**COMMENT RESOLUTION MATRIX:  Re-entry Data Message CCSDS 508.1-R-1**
**1 October 2018**

| Page | Section | Line | Type | Comment/ Rationale | Source of Comment (Name/Agency) | Suggested Disposition | Disposition (Completed by Principal Editor) |
|---|---|---|---|---|---|---|---|
| 3-4 | | | ed | The REF_FRAME only applies to the state vector (and maybe covariance block) in the data, not to "all data elements". This should be clarified. | Alexandru Mancas/ESA | to be fixed in 1.1 | added "orbit" before "data elements" |
| 3-7 | | | ed | There is a typo in the description: "of any fragment's impacting". The ' should be removed. | Alexandru Mancas/ESA | to be fixed in 1.1 | |
| 3-7 | | | ed | There is a typo in the description: "of the object's breaking". 's should be removed | Alexandru Mancas/ESA | to be fixed in 1.1 | |
| 3-7 | | | ed | There is a typo in the description: "any fragment's impacting". ' should be removed | Alexandru Mancas/ESA | to be fixed in 1.1 | |
| 3-7 | | | ed | There is a typo in the description: "re-entry event's causing<br><br>any casualties" | Alexandru Mancas/ESA | to be fixed in 1.1 | |
| 3-12 | | | ed | There is a typo: "to the highest probability of any fragment's impacting there" | Alexandru Mancas/ESA | to be fixed in 1.1 | |
| 4-4 | | | ed | There is a missing space: "Special tagsthat are not necessary". | Alexandru Mancas/ESA | to be fixed in 1.1 | |
| 5-3 | | | ed | Commas are used as thousands separators. Can they be switched to spaces? | Alexandru Mancas/ESA | to check with technical editor | |
| B-1, B-2 | | | te/ed | Should we add more ref frames and time systems to align with what will be in the SANA registry? | Alexandru Mancas/ESA | to be discussed with WG | |
| 3-7 to 3-9 | | | te | The *_LON and *_LAT keywords only speicfy units of degrees but no extra convetions. It should be clarified that | Alexandru Mancas/ESA | To be added in version 1.1 | two normative paragraphs added: 3.5.10  Values for all longitude keywords |

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|  |  |  |  | longitude should be between -180 and 180 (positive values are E) and latitude between -90 and 90 (positive values are N). |  |  | shall be between -180.0 and 180.0, with positive values for eastward longitudes and negative values for westward longitudes. 3.5.11  Values for all latitude keywords shall be between -90.0 and 90.0, with positive values for northern latitudes and negative values for southern latitudes. |
| 1-3 |  |  | ed | The list of units used in the document is missing 'deg' - degrees of arc | Alexandru Mancas/ESA | To be added in version 1.1 |  |
| 1-4 | 1.5 |  |  | The mentioning of an attitude criteria only makes sense when talking about a circular orbit. consider inverting this and just use the time as a definition with the altitude as an example in case of circular re-entries. Also split up mid and long term. Given that all predictions are most influenced by the Sun (at least omitting human influence such as propagator selector), a more pragmatic convention is 3 days prior to entry (short, the time where we get reasonably good predictions for space weather proxies), weeks to 11 years (mid, a single solar cycle), and more than 11 years (long, multiple solar cycles). | Stijn Lemmens/ESA |  | Re-wrote the paragraph to: *The following conventions apply when referring to Earth re-entry prediction simulations: a)  short-term re-entry prediction refers to simulations covering the last few days (up to a few weeks) before re-entry (for a circular orbit altitude below 200 km); b)  medium-term prediction refers to* |

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| | | | | | | | *simulations covering the last few weeks up to 11 years (one solar cycle) before re-entry; for the purposes of this standard it is grouped with long-term prediction;* <br> *c) long-term prediction refers to all re-entry simulations covering more than one solar cycle (over 11 years); grouped with medium-term prediction for this standard.* |
| 3-3 | n/a | | | Keyword OBJECT_TYPE has a Normative set of options. As those 5 listed options have no associated interpretation, there are within the creative freedom of the data provide and shall hence by E just as for OBJECT_OWNER. | Stijn Lemmens/ESA | | This approach is the same as the CDM, and indeed it leaves the selection of a value to the RDM provider, as there is little practical difference between, say, rocket body and debris. For consistency with the CDM, this will remain the same. |
| 3-4 | n/a | | | Keyword CONTROLLED_REENTRY has also only N value when combined with a standard dictating what a controlled re-entry is (and there is discussion on ISO/ECSS level). Make it E. | Stijn Lemmens/ESA | | The following paragraph has been added to section 1.5 (conventions and definitions): <br> *The term 'controlled* |

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| | | | | Definitions for "controlled re-entry" and "uncontrolled re-entry" are missing in the document. In order to avoid different interpretation by different users, it would be useful to have these terms clearly defined somewhere or specify reference to documents where these terms are defined. For example, these defintiions should be consistent with ESSB-ST-U-004 (ESA Re-entry Safety Requirements) and the next update of ISO 24113. | Sergio Ventura/ESA | | *re-entry' is used in this document for a re-entry event where: a) the re-entry epoch is controlled; and b) the impact of fragments on the central body's surface is confined to a predetermined area.* This aligns with ESSB-ST-U-004 |
| 3-5 | n/a | | | Keyword REENTRY_DISINTEGRATION, the values indicated do not imply the description. If one wants the coarse indication, one can just ask for this in a dedicated keyword. Moreover explosion is missing in the options, whih starts to make the combination of all three esthetically unpleasant, Please reconsider this one. | Stijn Lemmens/ESA | | *(including explosion)* was added after break-ups in the descriptions |
| | | | | It should be clarified that break-up includes explosion as well. | Benjamin Bastida Virgili/ESA | | |
| 3-5 | n/a | | | Keyword IMPACT_UNCERTAINTY_METHOD, change Monte Carlo to STOCHASTIC to have a broader set of options. | Stijn Lemmens/ESA | | done |
| 3-5 | n/a | | | The preivous message part linking is interesting, but is it truly necessary and how does it work when multiple entities | Stijn Lemmens/ESA | | The linking is only supposed to work backwards and you would supply both a |

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|  |  |  |  | want to refer to a subset of each others predictions. The chain would be broken and untracable for some of the readers. Consider dropping this or clarify its use practically. |  |  | previous message ID (which should be unique) and the epoch. The next message epoch is an estimate on when a new RDM will be provided. This is the same approach as the CDM and for consistency will stay the same. |
| 3-6 | n/a |  |  | Keyword LIFETIME_DISPERSION. The proposed 1-sigma, which first of all needs to be defined what this means, is not necessary what you want as plenty of studies have show (when interpreted as standard deviation). Prescribing is thus not considered useful in this way. Please drop it as the window start and end keywords are available, which could be augmented with a method identifier. The same applies to impacts which don't follow fixed distributions. | Stijn Lemmens/ESA |  | The keyword is there (and optional) to allow the 20 % (ish) empirical estimation of the orbital lifetime for medium/long term predictions. The REENTRY_WINDOW_START/_STOP keywords offer too much precision for this (you cannot specify just a date). I do not expect anyone to use this keyword for short-term predictions or when the probability distribution is asymmetric.<br><br>A REENTRY_UNCERTAINTY_METHOD keyword has been |

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| | | | | | | | added to the metadata as well. |
| 3-7 to 3-9 | n/a | | | In impact keywords, this needs to be extended to cover the full flexibility of NOTAMs it it wants to have a change of being practically useful. This is considered major. | Stijn Lemmens/ESA | | Improving the impact location specification is something that the NAV WG is planning for version 2. There is no time to accomplish this in version 1, and it was considered more important to publish the standard sooner, gather a user base that will provide comments for a better version 2. |
| H-4 | n/a | | | Objects in between (e.g., most nuts and bolts used in spacecraft assembly) will suffer total demise. -> I can send you a picture of some bolts. Please take this type of generalisations out or formulate more carful. | Stijn Lemmens/ESA | | changed to *Objects in between (e.g., most nuts and bolts used in spacecraft assembly) will typically, but not always, suffer total demise.* |
| 3-10 | | | | There should be some way to specify at which altitude the Cd and Bc are given. | Benjamin Bastida Virgili/ESA | | two ways around this: either adding an altitude for Cd and Bc, or adding multiple keywords, eg *_CONTINUUM_SUBSONIC, *_CONTINUUM_SUPERSONIC, *_TRANSITIONAL, etc, etc |

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| | | | | | | | DRAG_PARAMETERS_FLOW_REGIME keyword added to metadata in version 1.1. |
| 3 | 3.5.2 | | | In "Object physical parameters" in Table 3-3, the object MASS data should be provided with more information, including: dry mass, propellant/fluid mass, and wet (total) mass of the object. In case of uncertainty in the quantities, it could be recommended to specify a range of values. | Sergio Ventura/ESA | Change | Split MASS into WET_MASS and DRY_MASS in version 1.1 |
| 3 | 3.5.2 | | | In "Object physical parameters" in Table 3-3, for the DRAG_AREA, DRAG_COEFF, and BALLISTIC_COEFF data, it should be provided information about how these parameters have been assessed (e.g. by design, orbit tracking, average assessment). | Sergio Ventura/ESA | Change | DRAG_PARAMETERS_SOURCE keyword added to metadata in version 1.1 |
| 3 | 3.5.2 | | | Information on possible presence of hazardous chemical substances, especially if radiactive substances, in the object should be provided. | Sergio Ventura/ESA | Change/update | HAZARDOUS_SUBSTANCES keyword added to spacecraft parameters block in version 1.1 |
| A-1 | A.1.2 | | | Typo: in status column, "O" for "optional" is missing. | Sergio Ventura/ESA | Change | added in version 1.1 |

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