| Nav Green Book Vol 1 Version 3.5 COMMENT RESOLUTION MATRIXMarch 2014 | | | | | | |
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| **Reference** | | | **Comment/ Rationale** | **Source of Comment (Name/Agency)** | **Suggested Disposition of Comment** | **Final Disposition**  **(Do Not Fill In)** |
| **Page** | **Section** | **Line** |
| 3-14 | 3.3.2.5 |  | Add examples as a subsection or in the same section based on the viewgraphs presented by Juerguen Fertig. | Juan Carlos Raymond / NASA GSFC | Add examples as a subsection or in the same section based on the viewgraphs presented by Juerguen Fertig. | **Rejected.** Decision at the CCSDS Spring 2015 Technical meetings was to not elaborate too deep or be too exhaustive into current exchanges. |
| 2-6 | 2.3.2 | Figure 2-4 | [I'm not sure that this diagram will be popular given its focus on the NASA tracking networks. I would remove the text and leave the pictures. | David Berry/ NASA |  | **Overcome by events. I am unsure why this comment was not implemented before if this figure was removed in version 3.6 (figure 2-4 in version 3.4, figure 2-5 in version 3.5).** |
| 3-13 | 3.3.2.2 | 2nd paragraph | Check with Dave Finkleman... I think the Space Data Association is using OEM's and I think that Satellite Toolkit can read/write some of the ODMs too. | David Berry/ NASA |  | **Accepted.** |
| 3-15 | 3.3.2.3 | Last paragraph before section 3.3.2.4 | check with Alain and Juergen... may also be in use at CNES and ESOC | David Berry/ NASA |  | **Accepted.** |
| 3-16 | 3.3.2.5 | Last paragraph before section 3.3.2.6 | Section on TDRSS is nice |  |  | **Overcome by events.** This section was removed in previous versions of the document. |
| 2-7 | 2.3.2.1 | 3rd paragraph, first line | This is general: I may be wrong but I think telemetry (from the spacecraft to the ground antenna) is treated using separate CCSDS standards. If this is true then we should make clear that any information we input from the spacecraft is after initial ground processing (Level 0 processing). | Joseph Hashmall/NASA GSFC/a.i. Solutions |  | **Implemented.** Although the comment corresponds to version 3.4 of the Green Book vol.1, and the spacecraft section 2.3.2.1 was already removed out of more recent versions of the Green Book, I wrote a note for the spacecraft telemetry level 0 processing in exchange scenarios listed in section 2.3 of the version under revision. |
| 3-11 | 3.3.2.4 | entire | The discussion seems a little slim. You could mention figure 2-4, maybe provide just a bit more detail. Could mention that the CDM is intended to provide spacecraft owner/operators with information they can use to assess the risk of collision and design collision avoidance maneuvers if necessary, etc. | David Berry / NASA/JPL | Consider... | **Accepted.** |
| 3-11 | 3.3.2.5 | Somewhere | It would be desirable to capture somewhere in this description the idea that the requestor doesn't know the spacecraft attitude or the operational constraints in detail. They just want to point the spacecraft, and describe their desire in the PRM. Processing of the message taking into account the trajectory, attitude, and desired target will determine whether or not the pointing is feasible. | David Berry / NASA/JPL | Consider... | **Accepted.** |
| B-1 | Annex B |  | Terms to add to acronym list: ADCS, SFTP, TT&C, MOC (or OC... pick one not both MOC and OC). | David Berry / NASA/JPL | Add terms to acronym list that are used in the document | **Implemented.**  List of Acronyms and Abbreviations was updated with comments from the review of more recent versions of the Green Book. |

| COMMENT RESOLUTION MATRIX: Green Book Volume 1, Version 3.625-Sep-2014 | | | | | | | | | |
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| 1-4 | 1.5 | Ref [19] | all | ed | We should put the Green Books together as contiguous references, i.e., instead of [13] and [19], either [13]/[14], or [14]/[15], or [18]/[19], or some other contiguous set. | David Berry / NASA/JPL | Consider. | **Accepted.** Updated all the cross-references. |
| 2-6 | 2.3.1 | Fig 2-3 | N/A | te | The diagram doesn't have any predicted observations or measurements entering the "Compare" process. | David Berry / NASA/JPL | Revise diagram | **Rejected.** Diagram was removed during the CCSDS Spring 2015 Technical Meetings. |
| 2-6 | 2.3.1 | Fig 2-4 | N/A | ed, te | The figure refers to "OEMs" and "CDMs", but these haven't been defined yet. It also uses the term "Maneuver Ephemeris" as if it were different from a "Satellite Ephemeris". If you have the original figure I think it should be modified. | David Berry / NASA/JPL | If possible, change from "Satellite Ephemeris" to "Satellite State", from "Maneuver Ephemeris" to "Maneuver Plan", from "OEMs" to "Satellite Ephemeris ", from "CDMs" to "conjunction warnings" | **Accepted.** Reason why ODMs and CDMs are in this figure, and made references to the sections for each of the messages. Updated the figure with maneuver plan, instead of maneuver ephemeris. |
| 2-6 | 2.3.1 | Fig 2-4 | N/A | ed, te | The figure shows that "Plan Collision Avoidance Maneuver" is the only result of "Risk Assessment". | David Berry / NASA/JPL | The figure should have "Risk Assessment" shown as a decision box with "No Maneuver Needed" (or something like that) as one of the outputs. | **Rejected.** Diagram was removed during the CCSDS Spring 2015 Technical Meetings. |
| 3-3 | 3.3.1.1 | 1 | 1 | ed | During transition phase, list both references to Green Book. | David Berry / NASA/JPL | From: [45]  To: [13], [19] | **Implemented in version 3.7.** Fixed the numbering of the references, as well. |
| 3-5 | 3.3.2 | 1 | All and ff | ed, te | I recommend that the remainder of the document (up until Annex A) become a separate section 4 entitled "CCSDS Navigation Data Messages". This section 4 should be divided into sections as follows:  4.1 General  4.2 Completed Navigation Data Messages  4.3 Planned Navigation Data Messages | David Berry / NASA/JPL | Consider... I think it divides the "theoretical" of Section 3 from the practical considerations of actual messages. | **Implemented:** based on the decision made at the Fall 2014 CCSDS technical meetings. |
| 3-5 | 3.3.2 | N/A | N/A | te | We shoud indicate that this section reflects an application of the Navigation Message Exchange Framework described in Section 3. | David Berry / NASA/JPL | Somewhere in the text, probably early, indicate that this section reflects an application of the Navigation Message Exchange Framework described in Section 3. | **Accepted.** Added to the introduction section of the CCSDS Navigation Data Messages. |
| 3-7 | After Figure 3-5 | N/A | N/A | ed | Add a section 4.2 with title "Flight Dynamics Standards Published" | David Berry / NASA/JPL | Consider. | **Implemented:** based on the decision made at the Fall 2014 CCSDS technical meetings. |
| 3-11 | Between 3.3.2.4 and 3.3.2.5 | N/A | N/A | ed | Add a section 4.3 with title "Flight Dynamics Standards in Development" | David Berry / NASA/JPL | Consider. | **Implemented:** based on the decision made at the Fall 2014 CCSDS technical meetings. |
| 3-12 | 3.3.2.5 | 1 | 3 | ed | grammar/verb-subject agreement (add an "s" on "follow") | David Berry / NASA/JPL | From: "... such pointing requests are as follow:"  To: "... such pointing requests are as follows:" | **Accepted:** did not get an answer on whether or not this was also applicable for sentences that start with plural (in this case “Examples”) |

| COMMENT RESOLUTION MATRIX: Green Book Volume 1, Version 3.7February 12, 2015 | | | | | | | | |
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| N/A | 2 | N/A | N/A | ge | General: I think the size of the document is getting close to what was envisioned for volume 1, however, I think the cuts in Section 2 were maybe just a bit too aggressive. Having some definitions of terms is good (note the title of the document), however, detailed discussions of flight dynamics functions, allocation of responsibilities to organizations, etc., was not. | David Berry / NASA/JPL | We should discuss material cut from Section 2 that could be added back to the Green Book V.1 | **Accepted.** |
| 1-1 | 1.1 | 1 | 1 | ed | Awkward phrase: "... exchanged between during cross support..." | David Berry / NASA/JPL | Remove the word "between" to fix the sentence. | **Accepted.** |
| 1-1 | 1.1 | 1 | 4 | ed | Awkward phrase: "...facilitated through use of the various data messages defined in diverse navigation data messages (see Section 3)." | David Berry / NASA/JPL | Remove the phrase "... defined in diverse navigation data messages (see Section 3)."  This leaves "...facilitated through use of the various data messages defined in Section 3." | **Accepted.** |
| 1-1 | 1.1 | 2 | 1 | ed | Missing comma | David Berry / NASA/JPL | From: "...orbit, attitude, maneuver and conjunction assessment..."  To: "...orbit, attitude, maneuver**,** and conjunction assessment..." | **Accepted.** |
| 1-1 | 1.2 | 1 | 1 | te | Expanded statement of applicability. | David Berry / NASA/JPL | From: "... for the development of international standards..."  To: "... for the development and usage of international standards..." | **Accepted.** |
| 1-2 | 1.3 | 1 | 1, 5 | ed | 1.3(b) should refer to section 2, and 1.3(c) should refer to Section 3. | David Berry / NASA/JPL | Correct references. | **Accepted.** |
| 1-2 | 1.3 | 1 | 1 | ed | missing word | David Berry / NASA/JPL | From: "...overview of spacecraft navigation process..."  To: "...overview of the spacecraft navigation process..." | **Accepted.** |
| 1-2 | 1.3 | 2 | 2 | ed | When I look at the "changes accepted" version, the phrase "navigation data messagesnavigation data messages" appears. (NOTE: This appears 7 times in the document, making me think it was a global find/replace type error) | David Berry / NASA/JPL | Remove one instance of the phrase "navigation data messages" from the concatenation. | **Accepted.** Corrected all the other instances of the messagenavigation error. |
| 1-2 to 1-3 | 1.5 | Refs [2], [3], [4],  [5],  [12] | N/A | ed | None of these references appears to be referred to in this version. May have to remove them. | David Berry / NASA/JPL | When limited general flight dynamics function information is added back to the document (see first comment in this CRM), these references may become applicable again. | **Accepted.** |
| 1-3 | 1.5 | Ref [13] | 1 | ed, te | Since this is a Blue Book, the document is no longer "Proposed" | David Berry / NASA/JPL | From: Proposed for Space  To: Recommendation for Space | **Accepted.** |
| 1-3 | 1.5 | Ref [14] | N/A | ed | This reference appears to have been removed, but the number is still there (the PRM shows as reference [14] [15]) | David Berry / NASA/JPL | Correct reference list. | **Accepted.** |
| 1-3 | 1.5 | Refs [15],  [16],  [17] | 1 | ed, te | Error in title. | David Berry / NASA/JPL | From: "Proposed Draft Recommended Standard for Space"  To: "Proposed Recommendation for Space..." | **Accepted.** |
| 1-3 | 1.5 | Refs [15], [16], [17] | 1 | ed, te | Error in issue date. | David Berry / NASA/JPL | From: "August 2012", "July 2012", "April 2012" respectively  To: "to be published" | **Accepted.** |
| 1-4 | 1.5 | Ref [19] | 2 | ed | Ref [20] appears on the same line as the second line of Ref [19]. Needs a line break to put reference [20] on a separate line. | David Berry / NASA/JPL | Add line breaks as needed to fix. | **Accepted.** |
| 1-4 | 1.5 | Ref [22] | All | ed | I don't think this reference is applicable to the Green Book. | David Berry / NASA/JPL | Remove reference [22] | **Accepted.** |
| 2-5 | 2 | Title | 1 | ed | The last reference of section 1.5 ([23]) appears as part of the title of section 2. | David Berry / NASA/JPL | Move [23] to Section 1.5. This is relatively easy to fix (but hard to explain how...) | **Accepted.** |
| 2-6 | 2.3 | Fig 2-2 | caption | ed | Capitalization in the caption is inconsistent. | David Berry / NASA/JPL | From: "data message"  To: "Data Message" | **Accepted.** |
| 2-6 | 2.3 | Fig 2-2 | figure | ed, te | Figure 2-2 has "old" terminology | David Berry / NASA/JPL | If possible, change the text in the drawing of the arrow from "Navigation Message" to "Navigation Data Message" in accordance with our new convention. This may not be possible given the heritage of the drawing... | **Accepted.** |
| 2-7 | 2.3 | 5 | 1 | ed | capitalization consistency | David Berry / NASA/JPL | From: "...scenarios, Navigation data..."  To: : "...scenarios, navigation data..." | **Accepted.** |
| 2-7 | 2.3 | 5 | 1-2 | te | Missing exchange mode | David Berry / NASA/JPL | From: "... ground-to-ground and flight-to-ground..."  To: "... ground-to-ground, ground-to-flight, and flight-to-ground..."  Or: "... ground-to-ground, ground-to-flight/flight-to-ground..." | **Accepted,** although ground-to-flight was previously removed because the NDMs are not transmitted from the ground to flight at the moment. |
| 2-7 | 2.3 | 6 | 1 | ed | There's a lonely "navigation data message" phrase standing alone here. | David Berry / NASA/JPL | Remove... | **Accepted.** |
| 2-7 | 2.3.1(a) | 1 | 3 | ed | I think references to [18, 13] should be [7, 19]. In general I think the reference annotations in the document need to be updated (e.g., here, p.2-8, p.3-12, p.3-18, etc.). This need for renumbering is likely just a consequence of the re-ordering of references that was previously suggested. | David Berry / NASA/JPL | Review reference annotations throughout the document and correct as applicable. | **Accepted.** |
| 3-10 | 3.1 | 2 | 2 | ed, te | The statement "Standards are essential..." is asserted without discussion. I think "essential" might be too strong a word here given that many cross-agency supports are done without standardization in many areas... though it is true that doing cooperative missions without standards often points out the desirability. Replacing "essential" with "highly desirable" or "important" might be better. | David Berry / NASA/JPL | Consider replacing "essential" with "highly desirable" or "important". | **Accepted.** |
| 3-10 | 3.1 | 2 | 9-10 | ed | Word suggestion. | David Berry / NASA/JPL | From: "... could facilitate a level of automation..."  To: "... could facilitate an increased level of automation..." | **Accepted.** |
| 3-10 | 3.1 | 3 | N/A | ed | I think this paragraph could be re-organized a bit, as follows: (a) first part of paragraph remains as is, up to the word "respectively"; (b) immediately follow this with the sentences from lines 9-10 that refer to the 5 year process for reviewing the published standards; (c) create a new paragraph that starts with "There are also several navigation data standards being developed..."; (d) create a new paragraph starting with the phrase "The objective of all navigation data messages...". These 3 paragraphs now discuss in succession the published standards, the emerging standards, and the general characteristics of both. | David Berry / NASA/JPL | Consider. | **Accepted.** |
| 3-11 | 3.1 | Fig 3-1 | N/A | ed, te | The diagram still contains references to the Events Message (EVM), but all references to EVM have been removed from the text based on previous suggestions. Ironically, at the Fall 2014 Meetings just concluded, we got some approval to start reconsidering the development of the EVM given that the Timelines Data Exchange effort has seemed to fall a bit out of favor! I think we should leave the diagram as is, but maybe just add a sentence to the "in development" standards paragraph on the previous page that states something like: "Also under consideration is a standard framework for the exchange of orbit and attitude events; this standard is tentatively named the 'Events Message (EVM)', and leave it at that. I also wonder if we should change it to "Navigation Events Message", but that should be discussed in the WG. | David Berry / NASA/JPL | Consider adding sentence to the new paragraph on "in development standards". | **Accepted.** Didn’t rename it to “Navigation Event Message”. |
| 3-11 | 3.2 | 1 | 7-8 | ed | Minor grammar. | David Berry / NASA/JPL | From: "... agencies to tolerate the availability issues..."  To: "... agencies to tolerate availability issues..." | **Accepted.** |
| 3-12 | 3.2 | last | 9 | ed | Minor typo (capitalization convention) | David Berry / NASA/JPL | From: "(CSTS) working group"  To: "(CSTS) Working Group" | **Accepted.** |
| 3-13 | 3.3 | last | 6 | ed | Minor typo (word left out) | David Berry / NASA/JPL | From: "...deliver the trajectories to European..."  To: "...deliver the trajectories to the European..." | **Accepted.** |
| 3-14 | 3.3 | 1 | 8 | ed | Minor typo (sentence ends with comma) | David Berry / NASA/JPL | From: "...(JSpOC),"  To: "...(JSpOC)." | **Accepted.** |
| 3-14 | 3.3 | 1 | N/A | te | Suggestion for a sentence at the end of the last sentence (the one that ends with "JSpOC")... add a sentence something like: "Several other implementations are likely to exist given the popularity and flexibility of the OEM." | David Berry / NASA/JPL | Consider. I think we've reached a point where it's increasingly difficult to list all the implementations of the OEM. | **Accepted.** |
| 3-14 | 3.4 | N/A | N/A | te | Should this section have a couple of sentences on the topic of the active/passive attitude transformations? Joe has suggested this topic for V.2 of the Green Book, but I wonder if it should be introduced (very briefly) here? Then again, it might not be necessary at all. | David Berry / NASA/JPL | Consider. | **Reserved for Vol. 2** |
| 3-14 | 3.4 | last | 1 | ed | Minor typo. | David Berry / NASA/JPL | From: "...forecast or the spacecraft's attitude."  To: "...forecast of the spacecraft's attitude." | **Accepted.** |
| 3-15 | 3.4 | 1 | 2 | ed | Unnecessary words (this same "Even though..." phrase is used in two additional places in the document, and it's more appropriate there; here it seems unnecessary and overused). | David Berry / NASA/JPL | From: "Even though the APM allows..."  To: "The APM allows..." | **Accepted.** |
| 3-15 | 3.4 | 1 | 10 | te | "Files" and "messages" should be distinguished. | David Berry / NASA/JPL | From: "multiple APM or AEM files must be used"  To: "multiple APM or AEM messages must be used" | **Accepted.** |
| 3-15 | 3.4 | first | last | te | Besides GSFC I think that the ESOC is using the APM or AEM (probably the AEM) in some of its internal processing. | David Berry / NASA/JPL | Confirm with Jürgen Fertig. I recall his stating something to this effect at the Noorwijkerhout meetings. | **Accepted.** |
| 3-16 | 3.7 | 1 | 1 | ed, te | Should have some examples. | David Berry / NASA/JPL | At end of first sentence, add something like: ", e.g., from star trackers, accelerometers, inertial reference units, satellite global navigation systems (GNS), etc." | **Accepted.** |
| 3-16 | 3.8 | 1 | 3 | ed, te | Frequency of exchange is assumed, but should not be. | David Berry / NASA/JPL | From: "The frequent exchange of maneuver data..."  To: "The exchange of maneuver data..." | **Accepted.** |
| 3-16 | 3.8 | 3 | next to last | ed | Word choice. | David Berry / NASA/JPL | From: "...Delta-V related to one or several coordinate systems..."  To: "...Delta-V related to one or more coordinate systems..." | **Accepted.** |
| 3-17 | 3.9 | 1, 2 | All | ed, te | Suggestion for restructuring first 2 paragraphs: (a) leave first two sentences as is; (b) move the entirety of paragraph 2 immediately following the second sentence of paragraph 1; (c) create new paragraph starting with "Even though..." | David Berry / NASA/JPL | Consider. | **Accepted.** |
| 3-17 | 3.9 | 1 | 5 | ed | Extra word. | David Berry / NASA/JPL | From: "Likewise, the XML..."  To: "Likewise, XML..." | **Accepted.** |
| 3-17 | 3.9.1 | 1 | 1 | ed | Suggested re-phrasing that I think better captures your thought. | David Berry / NASA/JPL | From: "There is a lot in common with the suite..."  To: "There is much structural commonality within the suite..." | **Accepted.** |
| 3-17 | 3.9.1 | 1 | 5-7 | te | Another element of technical commonality is the use of SI units (where possible). | David Berry / NASA/JPL | From: "...origin of a particular message."  To: "... origin of a particular message; also, insofar as is possible, the units for all measurements in the NDMs are drawn from the International System of Units (SI)." | **Accepted.** |
| A-1 | "Attitude" | 1 | 1 | te | Add a qualifier | David Berry / NASA/JPL | From: "the body reference frame"  To: "the spacecraft body reference frame" | **Accepted.** |
| A-1 | Global Positioning System | 1 | 1 | ed, te | GPS is not discussed in the document. | David Berry / NASA/JPL | Consider removing this entry from the glossary. | **Accepted.** |
| A-1 | ground-to-flight | 1 | 1 | ed, te | I would reverse the order of the spacecraft and non-spacecraft participants. This will distinguish it from the "flight-to-ground" definition seen previously. | David Berry / NASA/JPL | Consider. | **Accepted.** |
| A-2 | Navigation Data Message | 1 | 1 | ed | Capitalization convention | David Berry / NASA/JPL | From: "Navigation data message"  To: "Navigation Data Message" | **Accepted.** |
| A-2 | Orbit | 1 | 1 | ed, te | Additional clarification | David Berry / NASA/JPL | From: "...body in space"  To: "...body in space, typically a path around a central celestial body" | **Accepted.** |
| A-2 | Range | 1 | 1 | ed | The term being defined ("Range") is not bold, but all other terms being defined are bold. | David Berry / NASA/JPL | Bold the term being defined for consistency. | **Accepted.** |
| A-2 | Spacecraft | 1 | 2 | te | Additional clarification | David Berry / NASA/JPL | From: "... *in situ* assets."  To: "... *in situ* assets such as landers or rovers." | **Accepted.** |
| A-2 | Trajectory | N/A | N/A | te | Missing term | David Berry / NASA/JPL | Consider adding, with definition: "The path followed by a celestial body in space." (yes, very similar to "orbit"). | **Accepted.** |
| B-1, B-2 | N/A | N/A | N/A | ed, te | Missing acronyms used in document: CARA, CSTS, JSpOC, NORAD, SFTP, TLE | David Berry / NASA/JPL | Consider adding terms to acronyms list. | **Accepted.** |
| B-1, B-2 | N/A | N/A | N/A | ed, te | Terms in acronyms list not used in document: GLONASS, GPS, NAVSTAR | David Berry / NASA/JPL | Consider removing terms from acronyms list. | **Accepted.** |
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| Vii, viii | Contents |  |  | Format | Many bookmarks not defined in the contents tables. | L. Martin/ESA | Correct bookmark references | **Accepted.** |
| 1-1 | 1.1 | 1 |  | Typo | “between during” together. | L. Martin/ESA | Correct typo | **Accepted.** |
| 1-2 | 1.3 | 1, 2 |  | Format | “Error! Reference source not found” most probably trying to reference section 2.  In addition, in point c) reference should be done to Section 3 instead of 2. | L. Martin/ESA | Correct references | **Accepted.** |
| 2-5 | 2 |  | 1 | Format | Incorrect title for section 2. Looks like there is an incorrect reference being replaced by Word. | L. Martin/ESA | Correct title | **Accepted.** |
| 2-5 | Figure 2-1 |  |  | Format | The title of the figure is below the page footer. | L. Martin/ESA | Most probably the figure should be moved upwards in the page. | **Accepted.** Corrected with the new sections and formatting. |
| 2-6 | 2.2 | 4 | 4 | Wording | “Other engineering parameters” doesn’t seem consistent with the rest of the sentence. | L. Martin/ESA | Proposed: “ other engineering activities” | **Accepted.** |
|  |  |  |  | Typo | “Navigation data message”, when referred in the document, appears two times consecutively | L. Martin/ESA | Remove second appearance of the term | **Accepted.** |
| 2-7 | 2.3 | 6 |  | Typo | “navigation data message” has no sense alone. | L. Martin/ESA | Remove the line | **Accepted.** |
| 3-10 | 3.1 | 2 | 4 | Approach | It is indicated that the standards are defined with the purpose of facilitating communications within an agency and/or between agencies. However, in other parts of the document and in other documents, it seems that the communication within an agency is not a valid use case. | L. Martin/ESA | Please clarify the general approach. | **Rejected.** |
| 3-11 | Figure 3-1 |  |  | Typo | EVM appears in the diagram. However, it doesn’t appear in the rest of the document. | L. Martin/ESA | EVM should be either removed from the diagram or a description added within the section. | **Accepted.** Implemented based on David Berry’s comment related to the EVM in the diagram. |
| 3-12 | 3.2 | 1 |  | Addition | It would be maybe interesting to add “optical observations” to the list of tracking data types included. | L. Martin/ESA | Add the missing use case and check if other use cases need to be added wrt modifications in TDM. | **Accepted.** |
| 3-15, 3-16 | 3.5, 3.7 |  |  | Content | Description included for CDM and NHM seems to be not as exhaustive as for other standards. | L. Martin/ESA | It is proposed to extend these descriptions to be at the same level of detail than others. For the case of the CDM, it is proposed to add a reference to the list of probability methods included in SANA | **Accepted.** |
| 3-14, 3-15, 3-16, | 3.4, 3.6, 3.8 |  |  | Consistency | Looking at the description of the ADM, PRM and SMM, it looks like both three can be used to communicate/request attitude changes. | L. Martin/ESA | It is proposed to clarify in each of the three standards definition which is the exact approach regarding attitude communications. | **Rejected.** SMM does not exist yet. The PRM does not directly request an Attitude change. |
| 3-17 | 3.9 |  |  | Completeness | As a suggestion, it would be interesting to add a reference to the SANA page where the xml standards are contained. | L. Martin/ESA | See comment. | **Accepted.** |
| A-1 | Annex A |  |  | Consistency | Some of the definitions included here have already been included in section 2. In addition, the definitions in the Glossary are not as exhaustive as the ones included in section 2.  Repeated definitions are: Agency Center, Ancillary Information, Flight-to-flight, Flight-to-ground, Ground-to-ground, Measurements, Navigation data, Navigation data message, Navigation session, Participant, Property, Spacecraft, Tracking Station | L. Martin/ESA | Consider whether it makes sense to have duplicated definitions or is better to have them in a single place.  Another question to discuss would be: are these definitions only applicable to Volume 1 or are they applicable to Volume 2 of the Green Book as well. | **Needs further discussion.** Deferred for future versions. |
| A-1 | Annex A | Attitude |  | Definition | The definition of Attitude assumes the existence of a body reference frame. | L. Martin/ESA | It is proposed to generalize the definition of Attitude in the following way: “Orientation of a give reference frame with respect to another reference frame.” | **Accepted.** |
| A-1 | Annex A | Ephemeris |  | Definition | An ephemeris does not necessarily have to contain the attitude information. | L. Martin/ESA | Propose to change the Ephemeris definition in the following way: “A list of positions and velocities (optionally including attitude) of a satellite as a function of time”. | **Accepted.** Implementation is slightly different to the suggested disposition. |
| A-1 | Annex A | GPS |  | Definition | The definition of GPS does not include other positioning systems. | L. Martin/ESA | It is proposed to replace the definition of GPS by the more generic definition of GNSS (Global Navigation Satellite System). | **Accepted.** Use GNS per David Berry’s comment. |
| A-1 | Annex A | Range |  | Format | Range is not in bold. | L. Martin/ESA | Change format of Range to bold as the rest of terms. | **Accepted.** |
| B-1 | Annex B |  |  | Content | GLONASS acronym not used within the document. | L. Martin/ESA | Proposed to remove the acronym. | **Accepted.** |
| B-2 | Annex B |  |  | Content | Agency acronyms (GSFC, NASA, JPL, JAXA, DLR, CNES, ESA, ESOC, ) are already defined in the Foreword of the document. | L. Martin/ESA | It is proposed to remove Agency acronyms from the Annex B since they are already defined in the Foreword. | **Rejected.** We think that people use the acronym list rather than the front material. |
| B-2 | Annex B |  |  | Content | Some acronyms used in the document have not been included in this section: | L. Martin/ESA | WG, NWG, NAV, FAX, ID, ASCII, SFTP, DOR, CSTS, EVM (if decided to be included), NORAD | **Accepted with partial implementation.** Did not include the abbreviations FAX, ID, and ASCII. |
|  |  |  |  |  |  |  |  |  |
| All | All |  |  | ed | The page numbering is no longer consecutive (for example the first page in section 3 is 3-10) | J.A.Hashmall/NASA/GSFC | When the next version is saved it would be clearer if you updated the table of contents which would renumber the pages. | **Accepted.** |
| 3-10 | 3.1 | 3 |  | ed | Paragraph 3 seems a bit long and somewhat unclear. |  | Consider breaking it into 3 shorter paragraphs: First about existing standards, second about standards we are developing, and third about standards that are having their periodic reviews. | **Accepted.** Implemented based on David Berry’s comment related to this paragraph. |
| 3-10-3-11 | 3.1 | 4-5 |  | ed,te | Discussion at the Fall 2014 meeting suggested that this diagram and description might be replaced by one that is centered more on information flow rather than mission operations. See Luis’ diagrams and my brief descriptions of the relationship among the messages. |  | Consider replacing with a data flow oriented description and diagrams. Consider whether to add simple summary descriptions in section 3.1 or whether to put each description in its corresponding section: 3.2 through 3.8 | **Accepted.** New section with the diagrams provided by Luis Martin. |
| 3-12 | 3.2 | 2 |  | te | Is it appropriate to describe the metadata section in the Green Book? |  | Consider removing. | **Rejected.** |
| 3-12 | 3.3 | Last |  | ed | The sentence starting “The ODM is divides into three separate messages…” is a bit unclear in its wording. It might mean that a single ODM has 3 parts. |  | Perhaps: “Each ODM may be one of three messages…” would be cleares | **Accepted.** |
| 3-13 | 3.3 | 5 |  | te | This isn’t directly relevant to section 3.3 but, since we are now moving in the direction of bundling multiple messages together into a “NDM” might it be worthwhile to consider writing a more general paragraph, similar to the one that starts, “Multiple OPM, OMM, or OEM messages…” in section 3.1? |  | Consider | **Needs further discussion.** Deferred for future versions. |
|  |  |  |  |  |  |  |  |  |
| A-1 | Glossary | n/a | n/a | Ge, ed | 14 of the 29 items in the Glossary are already fully defined in 2.2 General Definitions | Patrick Zimmerman / NASA / JSC | What is the reasoning or rationale for the duplication of information? How were the items in the Glossary chosen? (e.g. why is range, range-rate included but not angle?) Bigger question: is a glossary really needed? | **Needs further discussion.** Deferred for future versions. |
| A-1 | Control | 1 | 1 | Ed | Not in alphabetical order | Patrick Zimmerman / NASA / JSC | Move after ‘Bias’ in listing | **Accepted.** |
| A-1 | Doppler Shift | 1 | 2 | ed, te | Additional clarification | Patrick Zimmerman / NASA / JSC | From: “transmitter and receiver”  To: “transmitter with respect to the receiver” | **Accepted.** |
| A-1 | Ephemeris | n/a | n/a | ed, te | An ephemeris is used for more than just satellites, such as spacecraft (or celestial bodies) | Patrick Zimmerman / NASA / JSC | Consider adding ‘or spacecraft’ into definition | **Accepted.** Implementation is slightly different to the suggested disposition. |
| A-1 | GPS | 1 | 1 | Ed | Not clear why GPS is called out in Glossary | Patrick Zimmerman / NASA / JSC | Consider removing from list | **Accepted.** |
| A-1 | Ground-to-flight | 1 | 1 | Ed | Two things: not alphabetic. Sentence structure does not match other definitions | Patrick Zimmerman / NASA / JSC | Move prior to Ground-to-ground  Consider changing to “The set of exchanges between a non-spacecraft participant and any one spacecraft participant.” | **Accepted.** |
| A-2 | Navigation | 1 | 2 | Ed | Use of orientation instead of attitude, since attitude is the defined term | Patrick Zimmerman / NASA / JSC | From: “…, orientation and maneuver”  To: “…, attitude and maneuver” | **Accepted.** |
| A-2 | Orbit | 1 | 1 | ed, te | Additional clarification | Patrick Zimmerman / NASA / JSC | “Celestial body in space" is redundant.  Perhaps something like “Typically the trajectory or path followed by a spacecraft or satellite about a central body.” | **Accepted.** |
| A-2 | Range | 1 | 1 | ed | Not bolded. | Patrick Zimmerman / NASA / JSC | Term should be bold for consistency. | **Accepted.** |
| A-2 | Range Rate | 1 | 2 | Ed | Definition too restrictive. Range rate is also often determined by the range difference over a delta time | Patrick Zimmerman / NASA / JSC | Remove “Range rate is determined by measuring the Doppler shift of the satellite beacon carrier”. Or modify to state: “One method of determining range rate is by…” | **Accepted.** |
| A-2 | Tracking Station | 1 | 2 | Ed | Some tracking stations do not communicate with the spacecraft, such as C-band skin trackers, and simply provide tracking data measurements | Patrick Zimmerman / NASA / JSC | Modify. Perhaps “Space or ground-based facility used to track and/or communicate with a spacecraft.” | **Accepted.** |
| A-2 | Maneuver | N/A | N/A | te | Missing term | Patrick Zimmerman / NASA / JSC | Consider adding Maneuver, with definition, as it is specifically called out as a piece of Navigation data (similar to how attitude is defined) | **Accepted.** |
| B-2 | N/A | N/A | N/A | ed, te | SI not used in document | Patrick Zimmerman / NASA / JSC | Consider removing term from list. | **Rejected.** Incorporation of a comment received from David Berry made use of the SI abbreviation. |
| B-1, B-2 | N/A | N/A | N/A | ed, te | Not clear why certain nav constellations are included: GLONASS, GPS, NAVSTAR | Patrick Zimmerman / NASA / JSC | Consider removing terms from list. | **Accepted.** Removed based on similar comment from David Berry. |
| B-1, B-2 | N/A | N/A | N/A | Ed | Missing acronyms used in document: SOHO, CSTS, Delta DOR, ICD, ASCII, FAX, NORAD | Patrick Zimmerman / NASA / JSC | Consider adding terms to list | **Accepted.** List was updated but not sure if SOHO, Delta DOR, ASCII and FAX should be included. |
| 1-3 | 1.5 | N/A | N/A | Ed | Item [10] appears to have errors | Patrick Zimmerman / NASA / JSC | Verify date of Keystone conference. (likely 2006? not 26?) | **Accepted.** |
| 1-3 | 1.5 | N/A | N/A | ed | Both [14] and [15] are listed for the same item, but [14] is never used in the document | Patrick Zimmerman / NASA / JSC | Remove [15] and adjust and correct all higher numbered references in table and in document | **Accepted**. |
| 1-3 | 1.5 | N/A | N/A | Ed | Numerous books listed as “Issue N” | Patrick Zimmerman / NASA / JSC | Fill in Issue #’s where possible | **Rejected.** It was suggested to intentionally make it N for books that have not been published. |
| 1-4 | 1.5 | N/A | N/A | Ed | Item [20] is in-line with item [19] | Patrick Zimmerman / NASA / JSC | Add carriage return | **Accepted.** |
| 2-5 | 2 | N/A | N/A | Ed | Item [23] from prior section showing up as section title | Patrick Zimmerman / NASA / JSC | Move item into prior section | **Accepted.** |
| 3-13 | 3.3 | 7 | All | Ge | Not clear why the ODM section specifically calls out such extensive member agency usage, whereas no other section has this detail? | Patrick Zimmerman / NASA / JSC | Consider the intent of the document and the benefit of the details in this paragraph. If details of Message usage are deemed desirable for this document, then perhaps more examples can be provided throughout.  If needed, I can provide some summary information for additional uses of implementation of ODMs, TDMs and CDMs in our NASA JSC operations. | **Accepted.** Added brief statements on usage of TDMs and CDMs. |
|  |  |  |  |  |  |  |  |  |
| Iv to v |  |  |  |  | The reference to intermediate documents should be removed in the final version | Alain Lamy / CNES |  | **Accepted.** It will be removed in the final version submitted for publication. |
| 1.1 | 1 | 1.1 |  | ed | Spacecraft navigation data is exchanged between during cross support of space mission. | Alain Lamy / CNES | (see also comment below) | **Accepted.** |
| 1-1 |  |  |  | ed | Volumes 1 and 2 of this document.  Are these the correct terms ? or is the document either volume 1 or volume 2 ? | Alain Lamy / CNES |  | **Accepted.** |
| 1.1 | 1 | 1.1 |  | ed | Spacecraft navigation data is exchanged between during cross support of space missions. The purpose of volumes 1 and 2 of the …  There is no link between sentence 1 and 2. | Alain Lamy / CNES | Remove sentence 1. | **Rejected.** I think there is a link between the two sentences, unless they need to be reorganized. |
| 1.1 | 1 | 1.1 |  |  | This exchange is facilitated through the use of the various data messages defined in diverse navigation data messages.  Does not seem clear. | Alain Lamy / CNES | Remove end of sentence:  This exchange is facilitated through the use of the various navigation data messages. | **Accepted.** This was taken care of by a comment provided by David Berry. |
| 1.1 | 1 | 1.1 |  |  | the definitions and conventions associated with inter-Agency cross-support situations involving the transfer of navigation data  Does not seem clear what these “definitions” are does not seem clear. | Alain Lamy / CNES | Remove this part of the sentence | **Rejected.** This is the purpose of the document. |
| 1.1 | 1 | 1.1 |  |  | with the technical definitions and conventions used widely to describe the properties, measurements and ancillary information of spacecraft dynamics required for navigation.  Seems too much detail to me (and may not be clear to readers). I would simplify. | Alain Lamy / CNES | with the widely used spacecraft dynamics technical definitions and conventions. |  |
| 1.2 | 1 | 1.1 |  | ge | This document serves as a guideline for the development of international standards for the exchange of spacecraft navigation data.  Is this the primary purpose of the green book ? | Alain Lamy / CNES |  | **Accepted.** It is the primary purpose of the document. |
| 1-2 | b) | 1.3 |  |  | does not exist any more | Alain Lamy / CNES |  | **Accepted.** Even though it was removed in version 3.7 of the Green Book, David Berry suggested to add the navigation definitions and terms back. |
| 1-2 | c) | 1.3 |  |  | b) does not exist any more | Alain Lamy / CNES |  | **Rejected.** It does exist. |
| 2-5 |  | 2.2 |  |  | I think that examples should be given for : property, measurement, ancillary information, as these concepts are a bit abstract (in particular at the beginning of the document)  Also true for the “NOTE” | Alain Lamy / CNES |  | **Rejected.** Agreed. My intent was to include part of this information in vol. 1. However, the direction at previous CCSDS technical meetings was to remove any information related to the properties, measurements and ancillary data out of vol.1 because it made more sense to leave it in vol. 2 |
| 2-5 |  | 2.2  (fig 2-1) |  |  | A spacecraft as potential originator of a message is possible in theory, but messages are not designed for that situation in the first place.  Should this possibility be kept in the document ? | Alain Lamy / CNES |  | **Rejected. Navigation data can be originated from the spacecraft and downlinked in telemetry in a format defined by separate CCSDS standards. The navigation data messages are currently exchanged post level-0 processing of spacecraft telemetry based on a Joseph Hashmall’s comment.** |
| 2-6 |  | 2.3 | Fig 2.2 |  | Figure 2-2 describes the roles of navigation data versus navigation data messages  I would say show the navigation data inside a navigation message. | Alain Lamy / CNES |  | **Accepted.** I think this was taken care of byincorporating a similar comment provided by David Berry. |
| 2-6 |  | 2.3 |  |  | Ideally, every CCSDS Recommended Standard … the present time.  The meaning seems obscure. Why mentioning candidates…the objective of this paragraph is not easy to catch | Alain Lamy / CNES | Could probably be simplified | **Accepted.** Clarified the section. |