 | ed/te | The paragraph has the following sentence added to the end compared to other NDMs:*Where such epochs occur within one second after leap second introduction, the hh:mm:ss portion of the above time specification shall use the convention XX:XX:60.XXXX.*I understand that leap seconds (or improper handling of leap seconds by spacecraft operators) are the bane of every AGI engineer’s life, but I do not think this is the most elegant or appropriate way to mention leap seconds here.The normative paragraph does **not** say the value of ss shall be within 00-59. While the normative paragraph in other NDMs does not mention it explicitly, the referenced document (CCSDS 301.0-B-4) does mention how the time strings are to be used for leap seconds:when leap seconds are either subtracted or added. | A. Mancas/ESA | The offending sentence should be moved to a NOTE after the normative paragraph, saying something like:*During a leap second introduction, the value of the two digit integer seconds (ss) shall be ‘60’, as specified on page 3-6 of reference [whatever reference number].* | Fixed. |
| 7-3 | 7.5 | 7.5.11 | ed/te | The paragraph reads:The time system for CREATION\_DATE is UTC; for all other keywords representing times or epochs, the time system is determined by the TIME\_SYSTEM metadata keyword.This is not correct for the OCM, as at least one OCM keyword, OD\_EPOCH, is specifically stated to be UTC in table 6-12. I believe this was an error in table 6-12, and the time system for OD\_EPOCH should be whatever TIME\_SYSTEM in the metadata says it is. | A. Mancas/ESA | Fix inconsistency. | Fixed. |
| 7-4 | 7.6.1 | 7.6.1.2 | ed/te | The last sentence in the paragraph reads:*The notation ‘[n/a]’ should not appear in an OPM, OCM or OMM.*Is there a reason this is a should rather than a shall? | A. Mancas/ESA | Consider replacing should with shall. | Fixed. |
| 7-4 | 7.6.2 | 7.6.4 | te | The paragraph reads*Units for OCM keyword values shall be compatible with the corresponding orbit, covariance, or state transition matrix type’s requisite combination of units specified in the SANA registry [11 – 18]), or if not provided there for a specific keyword, then the “Units” column of the accompanying Keyword Value Tables (i.e., Tables 6-4 through 6.12) for each secion definition.*and is followed by a note*While the units used throughout the OCM are generally a combination of kilometers for distance and seconds for time (e.g., km/s for velocity, km/s^2 for acceleration and so forth). Mass is in kilograms, and force is in Netwons)*.I think this requirement and note are not sufficiently clear, and the lack of clarity is related to the new structure (data blocks with de facto metadata and data lines) and lack of a units section in the introduction.There are also two typos, the symbol for the exponent should be \*\* and newtons starts with a lowercase n. | A. Mancas/ESA | I would suggest splitting this into multiple normative paragraphs and harmonizing (the parts in red should be replaced with the ‘final’ terms) with terminology to be defined in 7.4.1, eg:*Units for OCM metadata keywords and OCM data block metadata sub-section keywords shall match the units specified in table 6-3 and follow the OPM and OMM specifications in 7.6.1.1 and 7.6.1.2.**If present, OCM orbit time state history block data block lines, the units shall be specified by the value of the ORB\_TYPE keyword and the units specified for that value in the SANA registry for Orbital Elements [ref something].*<<other paragraphs for other blocks with non-KVN lines>>The note can then be removed if a units sections is added to the introduction. | Fixed. |
| 7-5 | 7.7 | 7.7.6 | ed | There is a missing Oxford comma:*describe the OPM, OMM, OEM and OCM keywords.* | A. Mancas/ESA | Add missing comma:*describe the OPM, OMM, OEM, and OCM keywords.* | Fixed. |
| 7-67-7 | 7.8.1 | n/a | ed | There are multiple missing Oxford commas before “and OCM”. | A. Mancas/ESA | Add missing commas. | Fixed. |
| 7-8 | 7.8.2 | 7.8.2.4 |  | There is a missing Oxford comma:*Only those keywords shown in tables 6-2, table 6-3, table 6-4, table 6-5, table 6-6, table 6-7, table 6-9, table 6-10, table 6-11, table 6-12 and table 6-13 shall be used in an OCM.* | A. Mancas/ESA | Change to*Only those keywords shown in tables 6-2, table 6-3, table 6-4, table 6-5, table 6-6, table 6-7, table 6-9, table 6-10, table 6-11, table 6-12, and table 6-13 shall be used in an OCM.* | Fixed. |
| 8-9 | 8.1 | 3 | ed | missing Oxford comma | A. Mancas/ESA | add | Fixed. |
| 8-10 | 8.3 | 8.3.6 | ed/te | the text *(xxx = OPM, OMM, OEM, OCM)* is missing from the requirement, even though CCSDS\_xxx\_VERS is contained. | A. Mancas/ESA | Add *(xxx = OPM, OMM, OEM, OCM)* at the end. | Fixed. |
| 8-19 | 8.11 | 8.11.12 | ed/te | Most of the XML tags end in Parameters (eg <odParameters>), but for the “Perturbations Parameters” block the tag is just <perturbations>. Why not <perturbationsParameters> ? | A. Mancas/ESA | Consider changing to <perturbationsParameters> | Fixed – removed Parameters part. |
| 6-2 | Table 6-1 | Row 4 |  | Change ‘secton’ to ‘section’ | Halverson/NASA | Fix | Fixed. |
| 6-2 | Table 6-1 | Row 8 |  | Change ‘Paramters’ to ‘Parameters’ | Halverson/NASA | Fix | Fixed. |
| 6-2 | Table 6-1 | Last row |  | Change ‘user-defined parameters’ to ‘User-Defined Parameters’ | Halverson/NASA | Fix | Fixed. |
| 6-2 | 6.2.1.2 and 6.2.1.3 |  |  | Why bold text? That seems out of place with other sections and other messages. This comment applies throughout the material I read. | Halverson/NASA | Consider using non-bold font for consistency. | Fixed. |
| 6-4 | Table 6-2 |  |  | Put periods at the end of the sentences in the Description column | Halverson/NASA | Fix | Fixed. |
| 6-4 | Table 6-2 |  |  | Why are some ‘Yes’ entries bold and one is not in the Mandatory column? | Halverson/NASA | Fix for consistency | Fixed. |
| 6-5 | 6.2.3.4 |  |  | Formatting issue with last sentence. | Halverson/NASA | Fix | Fixed. |
| 6-5 | Table 6-3 |  |  | Why are the words inside parentheses bold? | Halverson/NASA | Consider using non-bold for consistency with other sections/messages. | Fixed. |
| 6-5 | Table 6-3 |  |  | The default column contains ‘n/a’ for some entries and not for others that are similar (PoC, for example) | Halverson/NASA | Fix | Fixed. |
| 6-5 | Table 6-3 |  |  | There are only two entries in the last column that are ‘yes’. Maybe just add that info to the Description for those two keywords?  | Halverson/NASA | Cosmetic. Could reduce the number of columns in the table. | Retained for completeness and consistency with other sections. |
| 6-7 | Table 6-3 | LIFETIME |  | ‘of’ missing after lifetime in the description | Halverson/NASA | Fix | Fixed. |
| 6-8 | Table 6-3 |  |  | Add the acronyms/shortened version of the Example of Values for the OCM\_DATA\_ELEMENTS to the other places they are listed. For example, you include ORBIT as an example value. In Table 6-1 you call it ‘Orbit Data’, and Section 6.2.4 is ‘Orbit State Time History’. Similar comments to the other sections. | Halverson/NASA | Recommend changing to add clarity. | Leaving for now. Table 6.1 has been replaced, and I felt that the title of the subsections needed more clarity than a single word. We can discuss. |
| 6-11 | 6.2.4.13 |  |  | Should the reference be to Reference 6 at the beginning of the document? Also, perhaps it would be clearer to say Annex [M-#] since there are two reference sections in the document (why?). | Halverson/NASA | Consider adding ‘Annex’ for clarity | There are two reference sections to the document. The normative references are placed in the body, and the informative are in the Annex. |
| 6-12 | ORB\_BASIS |  |  | The distinction between ‘DETERMINED\_OD’ and ‘DETERMINED\_TLM’, after reading the note, is a bit confusing. Perhaps you need to add more words to the ‘DETERMINED\_TLM’. Is ‘DETERMINED\_TLM’ just GPS point solutions, for example? What if that is all a mission needs for their ‘definitive’ OD? | Halverson/NASA | Consider updating for clarity | Fixed. |
| 6-13 | CENTER\_NAME |  |  | ISS appears twice in the examples | Halverson/NASA | Fix | Fixed. |
| 6-15 | QEB\_QC |  |  | In the preceding quaternion elements you refer to theta as the Euler rotation angle. Here you use Euler axis/angle rotation angle. Suggest using the same terminology for consistency. | Halverson/NASA | Consider changing for consistency | Fixed. |
| 6-17 | ATT\_POINTING |  |  | Wording is a little awkward. Perhaps ‘Combined knowledge and control accuracy’ | Halverson/NASA | Consider updating for clarity | Fixed. |
| 6-17 | IXX |  |  | Consider adding reference to the Green book (your Reference [M-1]) | Halverson/NASA | Suggestion | Fixed. |
| 6-21 | COV\_CONFIDENCE |  |  | Include an example | Halverson/NASA | Fix | Fixed. |
| 6-23 | 6.2.7.15 |  |  | Previous sections like this include the reference | Halverson/NASA | Review for consistency | Fixed. |
| 6-25 | STM\_ORB\_STATE |  |  | I don’t see a Reference [B-7] or maybe I missed something. | Halverson/NASA | Confirm reference, fix if needed | Per STM\_TYPE, which has the reference. |
| 6-26 | 6.2.8.1 |  |  | Here you call out Key Value Notation but didn’t in the first entry of the other sections. | Halverson/NASA | Review for consistency | Fixed. |
| 6-28 |  | First line |  | The word ‘composition’ appears, not sure if this is a typo or a sentence was lost. | Halverson/NASA | Fix | Fixed. |
| 6-28 | 6.2.8.14 |  |  | I think the second line should start with ‘be’ | Halverson/NASA | Fix | Fixed. |
| 6-30 | 6.2.8.16 |  |  | Last line is missing ‘be’: ‘shall be applied’ | Halverson/NASA | Fix | Fixed. |
| 1-5 | 1.7 |  | ed | The links point to websites with no content:[20] SANA Registry of Gravity Models: <https://sanaregistry.org/r/gravity_models> [22] SANA Registry of Operational Status of Space Object: <https://sanaregistry.org/r/operational_status> [24] SANA Registry of Orbit Types: <https://sanaregistry.org/r/orbit_types> Other SANA links might be affected too. | Ralph Kahle / DLR | Check all links and correct them if necessary | These registries are in work and will be present soon. |
| 6-4 | 6.2.3.3 |  | ed | Remove one “in” in: “At most, only one metadata section shall appear in in the entire scope of an OCM.” | Ralph Kahle / DLR | Correct typo. | Fixed. |
| 6-5 | Tab. 6-3 |  | ed | Remove space character in keywords “TECH \_ORG”, “TECH \_POC”, “TECH \_POSITION”, and “TECH \_PHONE” | Ralph Kahle / DLR | Correct typos. | Fixed. |
| 6-6 | Tab. 6-3 |  | te | For consistency with following \*\_MSG\_LINK keywords the keyword ATT\_MSG\_LINK might be renamed to ADM\_MSG\_LINK.The example might then be renamed too (ATT\_ID\_0572 🡪 ADM\_ID\_0572) | Ralph Kahle / DLR | Rename keyword and example | Fixed. |
| 6-7 | Tab. 6-3 |  | te | The keyword LIFETIME should be defined later in this table, i.e. after the keyword EPOCH\_TZERO has been introduced, since it relies on EPOCH\_TZERO.(I found a similar comment by Luc Maisonobe in the Aggregated CRM list. It says fixed there but maybe has crept in again) | Ralph Kahle / DLR | Change keyword order | Fixed. |
| 6-8 | Tab. 6-3 |  | te | The keyword TIME\_SYSTEM might be renamed, e.g. TIME\_SYSTEM\_TZERO, in order to clearly distinguish its application. Epochs other than EPOCH\_TZERO, e.g. PREVIOUS\_MESSAGE\_EPOCH, may refer to a different time system.Alternatively, TIME\_SYSTEM could globally define the time system. Then all epochs etc. rely on TIME\_SYSTEM. Description of some keywords (e.g. PREVIOUS\_MESSAGE\_EPOCH) has then to be adjusted. | Ralph Kahle / DLR | To be discussed | Fixed. |
| 6-9 | Tab. 6-3 |  | te | (related to previous comment):Time system information is needed for the keywords START\_TIME and END\_TIME in case absolute times are given. | Ralph Kahle / DLR | To be discussed | Fixed. |
| 6-16 | Tab. 6-5 |  | te | Keywords CONTROL\_MODE and ACTUATOR\_TYPE might be enhanced by prefix ATT\_ to indicate affiliation to Attitude Control domain and for consistency with following keywords, e.g. ATT\_KNOWLEDGE, ATT\_CONTROL etc. | Ralph Kahle / DLR | Add prefix ATT\_ to keywords CONTROL\_MODE and ACTUATOR\_TYPE | Fixed. |
| 6-17 | Tab. 6-5 |  | te | DV\_BOL and DV\_REMAINING keywords: The given example values are unrealistic high, i.e. 14000.0 km/s and 5000 km/s.  | Ralph Kahle / DLR | adjust examples to read 0.140 km/s and 0.050 km/s | Fixed. |
| 6-21 | Tab. 6-6 |  | ed | Remove space character in keyword “COV\_ FRAME\_EPOCH” | Ralph Kahle / DLR | Correct typo | Fixed. |
| 6-27 | 6.2.8.11 |  | ed | Remove one “be” in “Each maneuver data block should be be unique […]” | Ralph Kahle / DLR | Correct typo | Fixed. |
| 6-28 | Tab. 6-8 |  | te | The example values given for ACC\_\* and DV\_\* are unrealistically high and should be reduced (x1E-3). | Ralph Kahle / DLR | Adjust example values | Fixed. |
| 6-29 | Tab. 6-9 |  | te | The example values given for DEPLOY\_DV\_\* are unrealistically high and should be reduced (x1E-3). | Ralph Kahle / DLR | Adjust example values | Fixed. |
| 6.2 | Table 6.1 |  | ed | A single space object physical characteristics secton | Alain LAMY - CNES | Secton => section  | Fixed. |
| 6.4 | Table 6.2 |  | ed | Seems that the font used for CREATION\_DATE (in the “description” column) is not the same as for other keywords | Alain LAMY - CNES | Change font if necessary  | Fixed. |
| 6.5 | Table 6.3 |  | ed | TECH \_ORG, TECH \_POC, etc…: White space before “\_” in the keyword  | Alain LAMY - CNES | Remove white space | Fixed. |
| 6.7  | Table 6.3  |  | te | OBJECT\_DESIGNATOR : I think that it should be mentioned that this designator is the ID in the catalog whose name is “CATALOG\_NAME”  | Alain LAMY - CNES | Change if necessary | Fixed. |
| 6.8 | Table 6.3 |  | te | TIME\_SYSTEM: not only for EPOCH\_TZERO. Also for all time stamps | Alain LAMY - CNES | Change to: for all time stamps including EPOCH\_TZERO | Fixed. |
| 6.8 | Table 6.3 |  | te | SCLK\_EPOCH : is it really necessary ?  | Alain LAMY - CNES | For discussion  | Yes, per our discussion this week. |
| 6.8 | Table 6.3 |  | te | SCLK\_SEC\_PER\_SI\_SEC : it seems to me that adding this keyword complicated the standard a little, without being general enough. So is it really needed ? Or at least say that is is an approximate value.  | Alain LAMY - CNES | For discussion | Yes, per our discussion this week. |
| 6.9 | Table 6.3 |  | ge | TIME\_SPAN is defined as END\_TIME minus START\_TIME, so brings no new information. Do we have to keep it ?  | Alain LAMY - CNES | For discussion  | Yes, retained because these are all optional keywords. |
| 6.9 | Table 6.3 |  | te | TCOEFF\_SOURCE : the definition does not seem completely clear to me. Which coefficients exactly ?  | Alain LAMY - CNES | Clarify  | Fixed. |
| 6.10 | 6.2.4.4 |  | ed | Bold characters used. I suppose this is not intentional. Note : check in all document  | Alain LAMY - CNES |  | Fixed. |
| 6.10 | 6.2.4.4 |  | ed | It may be a question of language (so I’m not sure), but I think it would be clearer if you said: Each orbit state data block should (or shall) differ from all others in at least one of the following respects : * the selected element set (ORB\_TYPE),
* etc…

Note : appear in other places in the document.  | Alain LAMY - CNES |  | Fixed. |
| 6.13 | Table 6.4 |  | ed | “Orbit time history line(s) shall be formatted asdescribed above”: you should mention which section exactly  | Alain LAMY - CNES |  | Fixed. |
| 6.14 | Table 6.5 |  | ed | OEB\_PARENT\_FRAME definition: You mention OEB\_ROLL and OEB\_YAW : but they don’t seem to exist any more  | Alain LAMY - CNES | Replace by correct names | Fixed. |
| 6.14 | Table 6.5 |  | te | SOLAR\_RAD\_AREA : Even if the definition is clear, the name is the same as in other ODM messages but does not mean the same thing | Alain LAMY - CNES | Find another name for SOLAR\_RAD\_AREA | Fixed. |
| 6.14 | Table 6.5 |  | te | SOLAR\_RAD\_SCALE: I would say that the actual value for the SRP coefficient is SOLAR\_RAD\_COEFF \* SOLAR\_RAD\_SCALE(seems less ambiguous)  | Alain LAMY - CNES |  | Fixed. |
| 6.14 | Table 6.5 |  | te | ATT\_CONTROL : Accuracy of attitude control ? (instead of ability to control attitude) : Seems more precise. Note : same for ATT\_POINTING  | Alain LAMY - CNES |  | Fixed. |
| 6.28 | 6.2.8.14 |  | ed | “The MAN\_COMPOSITION keyword shall specify the elements of information toe provided … “ | Alain LAMY - CNES | E -> be | Fixed. |
| 6.28 | Table 6.8 |  | te | DV\_X, DV\_Y …“The actual ΔV should be impulsively applied at a time of <time tag> +½ (MAN\_DURA).”If mass is not constant, the thrust in the second half is more efficient than in the first half, so that the DV should not be applied at mid – thrust time. Should this be always neglected ?  | Alain LAMY - CNES | For discussion  | (as discussed, nothing is neglected - - we are simply representing the maneuver at the half duration point for consistency with other (thrust, accel) depictions. |
| 6.28 | Table 6.8 |  | te | THR\_DMASS: Additional mass change beyond …For information: what can it be for instance ?  | Alain LAMY - CNES |  | Fixed – now Rocket Eqn is included in DMASS. |
| 6.28 | Table 6.8 |  |  | DEPLOY\_DV\_X, …I think it has already been discussed, but the DV applies to the child not to the parent. Because the ODM applies to the main spacecraft, and because we’re mainly interested in the impact on the main spacecraft (I suppose), wouldn’t it be more logical to give the DV resulting on the main spacecraft instead of the DV acting on the children ?  | Alain LAMY - CNES | For discussion | It would be, except for the DEPLOY\_DCV\_RATIO momentum transfer usage; the emphasis of the DEPLOY\_DV must be on the deployed object, not the host. |
| 6.28 | Table 6.8 |  |  | DEPLOY\_DV\_RATIO : Do the bars above the DV mean “vector” ? They should be replaced by arrows for less confusion.  | Alain LAMY - CNES |  | Yes, this may be regional differences in depicting vectors. Bars are standard practice, in my opinion. |
| 6.28 | Table 6.8 |  |  | DEPLOY\_DV\_RATIO : It is said “as well as any rotationaltorque acted upon the host …” Question : How can you take this rotational impact into account using a multiplying factor ?  | Alain LAMY - CNES |  | It means that you could impart a DV to the child of 5 m/s, for example, yet the much bigger host does not experience a DV = (mass ratio) \* 5 m/s. Because some of this energy goes into induced rotational energy. |
| 6.28 | Table 6.8 |  |  | DEPLOY\_DV\_CDA: Question : what is this keyword used for ?  | Alain LAMY - CNES | Add information if this keyword is really necessary | This is the ballistic coefficient for the child, necessary to model its relative motion with respect to the host for collision avoidance purposes. |
| 6.29 | 6.2.8.15 |  |  | The example of time stamp is 2018-11-13T11:13:20.5ZIs the “Z” really allowed ?  | Alain LAMY - CNES |  | Yes, per 301B - YYYY-MM-DDThh:mm:ss.d→dZ, where Z is the optional “Time Code Terminator” |
| 6.29 | 6.2.8.15.1 |  |  | I don’t understand the link between “acceleration, impulsive ΔV, and thrust parameters shall not be additive” and “applied at a time tag of Tstart + ½ (MAN\_DURA)” | Alain LAMY - CNES |  | As discussed in our Plenary meeting, the DV, acceleration and Thrust parameters provide equivalent depictions of the same maneuver. They are not additive. And since DV is impulsive, it can best apply the DV at the burn centerpoint. |
| 6.33 | Table 6.10 |  |  | MAN\_CENTER\_NAME : Is this really necessary ? What is it used for ?  | Alain LAMY - CNES |  | Removed. |
| 6.33 | Table 6.10 |  |  | GRAV\_ASSIST\_NAME: in the description (and the examples) can be the solar system barycenter. Seems strange ! In the the examples : EARTH\_SUN\_L2 : seems strange too !  | Alain LAMY - CNES |  | Fixed. |
| 6.38 | Table 6.11 |  |  | CENTRAL\_BODY\_ROTATION: I wonder if the “inertial” reference frame is precise enough (as the Z axis is not perfectly inertial). But this may be a negligible fact.  | Alain LAMY - CNES | Add something in the description.  | Fixed. |
| 6.38 | Table 6.11 |  |  | OBLATE\_FLATTENING : why specifying the inverse ? It prevents the user from using a spherical body (for simple cases)  | Alain LAMY - CNES |  | Fixed. |
| 6.46 | Table 6.11 |  |  | USER\_DEFINED : Maybe add the syntax allowed for these parameters: For instance (TBC) : * uppercase only
* A-Z + “\_” only and beginning with letter
 | Alain LAMY - CNES |  | Changed to exactly match the OMM OPM and OEM |
| 1-2 | 1.2 | para 1, line 6 | ed | Mentions sections 3 through 5, but not 6. | David S. Berry / NASA | Add section 6, or say "Sections 3 through 6". | Fixed. |
| 1-2 | 1.4 | line 1 | ed | Says "Section 0" | David S. Berry / NASA | Should be Section 2 (you could probably leave this for the CCSDS Editor to fix). | Fixed. |
| 1-2 | 1.4 | 9,10 | ed | For Section 7 and Section 8, "OEM and OCM" is missing the Oxford comma. | David S. Berry / NASA | From: OEM and OCMTo: OEM, and OCMAlso check throughout document... there are several other occurrences. Alternatively, leave for CCSDS Editor. | Fixed. |
| 1-4 | 1.7 | Ref [16] | te | Reference [16] is not used in this document, so should not be listed. | David S. Berry / NASA | Remove reference | Fixed. |
| 1-5 | 1.7 | Ref [21] | ed | link is the same as that for Ref [18] | David S. Berry / NASA | Modify link text | Fixed. |
| 1-5 | 1.7 | Ref [21] | te | We should discuss whether this is deserving of a SANA reference. We have sections in CDM and RDM that can be validated. but putting this info into a SANA registry would make it hard to validate and may be inconsistent with CDM and RDM. | David S. Berry / NASA | Discuss value and necessity. | Fixed. |
| 1-5 | 1.7 | Ref [22] | te | We should discuss whether this is deserving of a SANA reference. We have sections in CDM and RDM that can be validated. but putting this info into a SANA registry would make it hard to validate and may be inconsistent with CDM and RDM. | David S. Berry / NASA | Discuss value and necessity. | Fixed. |
| 1-5 | 1.7 | Ref [24] | te | Are the classifications envisioned for this registry specified in a standard?  | David S. Berry / NASA | If not in a standard, it seems semi-arbitrary. | Removed. |
| 3-2 | Table 3-1 |  | ed/te | CCSDS\_OPM\_VERS Example of Values uses "old" version | David S. Berry / NASA | From: 2.0To: 3.0 | Fixed. |
| 3-2 | Table 3-1 |  | ed | ORIGINATOR: wouldn't it be more straightforward to just refer users to reference [10] rather than a redirect to Annex B and then a second redirect to reference [10]? We could indicate something like "See Annex B for rationale" or something like that. | David S. Berry / NASA | Consider (for this, and related multiple redirects to Annex B and to Section 1.7). | Let’s discuss. |
| 3-3 | Table 3-2 |  | ed/te | MESSAGE\_ID should be in header for consistency with other NDMs | David S. Berry / NASA | Please move the MESSAGE\_ID from Metadata into the header (last row of header). NOTE: CRM from P2.38 says this was fixed, but it is not. | Fixed. |
| 3-3 | Table 3-2 |  | ed | OBJECT\_NAME: After "reference [2]" there should be a closing parenthesis but there is not. | David S. Berry / NASA | Add closing parenthesis. | Fixed |
| 3-3 | Table 3-2 |  | ed/te | CENTER\_NAME: Refers to an "OBJECT\_DESIGNATOR". This is new in P2.39, and it's not in the Table 3-2 (nor should it be in my opinion).  | David S. Berry / NASA | Discuss. I don't see the need for this. If the OBJECT\_ID isn't sufficient, why would OBJECT\_DESIGNATOR be better? The format of OBJECT\_ID is not mandatory, so that keyword should be sufficient.  | Fixed - – cut and paste error for Annex B |
| 3-3 | Table 3-2 |  | te | I question the value of an OPM that has a CENTER\_NAME of a ground station. Again, this is new in P2.39. See note above. | David S. Berry / NASA | Discuss need (i.e., provide a credible use case). | Fixed. |
| 3-3 | Table 3-2 |  | ed | CENTER\_NAME: Use of requirements language. | David S. Berry / NASA | From: "which can draw"To: "which may draw" | Fixed. |
| 4-3 | Table 4-2 |  | ed | CENTER\_NAME: Says "Origin of the STM reference frame" (looks like a copy & paste anomaly). | David S. Berry / NASA | Remove "STM". | Fixed. |
| 4-4 | Table 4-2 |  | ed/te | REF\_FRAME: Example shows "TEME", but that value is not in the referenced SANA registry. | David S. Berry / NASA | From: TEMETo: TEMEOFDATE (probably, or TEMEOFEPOCH) | Fixed. |
| 5-5 | Table 5-3 |  | ed | CENTER\_NAME: Says "Origin of the STM reference frame" (looks like a copy & paste anomaly). | David S. Berry / NASA | Remove "STM". | Fixed. |
| 5-5 | Table 5-3 |  | te | I question the value of an OEM that has a CENTER\_NAME of a ground station. Again, this is new in P2.39. See note above. | David S. Berry / NASA | Discuss need (i.e., provide a credible use case). | Removed. |
| 5-5 | Table 5-3 |  | ed/te | CENTER\_NAME: Refers to an "OBJECT\_DESIGNATOR". This is new in P2.39, and it's not in the Table 3-2 (nor should it be in my opinion).  | David S. Berry / NASA | Discuss. I don't see the need for this. If the OBJECT\_ID isn't sufficient, why would OBJECT\_DESIGNATOR be better? The format of OBJECT\_ID is not mandatory, so OBJECT\_ID should be sufficient.  | Fixed. |
| 5-5 | Table 5-3 |  | ed | CENTER\_NAME: Use of requirements language. | David S. Berry / NASA | From: "which can draw"To: "which may draw" | Fixed. |
| 5-7 | 5.2.5.2 | 2 | ed/te | Refers to keyword "COV\_START" which should be "COVARIANCE\_START in the OEM | David S. Berry / NASA | From: COV\_STARTTo: COVARIANCE\_START | Fixed. |
| 6-2 | Table 6-1 |  | ed | Typo. | David S. Berry / NASA | From: ParamtersTo: Parameters | Fixed. |
| 6-2 | 6.2.1.4 | 2 | te | Use of "not permitted" is not part of the standard requirements terminology. | David S. Berry / NASA | Delete: "It is not permitted to mix".Add between "time" and "within": "shall not be used". Final statement: "Relative and absolutetime shall not be used within the same data block." | Fixed. |
| 6-4 | 6.2.3.4 NOTE | NOTE 1 | te | It is not clear why a new keyword "OBJECT\_DESIGNATOR" is being introduced in P2.39, late in the document development. Use of "OBJECT\_ID would be consistent with other parts of the ODM and with other NDM documents. | David S. Berry / NASA | Please provide rationale. | Explained an agreed at this week’s CCSDS ODM discussion. |
| 6-4 | Table 6-2 |  | te | CLASSIFICATION: There is no credible argument from the standpoint of consistency to add this to the Header section of the OCM when it is absent from every other header of every other Navigation Data Message. If it's truly necessary, it should be added to every header of every message, and not just in the ODM. An easy solution here if the CLASSIFCATION is seen as necessary is to move it to the metadata. | David S. Berry / NASA | Please move to the metadata section, high up in the table. If the DATA is classfied, putting this attribute in the METADATA (data about data) is appropriate. The analogous keyword was in metadata in P2.38. | Fixed. |
| 6-5 | Table 6-3 |  | ed/te | META\_START: the "Mandatory" column contains "n/a", but should contain "Yes". (See 6.2.3.2) | David S. Berry / NASA | From: n/aTo: Yes | Fixed. |
| 6-5 | Table 6-3 |  | ed | Default column: If there is no default, the column sometimes contains "n/a" and sometimes is just blank. | David S. Berry / NASA | Consistent usage is recommended. It will be easier to see the actual default values if the cells are empty if there is no default, so a blank cell if there is no default is recommended. | Fixed. |
| 6-5 | Table 6-3 |  | ed | TECH\_ORG: A different "Description" format is used here than was used for the ORIGINATOR field in the Header. | David S. Berry / NASA | Consistent usage is recommended. | Fixed. |
| 6-5 | Table 6-3 |  | ed | TECH\_POC, TECH\_POSITION, TECH\_PHONE keywords are shown with a blank space after "TECH" and before the underscore. | David S. Berry / NASA | Remove blank space in keyword. | Fixed. |
| 6-6 | Table 6-3 |  | ed | PREVIOUS\_MESSAGE\_ID: Rerquirements language. | David S. Berry / NASA | From: "One can provide"To: "One may provide" | Fixed. |
| 6-6 | Table 6-3 |  | ed | NEXT\_MESSAGE\_ID: Rerquirements language. | David S. Berry / NASA | From: "One can provide"To: "One may provide" | Fixed. |
| 6-6 | Table 6-3 |  | ed/te | ATT\_MSG\_LINK: All other links start with the acronym of a Navigation Data Message but this one does not. | David S. Berry / NASA | From: "ATT\_MSG\_LINK"To: "ADM\_MSG\_LINK" | Fixed. |
| 6-6 | Table 6-3 |  | ed/te | \*\*\*\_MSG\_LINK and above. There are potentially 17 lines of information relevant to a space object after META\_START before we finally encounter the OBJECT\_NAME. | David S. Berry / NASA | Consider whether OBJECT\_NAME (and other identifying keywords) should be moved earlier in the list of metadata items. Compare placement of this keyword in OPM, OMM, OEM metadata. | Fixed. |
| 6-7 | Table 6-3 |  | ed | CATALOG\_NAME: A different "Description" format is used here than was used for the ORIGINATOR field in the Header. | David S. Berry / NASA | Consistent usage is recommended. | Fixed. |
| 6-7 | Table 6-3 |  | te | CATALOG\_NAME: I wonder if we should rename the <https://sanaregistry.org/r/cdm_catalog> SANA registry and re-use it as the source for this field ? | David S. Berry / NASA | Consider | To discuss. |
| 6-7 | Table 6-3 |  | te | OBJECT\_DESIGNATOR: has language about control authority/source of this ID. Seems redundant given that the message developer can point to the CATALOG\_NAME for the info. (NOTE: See earlier comments on this newly added keyword.) | David S. Berry / NASA |  | Fixed. |
| 6-7 | Table 6-3 |  | te | LIFETIME: Belongs in RDM. P2.38 CRM says this was removed per recommendation, but it's still present. | David S. Berry / NASA | Please remove. | Removed. |
| 6-7 | Table 6-3 |  | te | OBJECT\_TYPE: Examples of values are not consistent with the same information in the CDM and RDM. | David S. Berry / NASA | Please provide example values that are consistent with the values used in CDM and RDM. | Moving to SANA registry and can standardize there. Let’s discuss as part of our SANA submittal.  |
| 6-8 | Table 6-3 |  | ed | TIME\_SYSTEM: Since "UTC" is in the "Default" column, it is redundant to have "(defaults to UTC) in the "Any OCM sections relying upon this field" column. | David S. Berry / NASA | Remove "(defaults to UTC)" from the far right column in table. Alternatively, remove the entire column "Any OCM sections relying upon this field ?". See later comments to this effect. | Fixed. |
| 6-8 | Table 6-3 |  | ed/te | EPOCH\_TZERO: refers to "block-specifc EPOCH\_TZERO values", but this version of OCM doesn't have any "block-specific EPOCH\_TZERO values". Instead there are "STM\_ORB\_TIME", and the maneuver override of EPOCH\_TZERO no longer seems to be present. | David S. Berry / NASA | I actually prefer that the block specific TZERO times have been removed (so thank you), although it's curious that the STM\* keyword changed and the MAN\_EPOCH\_TZERO went away even though the WG agreed to retain it in discussion at Mountain View. | Removed. |
| 6-8 | Table 6-3 |  | te | SCLK\_EPOCH: Another new keyword in P2.39. It's curious why the default would be 1.0 for this keyword. | David S. Berry / NASA | Seems like the default value would be 0.0. Maybe this was just a copy from the SCLK\_SEC\_PER\_SI\_SEC default (?)\_ | Fixed. |
| 6-8 | Table 6-3 |  | ed/te | SCLK\_SEC\_PER\_SI\_SEC: default doesn't reflect units. | David S. Berry / NASA | The default should be 1.0 [s] | Fixed. |
| 6-8 | Table 6-3 |  | ed/te | PREVIOUS\_MESSAGE\_EPOCH: Requirements language | David S. Berry / NASA | From: "One can provide"To: "One may provide" | Fixed. |
| 6-8 | Table 6-3 |  | ed/te | NEXT\_MESSAGE\_EPOCH: Requirements language | David S. Berry / NASA | From: "One can provide"To: "One may provide" | Fixed. |
| 6-9 | Table 6-3 |  | ed/te | END\_TIME: This keyword is functionally the same as "STOP\_TIME" in other NDMs, but syntactically inconsistent. | David S. Berry / NASA | From: END\_TIMETo: STOP\_TIME | Fixed. |
| 6-9 | Table 6-3 |  | ed | TAIMUTC\_AT\_TZERO: Uses symbol for "#" for number in the Description. There are 79 instances of the word "number" in the document; only 2 uses of "#" in descriptions. | David S. Berry / NASA | From: #To: number | Fixed. |
| 6-9 | Table 6-3 |  | ed/te | TCOEFF\_SOURCE: It's not clear what timing coefficients are referred to here. There is no other mention of the parameter or its use in the document. No examples utilize it. | David S. Berry / NASA | Please explain where/how this keyword is used. | Good – I wasn’t sure either. Deleted. |
| 6-9 | Table 6-3 |  | ed/te | META\_STOP: the "Mandatory" column contains "n/a", but should contain "Yes". (See 6.2.3.2) | David S. Berry / NASA | From: n/aTo: Yes | Fixed. |
| 6-5 thru 6-9 | Table 6-3 |  | ed | I think it might be best to remove the column labelled "Any OCM sections relying upon this field ?." There are only 2 entries in the 5 pages of this table that have "Yes" in this column, and that info could easily be added to the 2 table cells for which "Yes" is the answer. Rationale: It's the far right column of the table, which is the position of the "Mandatory" column in all other tables. It has the same value set as the "Mandatory" column. Since the "Yes" answers are very sparse, it's easy to miss them (I did it several times myself while reviewing Annex G OCMs). Thus the column doesn't seem to add a lot of value, and may even cause errors to be made. | David S. Berry / NASA | Consider removing the column and adding information about other OCM section dependencies to the relevant cells. | Fixed. |
| 6-10 | 6.2.4.5 |  | te | States: "In the event that the only difference between multiple orbit state time history data blocks is the selected element set (ORB\_TYPE), reference frame (ORB\_REF\_FRAME) and/or orbit center (CENTER\_NAME)..."The "and/or" construction here is problematic. From a user processing standpoint, the logical meaning is not at all clear (e.g., from the standpoint of a logical operation, it's not clear what a comma means). And the meaning is bound to change when the CCSDS Editor inserts the Oxford comma that is missing here. As written, it could mean:If the first comma means "and": "ORB\_TYPE and (ORB\_REF\_FRAME and CENTER\_NAME")"ORB\_TYPE and (ORB\_REF\_FRAME or CENTER\_NAME)" If the first comma means "or": "ORB\_TYPE or (ORB\_REF\_FRAME and CENTER\_NAME")"ORB\_TYPE or (ORB\_REF\_FRAME or CENTER\_NAME)" The truth value of these four compound conditional statements is different, and the consequent result of a program processing the OCM will be different depending upon how the programmer has interpreted this statement. The addition of the Oxford comma will change the logic too,. | David S. Berry / NASA | Consider just saying that the top-most orbit state time history is the true or master depiction. Alternatively, say that if there are differences in ORB\_TYPE or ORB\_REF\_FRAME or CENTER\_NAME (i.e., all the conditionals are "OR") then (action). Note that this doesn't state what should be done if there are no differences. | Fixed. |
| 6-11 | 6.2.4.11 | 2-3 | ed | I would move the opening parenthesis and remove semicolon. | David S. Berry / NASA | From: "...state elements (as defined by ORB\_TYPE; see SANA registry [17]..."To: "...state elements as defined by ORB\_TYPE (see SANA registry [17]..." | Fixed. |
| 6-12 | Table 6-4 |  | ed | ORB\_BASIS: Consider moving the material in the "Note" into the definition of "DETERMINED\_OD". The suggestion also avoids awkward anthropomorphism of "whose" | David S. Berry / NASA | From: existing NoteAdd to "DETERMINED\_OD": "Includes definitive OD solutions performed onboard that have been telemetered to the ground for inclusion in an OCM". | Fixed. |
| 6-13 | Table 6-4 |  | te | I question the value of an OCM that has a CENTER\_NAME of a ground station. Again, this is new in P2.39.  | David S. Berry / NASA | Discuss need (i.e., provide a credible use case). | Fixed. |
| 6-13 | Table 6-4 |  | te | CENTER\_NAME: I'm wondering why CENTER\_NAME is not in Metadata. By not having CENTER\_NAME in metadata, it's necessary to have \*\*\*\_CENTER\_NAME in most if not all the other data blocks; that seems to at least partially defeat one of the stated purposes of the OCM. It's hard to imagine how the CENTER\_NAME could realistically be different throughout an OCM when there's only a single metadata section and a single perturbations section.  | David S. Berry / NASA | Consider if it's really necessary to have all the "\*\*\_CENTER\_NAME keywords. | Let’s discuss. I think that the primary justification is so that orbits can be depicted relative to other formation-flown spacecraft. |
| 6-13 | Table 6-4 |  | ed | <Insert orbit lines here>: It might be good to provide the SANA registry reference here. | David S. Berry / NASA | Add reference to "[17]" From: "... as specified in the SANA Orbital Elements registry"To: "... as specified in the SANA Orbital Elements registry [17]." | Fixed. |
| 6-14 | Table 6-5 |  | te | DRAG\_AREA: I'm having trouble envisioning how much drag area is left after the spacecraft is already bounded by the OEB. The keyword seems to be something of a misnomer. | David S. Berry / NASA | The equation for calculating the DRAG\_AREA (as it is defined for the OCM) should be provided in Annex C. | Fixed. |
| 6-14 | Table 6-5 |  | te | DRAG\_SCALE: to what quantity is the DRAG\_SCALE applied? DRAG\_COEFF? if so, why is another parameter required; why not just build it into the specified DRAG\_COEFF? or is this just documentation of whether or not the scale factor was actually applied to the DRAG\_COEFF? | David S. Berry / NASA | Provide information about how DRAG\_SCALE and DRAG\_COEFF (or other parameter) are related. | These areas augment the area represented by the box. This is typically done when you have an area which constantly points into the relative wind (e.g., a sensor) that is different from an area you may wish to portray as being attitude-dependent. |
| 6-16 | Table 6-5 |  |  | SOLAR\_RAD\_AREA: As with DRAG\_AREA, I'm not understanding how the "not already incorporated into the attitude dependent 'AREA\_ALONG\_OEB' parameters" is calculated. In this case (unlike the DRAG\_AREA) there is an equation that seems to calculate the SOLAR\_RAD\_AREA. The "not already incorporated into" wording seems to imply a quantity that is added to the AREA\_ALONG\_OEB\_\*. | David S. Berry / NASA | I may not be understading this correctly, but it seems that the equation provided should be augmented with the terms used to calculate the area "not already incorporated into the attitude-dependent 'AREA\_ALONG\_OEB parameters'". | These areas augment the area represented by the box. This is typically done when you have an area which constantly points at the sun (e.g., solar panels) that is different from an area you may wish to portray as being attitude-dependent. |
| 6-16 | Table 6-5 |  |  | SOLAR\_RAD\_SCALE: Similar question as with DRAG\_SCALE... is this a factor applied to the SOLAR\_RAD\_COEFF? | David S. Berry / NASA | Provide information about how SOLAR\_RAD\_SCALE and SOLAR\_RAD\_COEFF (or other parameter) are related. | Fixed (removed) |
| 6-18 | 6.2.6.5 |  | te | This section suffers from the same problem described above for section 6.2.4.5, but to a lesser degree given that there are only 2 data elements that might differ in multiple covariances and drive the "master depiction" decision. In this case, you could get away with saying simply "or" instead of "and/or", since I think "or" is what you really mean. | David S. Berry / NASA | Consider just saying that the top-most orbit state time history is the true or master depiction. Alternatively, use "or" for the logical operation. | Fixed (chose option “A”) |
| 6-19 | 6.2.6.13 | NOTE | ed/te | The "NOTE" following this section is important, but I don't think we can dictate how users interpolate. In particular we don't have any way to enforce a "shall" here. Also, by CCSDS guidelines, we cannot have a requirement specification in a NOTE (CCSDS Publications Guide says "the NOTE format as defined in section 4 shall be used for brief non-normativecomments". (Sorry I missed this in the review of P2.38, which also had it). | David S. Berry / NASA | Re-word the NOTE to use a non-normative statement regarding the interpolation of the neighboring time points in the covariance matrix. This may be a good place to use the "it is recommended that" construct that we can't use to express a requirement. You could even say "strongly recommended that". Alternatively you could maybe make this a 6.2.6.14 normative statement and say "should"... I still don't think "shall" would be appropriate. | Fixed. |
| 6-20 | Table 6-6 |  | ed | COV\_BASIS: Consider moving the material in the "Note" into the definition of "DETERMINED\_OD". The suggestion also avoids awkward anthropomorphism of "whose" | David S. Berry / NASA | From: existing NoteAdd to "DETERMINED\_OD": "Includes definitive OD solutions performed onboard that have been telemetered to the ground for inclusion in an OCM". | Fixed. |
| 6-20 | Table 6-6 |  | ed/te | COV\_BASIS\_ID: Description refers to orbit state time history. | David S. Berry / NASA | From: "orbit state time history"To: "covariance time history" | Fixed. |
| 6-20 | Table 6-6 |  | ed/te | COV\_REF\_FRAME: The default value provided is not in the SANA Registry | David S. Berry / NASA | From: TNWTo: TNW\_INERTIAL or TNW\_ROTATING | Fixed. |
| 6-22 | 6.2.7.5 |  | te | This section suffers from the same problem described above for section 6.2.4.5, but to a greater degree given that there are 4 data elements instead of 3 that might differ in multiple state transition matrices and drive the "master depiction" decision. The final truth value matters depending on the interpretation of commas and the "and/or" construction. | David S. Berry / NASA | Consider just saying that the top-most orbit state time history is the true or master depiction. Alternatively, use "or" for the logical operation in all cases. | Fixed. |
| 6-24 | Table 6-7 |  | ed/te | STM\_ORB\_ID: The Description refers to a keyword "STM\_ORB\_STATE\_TIME" which does not appear elsewhere. | David S. Berry / NASA | Given the description of other keywords in the table, I think "STM\_ORB\_STATE\_TIME" should be changed to "STM\_ORB\_STATE" in the Description of STM\_ORB\_ID. | Fixed. |
| 6-24 | Table 6-7 |  | te | STM\_ORB\_ID: It's not clear how this will work in practice because the ORB\_ID as I understand it applies to an orbit state time history, i.e., not a single state. Is the intent of this keyword that the user would find the the orbit state time history with the identified ORB\_ID and then pick the state within the block at the STM\_ORB\_TIME as the initial state? | David S. Berry / NASA | The Description should probably be revised to state that the initial state will be found within the identified orbit state time history, and how to identify it. | Fixed. The orbit state time history block may or may not be present, so this is an optional linkage. |
| 6-24 | Table 6-7 |  | ed | STM\_BASIS: Consider moving the material in the "Note" into the definition of "DETERMINED\_OD". The suggestion also avoids awkward anthropomorphism of "whose" | David S. Berry / NASA | From: existing NoteAdd to "DETERMINED\_OD": "Includes definitive OD solutions performed onboard that have been telemetered to the ground for inclusion in an OCM". | Fixed. |
| 6-25 | Table 6-7 |  | te | I question the value of an OCM that has an STM\_CENTER\_NAME of a ground station. Again, this is new in P2.39. See notes above. | David S. Berry / NASA | Discuss need (i.e., provide a credible use case). | Fixed (removed). |
| 6-26 | 6.2.8.1 |  | ed | States "Only those keywords shown in Table 6-10 shall be used as Key Value Notation keywords in the OCM maneuver specification". In every other OCM section you have used a different structure: "Only those keywords shown in Table x-x shall be used in the OCM <data type> specification." | David S. Berry / NASA | From: existing (which uses a different acronym for "KVN" than is used elsewhere)To: "Only those keywords shown in Table 6-10 shall be used in the OCM maneuver specification." | Fixed. |
| 6-27 | 6.2.8.10.1 | 1 | te | Seems like maybe there should also be time bounds recommended on the maneuvers accumulated due to the ADDITIVE=YES attribute | David S. Berry / NASA | Consider adding "or over multiple days" at the end. | Fixed; the “additive” value has been eliminated. |
| 6-27 | 6.2.8.12 |  | te | The compound condition here is problematic (particularly the "and/or"). | David S. Berry / NASA | See comments for suggestion p.6-10, sec 6.2.4.5 . | Fixed, per our agreement at CCSDS Spring meeting. |
| 6-28 | 6.2.8.13 | 1 | ed | The line ends with a stray word "composition" | David S. Berry / NASA | Remove the stray word. | Fixed. |
| 6-28 | 6.2.8.14 | 2 | ed | Missing character. | David S. Berry / NASA | From: "... information to e provided..."To: "... information to be provided..." | Fixed. |
| 6-28 | 6.2.8.14 |  | te | The text specifies that the elements of information "shall be selected from one or more elements of Table 6-8 ... and Table 6-9...". In Table 6-10, it is stated that the MAN\_COMPOSITION elements of information lines should be populated "with values selected from Table 6-8 or Table 6-9". The bolding provided in Table 6-10 on MAN\_COMPOSITION implies to me that the "or" in this case is meant to be an "exclusive or" (i.e., from Table 6-8 or Table 6-9, but not both). | David S. Berry / NASA | In 6.2.8.14, "and" should be changed to "or", and it should be clear that it's an exclusive or. | Fixed. |
| 6-28 | 6.2.8.14 | 6 | ed | Closing parenthesis before the colon is not necessary | David S. Berry / NASA | Remove closing parenthesis before the colon. | OBE |
| 6-28 | Table 6-8 |  | ed/te | ACC\_\*: Units shown contain "^" for exponentiation instead of "\*\*" | David S. Berry / NASA | Change "^" to "\*\*" as required in 7.6.1.1(e) | Fixed. |
| 6-28 | Table 6-8 |  | ed/te | ACC\_\*: Example values shown start with decimal point. | David S. Berry / NASA | Add zero before decimal point per 7.5.6 | Fixed. |
| 6-28 | Table 6-8 |  | te | It's not clear why ACC\_DMASS, DV\_DMASS, and THR\_DMASS are all necessary. I understand that you can evaluate the rocket equation with any of these, but presumably the results would be "very close" for any given event. | David S. Berry / NASA | Is the need based on the particular spacecraft measurement instrumentation? If so, need understood. | Agreed and fixed. |
| 6-28 | Table 6-8 |  | te | THR\_DMASS: what thrust is attributable "beyond the mass change already prescribed by the rocket equation" and how is it measured or calculated? | David S. Berry / NASA | Could be ignorance on my part, but if not, elucidate. | Deleted |
| 6-28 | Table 6-8 |  | ed/te | The Descriptons for ACC\_DMASS and THR\_DMASS start with the word "Additional". But the "Additional" only seems to apply when "MAN\_IS\_ADDITIVE" is "Yes". I think it might be best to remove the word "Additional" (e.g., DV\_DMASS doesn't have this). | David S. Berry / NASA | Consider removing "Additional" from Description of ACC\_DMASS and THR\_DMASS | Deleted |
| 6-29 | Table 6-8 |  |  | DEPLOY\_DV\_CDA: What drag coefficient is used in determining this? | David S. Berry / NASA | I don't have suggestion... I don't know how this would be used in actual practice. | This is to support collision avoidance modeling of the host object w.r.t. the deployed object. The important thing is to be able to construct the ballistic coefficient, so Cd doesn’t actually matter by itself. |
| 6-29 | 6.2.8.15 | 4 | ed | If one doesn't consider the parenthetical example, the last line reads as "absolute time epoch tiime". | David S. Berry / NASA | Maybe remove "epoch time", yielding simply "absolute time". Alternatively, remove "time" in both cases, yielding "absolute epoch". | Fixed. |
| 6-30 | 6.2.8.16.6 | 2 | ed/te | Requirements language. | David S. Berry / NASA | From: "... is mandatory."To: "... shall be provided." | Fixed. |
| 6-31 | 6.2.8.16.7 |  | ed | Subject/verb agreement in NOTE 1 | David S. Berry / NASA | From: "Relationships... is"To: "Relationships ... are" | Fixed. |
| 6-32 | Table 6-10 |  | te | MAN\_DEVICE\_ID: Question. Description states that "'ALL' indicates that this maneuver represents thesummed acceleration (or velocity increment) imparted by any/all thrusters utilized in the maneuver." Since there is a block of "THR" related parameters in Table 6-8, should this "ALL" text include the summed thrust components as well? | David S. Berry / NASA | Consider:From: existing textTo: "... summed acceleration, velocity increment, or thrust imparted..." , or something like this (?) | Fixed. |
| 6-32 | Table 6-10 |  | ed | MAN\_IS\_ADDITIVE: Another instance where "Mandatory" is "Yes", but a default is specified. | David S. Berry / NASA | If it's mandatory to be specified, the default is superfluous. | Fixed; MAN\_IS\_ADDITIVE has been removed. |
| 6-32 | Table 6-10 |  | ed | MAN\_IS\_ADDITIVE: Assuming the default alluded to above is retained, having the default column specify "NO" should be sufficient. It doesn't need to be in the "Mandatory" column too. | David S. Berry / NASA | Remove "(defaults to 'NO')" from the "Mandatory column. | Fixed; MAN\_IS\_ADDITIVE has been removed. |
| 6-33 | Table 6-10 |  | te | I question the value of an OCM that has a MAN\_CENTER\_NAME of a ground station. Again, this is new in P2.39. See note above. | David S. Berry / NASA | Discuss need (i.e., provide a credible use case). | Fixed; MAN\_CENTER\_NAME is deleted. |
| 6-33 | Table 6-10 |  | te | MAN\_CENTER\_NAME: See previous comments regarding "OBJECT\_DESIGNATOR" | David S. Berry / NASA | See previous comments regarding "OBJECT\_DESIGNATOR" | Fixed; MAN\_CENTER\_NAME is deleted. |
| 6-33 | Table 6-10 |  | ed/te | MAN\_REF\_FRAME: The default value provided is not in the SANA Registry | David S. Berry / NASA | From: TNWTo: TNW\_INERTIAL or TNW\_ROTATING | Fixed. |
| 6-33 | Table 6-10 |  | te | GRAV\_ASSIST\_NAME: I don't think Earth/Sun L2 can be used for a gravity assist. Although it has relative motion with respect to the spacecraft, it has no mass, a critical element in gravity assists. | David S. Berry / NASA | Remove "EARTH\_SUN\_L2" from the list of examples. | Fixed. |
| 6-34 | Table 6-10 |  | te | DC\_MIN\_CYCLES/DC\_MAX\_CYCLES: I'm not a maneuver analyst, but I wonder if specifying defaults for these parameters might be dangerous (?) | David S. Berry / NASA | Consider. | I don’t believe so. The default values are designed to basically disable the duty cycle, so in my opinion this is safe. |
| 6-34 thru 6-36 | Table 6-10 |  | ed/te | Requirements language. There are a number of places in the table which state "... is mandatory if...", with a value of "No" in the column headed "Mandatory", creating something of a contradiction. Since the "is mandatory" formulation isn't official "requirements speak" per section 1.6, I think it would be better to phrase these as "shall" statements. | David S. Berry / NASA | From: "... is mandatory if..."To: "... shall be provided if..." | OBE |
| 6-36 | Table 6-10 |  | te | I find the description of the phase-angle based duty cycle parameters confusing, and they don't seem to align well with the Figure C-4. It's not clear to me just what is rotating or oscillating such that there is a phase angle that can be measured. | David S. Berry / NASA | This could just be me, not being very familiar with thruster hardware and control. | Fixed - clarified figure caption to be “Diagram of a rotating spacecraft body’s progression through an inertial clock angle-based duty cycle” |
| 6-37 | 6.2.9.4 | 3 | ed | Uses "i.e." when "e.g." (for example) would be more appropriate. | David S. Berry / NASA | From: "(i.e. 2 0)"To: "(e.g., 2 0)' | Fixed. |
| 6-37 | Table 6-11 |  | te | ORBIT\_CENTER\_NAME: It's not clear why this is necessary since the CENTER\_NAME is specified in the Orbit State Time History section. The idea of sending a perturbations section without an orbit state time history is a bit odd. | David S. Berry / NASA | Consider if this is necessary, and if so, how does starting it with "ORBIT" make sense. | Fixed, removed. |
| 6-37 | Table 6-11 |  | te | ORBIT\_CENTER\_NAME: The first and second+third paragraphs of the description are virtually identical. | David S. Berry / NASA | Remove duplication | Fixed, removed. |
| 6-37 | Table 6-11 |  | te | ORBIT\_CENTER\_NAME: The idea of using a ground station as the center for the perturbations section seems very odd. | David S. Berry / NASA | Provide a credible use case. | Fixed, removed. |
| 6-38 | Table 6-11 | 1 | ed | GRAVITY\_MODEL, GRAVITY\_MODEL\_DEGREE, GRAVITY\_MODEL\_ORDER: word choice... simulations are not the only place where gravity models are used. | David S. Berry / NASA | From: "simulation"To: "analysis" Use of "analysis" covers a whole range of modeling activities. | Fixed. |
| 6-38 | Table 6-11 | 5 | ed | N\_BODY\_PERTURBATIONS: Typo | David S. Berry / NASA | From: "satellites)t."To: "satellites" | Fixed. |
| 6-38 | Table 6-11 |  | ed | ALBEDO\_GRID\_SIZE: Uses symbol for "#" for number in the Description. There are 79 instances of the word "number in the document"; only 2 uses of "#" in descriptions. | David S. Berry / NASA | From: #To: number | Fixed. |
| 6-39 thru 6-41 | Table 6-11 |  | ed/te | From FIXED\_GEOMAG\_KP to end of table: There is explanatory material at the bottom part of most of these table cells that may be suitable for moving to an Annex C subsection. | David S. Berry / NASA | Consider. | Fixed. |
| 6-42 | 6.2.10.8 |  | ed/te | Given this requirement (shall), it seems that the "Note" at the very beginning of the section is superfluous. The corresponding statement from P2.38 was a "should". | David S. Berry / NASA | I would remove the "Note" since the requirement is more persuasive. | Fixed/removed. |
| 6-43 | Table 6-12 |  | ed | OD\_METHOD: There is a long parenthetical clause (starting with "commonly") listing OD methods that breaks up the description. It really could stand alone (as a non-parenthetical) after "...ODTK)." | David S. Berry / NASA | Consider. Implementing this suggestion will make the Description easier to read. | Fixed. |
| 6-43 | Table 6-12 |  | te | If the OD is not done in UTC, then OD\_EPOCH will be misleading. | David S. Berry / NASA | Consider specifying the OD\_EPOCH in the TIME\_SYSTEM instead of UTC. | Fixed. |
| 6-44 | Table 6-12 |  | ed/te | Either TDM\_IDS from this table or TDM\_MSG\_LINK in metadata seems superfluous. | David S. Berry / NASA | Consider if both of these keywords, which should have identical values if used, are necessary. | Fixed. |
| 6-46 | Table 6-13 |  | te | (USER-DEFINED): Note that the formation of the user defined keyword is different in the OPM, OMM, and RDM. | David S. Berry / NASA | Per NavWG Guideline 05, please make the formation of the user defined keywords consistent with that defined in the OPM, OMM, and RDM. There is also a well defined structure for the XML user defined keywords that conforms to the OPM, OMM, RDM that will apply to the OCM if this section is made consistent. Otherwise, user defined parameters will not be useable in an OCM/XML unless exchange participants modify the CCSDS schemas. I don't see why the OCM should be an exception. String length is not a good argument to ignore consistency, given the huge number of keywords that a user could potentially specify in an OCM. | Fixed. |
| 7-2 | 7.4.8 |  | ed | Two missing "Oxford commas" | David S. Berry / NASA | Detect, fix. | Fixed. |
| 7-3 | 7.5.11 |  | te | This specification, which appears in all Nav WG standards, may have implications to the OCM if any fields have "UTC" specified as the default but the "TIME\_SYSTEM" is specified as non-UTC. | David S. Berry / NASA | Check to see of any issues, which could well occur if someone sets a "non-UTC" TIME\_SYSTEM in an OCM and doesn't specifiy any fields that have UTC as a default time system (maybe nly OD\_EPOCH?) | Fixed. |
| 7-4 | 7.6.4 | 4 | ed | Table notation. | David S. Berry / NASA | From: 6.12To: 6-12 | Fixed. |
| 7-4 | 7.6.4 | 5 | ed | Typo | David S. Berry / NASA | From: secionTo: section | Fixed. |
| 7-4 | 7.6.4 | NOTE | ed | Incomplete sentence. | David S. Berry / NASA | From: "... so forth.) Mass..."To: "... so forth), mass..." Alernatively, remove the starting "While".In either case, also remove closing parenthesis after "Newtons.)" | Fixed. |
| 7-4 | 7.6.4.1 |  | te | I think maneuver lines should be added to the list of lines where units are not shown | David S. Berry / NASA | From: "... orbit state, covariance, or state transition matrix data line..."To: "... orbit state, covariance, state transition matrix, or maneuver data lines..." | Fixed. |
| 7-5 | 7.7.10 |  | ed | This specification lists each section of the OCM individually, but some of the names have changed over time and the orbit determination section is left out. Alternatively, refer to the OCM sections en masse because the comment placement is the same for all of them. | David S. Berry / NASA | From: Force ModelTo: "Perturbations"Also, add "Orbit Determination"Alternatively, "Comments in the sections of the OCM may appear only at the positions shown in the defining Tables..." | Fixed. |
| 7-8 | 7.8.2.4 |  | ed | In the list of tables, table 6-9 should be removed because that table number has been re-purposed since P2.38 | David S. Berry / NASA | Remove "table 6-9" from the list of tables of acceptable keywords. | Fixed. |
| 8-20 | 8.10.25 |  | te | Maybe we can discuss this after the virtual Spring Meetings? I think we both have a lot to do prior to those meetings (at least I do anyway). | David S. Berry / NASA | Consider. | Done. |
| B-2 | B3 | 1 | ed | Self reference in ANNEX B to ANNEX B is odd. | David S. Berry / NASA | From: '...provided in ANNEX B normative reference [13]."To: '...provided in normative reference [13]." | Fixed. |
| B-2 | B4 | 1 | ed | Subject/verb agreement | David S. Berry / NASA | From: The set of acceptable values ... are...To: The set of acceptable values ... is ... | Fixed per Spring Mtg rework. |
| B-2 | B6 | 1 | ed | Subject/verb agreement | David S. Berry / NASA | From: "An additional set ... are ..."To: "An additional set ... is ..." | Fixed per Spring Mtg rework. |
| C-1 | C1 | last | ed | Extra word "be" | David S. Berry / NASA | From: "... is always be defined..."To: "... is always defined..." | Fixed. |
| C-3 to C-4 | C2 |  |  | Not reviewed since it appears there are still some technical matters to resolve (several comments in the document, sections highlighted in red, and a few items from P2.38 awaiting inputs from Pat North). | David S. Berry / NASA | None... will review when the section is more mature. | Sounds fine. |
| C-5 | C3 | 2 | te | Says the section describes "cone-based duty cycles", but that has been removed from this version. | David S. Berry / NASA | From: "...time-based, phase-angle-based and cone-based duty cycle parameters."To: "...time-based and phase-angle-based duty cycle parameters." | Fixed. |
| C-5 | C3 |  | te | In text below figure C-3, it might be helpful to indicate what is rotating or oscillating between the angular limits. | David S. Berry / NASA | Describe. | Fixed – added section breaks to clarify. |
| C-6 | C3 | Fig C-4 | ge | As noted above, I spent a fair amount of time going back and forth from the keywords to this diagram and never felt like I really understood how to specify the parameters correctly. | David S. Berry / NASA | This could just be me, not being very familiar with thruster hardware and control. | Understood – hopefully clarified now. |
| C-7 | C4 |  | ed/te | Minor comment... | David S. Berry / NASA | I would just add "GDoP = " to the left of the formulation. | Fixed. |
| D-1 | Annex D |  | ed/te | Following text is obsolete given the Silver book status of ODM V.1 and pending Silver book status of the ODM V.2: "Fig. D-3 and Fig. D-4 include unique features of ODM version 2.0, and thus ‘CCSDS\_OPM\_VERS = 2.0’ (at a minimum) must be specified." | David S. Berry / NASA | Remove the text. | Removed. |
| E-1 | Fig E-2 |  | ed/te | Example uses frame "TEME" that is not in the SANA reference frame registry (should be "TEMEOFDATE") | David S. Berry / NASA | From: "TEME"To: "TEMEOFDATE" | Fixed. |
| E-2 | Fig E-3 |  | ed/te | Example uses frame "TEME" and covariance frame that are not in the SANA reference frame registry | David S. Berry / NASA | From: "TEME"To: "TEMEOFDATE" | Fixed. |
| E-3 | Fig E-4 |  | ed/te | Example uses frame "TEME" that is not in the SANA reference frame registry | David S. Berry / NASA | From: "TEME"To: "TEMEOFDATE" | Fixed. |
| E-4 | Fig F-5 |  | ed/te | Example uses frame "TEME" that is not in the SANA reference frame registry | David S. Berry / NASA | From: "TEME"To: "TEMEOFDATE" | Fixed. |
| F-4 | Fig F-3 |  | ed | The sample OEM contains the keyword "COV\_START" which is not valid in an OEM | David S. Berry / NASA | From: COV\_STARTTo: COVARIANCE\_START | Fixed. |
| G-2 | Fig G-2 |  | ed/te | The example shows ORIGINATOR\_POC, ORIGINATOR\_POSITION, and ORIGINATOR\_PHONE in the Header, instead of the metadata. | David S. Berry / NASA | Move cited keywords to Metadata Section | Fixed. |
| G-2 | Fig G-2 |  | ed/te | The example shows EPOCH\_TZERO, then TIME\_SYSTEM, which is not the correct order. | David S. Berry / NASA | Reverse order to:TIME\_SYSTEMEPOCH\_TZERO | Fixed. |
| G-2 | Fig G-2 |  | ed/te | Uses inconsistent specification of user defined parameter | David S. Berry / NASA | From: "EARTH\_MODEL"To: "USER\_DEFINED\_EARTH\_MODEL"But maybe this particular parameter should change since the user could use the standardized "GRAVITY\_MODEL = WGS-84" without a user defined parameter. | Fixed. |
| G-3 | Fig G-3 |  | te | I feel like this example ought to have a comment indicating that this is a simulation or study and not meant for ops since the spacecraft isn't identified. | David S. Berry / NASA | Add a comment. | Fixed. |
| G-3 | Fig G-3 |  | te | Mixes relative and absolute time in the Orbit State Time history... see 6.2.1.4 | David S. Berry / NASA | Choose one or other (probably relative since most of the entries are relative in this example). | Fixed. |
| G-3 | Fig G-3 |  | ed/te | This provides a good example why comments shouldn't be used for operational information. MASS in PHYS section says 100 kg, MASS in MAN section says 200 kg host. | David S. Berry / NASA | Probably should make them consistent in an example in the standard. | Fixed. |
| G-3 | Fig G-3 |  | te | I guess I was wrong that Table 6-8 or Table 6-9 was an "exclusive or"... | David S. Berry / NASA | Ignore previous comments about "exclusive or", but it should be made clear in discussion of Table 6-8/6-9 that elements from both can be mixed in the MAN\_COMPOSITION | Nope, I was wrong. Now clearly states “or”, but not both. |
| G-3 | Fig G-3 |  | te | Example uses value for MAN\_BASIS that is not in the normative set. (Both maneuver blocks). | David S. Berry / NASA | From: MAN\_BASIS = PREDICTEDTo: MAN\_BASIS = CANDIDATE (since object isn't identified, it couldn't be a real plan I don't think). | Fixed. |
| G-3 | Fig G-3 |  | te | Example uses obsolete keyword "MAN\_EOI" (both maneuver blocks) | David S. Berry / NASA | From: MAN\_EOITo: MAN\_COMPOSITION | Fixed. |
| G-3 | Fig G-3 |  | te | Example doesn't use mandatory keyword "DEVICE\_ID" (both maneuver blocks) | David S. Berry / NASA | Add "DEVICE\_ID = DEPLOYMENT" to the first maneuver, "DEVICE\_ID = some thruster to second maneuver. | Fixed. |
| G-3 | Fig G-3 |  | ed/te | "ORBIT\_ADJUST" isn't one of the suggested values for MAN\_PURPOSE. | David S. Berry / NASA | Probably should use one of the suggested values for the example in the standard. | Fixed. |
| G-3 | Fig G-3 |  | ed/te | Example doesn't use mandatory keyword "OD\_METHOD" | David S. Berry / NASA | Add mandatory keyword | Fixed. |
| G-5thruG-8 | Fig G-4 thru Fig G-6 |  |  | Not reviewed given that based on Fig G-3 they are probably stale. | David S. Berry / NASA | Recommend checking these examples to ensure they are up to date. | Fixed/checked. |
| G-9 | Fig G-7 |  | ge | I checked this example against the P2.38 draft XML schema for the OCM and it checks out, but the schema most likely needs to be updated too given the checking results on Fig G-3. | David S. Berry / NASA | None | Understood. |
| K-1 | K1 | 2 | ed | Wrong OCM section cited | David S. Berry / NASA | From: "section 4"To: "section 6" | I believe that it is correct now. |
| K-1 | K2 | 3 | ed/te | We pretty much know where the registries will be found. | David S. Berry / NASA | From: "..."To: sanaregistry.org | Fixed. |
| M-1 |  |  |  | Ref [M-1]: Obsolete version is cited | David S. Berry / NASA | Use 500.0-G-4, Issue 4, November 2019. | Fixed. |
| M-1 |  |  | ed | Not sure why M-3 is in red... is there a revision in progress? or might it be subject to removal from the list? | David S. Berry / NASA | Not sure how to resolve. | Fixed. |
| M-1 | Ref M-9 |  | ed | Title provided doesn't match title on paper. | David S. Berry / NASA | From: Position covariance visualizationTo: Attitude covariance visualization | Fixed. |
| M-1 | Ref M-10 |  | ed/te | I received a "404 Not found" when looking for this site. | David S. Berry / NASA | Provide alternative website? | Fixed. |
| Many | General |  | ed/te | Phrases like "documented in an ICD", "in an ICD", "in the ICD" appear frequently. This has been a staple feature of Nav WG standards. However, in anticipation of pushback from CESG, It may be proactive to try to reduce explicit references to an ICD. | David S. Berry / NASA | Review each instance of "ICD" to see if it can be viably replaced by the implicit suggestion of an ICD rather than an explicit statement, e.g., "should be agreed to between exchange partners" or something similar. This suggests an ICD between the parties but doesn't explicitly recommend it. | Fixed. |