| **Page** | **Section** | **Line** | **Type** | **Comment/ Rationale** | | **Source of Comment (Name/Agency)** | **Suggested Disposition** | **Disposition**  **(Completed by Principal Editor)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1-1 | 1.2, para 2 | 4 | ed | Typo: "For example and RDM..." | | David Berry / NASA | Change "and" to "an" | yes |
| 1-1 | 1.2, para 2 | 6 | te | States that "The presence of users defined keywords..." | | David Berry / NASA | We should discuss whether or not this convention should be continued in Nav WG standards. I'm in favor of deleting from RDM. | to be discussed |
| 1-1 | 1.2, para 2 | 7 | ed | Typo: "... information to be exchange after..." | | David Berry / NASA | Change "exchange" to "exchanged" | already fixed |
| 1-1 | 1.2, para 3 | All | te | Regarding RDM originators and consistency... should this admonition appear? | | David Berry / NASA | Discuss viability of this admonition. | It can be deleted; this has more to do with good practice than standardisation |
| 1-3 | 1.4.2 | 1 | ed | Typo: "normative specification" | | David Berry / NASA | Change "specification" to "specifications" (plural) | fixed |
| 1-4 | 1.5 | Ref [1] | ed/te | The SI document has been updated... it's still shown as the 2006 edition, but it's stated to have been updated in 2014. | | David Berry / NASA | Change "2006" to "2006, updated 2014" (see http://www.bipm.org/en/publications/si-brochure/ ) at the top, just below the menu bar. | fixed |
| 1-4 | 1.5 | Ref [5] | ed/te | Some of the main words in the title are not capitalized. | | David Berry / NASA | Capitalize the main words in the title. | fixed |
| 1-4 | 1.5 | Ref [5] | ed/te | Typically this type of reference would be put into a special annex of "Informative References" | | David Berry / NASA | Add an annex for "Informative References" (see the CDM, for example) | fixed(ish) |
| 3-1 | 3.1.3 | 1 | te | The stated requirement here cannot be enforced. | | David Berry / NASA | Change "shall" to "should" | fixed |
| 3-2 | Table 3-1, CREATION\_DATE |  | ed | Directing the reader to reference [6] is not specific enough (e.g., there are several binary formats in that document). | | David Berry / NASA | Change "see [6]" to "see 4.3.2.5", because that is where it is stated to use either "ASCII Time Code A or B". | fixed |
| 3-2 | Table 3-1, ORIGINATOR |  | te | The CESG has recently indicated that "freeform" agency or operator identifiers are discouraged. | | David Berry / NASA | Change the ICD recommendation to use of the SANA Registry (specific registry TBD... they are reorganizing the overall registry). | fixed(ish) |
| 3-2 | Table 3-1, MESSAGE\_FOR |  | te | Alexandru's comment states "Proposed for deletion". I think this is a good idea. | | David Berry / NASA | Remove "MESSAGE\_FOR" keyword | already deleted |
| 3-3 | Table 3-2 |  | ed/te | There are several keywords identical to those in the CDM, which is good from a re-use standpoint. Putting them in the same order in the RDM and CDM might be something to consider. | | David Berry / NASA | Consider. | Is this about the object name, international designator, catalog name? If so this needs to be discussed, as we should have the same across all standards. |
| 3-3 | Table 3-2, OBJECT\_NAME |  | te | The Description refers to the UNOOSA registry, but doesn't indicate how to find it. | | David Berry / NASA | Suggest adding a reference in Section 1.5, and then adding the reference number to the description. | added to reference documents |
| 3-3 | Table 3-2, OBJECT\_OWNER |  | te | The CESG may suggest that this info come from an organization related SANA registry. | | David Berry / NASA | Consider changing the preferred source to the SANA Registry (specific registry TBD... they are reorganizing the overall registry), with an option to use freeform text if not in SANA. | There is a candidate SANA registry called “organizations”, but this only covers public bodies (eg NASA or ESA), and not commercial operators. |
| 3-3 | Table 3-2, ORBIT\_CENTER |  | te | "ORBIT\_CENTER" is used in the CDM, but "CENTER\_NAME" is used in all the ODM and ADM messages. I cannot recall why we made this inconsistent change, but there is a clear precedent for "ORBIT\_CENTER" | | David Berry / NASA | Discuss which keyword to use. | This needs discussion. I agree with your point but IIRC at the Rome meeting the general feeling was that the CDM was the inconsistent message. |
| 3-4 | Table 3-2 |  | ed | Headers do not appear on this page of the table. | | David Berry / NASA | Activate the MS Word "Repeat Header Rows" feature. | fixed |
| 3-4 | Table 3-2, TIME\_SYSTEM |  | te | The description indicates that a time system value should be chosen from the "Navigation Data - Definitions & Conventions" Green Book, which makes sense on one level. Unfortunately, the CCSDS doesn't allow references like this to a non-normative document in a normative document. That's why all the books have an annex that contains the allowed time systems and reference frames. (Just for the record, I personally made the same error in the first issue of the ODM.) | | David Berry / NASA | Consider adding a normative Annex that contains the allowed time systems. Alternatively, we have discussed the potential of putting a normative list in the SANA Registry, which would simplify a lot of our standards. | normative annex added, though a SANA registry makes much more sense |
| 3-4 | Table 3-2, REF\_FRAME |  | te | The description indicates that a reference frame value should be chosen from the "Navigation Data - Definitions & Conventions" Green Book. See above "TIME\_SYSTEM" comment for other relevant discussion. | | David Berry / NASA | Consider adding a normative Annex that contains the allowed reference frames. Alternatively, we have discussed the potential of putting a normative list in the SANA Registry, which would simplify a lot of our standards. | normative annex added, though a SANA registry makes much more sense |
| 3-4 | Table 3-2, GRAVITY\_MODEL |  | ge | The description here (and for several other entries in the table) refers to "the simulation", however, it is not clear what simulation is being referred to. | | David Berry / NASA | Consider adding some contextual material in either Section 2 or an informative annex about the re-entry modeling methodology, and how an RDM might figure into that (either as input to or output from the simulation). | could be done in a future version |
| 3-4 | Table 3-2, N\_BODY\_PERTURBATIONS |  | te | The Nav WG will be filing a corrigendum to the CDM on this keyword (but it hasn't been filed yet). We will want to make this keyword consistent with the corrected CDM and the OCM. | | David Berry / NASA | None for now, but may need to change the examples of values when the corrigendum is completed. | thanks for the heads up |
| 3-5 | 3.4.1 | 7 | te | Refers to a logical block for "User defined parameters." | | David Berry / NASA | We should discuss whether or not this convention should be continued in Nav WG standards. I'm in favor of deleting from RDM. | ok with deleting it; needs further discussion |
| 3-6 | Table 3-3 |  | ed | Headers do not appear on this page of the table. | | David Berry / NASA | Activate the MS Word "Repeat Header Rows" feature. | fixed(ish) |
| 3-6 | Table 3-3, ORBIT\_LIFETIME |  | te | The value is specified to be in a unit of days, but it is not specified if this should be integer days or fractional days. | | David Berry / NASA | Specify the format of the value (integer or double precision). | double precision  integers assumed to be .0 |
| 3-6 | Table 3-3, LIFETIME\_DISPERSION |  | te | This keyword seems out of place. | | David Berry / NASA | Move "LIFETIME\_DISPERSION" immediately after the "ORBIT\_LIFETIME" keyword. | fixed |
| 3-6 | Table 3-3, NOMINAL\_REENTRY\_EPOCH |  | te | No format for the value is specified. | | David Berry / NASA | Add "See 4.3.2.5 for format specification." | fixed |
| 3-6 | Table 3-3, REENTRY\_WINDOW\_START |  | te | No format for the value is specified. | | David Berry / NASA | Add "See 4.3.2.5 for format specification." | fixed |
| 3-6 | Table 3-3, REENTRY\_WINDOW\_END |  | te | No format for the value is specified. | | David Berry / NASA | Add "See 4.3.2.5 for format specification." | fixed |
| 3-6  3-7 | Table 3-3 |  | ge | Question based on ignorance: Why is the uncertainty matrix of re-entry location only based on North and East? | | David Berry / NASA | Question. No action necessarily required. | Not 100% sure – this is what our contractors came up with for the prototype. One possible explanation is that for land impact you only need a 2x2 cov matrix because the Earth’s surface would determine the z-component. |
| 3-7 | Table 3-3 | 2 | te | The comment for the state vector is proposed for removal. I don't think this is a good idea, but we should discuss. | | David Berry / NASA | Discuss. | Agree. Comment deleted. |
| 3-7 | Table 3-3 | 2 | te | In the comment for the state vector, it is not indicated whether or not a partial state vector is permissible. | | David Berry / NASA | Should state in the comment that all or none of the state vector elements should be provided. | Clarification added |
| 3-7 | Table 3-3, EPOCH |  | ed | Verb tense: Instead of "will be given", should use "is given". | | David Berry / NASA | Change "will be given" to "is given" | fixed |
| 3-7 | Table 3-3, EPOCH |  | ed | Format for the EPOCH is not given. | | David Berry / NASA | Add "See 4.3.2.5 for format specification." | fixed |
| 3-7 | Table 3-3, \*\_DOT |  | te | Question based on ignorance: Not familiar with the use of u-component, v-component, w-component for the velocity components | | David Berry / NASA | Question: Is this common usage? | changed to x/y/z |
| 3-7 | Table 3-3 | 2 | te | The comment for the position/velocity covariance matrix is proposed for removal. I don't think this is a good idea, but we should discuss. | | David Berry / NASA | Discuss. | comment deleted |
| 3-8 | Table 3-3 | 2 | te | The comment for the spacecraft parameters is proposed for removal. I don't think this is a good idea, but we should discuss. | | David Berry / NASA | Discuss. | comment deleted |
| 3-8 | Table 3-3, SOLAR\_RAD\_AREA |  | te | In a re-entry scenario, is this necessary? The SOLAR\_RAD\_COEFF is proposed for removal. | | David Berry / NASA | Discuss | both rad coeff and rad area proposed for removal |
| 3-8 | Table 3-3, DRAG\_AREA |  | ed/te | "DRAG\_AREA" in ODM, "AREA\_DRG" in CDM. Cannot recall why we allowed this inconsistency. | | David Berry / NASA | Discuss | should be fixed in all messages |
| 3-8 | Table 3-3, TIME\_LASTOB\_END | 1 | ed | Description states "The start of a time interval...", but this is the end... looks like a copy/paste error. | | David Berry / NASA | Change "The start..." to "The end..." | fixed |
| 3-8 | Table 3-3, RECOMMENDED\_OD\_SPAN |  | te | The value is specified to be in a unit of days, but it is not specified if this should be integer days or fractional days. | | David Berry / NASA | Specify the format of the value (integer or double precision). | double precision |
| 3-8 | Table 3-3, ACTUAL\_OD\_SPAN |  | te | The value is specified to be in a unit of days, but it is not specified if this should be integer days or fractional days. | | David Berry / NASA | Specify the format of the value (integer or double precision). | double precision |
| 3-9 | Table 3-3, WEIGHTED\_RMS |  | te | The method for calculating this is not specified. | | David Berry / NASA | Add material to section 2, or the description in Table 3-3, or an informative annex, as to how this is calculated. | to be added to an informative annex |
| 3-9 | Table 3-3, User defined parameters |  | te | The concept of user defined parameters is a slippery one in the context of standards development. | | David Berry / NASA | Discuss whether or not this should be retained. | am ok with removal, but since this type of service is in its infancy, might be ok to allow some flexibility |
| 3-9 | 3.4.4 | 1 | ed/te | Standards text... "COMMENT lines are allowed..." should be re-worded. | | David Berry / NASA | Change cited text to "COMMENT lines may be utilized..." or "... may be used..." | fixed |
| 3-9 | 3.4.5 | 1 | ed | Typo: "IMPACT\_REFT\_FRAME" | | David Berry / NASA | Change "REFT" to "REF" | fixed |
| 3-9 | 3.4.8 | All | te | The concept of user defined parameters is a slippery one in the context of standards development. | | David Berry / NASA | Discuss whether or not this should be retained. | see response above |
| 3-10  3-11 | 3.5 | All | te | The CCSDS editor is not in love with examples in-line in the standards text. | | David Berry / NASA | Consider moving the examples to an informative annex. | can be moved |
| 3-10 | Figure 3-1 |  | te | The figure caption says that it only uses mandatory keywords, however, the example contains "OBJECT\_TYPE", which is not mandatory. It also does not contain the "NOMINAL\_REENTRY\_ALTITUDE", which is listed as mandatory. | | David Berry / NASA |  | fixed |
| 3-10 | Figure 3-2 |  | te | The figure does not contain the "NOMINAL\_REENTRY\_ALTITUDE", which is listed as mandatory. | | David Berry / NASA | Add the "NOMINAL\_REENTRY\_ALTITUDE" | fixed |
| 4-1 | 4.2.3.1 | 1 | ed/te | Uses the word "obligatory", which was used in earlier Nav WG standards, but must now be replaced. | | David Berry / NASA | Replace "obligatory" with "mandatory". | fixed |
| 4-3 | 4.3.2.1 | 4 | ed/te | Mathematical error: +2,147,483,648 is not 231-1 | | David Berry / NASA | Change "+2,147,483,648" to "+2,147,483,647" | fixed |
| 4-3 | 4.3.2.1 | 4 | ed/te | Mathematical error: 221 is not correct. | | David Berry / NASA | Change "-221" to "-231" | it’s already that |
| 4-4 | 4.3.3(b) | 1 | te | Indicating "the correct case" may not be sufficient. | | David Berry / NASA | Should indicate "as shown in Table 3-3", since that table shows the correct case. | fixed |
| A-11 | Annex B | All | ed | The annex is just what is shown in the document template. | | David Berry / NASA | Recommend to copy Annex E from the PRM document and modify as necessary (should be minimal modifications required). | parts from the PRM drafted added and modified |
| A-14  A-15 | Annex D | Table D-1 | te | The "M/O" column in the requirements list is not necessary. | | David Berry / NASA |  | ok |
| A-14  A-15 | Annex D | Table D-1 | te | This annex specifies the requirements for the RDM specification itself, not the requirements for a given instantiation of the RDM, so the requirements should primarily be "shall" statements. | | David Berry / NASA | Re-evaluate the "shall/should" wording of the requirements. | fixed |
| 3-1 | 3.1.2 NOTES 2 | 1 | Editorial | | Typo “… standard or of keyword …” | Frank Dreger/ESOC | Change to “… standard or of keywords …” | fixed |
| 3-2 | Table 3-1 | 5 | Minor | | The need to a repetition of the object name as “MESSAGE\_FOR” in the header is not convincing. | Frank Dreger/ESOC | I agree with the proposal to remove “MESSAGE\_FOR” from the header block. | row removed |
| 3-3 … 3-3 | 3.3.2 Table 3-2 | All | Editorial | | The table cells are not well aligned. | Frank Dreger/ESOC | Fix formatting of table, align columns. | it’s done this way yto match the contents, otherwise you end up with the keywords split over two rows which I was trying to avoid |
| 3-3 … 3-3 | 3.3.2 Table 3-2 |  | Major | | The keyword “ORBIT\_CENTER” is different w.r.t. the definition of the ODM, but shares the same meaning. | Frank Dreger/ESOC | Rename “ORBIT\_CENTER” to “CENTRE\_NAME” to be in line with ODM (Table 4-2). | Changed to CENTER\_NAME (US spelling) to match the ODMs. I think we should revise the CDM as it is inconsistent with the other messages. |
| 3-5 … 3-9 | 3.4.2 Table 3-3 |  | Minor | | There only 2 of the many data entries mandatory. Is it meaningful to issue a RDM if only the day and altitude (and planet) is known? | Frank Dreger/ESOC | Consider changing some data entries to ‘M’. | Since re-entry prediction services are still in their infancy, it is hard to say know which data must be included. This can change before the document is finalized and I do expect to have more mandatory fields. |
| 4-1 | 4.2.4.1 | 1 |  | | Change ‘the’ to ‘they’ | J. Thienel/NASA GSFC | fix | fixed |
| 4-3 | 4.3.2 |  |  | | Change ‘CDM’ to ‘RDM’ in title | J. Thienel/NASA GSFC | fix | fixed |
| 4-3 | 4.3.2.1 | 4 |  | | In the line of values, fix the exponent. Change -2^21 to -2^31 | J. Thienel/NASA GSFC | fix | fixed |
| 3-3 | 3 | ~29 | Te | | The “CATALOG\_NAME” entry of “SATCAT” is not clear. Typically, SATCAT refers to the Satellite Catalog, which is a specific file that may be obtained from Space-Track.org or CelesTrak. These two formats are fairly similar and relate to a specific set of columns that don’t contain the satellite’s (or object’s) orbital state vector, ephemeris, etc. Is this what was intended ? | Oltrogge/NASA | Suggest “TLE Catalog” in either two- or three-line elements, (again, if that was what was intended). | The SATCAT value is taken from the SANA registry (<http://sanaregistry.org/r/cdm_catalog/cdm_catalog.html>) as is supposed to mean “United States Strategic Command (USSTRATCOM) satellite catalog” |
| 3-3 | 3 | Bottom | Ge | | ORBIT\_CENTER” … | Oltrogge/NASA | seems like something that we should standardize in the SANA registry | we should; The ODMs say “There is no CCSDS-based  restriction on the value for this keyword, but for  natural bodies it is recommended to use names  from the NASA/JPL Solar System Dynamics  Group at <http://ssd.jpl.nasa.gov>”. A SANA registry would be better |
| 3-4 | 3 | Top | Te | | TIME\_SYSTEM… | Oltrogge/NASA | Not your headache, but we should look to the SANA registry for these. | yes, we should |
| 3-4 | 3 | Top | TE | | REF\_FRAME … | Oltrogge/NASA | Is also not complete in NAV DEFINITIONS document | A normative annex was added to the document. A SANA registry would make more sense here as well. |
| 3-4 | 3 | Bottom | TE | | INTRACK\_THRUST… | Oltrogge/NASA | While I understand the desire to know this, what about cross-track? What about how much thrusting? Direction? | That would be better covered by and OCM or SDM (if we ever do one). Intrack thrust can be paired with controlled re-entry to help model the re-entry better. |
| 3-6 | 3 | Top | TE | | LIFETIME\_DISPERSION can be highly non-Gaussian. | Oltrogge/NASA | Recommend percentiles, etc. | To be investigated |
| 3-6 | 3 | TOP | TE | | ORBIT\_LIFETIME - | Oltrogge/NASA | Recommend use of “median” orbit lifetime | This could be specified in an ICD. It think it would depend on how the re-entry prediction algorithm works. To be investigated when the informative annex on re-entry prediction simulation is written. |
| 3-6 | 3 | Bottom | TE | | CNORTH\_NORTH, CNORTH\_EAST, CEAST\_EAST is not a realistic reference frame for reentry. Majority of dispersion is along-track, with cross-track affected by high-alt windows during terminal velocity phase. From the current ISO 21095 draft document: “To estimate the risk to human beings, typically “casualty area” is defined as an envelope covering all the locations of the geometric centre of maximum projected area of a surviving object which interferes with an average-size human being in a static standing position.” | Oltrogge/NASA | Recommend switching to a “95th percentile polynomial” or some such. Alternately, something like 95th percentile uprange and downrange distances and crosstrack left and crosstrack right or something. | You would need to specify the impact velocity vector or something similar to make this work (seems wrong to rely solely on state vector propagation). The current approach allows that in three terms. |
| 3-8 | 3 | All | TE | | As a group, we continue to be hampered by duplicating major portions of messages because of our parsing of messages. | Oltrogge/NASA | Seems like we really need to switch our mentality to a more unified message that contains optional key components. | Could work; the current RDM has “building blocks”, but there is some separation between data and metadata. |
| 3-6 | 3 | All | TE | | Is this where a field such as the expected number of casualties (Ec) should go? | Oltrogge/NASA | For us to discuss | No, but it doubt it would be used in practice. |
| 1-1 | 1.2 | 12 | ed | | example and RDM should … | D Force/NASA | example an RDM could … | fixed |
| 1-1 | 1.2 | 15 | ed | | to be exchange .. | D Force/NASA | to be exchanged … | fixed |
| 1-2 | 1.3 | 3 | ed | | [The XML version of the RDM] | D Force/NASA | Doesn’t apply to Section 3 now |  |
| 1-4 | 1.5 | [5] | ed | | and Convention | D Force/NASA | and Conventions | fixed |
| 2-1 | 2.1 | 1 | ed | | CCSDS-draft, the draft is unnecessary | D Force/NASA | Use CCSDS only | fixed |
| 2-2 | None | None | ed | | Blank page between sections 2 and 3 | D Force/NASA | Eliminate blank page | done |
| All |  |  | ed | | Page footer information needs modification | D Force/NASA | Modify footer information | updated to February 2017 |
| 13 | 1.4.1 | 6 |  | | Remove extra \* in parenthesis | J. Thienel/NASA | change | Fixed in v2 |
| 18 | 3.2 | Row3 |  | | CREATION\_DATE description unfinished. | J. Thienel/NASA | change | Fixed in v2 |
| 18 | 3.2 | Rows 5-6 |  | | Why does this message have these extra fields? | J. Thienel/NASA | question | Fixed in v2 |
| 19 | 3.3.2 | Row 3 |  | | The SPACEWARN bulletin appears to have been discontinued in 2011. | J. Thienel/NASA | recommendation | Fixed in v2 |
| 19 | 3.3.2 | Row 9 |  | | Why is TIME\_SYSTEM not mandatory? | J. Thienel/NASA | question | Fixed in v2 |
| 21 | 3.4.2 | 4 |  | | Missing ‘of’ | J. Thienel/NASA | change | Fixed in v2 |
| 22 | 3.4.2 | Rows 10-12 |  | | Consider removing WGS-84 since other reference frames may be used. Reference system specified in IMPACT\_REF\_FRAME already. | J. Thienel/NASA | recommendation | Fixed in v2 |
|  | 3.4.2 |  |  | | Check that all COMMENT rows are complete. Consider adding words in ‘Description’ column along the lines of other messages. | J. Thienel/NASA | Change/recommendation | Fixed in v2 |
| 22 | 3.4.2 |  |  | | EPOCH missing ‘n/a’ in units column | J. Thienel/NASA | change | Fixed in v2 |
| 23 |  |  |  | | COV\_REF\_FRAME missing ‘n/a’ in units column | J. Thienel/NASA | change | Fixed in v2 |
| 25 | 3.4.3 | 2 |  | | Change OPM to RDM | J. Thienel/NASA | change | Fixed in v2 |
| 32 | 4.3.2.5 | 11 |  | | Change CDM to RDM | J. Thienel/NASA | change | Fixed in v2 |
| 36 | A2.2 | Item 16 |  | | Remove word ‘toggle’. Options earlier in document were YES, NO, UNKNOWN | J. Thienel/NASA | Change/recommendation | Fixed in v2 |
| 36 | A2.2 | Item 27 |  | | Remove ‘yes/no’. Solar radiation pressure is either to include model name or include NO | J. Thienel/NASA | Change/recommendation | Fixed in v2 |
| 36 | A2.2 | Item 32 |  | | Feature and Keyword don’t agree | J. Thienel/NASA | change | Fixed in v2 |
| 37 | A2.2 | Item 38 |  | | Fix typo in ‘lifetime’ | J. Thienel/NASA | Change | Fixed in v2 |
| 39 | A2.2 | Item 92 |  | | Fix typo in ‘area’ | J. Thienel/NASA | Change | Fixed in v2 |
| 39 | A2.2 | Item 94 |  | | Fix typo in ‘area’ | J. Thienel/NASA | change | Fixed in v2 |