

Lunar Terrain Vehicle (LTV) Services (LTVS)

Industry Day Questions and Answers – Batch 2 of 2

No.	Question	Answer
1	The early Request for Information (RFIs) issued by NASA indicated that the LTVS would be landed on a CLPS lander. What is the reliability that NASA requires the lander to have?	<p>NASA's current strategy is to award multiple Indefinite Delivery Indefinite Quantity (IDIQ) contracts to create a pool of pre-qualified contractors capable of providing end-to-end LTV Services when issued competitive FFP task orders. The "End-to-end LTV Services" to be procured under the IDIQ contracts are intended to include the LTV system (i.e., lunar surface transportation system) as well as the delivery system (i.e., launch/transit vehicle plus lunar landing system) services.</p> <p>Please see the Draft RFP (DRFP) for requirements relative to the end-to-end services required for the LTVS Contract.</p>
2	Engaging with interested parties seeking to do business on the moon is critical to LTV commercial use. Will NASA develop a commercial Lunar Economy forecast to inform industry regarding LTV business decisions?	NASA does not intend to develop a commercial Lunar Economy forecast. The DRFP addresses the requirement for commercialization plans from offerors. It is NASA's expectation that Industry will identify and anticipate non-NASA needs in order to inform its response to the commercialization plan requirement.
3	Is NASA's assumption that standard Mission A/B are fixed pricing schedule? CLIN 1a vs 1b; is assumption that standard mission A/B is a fixed cost; is there a mission 1 cost and then there is subsequent mission pricing?	Yes, NASA anticipates fixed pricing for the standard missions A and B. Please see the DRFP for terms and conditions and instructions to offerors relative to standard mission pricing.
4	Will the RFP address insurance and/or liability requirements?	The Draft RFP contains a number of liability, insurance, waiver, and indemnification clauses that are still being aligned for consistency. NASA's intent is to include a deviated cross waiver in the final RFP which does not allow the contractor(s) or the US government to pursue claims of liability against one another. In addition, NASA's intent is to have a requirement that third-party users indemnify the US government for non- NASA activities through mandated

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		flow down provisions. NASA continues to refine this DRFP and is considering the clauses in Attachment A to the DRFP Cover Letter. NASA invites industry to comment on these clauses and provide input as NASA finalizes the RFP.
5	Who provides training?	The Contractor will be responsible for providing crew training.
6	Who owns the data Intellectual Property (IP)? LTV system collects imagery from LTV system cameras and data, but who owns that? Would NASA have internal use rights or publish rights? Are there restrictions on advertising on the vehicle?	The Draft RFP includes terms and conditions relative to data rights and contractor advertising on the vehicle.
7	What can astronauts do in the one hour extravehicular activity (EVA) timeframe? Does the 1 hour of EVA time include prep and post-work? Does maintenance count against the EVA time?	The one-hour EVA time is the time allocated for actual maintenance activities.
8	With the IDIQ contract is there a minimum time frame from order to delivery?	Task order(s) issued under the Indefinite-Delivery Indefinite-Quantity (IDIQ) contract(s) will specify the delivery date requirements.
9	What is the procedure in case of incapacitated crewmember, will a system be needed to assist?	Please see the DRFP for technical requirements for the LTV.
10	Regarding payloads and mass on the vehicle, is it assumed that the slots are NASA owned all year long?	This should be the assumption however industry is welcome to weigh in on how to mechanize the contract to make equitable use of these slots when available.
11	Question on maintenance time if payload needs to be plugged in for commercial purpose. Does commercial payload time count against maintenance time?	Please see the DRFP for technical requirements for the LTV.
12	Will the 150-hour Lunar Night requirement be a NASA dictated requirement or will it be vendor responsibility to determine how to survive? Can the vendor drive the risk trade?	Please see the DRFP for technical requirements for the LTV.
13	If we were to want to find scientists to hire where should we go?	NASA does not endorse any particular approach to offerors making hiring decisions. Offerors may consider any number of resources available for identifying candidates, which

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		could include major domestic science conferences, including but not limited to: Lunar and Planetary Science Conference (LPSC), Lunar Exploration Analysis Group (LEAG), and NASA Exploration Science Forum (ESF).
14	Can you provide ranges for budget? Number of awardees for the business cases?	<p>NASA has a budget for LTV that is supported by the Agency, and does not intend to share its internal budget with Industry. It is NASA's expectation that offerors will propose competitive pricing that is reasonable and realistic for the scope of the contract and the Government will be responsible for determining what it can afford within its available budget.</p> <p>NASA intends to award multiple IDIQ contracts to create a pool of pre-qualified contractors capable of providing end-to-end LTV Services when issued competitive firm-fixed-price (FFP) task orders. NASA also intends to have the capability to on-ramp additional vendors throughout the period of performance of the contract. While NASA anticipates awarding IDIQ contracts along with initial LTV Services Feasibility task orders (“Refine the Service”) to multiple contractors, NASA anticipates the task order for the LTV Demonstration phase (“Enable the Service”) may only be issued to one vendor based on budgetary restrictions. However, the ultimate number of offerors to be awarded an IDIQ contract, issued an LTV Demonstration task order, and/or to be on-ramped during contract performance will be dependent on the quality and price of proposals received as well as NASA's available budget.</p>
15	Regarding robotic arm requirements, can you provide clarification for stowing? Does this mean the arm is not moving? Can we get clarification of deployable configuration and use cases? Should the arm be 'stowed' or is 'secured' ok? The arm might be useful while crew	The intent of the requirement is to enable safe securing of the arm in case of a malfunction while in the deployed configuration. Please see the DRFP for technical requirements for the LTV.

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	is present and possibly even when crew is driving. Mast and robotic arm could be the same thing, so would have to be deployed during mobile operations.	
16	To use Radioisotope Heater Units (RHUs), they are much more efficient heat-producers and will take care of mass concerns for survive the night. What is NASA's position on RHU use for LTV? For RHU, if we needed a certain amount of nuclear material (for example), would we be able to obtain it? Can you provide clarification for that process? Can you also provide some conversations about RHU? Otherwise, it seems like NASA doesn't want to use RHU and it might send a signal that this trade space is not available.	There is no restriction on use of nuclear power in the DRFP at this time. As the expectation for achieving the requirements of the contract is the provision of a fully integrated, service contract to NASA, industry would be solely responsible for the approvals and procurement of any nuclear source material they intend to use. If an offeror anticipates the use of RHUs, it is requested that the offeror clearly communicate that intent to the Government within its response to the DRFP, as well as within its proposal in response to the Final RFP, as specific requirements, regulations, and coordination may be required.
17	Regarding requirements verbiage, would it be better to classify "power" as "energy" or "heat" instead? Also, relating to the 50-watt requirement, is this needed for the whole time or only for a short time? Do you need heat or power for a 50-watt request for 150-hour night survival? Other sources of heat might not require power. When you hibernate, everything is off. Suggest to change requirement to heat.	Please see the DRFP for technical requirements for the LTV.
18	Regarding environment and lighting tools, could we be provided with a list of the modeling tools that we will be able to use so we do not need to reinvent these? This would help us make the design trade and empower us to use that info in our trade studies.	Please see the DRFP for technical requirements for the LTV.
19	Regarding the robotic arm requirements, is it NASA's intent for the robotic arm to be "out of the way," or does it need to be removable? Can you provide some additional verbiage to expand the robotic arm requirements for clarification? It should be removable or multiple fault tolerant. The arm is a requirement, you	The intent of the requirement is to enable safe securing of the arm in case of a malfunction while in the deployed configuration. Please see the DRFP for technical requirements for the LTV.

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	would not say if your solar panel was damaged you would toss it; the arm could be similar depending on design.	
20	In the contract, there was a point made that this is not a FAR Part 12 procurement. Is the Commercial Lunar Payload Services (CLPS) contract a reasonable reference for this? Can NASA describe what rules apply? FAR 52? An analog contract?	The LTVS procurement is expected to be conducted utilizing the procedures of FAR Part 15, Contracting by Negotiation. The Draft RFP provides the terms and conditions as well as instructions to offerors and evaluation criteria consistent with a FAR Part 15 procurement. A recent NASA contract that could be considered to have a similar structure would be the Exploration Extravehicular Activity Services (xEVAS) contract, which was also procured in accordance with FAR Part 15 procedures.
21	Can you preview the level of detail around service pricing you would expect to see (in the IDIQ response)? Is it accurate to say that part of the first phase is to define the pricing requirements of the commercial model? Can you state if you would want this within the 2-5 year range? Do vendors have to go into this RFP response with a notional commercial plan? Knowing we need NTEs is helpful; what is the time range we'd need those for?	Please see the Draft RFP for terms and conditions and instructions to offerors relative to pricing.
22	In a scenario of multiple vendors selected, will a particular vendor be governed by others' progress? For example, if a vendor is in the Enable/refining stage, and then NASA moves into a blackout period, how will that be handled? Also, are you imagining on-ramp opportunities?	The Draft RFP defines the anticipated period of performance associated with the initial task order for the "Refine the Service" phase. Subsequent order(s) to be issued for the LTV Demonstration phase ("Enable the Service") would define the need dates for those orders and offerors would provide their proposals to meeting the Government's requirements, which would include their schedule for performance. NASA does intend to have the capability to on-ramp additional vendors throughout the period of performance of the contract, which is addressed in the Draft RFP.

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23	Will there be on-ramp opportunities for vendors not online by 2028? Is there a process /mechanism in place to add needs? Do you expect to add needs later on in the process if we encounter a new need?	NASA intends to have the capability to on-ramp additional vendors throughout the period of performance of the contract, which is addressed in the Draft RFP.
24	Have you considered a costing model around the NASA provided communication systems? Would that be handled as a Government Task Agreement (GTA)? Is there a mechanism to add GTAs after the contract, if a new need is identified in the process?	Please see the DRFP for technical requirements for the LTV.
25	Certification - Do you see that it's within your scope to certify the delivery system as part of this program? Where does the oversight go back into? Is it in your purview? Does NASA see it in NASA's scope to certify the lander system?	The Government anticipates the LTVS contract to provide end-to-end services. The Draft RFP defines the deliverables, milestones, and reviews that will be required to enable NASA insight and approval.
26	In the enable service phase, are we certifying the specific design or the article? If the vendor delivers multiple rovers, would each rover have to be certified?	It is anticipated most of NASA's requirements will be related to the design, but NASA may also have a certain amount of as-built requirements that the Contractor would need to verify as well.
27	Payload related question - Can NASA provide the Artemis IRD standard? Can we provide input for the payload IRD when the draft comes out, or is it fixed?	Please see the DRFP for technical requirements for the LTV.
28	Will there be mass allocation on "Artemis 5/6/7" for LTV providers to bring down commercial payloads?	Please see the DRFP for technical requirements for the LTV.
29	Can you say anything about the Concept of Operations for the new payloads relating to how they make their way to the rover? Is the expectation that the crew is bringing these payloads, or will they be arriving on a different lander?	Please see the DRFP for technical requirements for the LTV.
30	Questions relating to NASA payloads - Should these be considered permanent fixtures, or is the plan for the payloads to only be there during the service period? If a NASA payload dies will it be stuck on the LTV?	The intent is for all payloads to be replaceable over time and not permanent installations on the LTV. Please see the DRFP for technical requirements for the LTV.

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31	Is there an ownership concept for the payloads? Will the payloads be available for commercial purposes outside of the NASA timeframe?	Please see the DRFP for technical requirements, exceptions, and data rights terms and conditions for the LTV.
32	Can we use the data acquired thru LTV for commercial purposes?	Please see the DRFP for technical requirements and data rights terms and conditions for the LTV.
33	Who defines the landing target, NASA or us? Do you care about 180 m radius if we define it? Why is this a requirement? Why is there a 100 m landing ellipse requirement if the rover can get to the location?	The DRFP states that the LTV Delivery System shall allow for the specific LTV landing location area to be specified and agreed upon jointly by NASA and the Contractor as late as one year before the LTV launch. The intent of defining the landing location and accuracy is to ensure that the lander is capable of landing in a designated area and those locations support future Artemis missions. Please see the DRFP for technical requirements for the LTV.
34	What does reduced performance mean for fully loaded LTV?	Please see the DRFP for technical requirements for the LTV.
35	Relating to the 1300 km per year requirement, is that NASA use or does it include commercial use?	This is a NASA use requirement.
36	How good do you feel about the 150-hour survive the night battery life requirement? How firm is this requirement?	NASA performed extensive analysis and technical trades to define the referenced requirement. Please see the DRFP for technical requirements for the LTV.
37	Is there a fault tolerance for lunar night survival? Do we need to have twice the battery capacity?	Please see the DRFP for technical requirements for the LTV.
38	How much margin is incorporated in the 150-hour shadow survival requirement?	Each of the 4 known hibernation points will encounter a sustained shadow duration less than 150 hours. It is location dependent on how much margin exist with the 150-hour shadow survival requirement.
39	Is the one hour for maintenance relating to planned maintenance?	Yes, the one hour for maintenance is related to planned maintenance.
40	Will there be a design reference for terrain / distribution of rocks included in the draft RFP? Would it be possible to get this before the Draft RFP?	Please see the DRFP for technical requirements for the LTV.
41	To the greatest extent practicable, we recommend the use of FAR 12-based, commercial product/commercial	NASA intends to acquire the LTV as a service utilizing FAR Part 15 procedures, as opposed to FAR Part 12 procedures,

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	service contract clauses (including foregoing certified costing), as a FAR 12-based model would be consistent with NASA's stated goal of having LTVs be truly commercial offerings, with NASA itself one of multiple viable customers.	based on the results of market research. The expectation is that NASA will have to help the development of the lunar marketplace. As the market develops, the Government's investment is expected to decrease.
42	To the greatest extent practicable, we recommend the use of limited Government-rights contract clauses and mechanisms, to ensure LTV providers retain the rights and intellectual property necessary to sell their LTVs/LTV services to non-NASA customers.	NASA appreciates this feedback. Please see the Draft RFP for terms and conditions relative to data rights.
43	Can NASA provide some guidance on the level of detail it expects to have from bidders on labor rates as part of bidders' RFP response?	Please see the Draft RFP for terms and conditions and instructions to offerors relative to pricing.
44	Can NASA provide some guidance on the anticipated time between release of final RFP and proposals being due?	Please see the Draft RFP and the LTV procurement website for the anticipated time frame for proposal submission following RFP issuance.
45	Can NASA elaborate on what the requirements, at a high level, are expected to be of the mockup mentioned on Slide 48 of the Industry Day presentations?	Please see the DRFP for technical requirements for the LTV.
46	How much time does NASA anticipate there being between refinement of service (SubCLIN 2A) and enabling of the service (SubCLIN 1A)? Does NASA anticipate these being weeks, months, or even years apart?	NASA currently anticipates issuing the Request for Task Order Proposal (RFTOP) for SubCLIN 1A as soon as possible after the conclusion of all SubCLIN 2A task order work.
47	Regarding the permanently mounted science payloads referenced in the Industry Day slides 20 and 26: Generally speaking, permanently mounted payloads reduce capacity for commercial use of the LTV. How conservative is the 250-kg estimate covering these payloads and crew support items? How much of this is allocated to the permanently mounted payloads?	Please see the DRFP for technical requirements, including those for NASA's required payload allocation for the LTV.
48	Can you provide additional details related to the how procurement will be structured (e.g, the 3-phased	Please see the Draft RFP for terms and conditions and instructions to offerors relative to pricing.

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	approach, etc)? Relating to the CLIN approach - do you expect the vendors to bid on all three CLINS (all at once)? Defining the system, how vendors will do business, makes sense; that has to be done before costing the end-to-end services. Industry must understand the LTV design before engaging with lander providers to provide pricing. The NTE for entire mission service package will be difficult to estimate.	
49	Cost of Delivery (COD) - Is it required for all vendors to come up with everything up front?	Please see the Draft RFP for terms and conditions and instructions to offerors relative to pricing.
50	For the initial task order - Do you think 12-month out of the gate? Does that include HITL and test demonstration? Will NASA request a mock-up?	Please see the Draft RFP for requirements for the Initial Task Order.
51	For Sub CLIN 2C - Can you clarify scope, exactly what that means?	Please see the Draft RFP for the description of the scope for SubCLIN 2C.
52	Sub CLIN 1C scope - Is that focused on NASA desired capabilities that don't exist in the initial task order? Or can we provide unique capabilities and see if NASA is interested?	Please see the Draft RFP for the description of the scope for SubCLIN 1C.
53	On chart 51 (matrix for crewed expeditions/science), there is a row stating that NASA must approve all non-NASA activities during crewed activities. Can you provide some additional clarification about that?	Please see the Draft RFP for activities requiring NASA approval.
54	Do you anticipate providing a reference Design Reference Mission (DRM) as part of the draft RFP to make sure we can meet those requirements?	Please see the Concept of Operations (ConOps) included within the DRFP.
55	There is a very small graphic where it shows commercialization plan with curves and mountains (capital infusion, etc.). Does this meant to imply that NASA providing investment capital? [Is that NASA providing capital or is that intended for vendors to get capital?]	NASA intends to provide performance-based payments in accordance with FAR 32.10 upon successful completion of milestones defined at the task order level throughout each of the "Refine," "Enable," and "Utilize" phases. The level of corporate investment and/or commercialization that will inform the pricing proposed will be the decision of the offerors in preparing their competitive proposals.

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56	How are the task orders funded? Is this a lump guarantee at the end, or milestone payments? [Payment milestone approach? Lump after services? At least 10 percent of the contract value?]	NASA intends to provide performance-based payments in accordance with FAR 32.10 upon successful completion of milestones defined at the task order level throughout each of the "Refine," "Enable," and "Utilize" phases. Please see the Draft RFP for terms and conditions relative to milestone payments.
57	Is NASA planning for a shared approach to risk management?	The Draft RFP includes terms and conditions relative to the liabilities of the Government and Contractors.
58	How will a loss of vehicle be covered? Should the provider provide insurance or will NASA cover? If our company provided insurance, we would have to work that into price. Would NASA consider bearing some of that risk so that the price would be lower? Could that be worked out as part of the reasonability part versus part of the draft RFP? Is there any flexibility with this?	The DRFP contains a number of liability, insurance, waiver, and indemnification clauses that are still being aligned for consistency. NASA's intent is to include a deviated cross waiver in the final RFP which does not allow the contractor(s) or the US government to pursue claims of liability against one another. In addition, NASA's intent is to have a requirement that third-party users indemnify the US government for non- NASA activities through mandated flow down provisions. NASA continues to refine this DRFP and is considering the clauses in Attachment A to the DRFP Cover Letter. NASA invites industry to comment on these clauses and provide input as NASA finalizes the RFP.
59	In the requirements, 800 kg is standard mission and 1600 kg for reduced performance; 20 km, 20 deg slope, 30 cm clearance; does LTV still have to meet those requirements? What does "reduced performance" mean? Do you expect to define that?	Please see the DRFP for technical requirements for the LTV.
60	Jointly agreeing on requirements during the "refine the service" phase would be helpful. Would this be something you might consider?	The Draft RFP includes requirements for the Initial Task Order ("Refine the Service" phase). The Government may consider revising or updating its requirements based on the outcomes or information provided as a result of the "Refine the Service" phase.
61	Vendor would like to use data NASA already has, incorporate the data into their system which has	Please see the DRFP for the Government's technical requirements for this procurement.

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	compatible software, and perform own trade studies on locations.	
62	We're designing for the Lunar South Pole. Does NASA envision anywhere else on the moon?	The Government's current requirements are based on the Lunar South Pole environment. Please see the Draft RFP for the Government's technical requirements for this procurement.
63	With a pool of potential providers after the feasibility stage, are you expecting a down-select based on the results of the down-select? How will the different TOs work, be selected?	<p>NASA intends to award multiple IDIQ contracts to create a pool of pre-qualified contractors capable of providing end-to-end LTV Services when issued competitive firm-fixed-price (FFP) task orders. NASA also intends to have the capability to on-ramp additional vendors throughout the period of performance of the contract. While NASA anticipates awarding IDIQ contracts along with initial LTV Services Feasibility task orders ("Refine the Service") to multiple contractors, NASA anticipates the task order for the LTV Demonstration phase ("Enable the Service") may only be issued to one vendor based on budgetary restrictions. However, the ultimate number of offerors to be awarded an IDIQ contract, issued a LTV Demonstration task order, and/or to be on-ramped during contract performance will be dependent on the quality and price of proposals received as well as NASA's available budget.</p> <p>The evaluation criteria for the initial Master IDIQ Contract Awards is defined in the Draft RFP. Evaluation criteria for any subsequent competitions for task order awards would be defined in the applicable Request for Task Order Proposal (RFTOP).</p>
64	Can you clarify the minimum requirements for years of operations? 12-month period of performance; once there's a vehicle on the surface, but they'll be expected to propose to new task orders every year?	Please see the Draft RFP for terms and conditions relative to the period of performance for the Initial Task Order, as well as the ordering period ordering clauses for the Master IDIQ Contracts.

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65	In what form would you like our feedback for risk management? Can we meet in-person?	Industry is invited to provide written feedback to the CO relative to the Draft RFP.
66	What was the process that drove the inclusion of a manipulator arm on the vehicle? What was the origin?	NASA's inclusion of the requirement for a manipulator arm considered Government requirements as well as the desire to increase usability of the vehicle when crew is not present, which would be expected to increase commercialization.
67	How do you see Lunar construction as playing into the role of the LTV? We talked about use cases including science and logistics; what about Lunar construction/site preparation fitting in the mission of the LTV?	The Draft RFP defines the Government's requirements against which offerors are anticipated to propose. Companies are not precluded from proposing augmented capabilities for the Government's consideration, subject to the instructions and evaluation criteria to be included in the RFP.
68	Will the CLIN structure and timeline be spelled out in more detail in the draft RFP? Clarity on timing of task order release? Is there a gap between Refine and Enable?	NASA currently anticipates issuing the RFTOP for SubCLIN 1A as soon as possible after the conclusion of all SubCLIN 2A task order work. Please see the Draft RFP for details regarding the CLIN structure for the LTVS contract.
69	What is expected to be priced for the initial submission, in the RFP response? For the utilize task, will there be multiple reference missions to price or just one example?	Please see the Draft RFP for terms and conditions and instructions to offerors relative to pricing.
70	We understand you can not comment on budget, but is this program dependent on a Congressional budget being passed?	No, the team's ability to progress is not anticipated to be impacted by the Continuing Resolution.
71	What are your thoughts on pursuing a Broad Agency Announcement (BAA) for this procurement?	The Government does not intend to pursue a BAA for this procurement. NASA intends to acquire the LTV as a service utilizing FAR Part 15 procedures.
72	Is there any considerations being given to having a mission ops with two vehicles or adjusting the crew safety range beyond 2 km radius?	The Draft RFP and Final RFP are anticipated to be structured in a way to provide offerors with the flexibility in proposing their approach to meeting NASA's requirements for LTV Services, including NASA's requirements to support both NASA crewed extravehicular activity (EVA) expeditions and NASA uncrewed science/exploration expeditions within the Standard Mission Service Task Orders. NASA's requirements are intended to be written at a

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		<p>level that enables flexibility in design and supports specific capabilities during different mission phases. As such, it will be up to the offerors to propose whether a single LTV will be utilized to meet the requirements for both crewed and uncrewed expeditions or if separate LTVs will be proposed.</p> <p>The 2 km radius is only applicable when LTV is not part of the mission. Please see the Draft RFP for technical requirements for the LTV.</p>
73	Are you considering adding additional consumables to LTV requirements? HLS has a ConOps for extra consumables on the rover. It might be good to have an attach point for crew, a PLSS or something else.	The current intent is that LTV will not have any EVA consumables related requirements. Please see the DRFP for technical requirements for the LTV.
74	When astronauts are on the vehicle, is it considered human rated?	Yes, the LTV will be considered human rated when crew are present and the human rating will be at the program level, rated across Artemis.
75	Training clarification - Would primes be responsible for training, or will NASA lead this training?	The Prime will lead training crew how to drive the LTV; other mission training that involves LTV will be led by NASA with LTV Prime support (with NASA involved in the joint/integrated training).
76	Are there any type of construction requirements for the LTV at this point, or is that still in trade space?	While there could be a potential future need for the LTV to support construction, NASA does not currently have enough information to provide requirements, and that capability would be expected to impose many more constraints and requirements on the vehicle. NASA has defined the minimum requirements that NASA needs the LTV to perform within the DRFP. The DRFP and Final RFP are anticipated to be structured in a way to provide offerors with the flexibility in proposing their approach to meeting NASA's requirements for LTV Services. As such, it will be the decision of the offerors regarding whether or not they choose to propose augmented capabilities in their design.

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77	Is the time allotted for maintenance anticipated to include a lot of dust cleanup or is this more to remove and replace a broken part?	The times referenced in the DRFP for maintenance are for the actual activity and not counting set-up or clean-up in that one- or four-hour block. Dust removal would be considered part of the maintenance task; that time is considered for any maintenance with crew. That maintenance time limit applies to crew time only; if additional maintenance is needed and performable robotically, that doesn't count towards the maintenance time limit. It is unclear how much dust will accumulate when crew isn't present; the most dust accumulated during Apollo was when the fender broke while crew drove quickly; when uncrewed, the vehicle would be anticipated to move slower and may be less likely to kick up dust. Please reference the DRFP for requirements relative to LTV maintenance.
78	Early on, the transportation method, a CLPS method was suggested, but then it opened up to a human lander. Is there a preferred method? Lander: Trade space open for what lander can be used?	NASA's current strategy is to award multiple IDIQ contracts to create a pool of pre-qualified contractors capable of providing end-to-end LTV Services when issued competitive FFP task orders. The "End-to-end LTV Services" to be procured under the IDIQ contracts are intended to include the LTV system (i.e., lunar surface transportation system) as well as the delivery system (i.e., launch/transit vehicle plus lunar landing system) services. The approach to fulfilling requirements for lunar surface transportation, including potential use of other companies or providers will be the decision of the offerors.
79	For clarification, duration of contract - 15 years period of performance, correct?	Yes, the LTVS Contract is anticipated to include a 13-year ordering period with an additional two years allotted to complete any task orders issued within the the 13-year ordering period. This results in a total potential period of performance of 15 years.
80	Is there a mockup at the end of the task order? Do you need the suit interfacing with mockup? What milestones will be in the first TO? Would it be to PDR level?	Please see the Draft RFP for requirements for the Initial Task Order. Regarding xEVAS suit interfacing, NASA intends to draft an EVA to LTV Interface Requirements

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		Document (IRD), but it is not yet complete. The details on the interfaces are still under development in the xEVAS contracts. At the start of the LTVS contract, NASA anticipates that the xEVAS and LTV vendors will work together under the required Associate Contractor Agreement (ACA) to develop interface details. For LTVS work, NASA anticipates flexibility for suit constraints because the xEVAS suits will be required to interface with multiple systems across NASA Programs.
81	Will you be considering multiple awards for the different task orders?	NASA intends to award multiple IDIQ contracts to create a pool of pre-qualified contractors capable of providing end-to-end LTV Services when issued competitive firm-fixed-price (FFP) task orders. NASA also intends to have the capability to on-ramp additional vendors throughout the period of performance of the contract. While NASA anticipates awarding IDIQ contracts along with initial LTV Services Feasibility task orders (“Refine the Service”) to multiple contractors, NASA anticipates the task order for the LTV Demonstration phase (“Enable the Service”) may only be issued to one vendor based on budgetary restrictions. However, the ultimate number of offerors to be awarded an IDIQ contract, issued a LTV Demonstration task order, and/or to be on-ramped during contract performance will be dependent on the quality and price of proposals received as well as NASA's available budget.
82	Do you anticipate that there might be vehicles assigned for particular missions with different purposes?	NASA intends to award multiple IDIQ contracts to create a pool of pre-qualified contractors capable of providing end-to-end LTV Services when issued competitive firm-fixed-price (FFP) task orders. NASA also intends to have the capability to on-ramp additional vendors throughout the period of performance of the contract. While NASA anticipates awarding IDIQ contracts along with initial LTV Services Feasibility task orders (“Refine the Service”) to

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		multiple contractors, NASA anticipates the task order for the LTV Demonstration phase (“Enable the Service”) may only be issued to one vendor based on budgetary restrictions. However, the ultimate number of offerors to be awarded an IDIQ contract, issued a LTV Demonstration task order, and/or to be on-ramped during contract performance will be dependent on the quality and price of proposals received as well as NASA's available budget.
83	Are you anticipating one task order per year once it gets rolling? How long do TOs last?	The number of task orders to be issued during the utilization phase has not yet been determined and will depend on NASA’s mission needs during the utilization phase.
84	Is the intent to have a blackout after each task order? If a vendor is on multiple teams with blackout periods, how would that scenario be handled? Would suit vendors be subject to the same blackout notice as NASA?	Yes, NASA and Industry would need to abide by required blackout procedures as addressed in the associated blackout notice.
85	Regarding the evaluation of Task Order 1 or 2 - Is this similar to EVAS with total accumulated price?	Please see the DRFP for instructions and evaluation criteria.
86	It was suggested that the robotic arm be "removed." What was the driver behind that?	The robotic arm is anticipated to be stowed when crew is present, but removeable if it poses risk to crew or vehicle safety or requires an update or replacement. Please see the DRFP for requirements related to the robotic arm for the LTV.
87	Are there any other removable/replaceable activities that a crew member might need?	It is NASA's expectation that any activities involving crew interaction will meet the compatible requirements governing crew interfaces. Please see the DRFP, including the LTV System Requirements Document, for requirements for the LTV.
88	Can industry get access to the lighting video to share with our own team members?	Please see the LTVS Contract website (https://www.nasa.gov/jsc/procurement/ltv) for a link to the charts presented at Industry Day. Additional lunar lighting information is available from the Scientific Visualization Studio at the following website: https://svs.gsfc.nasa.gov/ .

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89	Regarding the tools - Is the plan to have a dedicated tool chest on the vehicle as a standard set?	Please see the DRFP for requirements relative to Extravehicular Activity (EVA) Tools.
90	If NASA plans to have the LTV on the ground no later than Aug 2028, when does the rover need to be delivered to NASA?	As the LTVS contract is structured to be a service contract, the LTV will not be delivered to NASA. The LTVS Contract is intended to require end-to-end LTV Services, which would include the LTV system (i.e., lunar surface transportation system) as well as the delivery system (i.e., launch/transit vehicle plus lunar landing system) services. Please see the DRFP for requirements relative to the LTVS IDIQ contract and the Initial Task Order. Specific schedule requirements for the Demonstration task order(s) to be issued after IDIQ contract award are intended to be identified within the applicable RFTOP.
91	There is a selection for vehicle to be single fault tolerant. Can you explain one level fault (single fault tolerance) for vehicle safety for the crew?	Please see the DRFP for requirements relative to fault tolerance.
92	As an early design driver consideration, could you provide some details related to the amount of direct crew steering control that is desired? Nuances to crew control, full control or commanding? Provide some thinking for how much crew control is required, desired, vs not? This drives design.	Please see the DRFP for NASA requirements related to crew interfaces.
93	Will the LTV be considered a human rated vehicle?	Yes, the LTV will be considered human rated when crew are present and the human rating will be at the program level, rated across Artemis.
94	Would human rating involve a tailoring process? Has 003 been baselined yet?	Please see the DRFP for NASA requirements related to capability with crew.
95	What was the thought process behind publishing all of the one-on-one meeting questions?	The questions and answers from Industry Day, including the questions and answers from the one-on-one sessions, are being posted publicly to ensure all interested parties are provided access to the same information relative to the LTVS procurement.

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96	It's clear that stranding an astronaut away from the habitat cannot happen. Are there any other things from a safety or mission success standpoint that are a severe concern?	Other areas of concern include loss of communications, navigation accuracy, and design robustness to support mission duration. Please see the DRFP for technical and safety requirements.
97	Regarding additional capabilities, is it better to have a higher payload capacity or would that be considered unnecessary?	The Draft RFP defines the Government's requirements against which offerors are anticipated to propose. Companies are not precluded from proposing augmented capabilities for the Government's consideration, subject to the instructions and evaluation criteria to be included in the RFP. Please see the DRFP for requirements relative to the LTVS Contractor(s) ability to utilize excess capacity for commercial purposes as well as the requirements for applicable safety reviews and approval relative to LTV payloads and activities to be performed while crew is present.
98	Are there further requirements for restraining an incapacitated crew member? (e.g, positioning of crew member, horizontal/seated/orientation, precautions)	Please see the DRFP for technical requirements for the LTV.
99	Regarding the 15 km speed min/max, does that apply to permanently shadowed regions (PSRs)? Will there be expected performance changes based on PSRs? Top speed will depend on battery performance, so the top speed might decrease.	Please see the DRFP for LTV speed requirements. 15 kilometers per hour is the anticipated requirement for the top speed the crew can drive the vehicle on a level and smooth surface, with the LTV being able to be throttled to lower speeds.
100	About the usage of excess capability and how it could be used, what margin are we looking for on capabilities?	The Draft RFP defines the Government's requirements against which offerors are anticipated to propose. Companies are not precluded from proposing augmented capabilities for the Government's consideration, subject to the instructions and evaluation criteria to be included in the RFP. Please see the DRFP for requirements relative to the LTVS Contractor(s) ability to utilize excess capacity for commercial purposes as well as the requirements for applicable safety reviews and approval relative to LTV

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		payloads and activities to be performed while crew is present.
101	Regarding redundancy, can fault tolerance be achieved if the vehicle breaks in some way? Is there a valid form of fault tolerance (e.g., could a fault tolerance be 3 motors instead of two)?	The Government anticipates there are multiple valid ways to achieve the fault tolerance and reliability requirements. Please see the DRFP for requirements relative to fault tolerance.
102	Regarding the use of end effectors, can you give examples of what these should be doing? Can you give some examples of possible ones we might see?	Please see the DRFP, including the LTV Payload IRD and ESDMD-412, for requirements relative to end effectors.
103	Regarding the volume of payloads, mass was mentioned. Is there any volume specification for these payloads? Can you provide the volume?	Please see the DRFP, including the LTV Payload IRD, for requirements relative to volume specifications.
104	Regarding In-Situ Resource Utilization (ISRU), are there definite dates of delivery to the moon?	The ISRU plan is still in the concept stage and NASA does not have any further information to share relative to ISRU at this point in time.
105	Historically, what have you seen is the best approach for small businesses trying to secure a contract? Sub with larger companies?	Industry is welcome to reach out to the NASA Office of Small Business Programs to seek resources relative to small business contracting opportunities. A copy of the Industry Day presentation can be found on the LTVS Contract website at https://www.nasa.gov/jsc/procurement/ltv , which includes contact information for the NASA Office of Small Business Programs. Additionally, industry may refer to the posted list of companies that attended the LTVS Industry Day and applicable interested parties list(s) to communicate with other interested parties relative to teaming and subcontracting arrangements.
106	What are the target temperature ranges for the vehicle?	NASA has defined the minimum requirements that NASA needs the LTV to perform within the DRFP. The DRFP and Final RFP are anticipated to be structured in a way to provide offerors with the flexibility in proposing their approach to meeting NASA's requirements for LTV Services. Please see the DRFP for environment requirements.

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107	What are the qualification distances? If target was 1300 km; what are the qualification distances, 2x, 3x?	Please see the DRFP for NASA's standards and requirements relative to qualification distances.
108	How will NASA establish compliance for materials that are currently less well-defined?	Please see the DRFP for information relative to required standards for materials and associated safety requirements.
109	Do you have a specification for how to test materials to ensure it meets your standards? Can you provide standards about what you'd expect for materials specification, how to test non-standard to meet requirements? If the company does testing in the company's facility, it's easy to get down to 80 K, is that acceptable, or do company's need to test down to 40-50 K?	Please see the DRFP for information relative to required standards for materials and associated test requirements.
110	What is your thinking behind how you arrived at the decision to include a landing service in the LTV prime contract, and is this a firm decision?	<p>NASA's current strategy is to award multiple IDIQ contracts to create a pool of pre-qualified contractors capable of providing end-to-end LTV Services when issued competitive FFP task orders. The "End-to-end LTV Services" to be procured under the IDIQ contracts are intended to include the LTV system (i.e., lunar surface transportation system) as well as the delivery system (i.e., launch/transit vehicle plus lunar landing system) services.</p> <p>NASA's decision to include delivery as part of the "End-to-End LTV Services" is intended to provide the offerors the greatest amount of flexibility when architecting the LTV system.</p> <p>Please see the DRFP for requirements relative to the end-to-end services required for the LTVS Contract.</p>
111	How are you thinking about the risk associated with the LTV rover? For example, the ConOps states the rover would arrive on a human rated lander vs. one that is not human rated.	Please see the DRFP for draft proposal evaluation criteria.
112	Do you anticipate having certain requirements related to risk?	Please see the Draft RFP for technical and safety requirements.

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113	What are your thoughts about "first right of refusal?"	Please see the DRFP for terms and conditions and technical requirements regarding excess capacity and prioritization of NASA mission time.
114	Notional approval authority was a great framework to start thinking about the issue; need to understand when NASA needs full control and rapidly respond to customer needs without needing NASA approval every step of the way or threaten asset to achieve upcoming mission.	Please see the Draft RFP, including the Performance Work Statement (PWS) for details on mission authority.
115	Will contractors have to get certain use cases approved ahead of time?	Please see the Rules of Operation Data Requirements Description (DRD) and DRFP terms and conditions regarding non-NASA use.
116	Can the purpose of NASA's new Technology and Development Group be published? Where will Government Task Agreements (GTAs) will be worked?	Please see the DRFP and Industry Day presentation regarding the use of GTAs.
117	Is there a catalog for what technologies NASA is developing that can be shared with industry?	There is no one catalog as NASA is pursuing technology in many areas spread across all Mission Directorates. The Space Technology Mission Directorate (STMD) has developed a strategic framework identifying the Envisioned Future of key technologies needed for Moon and Mars and has released that framework publicly at the following link: https://techport.nasa.gov/framework . The EVA and Human Surface Mobility Program (EHP) is developing Roadmaps focused on relevant technology for Lunar Surface that will compliment the Envisioned Futures, and these are planned for release in Spring 2023.
118	Would you encourage NASA inline involvement/testing for LTV?	Please see the DRFP, including the PWS and terms and conditions regarding NASA insight and approval and joint testing.
119	Has there been any thought about how you might share LTV infrastructure and resources with other users when NASA doesn't need these? Or should contractors go find support services? How will communication be	This concept remains a work in-progress. The Government does not have additional information to share at this time.

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	shared with the lunar economy when NASA is not using it for the dedicated Artemis items? Any thought into how NASA might share communication infrastructure during time when NASA doesn't need day-to-day access? Shared resources could help lunar economy? Or does industry have to find own resources?	
120	Looking forward, if you have a wish list, what would you like to see as stretch goals? What are next 5-10 years goals?	It is anticipated that Industry will base its stretch goals on LTV commercial market needs. NASA has defined the minimum requirements that NASA needs the LTV to perform within the DRFP. The DRFP and Final RFP are anticipated to be structured in a way to provide offerors with the flexibility in proposing their approach to meeting NASA's requirements for LTV Services. As such, it will be the decision of the offerors regarding whether or not they choose to propose augmented capabilities in their design.
121	What are some things that the team (and program) are looking forward to and are excited about?	NASA is looking forward to a robust lunar infrastructure in which NASA will be one of many customers.
122	When do you think we'll be able to collaborate with other vendors? When will LTV vendor be able to work directly with xEVAS vendors?	The DRFP addresses interaction with other contractors, including Associate Contractor Agreements (ACAs) and Interface Control Document (ICD) development. At the start of the LTVS contract, NASA anticipates that other Artemis contractors, including the xEVAS vendors, and LTV vendors will work together under the required ACA to develop interface details.
123	When will the down-select be made for the suit on the lunar surface?	It is anticipated that the LTV to EVA interface should be robust and flexible to accommodate a range of possible suit configurations. Please see the DRFP for interface requirements.
124	When will the Payload IRD be published?	Please see the DRFP for interface requirements.
125	Inventing a new solution for restraints might not be the right choice.	Please see the DRFP for interface requirements.

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126	For the science portions, will science help coordinate with other centers for science experiments? Will NASA consolidate all of the NASA payloads?	Yes, NASA will provide all NASA requirements as a single customer. Payload integration would be service-provided.
127	What part of the services approach does NASA really value? What are the high value areas for us to understand?	Please see the DRFP which addresses Key Service Capabilities assessment as well as proposal evaluation criteria.
128	Do you see there being as many requirements as Orion? How many requirements should industry expect to see?	Please see the DRFP for all technical requirements related to this procurement.
129	Are there specific challenges that industry can help to crystallize so we can think about those? Requests from NASA for how industry can help the work for the draft RFP?	NASA welcomes feedback on proposed solutions for streamlining processes.
130	<p>Recommendation: NASA minimize aggregation of NASA Un-crewed missions. Specifically, NASA should procure distinct surface mobility services via its IDIQ TO approach. Examples include distinct services such as payload deployment/recovery/survival, mission scouting, surface clearing, and complex dedicated science missions.</p> <p>Rationale: As currently proposed by NASA at Industry Day, Standard Mission Service TO's are bid by industry in large blocks without any insight into the type and complexity of the mission objectives. Procuring services individually can drastically lower the price to NASA versus large, time-driven blocks. Lower prices are realized by paying only for time that is needed. Opening unneeded blocks of time allows industry to use these blocks for other customers, supporting the goal of NASA as one of many customers. In addition, mission objectives can vary drastically, requiring different capabilities, sophistication, and mission planning</p>	NASA acknowledges this feedback.

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	<p>times. Procuring services individually allows NASA to pick the best service at the lowest price for the anticipated tasks while incentivizing industry innovation to offer diverse and unique mobility offerings tailored to address comprehensive needs.</p>	
131	<p>Recommendation: NASA should allow offerors to propose Phase 1 durations that best support industry business cases.</p> <p>Rationale: This approach increases value to both NASA and industry by allowing alignment of offerors' in-work formulation, design, and/or development activities with the needs of NASA. This allows NASA to take advantage of cost and schedule efficiencies, and ultimately decrease industry's price to NASA.</p>	<p>Please see the DRFP which includes the required duration for the SubCLIN 2A Initial Task Order.</p>
132	<p>Recommendation: NASA should not require approval of non-NASA missions.</p> <p>Rationale: Industry flexibility to adjudicate missions planning will enable lower prices and agility for NASA service needs. Vendors understand the criticality of protecting the LTV's ability to safely meet NASA mission requirements. Vendors support NASA insight on non-NASA missions. Safe operation of the LTV is in industry's best interest to protect the asset for future obligations and continued revenue generation. [Ref Industry Day Chart 51, entitled, "Standard Mission Services TOs- Notional Mission Authority Definitions"]</p>	<p>NASA understands needing flexibility to accommodate non-NASA uses. Please see the DRFP which includes scope and terms and conditions for non-NASA use.</p>
133	<p>Recommendation: Vendor supports an industry-attended TIM on Risk and Liability.</p>	<p>Please see the DRFP cover letter which specifically invites industry feedback on documented liability/insurance approach.</p>

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	Rationale: As discussed during one-on-one industry day, industry-NASA coordination will be required to meet NASA and Industry goals and objectives.	
134	<p>Recommendation: NASA should eliminate as many government procurement-specific requirements as possible, including certified cost and pricing data, cost accounting standards (CAS), and other traditional FAR requirements that deviate from standard commercial contracting practices. A Space Act Agreement (an “Other Transaction”) is preferred over FAR Part 15 requirements.</p> <p>Rationale: This approach will incentivize commercial development and minimize cost while ensuring the capabilities required for LTV are achieved.</p>	Please see the DRFP which includes terms and conditions related to these items and is available for industry feedback.
135	Statement: Vendor appreciates NASA leveraging past work adjudicating standards where appropriate and NASA's outreach to past programs to explore how to improve the process. Vendor is reviewing its experiences in the NASA standards adjudication process to inform a recommendation that vendor can include with its response to the eventual draft RFP.	Please see the DRFP which includes scope for standards adjudication.
136	Slide #7 - Is it expected that there is any level of commonality between the LTV and the Mars terrain vehicle? Will the LTV be expected to do anything to prepare for Mars mission? If so then what are those tasks?	No specific requirements have been identified at this time relative to preparation for a Mars mission. NASA’s expectation is that knowledge gained in the development of the LTV will feed into the development of the Mars vehicle.
137	Regarding delivery of LTV, if the vendor were to propose delivery of LTV and want to carry additional payload, what requirements would be placed on Vendors for co-manifested payloads from other customers?	Please see the DRFP which includes terms and conditions for non-NASA activities.

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138	Will the pressurized rover and LTV be expected to work together? If so, how?	No specific requirements have been identified at this time regarding the interaction between the pressurized rover and LTV.
139	Slide #18 - Are there any more details that can be provided for the use case for LTV to gather additional data during EVA operations?	Please see the DRFP which includes requirements on data rights and non-NASA activities.
140	Slides #18 and #20 (logistics carriers) will this be by other assets or is this solely an LTV responsibility?	Please see the DRFP which includes a payloads IRD.
141	Slide #18 - What type of positive escalation and mobility assets are expected?	Cooperative exploration between LTV and a pressurized rover is not yet defined.
142	Slides #22 and #25 - Is the LTV responsible for providing remote operation stations from other assets, e.g. GW, PR, HLS, etc.?	NASA requirements include operations by the onboard crew or remote operators located on the lunar surface, in cis-lunar space, and on Earth. The requirement is for the vehicle to be controllable from these locations. No requirement to provide operations stations currently exists.
143	Slide #25 - What is driving the capability to have the manipulator removable by the crew?	The intent of the requirement is to enable safe securing of the arm in case of a malfunction while in the deployed configuration. Please see the DRFP for technical requirements for the LTV.
144	Slide #50 - What are your thoughts on conditions for owning and operating the LTV? What if the rover breaks down and needs astronauts to repair it, would NASA continue paying or would payments stop until rover is repaired?	Please see the DRFP which includes terms and conditions such as those defining mission success determination and performance-based milestone payments.
145	Slide #24 - During vendor EVA time, what happens if a procedure happens to take longer than the allotted time for any reason? How would this be charged? [What happens if it takes longer than the 1hr. or 4hrs. planned time for maintenance?]	Please see the DRFP which includes requirements for planned and unplanned tasks.
146	In the scenario that an astronaut crew launch is delayed and the LTV needs preventative maintenance, how would that be handled?	Please see the DRFP which includes requirements for maintenance.

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147	If the LTV was delivered on the lander and a vendor wanted to sell extra space to other customers, what requirements would NASA impose on the additional customer?	Please see the DRFP which includes terms and conditions for non-NASA use.
148	What rules would the vendor need to follow if the rovers are provided to other customers?	Please see the DRFP which includes a Rules of Operation DRD as well as terms and conditions for non-NASA use.
149	From a congressional standpoint, do you expect to bucket list all those line items?	No – NASA does not expect to bucket list the line items.
150	You have stated that there will be a robotic manipulator on LTV. Where do you stand with excavation systems? Would this be a payload or part of the capability of the LTV?	Please see the DRFP which includes all required capabilities for the LTV.
151	Does NASA intend to select one provider or a portfolio of providers? If a portfolio, how many does NASA anticipate being able to award?	NASA intends to award multiple IDIQ contracts to create a pool of pre-qualified contractors capable of providing end-to-end LTV Services when issued competitive firm-fixed-price (FFP) task orders. NASA also intends to have the capability to on-ramp additional vendors throughout the period of performance of the contract. While NASA anticipates awarding IDIQ contracts along with initial LTV Services Feasibility task orders (“Refine the Service”) to multiple contractors, NASA anticipates the task order for the LTV Demonstration phase (“Enable the Service”) may only be issued to one vendor based on budgetary restrictions. However, the ultimate number of offerors to be awarded an IDIQ contract, issued a LTV Demonstration task order, and/or to be on-ramped during contract performance will be dependent on the quality and price of proposals received as well as NASA's available budget.
152	Will NASA make available a list of attendees at the Industry Day event held on 8/31/22?	Yes, the list of attendees from the LTVS Industry Day held on 8/31/2022 has been posted to the LTVS procurement website at https://www.nasa.gov/jsc/procurement/ltv .
153	Does NASA have performance criteria for the LTV following a single fault? Is the expectation that the	Please see the DRFP which includes safety requirements.

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	vehicle will meet the same general performance criteria (speed, power, terrain, etc.) that is specified for the vehicle?	
154	What is the LTV program's expectation for verification and validation activities. Are they looking to have industry manage all of that, or would there be a certain level of guidance or oversight from NASA?	Please see the DRFP which includes Verification, Validation, and Certification Plan DRD.
155	Will NASA provide written responses to questions industry asked verbally, either during tours or 1:1 sessions? Or is NASA's expectation that any question industry would like answered be submitted through this tool, or via email to the CO?	NASA will provide written responses to questions received both verbally during Industry Day events and received in writing.
156	If a company has an existing Reimbursable Space Act Agreement (RSAA) with NASA for technology that could be applied to the LTV, and that company is bidding for LTV, how do they handle blackout period.	NASA and Industry would need to abide by required blackout procedures as addressed in the associated blackout notice.
157	How / Where can folks get Lunar Soil Simulant?	It will be the responsibility of the LTVS Contractors to identify sources for any supplies needed to fulfill contractual requirements of the LTVS Contract.