

INSRP SER Development Meeting
Air Force Safety Center, Kirtland AFB, Albuquerque, NM
March 27-28, 2019

Attendees: Representatives from all 5 agencies, and all INSRP Working Groups

Note: This is not a comprehensive set of notes; it is simply intended to capture items of particular note to me (ticklers for later reference). There are associated slides for most of the presentation areas.

Day 1:

Opening Remarks – Matt Forsbacka, NASA

- Need to be able to articulate what we think of the methodology, and things that we think they (the Program) need to be looking at
- Are the assumptions being made reasonable? Is the uncertainty adequately addressed?
- Can we communicate our findings to decision-makers and non-technical stakeholders

Schedule – Don Helton, NRC

- See associated slides
- Scope of changes are important for one-off versus new SAR, but degree of change in risk results is also very important in terms of how much disruption the new SAR will cause to the SER development
- There was feedback related to the bi-weekly tagups, which is captured later

Sensitivity Analysis Tickler – Don Helton, NRC

- See associated slides

Aside – Matt Forsbacka, NASA

- Discussed the SAR comments that NASA circulated on March 25th, 2019
- There are a mix of cases where NASA has identified concerns that INSRP is aware of and agrees with, INSRP is aware of and disagrees with, and possibly a few that weren't on our radar.
- WGs will provide 1-liner viewpoint on each item to support Matt's interaction with his NASA counterparts

DOD SER Status – Lance Peterson, DOD

- See associated slides
- Up-front material is mostly complete
- Provide references as we go - (agency, year) format

LAWG Update – Amber Chang-Armstrong, USAF

- See associated slides
- Discussion about how the WGs should approach the in-hand SAR versus the expected Summer SAR situation - resolution of this is captured later
- Upcoming Atlas V (9), Delta IV M (1), Delta IV H (1) launches, and the possibility of new failures, is a key assumption – other launch failures (e.g., Falcon) could also have an impact from a Range risk assessment perspective, though not from a Databook perspective

- Discussion about how to handle the possibility of the new PD/NSC-25 policy, especially if M2020 is not grandfathered – resolution of this is captured later
- For the small pieces that would nominally be the same between all the STIVs, Amber has taken a crack at this and will circulate it to the other WGs
- Discussion of whether the STIVs should have “Lessons Learned” and whether the mission should do an overall Lessons Learned report – resolution of this is captured later

SNSWG Updates – Damon Burnette and Greg Wyss, et al., Sandia, INSRP

- See associated slides
- As an aside, Greg pointed out that the MMRTG (M2020, MSL...) uses thermal conductivity rather than radiative heat transfer for the thermo-electrics, which change the clad temperature somewhat (in an unfavorable direction from a nuclear safety perspective) – this doesn’t impact the current analysis, but it does point to an opportunity to improve the design from a nuclear safety perspective going forward (if there aren’t operational challenges associated with returning to the radiative design)

METWG – Will Pendegrass, ORNL

- See associated slides
- IAT model has generally been tuned, rather than validated – major concerns here
- Insufficient access to source code and documentation – somewhat ameliorated by a Day 2 breakout between MET/BEES and SAR team
- Use of HYSPLIT for high-altitude releases carried out over multiple days is unjustified, and is probably conservative in terms of ground-level exposures
- Ground level concentration / plume graphics can be dramatically misleading, because some of the plotted contours are at extremely low levels (as low as fractions of a particle per computational cell)
- Still actively debating what a reasonable computational threshold (RCT) should be to capture de minimus exposures – working with BEES and need more time, but see this as critical to characterizing the actual results more appropriately (believe that the Program results are unphysical (over-state some aspects of the risk) in this respect)

BEESWG – Bob Nelson, PNL

- No associated slides
- Echoed previously-stated concerns about DDREF values used, FDOSE assumptions, DCFPAK4, etc. – some of these concerns/questions are now in the DRT

REWG – Mike Weaver, Aero

- See associated slides
- Discussion about the clad temperature during reentry accidents (free-flying GIS experiencing convective cooling prior to ground impact)

SQAWG – Matt Forsbacka, NASA

- Based on the 3/26 few-hour on-site visit, seems like all the mechanisms are in place, and are planning on doing the remainder of the review by document review in April/May
- Program is following an NQA-1-like process

Additional Risk Issues – Don Helton, NRC

- See associated slide

RI&U WG, Curtis Smith, INL

- See associated slides
- Highlighted the afore-discussed need for the panel to provide further direction on what results will be provided in the SER and STIVs, building off the notes from the December 2018 caucus
- For relevant basic events in the model, RI&U is looking to the other WGs for:
 - Does using the mean SAR value make sense?
 - Should the uncertainty be characterized by a maximum entropy fit to the SAR information, or something else?
 - What sensitivity analysis should be run?
- Some additional coordination between SNS, MET, BEES, and RI&U is needed (and planned) in terms of selecting scenarios that can be investigated soup-to-nuts, and ensuring the various folks interrogating STORM outputs are benefiting from each other's work/knowledge

Day 2:

DOE-NE / SAR Team Status – Dan Clayton, Sandia (Program)

- See associated slides
- General timeline of ongoing calculations:
 - End of April – Source Terms
 - End of May – Consequences
- The final version of Databook Addendum #3 (3/22/2019) includes some updates to the accident uncertainty characterization above what was in the draft version of Databook Addendum #3 (2/15/2019) – *JPL subsequently posted a delta document*
- Guestimate is that the summer SAR mean max individual dose will be ~300 mrem
- All RAS will be repeated, and thus all new LASEP runs, all new STORM outputs, etc.
- Not sure if they will re-run the fire and thermal analysis; are making some additional changes to IAT (and it is unclear whether they will be using a new version of IAT for the summer SAR)
- Dan is envisioning that the SAR will be annotated with a left line denoting changes a la a page/replace (rather than a true redline/strikeout)...and envisioning that virtually every table would change
 - Should be able to provide SQA descriptions of changes in a near real-time manner
- Could potentially provide the summer SAR to INSRP in parallel to DOE-NE review...in mid-July...provide draft chapters in the interim...?
- Proposal to use first 10-15 minutes of bi-weekly for Dan to report out on SAR changes/updates in the prior 2 weeks

Working Group questions for SAR team – All [like all parts of these notes, this is not comprehensive of what was discussed]

- For REWG:
 - several cases were identified where the SAR doesn't adequately describe specific modeling assumptions, and these were verbally clarified and will be enhanced in the summer SAR
 - Agreement that the technical basis for a 900C ground impact temperature is not defensible as described in the January 2019 SAR – SNL SAR team has performed new LAPS/TAOS/HANDI/CMA analysis (1D thermal model) that provides additional justification that the actual ground impact temperatures would

be greater than 900C – discussion about why RAS 3 / suborbital cases could be at lower temperatures (and the documentation is not entirely clear about whether RAS 3 uses 730C or 900C)

- For RI&U WG:
 - Inability to reproduce the SAR tables from the STORM originating data... - commitment to follow-up on this
 - No documentation in the SAR of:
 - Instances where they've found errors in their own work, that have been addressed (would be captured in SQA documentation)
 - Review of individual realizations to confirm the results make sense (though Dan asserted that this was done)
 - For sensitivity analysis performed inherent to the post-January SAR, they envision these guiding the changes to SAR descriptions, but they are not intending to document them as official sensitivity analysis
- For LAWG WG:
 - Phase 0 – right now they are assuming 1 person at the VIF for Phase 0 (for the revised analysis)
 - Phase 1 – not clear if SLC-40 workers are being accounted for
 - Some apparent differences between the Databook and the SAR's implementation of the FRAG45 results
- For METWG:
 - Would like to know the IAT sensitivity studies being conducted, and their results, via the bi-weeklys
- For SNSWG:
 - Looking at the entrainment model results seems to suggest no dependence on the rate of vaporization as a function of standoff distance, which doesn't seem realistic – John Hewson committed to providing some examples and Dan committed that they would look in to it
- For BEESWG:
 - Seems like the dose coefficients for inhalation in bins 8-13 are un-realistically high, given that they are above the respirable range
 - Information provided (including a supporting spreadsheet) doesn't map the specific assumptions made when using DCFPAK4
 - Seems to be an issue with the density used in calculating the inhalation dose
 - Repeated that the DDREF distribution used (which goes up to 8) is only appropriate for low LET radiation, not the high LET radiation associated with Pu inhalation

Panel Breakout:

- Mark will work with Lori/Lance to layout the plans for the bi-weeklys, using what we discussed yesterday and today
 - Bi-weekly with program to become 90 minutes, and to include a 'lightning round' for all WGs to ask questions and a 'deep soak' on the designated WG-of-the-call
 - Clarify what is expected to the WGs (e.g., MET may want to engage at a higher level b/c of more systemic concerns, whereas RE may want to engage at a very detailed level given their closer alignment)
 - Understand that bi-weekly round robin is inherently subject to change
 - Flip BEES and RI&U in the schedule proposed in my presentation (slide 7)

- Mark will resurrect the abandoned M2020 INSRP Roadmap, for possible use in developing the INSRB Terms of Reference, once the new Nuclear Space Launch Policy has been issued
- Regarding “lessons learned,” Section 5.2 of the suggested STIV outline will hereafter read, “Areas of Key Uncertainty, Key Assumptions, Concerns, and Observations”
 - Defer any decision to do a dedicated Lessons Learned report until August
 - Don will circulate the template with this revision (will be “Rev. 2”)
- Regarding presentation of results, the WGs should continue on their current path, and they will be asked to eventually use existing results to plot/table those results against the new launch policy and Air Force safety guidelines
 - The expectation is that doing so does not require any re-work, and if this isn’t the case, the WGs should raise this to the Coordinators
- Regarding how the WGs should approach the January vs. summer SAR:
 - Continue to work using the January SAR
 - Plan to reflect on the summer SAR when it is ready
 - To the extent practical, WGs should differentiate (organically in their SER/STIV development activities, not formally) between long lead-time work (which needs to be done now) versus short lead-time work (which can be done later, and ideally with the summer SAR)...
 - Reality is more complicated than this, and individual issues should be taken up with your Coordinator
- Regarding the “state of the review” document (early April)
 - Recipients will be Charlie and George
 - Coordinators will review (and revise if necessary) their WG inputs, and provide to Don
 - Don will package those inputs, add an introductory and closing paragraph, and then return to the WGs for comment
 - Mark will be out from April 2-19, and Jacob Habrum will be the POC for DOD on finalizing this
- Regarding the idea of a draft SER in June...
 - No, but could do an annotated SER outline and a briefing in July, provided during a joint workshop, and they will provide their pre-release Summer SAR (in parallel to DOE review)
 - Suggestion for a pre-meeting with the panel and WG leads ahead of this
- Regarding Agency Views:
 - Was introduced to the PD/NSC-25 process for courtesy purposes, and there is some thought that it does not provide benefit in the current situation
- Regarding communication with OSTP:
 - Communicate to OSTP via an in-person brief, to provide an update of where things stand relative to the our past briefings about problems – to occur soon after the release of the new policy
- Regarding the STORM/LASEP outputs associated with the summer SAR, it was confirmed that we will be requesting these