## Guidelines

The timeline for this challenge is extremely ambitious. But the payoff is considerable - ultimate success in this endeavor could mean that your payload is deployed on the lunar surface!

In order for NASA to meet timelines associated with the Artemis program, it must receive your working prototypes by January 28, 2022. NASA wants you to be successful and will be very participatory in this challenge. NASA has already each team with the internal feedback garnered by their submissions to the preceding ideation challenge so that teams can see where weaknesses have been identified and react accordingly. Additionally, there will be an opportunity during the Phase 1 open submission period to have NASA review your preliminary project plan so that you can strengthen your submission and address any missing elements.

To be successful in this prototype competition, your team will have to provide:

* A highly credible payload project plan that meets NASA’s technical specifications and describes the operation scenario by January 4, 2021
* 3 or more identical, working prototypes at a technology readiness level (TRL) of 5 or greater by January 28, 2022

An updated version of the Small Lunar Payload User’s Guide is available under the Resources tab. You are strongly encouraged to familiarize yourself with this expanded set of specifications. Note: the payload user’s guide may undergo minor revisions, due to the dynamic nature of the CLPS and Artemis programs.

## Phase 1

The 14 winning teams of the Honey, I Shrunk the NASA Payload challenge are all eligible to participate. No new teams will be accepted into this challenge.  **However, the 14 teams are allowed to recruit new team members** to round out their teams with additional competencies and expertise, as needed. If you are interested in joining a team, please visit the [Teams tab](https://www.herox.com/NASApayload) to review the needs of teams accepting new members. All team members must abide by the eligibility rules, in particular those regarding country of origin (see Rules section for more details).

The deadline to submit complete and final payload project plans is January 4, 2021. NASA wants you to make it tough for them to select Phase 1 winners! So be sure to take advantage of all the tools and resources available. Specifically,

* Review the feedback to your winning ideation submission.
* Be ready to submit a preliminary project plan by November 10, 2020.
* Use the Team Matching function to help augment your team.
* Be sure to include all the required elements of the submission.

One of the most important things for success in this phase is the development and submission of a comprehensive and realistic timeline to support your activities in the prototyping phase. NASA’s extensive experience in this area has shown them that a highly credible timeline is a key indicator of success in ambitious projects like this one.

If you are an international participant, be sure to allow sufficient time in your timeline for your prototypes to clear customs and arrive at NASA. You are strongly encouraged to start immediate research and planning to ensure that you have all necessary paperwork in place to support your prototype delivery satisfying both US and your country’s import/export rules and regulations. A good place to start is to check with your own country’s state department.

NASA will review the preliminary project plan from any team that has been submitted by November 10, 2020. High-level feedback will be provided by November 20 to each team. This feedback is intended to help teams create the best, most complete version of their project plans possible by helping teams to consider all important factors, highlight any missing elements, and/or more fully address key concerns.

Your preliminary submission should include:

* The Preliminary submission form
* A completed Quad Chart (see template in Resources tab)

Your complete and final submission to Phase 1 should include:

* The Phase 1 submission form
* A completed Quad Chart
* A completed Payloads Specifications and Capabilities form (see form in Resources tab)

NASA will select up to four teams to advance to Phase 2. The evaluation criteria are listed below. Advancing teams will win award money to support their prototyping efforts. The specific amount of award money won will be determined by the budget listed within each winning project plan, as well as other factors. The maximum amount awarded to any one team will be $225,000.

If NASA determines that none of the submitted payload project plans are highly credible, providing high confidence levels that working prototypes can be successfully delivered by the end of the Phase 2, then the challenge will conclude at the end of Phase 1. In that case, the top three ranked teams will each receive a $20,000 prize.

## Phase 2

Upon being selected as a Phase 1 winner, each winning team will be assigned a NASA project manager. A portion of the award money will be distributed at once, to help development efforts get underway. The remainder of the award money will be distributed upon achievement of two significant milestones, with half of the remaining award money being paid for each milestone achieved. The team and the NASA project manager will determine a set of mutually agreed-upon milestones against which remaining prize payments will be made. It is expected that each team will be in regular contact with its project manager throughout the prototyping period. In addition to development funds, teams will also have up to 40 hours of access to subject matter experts (SMEs). These experts will be drawn from NASA and will vary, depending on the specific expertise required by a team.

NASA is committed to helping Phase 2 teams be as successful as possible. To this end, they are offering valuable support mechanisms that are in addition to 40 hrs SME support. NASA is willing to assist with an initial design review, including a review of the design drawing and the material and equipment list, before teams start payload fabrication. This can be set up through a team’s project manager. Although documentation packages can be submitted for high level feedback (see below), teams should be proactively working with their project managers to identify and address documentation issues on an ongoing basis.

NASA must receive at least 3 identical, working prototypes, accompanied by a full documentation package, an annotated sample data set, and any additional information by January 28, 2022. If a team is able to provide additional prototypes, this is encouraged. The documentation package covers the following topics (see Resources tab for descriptions of each topic):

* Interface Verification
* As-built Bill of Materials and Material certifications
* Material Item Usage List
* Structural Verification Plan
* Payload User Manual
* Special Handling Constraints document
* Design Package (hardware and software)
* End Circuit Data Sheet
* Testing, Verification, and Validation documentation
* Anomalies List

NASA will review the documentation packages from any team that have been submitted by October 29, 2021. High-level feedback will be provided by November 19, 2021 to each team. Good supporting documentation for prototypes is critical. NASA expects to receive near-final versions of documentation packages. There will be an opportunity to revise your documentation based on NASA’s feedback and any modifications made prior to final submission.

NASA plans to test one to two prototypes to failure and to reserve the remaining one(s) for possible deployment. These prototypes should arrive at NASA ready to undergo several weeks of rigorous testing. They should represent the final instrument design and should be ready for deployment. It is expected that prototypes, including all sub-systems, will be at TRL of 5 or higher. At the conclusion of the testing and evaluation period, NASA will select a winner and a runner up, based on prototype performance, scientific impact, and overall mission confidence. The winning team will receive $100,000, and the runner-up team will receive $25,000. Due to time constraints, only a portion of environmental testing will occur prior to the award decisions. **Award decisions will be made primarily on prototype functional test results and analysis showing the design can survive the expected environments, which teams provide in the documentation package.**  Additional testing that occurs after award decisions will help inform whether or not prototypes are assigned to future missions.

## Prize

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This challenge has a total prize purse of $800,000.

The Phase 1 prize purse of $675,000 will be shared among up to 4 Phase 1 winning teams. NASA will determine the specific amounts won by each advancing team based on the proposed project budgets from each winning submission and other factors. The maximum amount awarded to any one team will be $225,000. The payment of winnings will be tied to progress against each team’s project plan.

At the end of Phase 2, after testing and evaluation of the received prototypes, NASA will award the winning team $100,000 and a runner-up team $25,000.

In addition to the prizes discussed above, winners will also receive the following non-monetary incentives:

* An opportunity to talk or collaborate with NASA engineers about prototype integration
* An opportunity for winning technologies to be flight and/or mission-tested
* If payload is integrated and deployed, photo-documentation of the payload on the...
* A virtual event that allows all prize winners to present their ideas and interact with NASA JPL technical staff
* Participation in a ‘Winners Webinar’

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## Timeline

Phase 1 Challenge launches to public

Phase 1 Preliminary project plans due

Phase 1 Project plans due

Phase 1 Submission evaluation period

Phase 1 Winners announced Phase 2 Development period

(team specific milestones met throughout this period)

Phase 2 Initial documentation pkg due

Phase 2 Payloads must arrive at JPL

Phase 2 Evaluation period

Phase 2 Winners announced

October 15, 2020

November 10, 2020

January 4, 2021 (12 weeks)

January 4-25, 2021 (16 days)

January 28, 2021

Jan 28, 2021 - Jan 3, 2022 (49 weeks)

October 29, 2021

January 28, 2022

January 28 - February 18, 2022 (3 weeks)

February 23, 2022

## Judging Criteria

**Phase 1 Judging Criteria**

|  |  |  |
| --- | --- | --- |
| Section | Description | Overall Weight |
| Project plan, timeline, risk and risk mitigation | Quality of project plan, including clear, concise writing and thoughtful and complete responses. Is a realistic timeline provided? Are milestones tied to significant achievements and meaningful progress? Is the development plan credible? Are all necessary resources considered and planned for? Were any NASA feedback provided understood, addressed, and incorporated? Are all required elements/components present? Have import/export issues been addressed, if necessary?  Have all primary risks been identified? Have risk mitigation strategies been provided? | 25 |
| Team | Likelihood that the proposing team has the expertise, experience, resources, and commitment to successfully deliver at least 3 working prototypes to NASA on time. | 15 |
| Cost | Is the budget complete? Are the costs provided realistic and complete? Are the proposed milestones reflective of major accomplishments and progress? Are they appropriately tied to award payments? | 20 |
| Payload impact and capability | The impact of proposed payload if it is successfully prototyped and deployed. Are the stated capabilities realistic? Is successful payload performance in a lunar environment likely? Is the information gathered important and aligned with the objectives of the Artemis program? | 25 |
| Likelihood of operational success | Is the feasibility of the proposed payload to operate in a lunar environment demonstrated? Do submitters provide a reasonable justification/analysis that provides confidence their payload can operate under the expected lunar environments? Is a credible operations scenario provided? | 15 |

**Phase 2 Judging Criteria**

|  |  |  |
| --- | --- | --- |
| Section | Description | Overall Weight |
| Operational Testing | Benchtop demonstration - does it work? | 25 |
| Functional Performance Testing | Does it make the claimed measurements? Are the measurement accuracy, precision, detection limit, and other performance criteria met? | 20 |
| Likelihood of surviving environmental testing | Will it perform in the lunar environment? | 20 |
| Scientific and Technical Impact | The impact of proposed payload if it is successfully deployed. | 25 |
| Quality of supporting documentation package | The documentation package is comprehensive and complete. | 10 |

## Submission Forms

## Preliminary submission form

1. Project Overview (3000 character limit)
   1. Please address what the payload is, what capability it offers, why the capability is important, and how long it will take to develop and deliver at least 3 prototypes.
   2. Also, provide a top level budget that includes a rough order of magnitude estimate.
   3. Then provide a clear and concise overview of the project plan that you will use to deliver at least 3 prototypes to NASA by January 28, 2022.
2. Payload project plan timeline, milestones, and deliverables (6000 character limit)
   1. You will have 49 weeks to build and deliver at least 3 identical, working prototypes to NASA by January 28, 2022. Please provide a detailed and complete timeline to support this objective. Remember, NASA considers a comprehensive and realistic timeline to be a key indicator of success.
   2. Your timeline should show the work flow, identify key milestones and deliverables, and should identify 2 significant milestones against which you propose progress award payments should be made.
3. Quad Chart (file upload)

## Phase 1 submission form

1. Team Information (6000 character limit)
   1. Please introduce yourself and your team. The team captain should be identified and will be the primary point of contact for the team.
   2. Each team member should provide his/her full name and email address, along with several sentences that describe the expertise the team member brings and the role s/he will play in the prototyping phase.
   3. Please include a diagram showing the management structure.
2. Project Overview (3000 character limit)
   1. Please address what the payload is, what capability it offers, why the capability is important, and how long it will take to develop and deliver at least 3 prototypes.
   2. Also, provide a top level budget that includes a rough order of magnitude estimate.
   3. Then provide a clear and concise overview of the project plan that you will use to deliver at least 3 prototypes to NASA by January 28, 2022.
3. Prototype Capability (9000 character limit)
   1. Please fully describe your prototype payload’s capabilities.
   2. Why is this information important and how does it align with the goals of the Artemis program?
   3. What is the rationale for why this payload will operate in a lunar environment? What are the system performance specifications for your payload and why are they realistic?
   4. What precise measurement is being made and to what resolution? What are the detection limits?
   5. What are potential error sources for measurements made?
   6. How is data processing handled?
   7. Please provide a state-of-the-art comparison for your prototype. Why can’t it be used instead of your prototype, and what advantages does your prototype offer? Does your prototype advance the state of the art? If so, how?
4. Payload project plan timeline, milestones, and deliverables (6000 character limit)
   1. You will have 49 weeks to build and deliver at least 3 identical, working prototypes to NASA by January 28, 2022. Please provide a detailed and complete timeline to support this objective. Remember, NASA considers a comprehensive and realistic timeline to be a key indicator of success.
   2. Your timeline should show the work flow, identify key milestones and deliverables, and should identify 2 significant milestones against which you propose progress award payments should be made.
   3. NASA recommends that you collaboratively validate your design with them. Please share your plan to do this (for example, sharing a design drawing in advance of any fabrication work).
5. Resources (3000 character limit)
   1. Please describe the resources needed to develop and deliver at least 3 prototypes. Resources include things like facilities, equipment, testing capabilities, and raw materials or goods.
   2. For each resource mentioned, please explain whether you already have it, have a plan and the means to acquire it, or still need to develop a plan to address the gap.
6. Risk and risk mitigation (3000 character limit)
   1. Please list and fully describe at least three primary risks associated with your payload. These include risks in developing the prototypes, as well as operational risks when the payload is deployed.
   2. For each risk, please provide a risk mitigation strategy.
7. Prototype demonstration and operations (9000 character limit)
   1. Demonstrate the feasibility of your proposed payload to operate in a lunar environment.
   2. NASA will perform the required testing on delivered prototypes, so submitters must provide a reasonable justification/analysis that provides confidence their payload can operate under the expected lunar environments (i.e. documentation showing flight heritage of components, modeling, simulation, analyses, or other justifications).
   3. What is your high-level operations plan and how will your prototype operate when deployed? Important things to consider include:
      1. Data collection time
      2. How much time do you need for “sampling” and at what resolution?
      3. Ideal lunar site (taking into consideration the likely landing site information given in the Users’ Guide)
      4. Mechanical Stability requirements
      5. Thermal requirements
      6. Mechanical requirements
      7. Environmental hazards
      8. What does the payload need to make a measurement? e.g. does it need to be held at a certain distance, does it need access to certain views for calibration, does it need to be shielded from the environment in a specific way?
8. Budget (6000 character limit)
   1. Please provide a complete and realistic budget for delivering at least 3 prototypes to NASA by March 18, 2022. Your budget should align with the timeline provided previously, and the proposed milestone payments should occur in a manner that supports your overall budget.
   2. Be sure to justify the basis of any estimates you provide.
9. Supporting resources (zip file upload)
   1. Please upload a zip file that contains:
      1. Your completed Quad Chart
      2. Any references, charts, graphs, tables, or other supporting material

## Phase 2 Submission

A complete submission to Phase 2 consists of:

* Three or more identical, working prototypes
  + The specific address for prototype shipping will be shared with teams during a regular check-in with their NASA project manager.
  + Prototypes should be packaged carefully and securely to ensure safe delivery.
* Full documentation package
* An annotated sample data set
* Any additional information or documents that may be helpful to NASA.

# Rules

Participation Eligibility:

The Prize is open to anyone age 18 or older participating as an individual or as a team. Individual competitors and teams may originate from any country, as long as United States federal sanctions do not prohibit participation (see: <https://www.treasury.gov/resource-center/sanctions/Programs/Pages/Programs.aspx>).

If you are a NASA employee, a Government contractor, or employed by a Government Contractor, your participation in this challenge may be restricted.

Submissions must originate from either the U.S. or a designated country (see definition of designated country at https://www.acquisition.gov/far/part-25#FAR\_25\_003), OR have been substantially transformed in the US or designated country prior to prototype delivery pursuant to [FAR 25.403(c](https://www.acquisition.gov/far/part-25#FAR_25_403)).

Submissions must be made in English. All challenge-related communication will be in English.

You are required to ensure that all releases or transfers of technical data to non-US persons comply with International Traffic in Arms Regulation (ITAR), 22 C.F.R. §§ 120.1 to 130.17.

To be eligible to compete, you must comply with all the terms of the challenge as defined in the Challenge-Specific Agreement.

Intellectual Property

Innovators who are awarded a prize for their submission must agree to grant NASA a royalty free, non-exclusive, irrevocable, world-wide license in all Intellectual Property demonstrated by the winning/awarded submissions. See the Challenge-Specific Agreement for complete details.

Registration and Submissions:

Submissions must be made online (only), via upload to the [HeroX.com](http://herox.com/) website, on or before June 1, 2020, at 5:00 pm ET. No late submissions will be accepted.

Selection of Winners:

Based on the winning criteria, prizes will be awarded per the weighted Judging Criteria section above.

Judging Panel:

The determination of the winners will be made by HeroX based on the evaluation by relevant NASA specialists.

Additional Information

* By participating in the challenge, each competitor agrees to submit only their original idea. Any indication of "copying" amongst competitors is grounds for disqualification.
* All applications will go through a process of due diligence; any application found to be misrepresentative, plagiarized, or sharing an idea that is not their own will be automatically disqualified.
* All ineligible applicants will be automatically removed from the competition with no recourse or reimbursement.
* No purchase or payment of any kind is necessary to enter or win the competition.
* Void wherever restricted or prohibited by law.