National Aeronautics and Space Administration

JUICE PEA and NASA TMC Evaluation

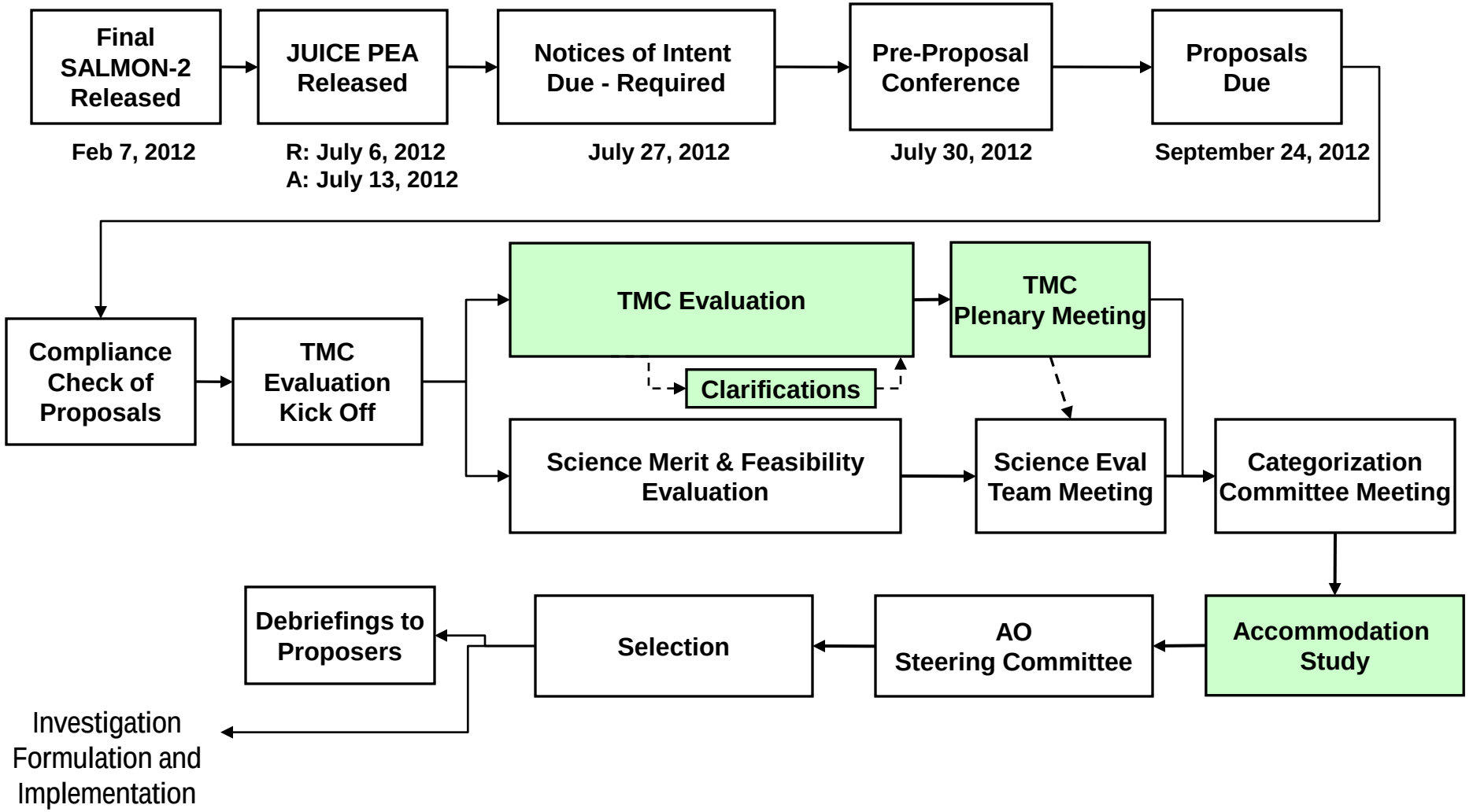
Cindy Daniels
TMC Lead (SOMA)

Pre-Proposal Conference for NASA JUICE AO
July 30, 2012

Introduction - Purpose

- Present to the community the Jupiter Icy Moon Explorer (JUICE) PEA overview of the “TMC Feasibility of the Investigation Implementation, including Cost Risk” criteria that are assessed by the Technical, Management and Cost (TMC) panel.
- Instrument considerations for Pre-Phase A proposals.
- To collect comments and answer questions.
- Important Note: This PEA is to the SALMON-2 AO.
- All proposers must read the final amended JUICE PEA & the final SALMON-2 AO carefully, and all proposals must comply with the requirements and constraints

Proposal Evaluation Flow



JUICE Evaluation Criteria
Technical Management and Cost

- *7.2.4 TMC Feasibility of the Investigation Implementation, including Cost Risk*

  The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule. The factors for feasibility of investigation implementation include the following, **as applicable** for the investigation being proposed:
  - Factor C-1. Adequacy and robustness of the instrument implementation plan.
  - Factor C-2. Adequacy and robustness of the mission design and plan for mission operations.
  - ~~Factor C-3. Adequacy and robustness of the flight systems.~~
  - Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.
  - Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.

JUICE Evaluation Criteria
Technical Management and Cost

- Factor C-1. Adequacy and robustness of the instrument implementation plan. The maturity and technical readiness of the instrument complement will be assessed, as will the ability of the instruments to meet investigation requirements. This factor includes an assessment of the instrument design, ~~accommodation, interface~~, heritage, and technology readiness. This factor includes an assessment of the instrument hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of the instrument complement. This factor also includes adequacy of the plans for instrument systems engineering and for dealing with environmental concerns. This factor includes an assessment of plans for the development and use of new instrument technology and the adequacy of backup plans to ensure success within the proposed cost and schedule when technologies having a TRL less than 6 are proposed.

Clarifications

- Proposers should be aware that, during the evaluation and selection process, NASA may request clarification of specific points in a proposal; if so, such a request from NASA and the proposer's response must be in writing.
- In particular, ***before finalizing the evaluation of the feasibility of the mission implementation (see Section 7.2.4), NASA will request clarification on specific, potential major weaknesses in the feasibility of mission implementation*** that have been identified in the proposal.
- NASA will request clarification in a uniform manner from all proposers.
- The ability of proposers to provide clarification to NASA is extremely limited, as NASA does not intend to enter into discussions with proposers. A typical limited response is to direct NASA's attention to pertinent parts of the proposal without providing further elaboration. (7.1.1 SALMON-2)
- No clarifications will be requested concerning findings from evaluation of the classified appendix regarding heritage. (SALMON-2 5.10.3)

Clarification Details

•NASA will request clarification of potential major weaknesses in the TMC Feasibility of the Mission Implementation that have been identified by the TMC evaluation panel. Similarly, NASA may request clarifications on potential major weaknesses for Science evaluation criteria.

- NASA will request such clarification uniformly, from all proposers.
- All requests for clarification from NASA, and the proposer's response, will be in writing.
- The ability of proposers to provide clarification to NASA is extremely limited, as NASA does not intend to enter into discussions with proposers.
- PIs whose proposals have no major weaknesses will receive an email informing them.
- The form of the clarifications is strictly limited to a few types of responses:
  - Identification of the locations in the proposal (page(s), section(s), line(s)) where the major weakness is addressed.
  - Noting that the major weakness is not addressed in the proposal.
  - Stating that the major weakness is invalidated by information that is common knowledge and is therefore not included in the proposal.
  - Stating that the analysis leading to this potential major weakness is incorrect and identifying a place in the proposal where data supporting a correct analysis may be found.
  - Stating that a typographical error appears in the proposal and that the correct data is available elsewhere inside or outside of the proposal.

•The PI will be given at least 24 hours to respond to the request for clarification. Any response that goes beyond a clarification will be deleted and will not be shown to the evaluation panel.

TMC Evaluation Ratings

- The third criterion, TMC feasibility of the proposed investigation, including cost risk, will be reported as Low Risk, Medium Risk, or High Risk.
- **Low Risk** There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation well within the available resources.
- **Medium Risk** Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Mission design may be complex and resources tight.
- **High Risk** One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.

Accommodation Comments

- The review panel evaluating the third evaluation criterion; technical, management, and cost (TMC) feasibility of the proposed investigation, including cost risk, will also provide comments to NASA regarding the extent to which the proposed instrument is compatible with the JUICE spacecraft interfaces and operations.
- These comments will not contribute to the TMC feasibility risk rating but will be considered by the selection official. (JUICE PEA K section 6.1)

TMC Evaluators

- TMC evaluators are experts in TMC factors
- TMC contractors are checked for
  - Organizational conflicts of interest
  - Personal conflicts of interest
  - Financial conflicts of interest
- TMC contract evaluators are required to comply with the Limitation in future contracting clause. They may not work on selected investigation.

Cost Requirements

- **Requirement K-6**. Proposals shall be for complete investigations including Phases A-E.
- **Requirement K-7**. Proposals shall include detailed plans and budgets for Phases A-F for costs that are within the PI-Managed Investigation Cost (see Table 2).
- **Requirement K-8**. Proposals shall include integration plans and planning budgets that occur during Phase D and that align with the schedule provided by ESA in the Science Management Plan.

Cost Constraints

- NASA's entire contribution consisting of the sum of all three types of contributions shall not exceed $100M (RY) for total life cycle costs. Within this budget cap, NASA expects to fund approximately two U.S.-led instrument investigations along with a number of NASA-funded instrument components and U.S. Co-Is on non-U.S.-led instruments. (JUICE PEA K 1.1)
- **Proposal will be evaluated (Factor C-5) against the proposed cost of their investigation.**

Schedule Requirements and Constraints

- JUICE PEA 4.4.2
- Each selected investigation under the JUICE solicitation will be expected to deliver an instrument that can be integrated onto the ESA provided spacecraft according to the schedule provided by ESA.
- Nominally, this will span the years of FY 2013-FY 2018, with instrument delivery to the spacecraft for integration currently scheduled for November 2018. This is expected to cover development Phases A through C.
- Proposals that include a more rapid instrument development timeline may be selected, provided the required budget phasing can be accommodated by NASA.
- **Requirement K-9**. Proposals shall include a detailed development schedule (including integration plans) and an associated planning budget that aligns with the schedule provided by ESA in the Science Management Plan.

Classified Proposal Appendix regarding Heritage

- The use of a classified appendix regarding heritage is being permitted by SMD for this AO as a trial.
- NASA will endeavor to use the information in the classified appendix regarding heritage to better understand the proposed investigation.
- However, NASA cannot guarantee that this process will be fully successful in informing the review panel of the impact of a classified appendix regarding heritage which they have not read. (SALMON-2 5.10.3)

Eligibility to Propose

- Section 4.1 of the JUICE PEA K: Eligibility to Propose
- Refer to Section 4.2 of the SALMON-2 AO for the rules on participation policy. For this particular PEA, NASA will place full or partial limitations (as described in the SALMON-2 AO) on organizations that will be involved in the evaluation process.
- **Cornell Technical Services LLC (CTS) is subject to the "Full Limitation" as described in Section 4.2.1 of the SALMON-2 AO. There is no limitation on the Aerospace Corporation for JUICE.**

SALMON-2 Section 7.2.4 Cost Factor C-5

- Factor C-5 Adequacy and robustness of the cost plan, including cost feasibility and cost risk. This factor includes proposal elements such as cost, cost risk, cost realism, and cost completeness including assessment of the **basis of estimate**, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work (covering all elements of the investigation, including contributions). Proposals will be evaluated for the adequacy of the cost reserves and whether proposals with inadequate cost reserves demonstrate a thorough understanding of the cost risks. This factor also includes an assessment of the proposed cost relative to estimates generated using parametric models and analogies. Also evaluated under this factor are the proposed cost management tools to be used on the project.

SALMON-2 Appendix B

Proposal Structure and Page Limits		
Section	**Contents**	**Page Limits**
A	Graphic Cover Page Export Controlled Material statement Optional Restriction on Use statement	1 0.5 0.5
	PI Commitment	1
B	Fact Sheet	2
C	Table of Contents	None
D E	Science, Exploration, or Technology Investigation Experiment Implementation	20
F G	Investigation or Mission Implementation Schedule Foldout Management	15 (none on Schedule Foldout(s))
H	Cost and Cost Estimating Methodology Cost Table B3	8 (none on Table B3)
I	Acknowledgement of E/PO requirements Optional Student Collaboration plan	1 + 2 for optional student collaboration
J J.1 J.2 J.3 J.4 J.5 J.6 J.7 J.8 J.9 J.10 J.11	Appendices (no others permitted): Table of Proposal Participants Letters of Commitment Resumes Summary of Proposed Program Cooperative Contributions Draft International Participation Plan Discussion on Compliance with U.S. Export Laws and Regulations Compliance with Procurement Regulations by NASA PI Proposals Discussion of End-of-Mission Spacecraft Disposal Requirements Master Equipment List (MEL) Heritage List of Abbreviations and Acronyms List of References (optional)	 None None None None None None None None None None None

Proposal Section H - Cost

- Section H of the Proposal is limited to 8 pages plus Table B3 (no limit on Table)
- **Requirement B-50.** This section shall include the estimated cost of the proposed investigation. The estimated cost shall encompass all proposed activities, including all applicable mission phases, flight systems, ground systems, contributions, any other AO-specific activities, and all cost reserves. These costs shall be consistent with the policies and requirements described in Section 4 and Section 5 of this AO.
- **Requirement B-51.**This section shall include a description of the methodologies used to develop the estimate. …. See next page
- **Requirement B-52**.This section shall include a discussion of cost risks.
- **Requirement B-53**.This section shall provide a foldout cost table, Table B3, which will not be counted against the page limit. ……
- **Requirement B-54**.This section shall include a statement as to whether the proposer's approved forward pricing rates were used or NASA's inflation/deflation indices were used. If the proposer's approved forward pricing rates were used, this section shall include an explanation for how the forward pricing rates were derived.

SALMON-2 Appendix B

- **Requirement B-51**.This section shall include a description of the methodologies used to develop the estimate.
  - The cost estimating methodology discussion in this section shall provide an overview of the cost estimate development process.
  - Any additional cost estimates or other validation efforts shall be described, the results presented, and any significant discrepancies discussed.
  - The rationale for the proposed cost reserve levels shall be presented.
  - Proposers shall provide additional Basis of Estimate data to assist the validation of their cost estimates.
  - Examples of useful Basis of Estimate data include cost comparisons to analogous items/missions, vendor quotes, and parametric model results

Proposal Appendix J.8

- Heritage Appendix J.8
- **Requirement B-70**. This section shall discuss each element of any heritage from which the proposed investigation derives substantial benefit, including heritage from spacecraft subsystems, instruments, ground systems, flight and ground software, test set ups, simulations, analyses, etc. This discussion shall be at an appropriate level of granularity (e.g., component, assembly, subsystem) to clearly separate the heritage element from other elements of the design. The discussion of each element shall include:
  - a concise description of the design heritage claimed;
  - the anticipated benefits to the proposed investigation;
  - a brief rationale supporting the claim that the benefits of heritage will be achieved; and
  - for any proposed elements with substantial design heritage, **a comparison of the cost of the heritage items to the proposed cost.**

Proposal Appendix J.9

- Master Equipment List Appendix J.9
- **Requirement B-69**. This section shall include a Master Equipment List (MEL) summarizing all flight element subsystem components and individual instrument element components to support validation of proposed mass estimates, design heritage, and cost. **A template for this MEL is included as Table B5**.
  - For each component, current best estimates (CBE) and contingency for mass and power, number of flight units required, and some description of the heritage basis must be provided. Power values should represent nominal steady-state operational power requirements. Information to be provided includes identification of planned spares and prototypes, required deliveries for simulators and testing, contingency allocations for individual components, and other component description/characteristics. Certain items (like electronic boxes and solar arrays) should include additional details, as applicable, to identify and separate individual elements.

Basis of Estimate (BOE) Appendix C

- Basis of Estimate (BOE) — A record of the procedures, ground rules and assumptions, data, environment, and events that underlie a cost estimate's development or update. Good documentation of the BOE supports the cost estimate's credibility.

Cost Table B3

- **Requirement B-53**.This section shall provide a foldout cost table, Table B3, which will not be counted against the page limit. Table B3 shall identify the proposed cost required in each mission phase and in each fiscal year; the costs shall be in real year dollars (RY$). The top portion of Table B3 shall contain cost data relevant to the PI-Managed Mission Cost. The lower portion shall contain cost data for contributions. The rows in Table B3 shall be the NASA standard WBS elements, as defined in NPR 7120.5D NID. The WBS must provide adequate insight into each individual instrument. The columns in Table B3 shall be grouped and subtotaled by mission phase and shall be labeled with the appropriate fiscal years. Fiscal years that span more than one mission phase shall be split into two columns by mission phase. The final columns total is in real year dollars (RY$). Proposers shall use their own approved forward pricing rates. For organizations that are without approved forward pricing rates, proposers may use the most recent NASA inflation/deflation indices available at http://www.nasa.gov/offices/ipce/CA.html. The NASA FY 2011 new start inflation index for use in FY 2012 is provided in Table B4.

Cost Table B3

Excel Template for Table B3 is in JUICE Library at http://soma.larc.nasa.gov/juice/programlibrary.html

FY costs in Real Year Dollars (RY$), Totals in Real Year Dollars (RY$)

WBS#	WBS Element	Phase A			Phase B				Phase C					Phase D					Phase E							RY$
		FY2013	FY2014	Total	FY2014	FY2015	FY...	Total	FY...	FY...	FY...	FY...	Total	FY...	FY...	FY...	FY2022	Total	FY...	FY...	FY...	FY...	Total	FY...	Total	Total
01	Project Management																									
02	Systems Engineering																									
03	Safety & Mission Assurance																									
04	Science / Technology																									
	Breakout pre-launch science from technology development activities																									
	Science Team																									
05	Payload(s) List each instrument and component separately																									
5.1	Instrument 1																									
5.1.1	Instrument 1 Component A																									
5.1.2	Instrument 1 Component B																									
5.1.n	Instrument 1 Component n																									
5.2	Instrument 2																									
5.2.1	Instrument 2 Component A																									
5.2.2	Instrument 2 Component B																									
5.2.n	Instrument 2 Component n																									
5.X	Instrument X																									
5.X.1	Instrument X Component A																									
5.X.2	Instrument X Component B																									
5.X.n	Instrument X Component n																									
07	Mission Operations																									
08	Launch Vehicle / Services																									
09	Ground System(s)																									
	Breakout non-standard cost, e.g., coordinating ground stations																									
10	Systems Integration & Testing																									
11	Education and Public Outreach																									
12	SC cost above 1% of the PI-Managed Mission Cost Reserves																									
	Breakout unencumbered and encumbered reserves																									
	PI-Managed Mission Cost																									
	Student Collaboration (SC) Optional Up to 1% of the PI-Managed Mission Cost																									
	Outside PI Managed Costs - NASA Funded																									
	Contributions																									
	List by organization and WBS element																									
	Total Contributions																									
	Total Mission Cost																									

Label columns with actual fiscal years. Add or remove FY columns as necessary.

Table B5 MEL

Excel Template for Table B5 is in JUICE Library at http://soma.larc.nasa.gov/juice/programlibrary.html

Table B5

MASTER EQUIPMENT LIST (MEL) Template - MISSION X

Payload Element 1		# OF UNITS			FLIGHT HARDWARE MASSES			FLIGHT HARDWARE POWER			OTHER COMPONENT INFORMATION	
Subsystem/Component	Unit Mass, Current Best Estimate (CBE)	Flight Units	Flight Spares	EMs & Proto-types	Total Mass, kg CBE	Contin-gency %	Total Mass w/ Contin-gency	Total Power, W CBE	Contin-gency %	Total Power w/ Contin-gency	Description (Vendor, Part #, Heritage Basis)	Other characteristics/issues (volume, other component-specific information)
Total Mass/Power												

Payload Element *n*		# OF UNITS			FLIGHT HARDWARE MASSES			FLIGHT HARDWARE POWER			OTHER COMPONENT INFORMATION	
Subsystem/Component	Unit Mass, Current Best Estimate (CBE)	Flight Units	Flight Spares	EMs & Proto-types	Total Mass, kg CBE	Contin-gency %	Total Mass w/ Contin-gency	Total Power, W CBE	Contin-gency %	Total Power w/ Contin-gency	Description (Vendor, Part #, Heritage Basis)	Other characteristics/issues (volume, other component-specific information)
Total Mass/Power												

Reference Documents

- The SOMA office develops white paper and lessons learned documents related to TMC evaluations of SMD missions and instrument proposals.
- These documents are available at http://soma.larc.nasa.gov/
  - ***Instrument Considerations for Pre-Phase A Proposals***
    - Based on a review of past SMD instrument evaluations
      - Looked at what information was missing from instrument proposals that led to weaknesses
    - Provides guidelines on what information is needed for instrument proposals.
    - This is not specific to the JUICE PEA but may be helpful to proposers to consider.

All Questions

- Questions or comments must be sent to Dr. Curt Niebur, JUICE Program Scientist
- Curt.niebur@nasa.gov (subject line to read “JUICE PEA”)