



NASA's Human Lander Challenge (HuLC)

2025 Proposal Guidelines

Advanced Cryogenics



HuLC
HUMAN LANDER CHALLENGE

Table of Contents

TABLE OF CONTENTS	2
CHALLENGE OVERVIEW	3
CONTEXT FOR THE 2025 THEME: ADVANCED CRYOGENICS	3
CHALLENGE DESCRIPTION AND PROPOSAL CATEGORIES	3
DESIGN CONSTRAINTS AND GUIDELINES	4
HOW TO COMPETE IN THE HUMAN LANDER CHALLENGE (HULC)	5
STIPENDS AND PRIZES	7
ELIGIBILITY	6
DATES AND DEADLINES	7
NOTICE OF INTENT (NOI)	8
PROPOSAL PACKAGE (PROPOSAL PAPER AND VIDEO) GUIDELINES	8
INTELLECTUAL PROPERTY (IP) AND MEDIA RELEASE	13
DELIVERABLES FOR FINALIST TEAMS	14
RESOURCES	15
CONTACT INFORMATION	15

This document was originally published on August 13, 2024.

Challenge Overview



The Human Lander Challenge (HuLC) is an initiative supporting NASA’s Exploration Systems Development Mission Directorate’s (ESDMD’s) efforts to explore innovative solutions for a variety of known HLS challenge areas. Through this competition, college students become important partners in NASA’s advancement of HLS technologies, concepts, and approaches. Improvements in these technology areas have the potential to revolutionize NASA’s approach to space exploration, and contributions from the academic community are a valuable part of the journey to discovery.

HuLC is open to full-time or part-time undergraduate and graduate students at an accredited U.S.-based community college, college, or university. Minority Serving Institutions are encouraged to apply. HuLC projects allow students to incorporate their coursework into real aerospace design concepts and work together in a team environment. Interdisciplinary teams are encouraged.

The 2025 Human Lander Challenge asks teams of students and their faculty advisors to design innovative solutions and technology developments addressing in-space cryogenic liquid storage and transfer systems for long duration NASA missions to the Moon.

Based on a review of initial proposals, up to 12 teams will be selected to compete at the HuLC Forum in Huntsville, Alabama in June 2025. Each finalist team will receive a \$9,250 stipend to facilitate participation in the Forum, which includes the submission of a final technical paper and poster and presenting their concepts to a panel of NASA and industry subject matter experts during the HuLC Forum. Inclusion of a design model or prototype is encouraged when appropriate. The top three placing teams will share a total prize purse of \$18,000.

Context for the 2025 Theme: Advanced Cryogenics

In-space propulsion systems utilizing cryogenic liquids as propellants are necessary to achieve NASA’s exploration missions to the Moon, and later to Mars. In current state of the art (SOA) human scale, in-space propulsion vehicles, cryogenic liquids can be stored for several hours. In order for the planned HLS mission architecture to close, cryogenic liquids must be stored on-orbit on the order of several months.

Challenge Description and Proposal Categories

Through the HuLC competition, NASA is engaging students for ideas to help achieve their lunar exploration goals (refer to [NASA’s Plan for Sustained Lunar Exploration and Development](#) and [NASA’s Initial and Sustained Artemis Human Landing Systems](#)). The 2025 HuLC competition asks student teams to **develop innovative, systems-level solutions to understand, mitigate potential problems, and mature advanced cryogenic fluid technologies that can be implemented within 3-5 years**. The potential solutions that teams can propose include, but are not limited to, the following categories:

2025 Human Lander Challenge (HuLC) Guidelines

- **On-Orbit Cryogenic Propellant Transfer** – On the ground, the transfer of cryogenic fluids is considered routine. However, on-orbit there is no experience in transferring large quantities of cryogenic fluids between tanks/vehicles in an unsettled (microgravity or surface tension dominated) environment. Understanding the thermo-fluid physics of cryogenic liquids during line chilldown, tank chilldown, and transfer fill operations is critical to developing an efficient propellant transfer scheme for refueling missions.
- **Microgravity Mass Tracking of Cryogenics** – Current state of the art mass gauges typically need a relatively high acceleration to gauge the propellant tanks. The existing gauges perform well during engine burns or on the ground. There is a gap in propellant quantity gauging during periods of micro gravity, where the liquid within the tank can move with minimal constraint, which on HLS mission can range in on the order of months. Propellant sloshing during landing or initial engine thrust can also compromise settled gauging accuracy.
- **Large Surface Area Radiative Insulation** – In cislunar space, a large amount of heat entering the propellant tanks is due to radiative heat transfer, either from solar radiation, earth albedo, other planetary bodies, other parts of the spacecraft, or engine operations. Because in-space vehicles require large capacity cryogenic propellant tanks, on the order of 5-7 meters in diameter and 10 meters tall, large surface area radiative insulation is needed to cover the entire tank acreage and reduce the total thermal energy entering the cryogenics.
- **Advanced Structural Supports for Heat Reduction** – Traditional launch vehicle structural supports are made from metallic, high conductivity materials that allow on the order of kilowatts of heat to transfer into the propellant tanks. In addition to radiative insulation, novel ways of reducing the structural heat leak to the propellant is needed for long duration cryogenic vehicles. Examples of this can be thermal breaks in the skirt, separation of dry mass from the vehicle, or coatings that reject heat to cislunar space.
- **Automated Cryo-Couplers for Propellant Transfer** – For transferring large quantities of cryogenic liquids between vehicles, a reusable automated coupler must be developed to support multiple cryogenic propellant refueling missions.
- **Low Leakage Cryogenic Components** – Traditional launch vehicle cryogenic valves, relief valves, check valves, and other components have an acceptable leak rate for missions lasting on the order of several hours. Better valve performance is needed, because for long duration missions on the order of multiple months, this leak rate would lead to the depletion of the entire cryogenic liquid inventory.

Design Constraints and Guidelines

Advanced cryogenic spacecraft must be able to survive on-orbit for extended periods of time to meet HLS requirements. Technologies, instrumentation, designs, and approaches developed for HuLC must survive and operate in extreme environments in cislunar space and on the Moon. Additional constraints include:

- Minimal barriers to NASA adoption (e.g., low mass, small size, low power, etc.)
- No additional risks posed to crew
- Ability to survive launch loads
- Must have a mission operational life of multiple months

Proposed Solutions Must Consider

Proposals must be innovative and include a clear description of the need, utilization or application, impacts, and outcomes in reducing and mitigating the risks posed by the long duration storage and transfer of cryogenic fluids in an unsettled or minimally settled condition. Proposing teams should clearly identify their assumptions and provide rationale to support them. The list below includes some recommended assumptions, but adjustments are permitted if accompanied by good engineering rationale.

- Targeted use on the Moon near-term (within 3 to 5 years)
- Cost-effectiveness with well justified estimates
 - Solutions should be affordable enough to merit consideration for implementation
- Simplicity of implementation, operational use, and interpretation
- Design for cislunar and lunar environments
 - Refer to the [SLS-SPEC-159 NASA Cross-Program Design Specification for Natural Environments \(DSNE\) Revision I](#)
- Deployment on or implementation for a NASA/commercial HLS lunar cryogenic vehicles
- Key technologies where relevant, including technology readiness levels (TRLs), as well as the systems engineering and architectural trades that guide the recommended approach
- Technical merit and rationale of mission operations in support of an exciting and sustainable space exploration program
- Supporting engineering analysis and justification of assumptions
- Realistic assessment of project schedule and milestones, as well as realistic development and annual operating costs (i.e., budget)
 - Realistic assessment of costs includes technology maturation, system development, mission infusion/adoption, integration, and operations (as appropriate)
- Adherence to the requirements and constraints of the design competition

How to Compete in the Human Lander Challenge (HuLC)

1. Thoroughly review this document and the Competition Website.
2. Find a qualified advisor and a team of students with diverse skills.
3. Ensure that your team meets the eligibility requirements.
4. Submit a Notice of Intent by the deadline.
5. (Optional but Recommended) Attend the Question & Answer (Q&A) Session.
6. Develop and submit a Proposal Package by the deadline.
7. Proposal Package Submissions will be reviewed and evaluated by the Judging Panel.
8. Selected teams will advance as Competition Finalists and be invited to attend the HuLC Forum in June.
9. Participation in the HuLC Forum includes an in-person presentation and submission of a technical paper, technical poster, and/or design a model or prototype demonstration (if applicable to team's proposed concept), by the appropriate deadlines.

Eligibility

HuLC is open to full-time or part-time undergraduate and graduate students at an accredited U.S.-based community college, college, or university. Teams may also include senior capstone students, clubs, and/or multi-university teams. Multi-disciplinary teams and Minority Serving Institutions are highly encouraged to apply at an accredited U.S.-based university or college. Teams may include senior capstone students, clubs, multi-university teams, or multi-disciplinary teams.

While advisors can contribute to the team's work, it is expected that the bulk of the work is completed by the undergraduate and/or graduate student team members. Student team members are also expected to be the primary presenters of their work at the on-site Forum.

Student Teams Must Include

- Team sizes vary widely, but **must contain, at a minimum, one faculty advisor with an affiliation at the primary proposing university/college and 2 students from that U.S.-based university/college who work on the project and present at the HuLC Forum**. There is no limit to the number of students who can participate throughout the year on a team.
 - If finalist teams desire to bring more than 10 students to the HuLC Forum, permission must be requested from the HuLC Program Staff prior to registering. Requests will be reviewed, and approvals will be granted on a case-by-case basis, space permitting.
- A faculty advisor is strongly encouraged to attend the Forum with each team.
 - The Forum offers faculty networking opportunities that can lead to exciting new partnerships and/or future collaboration opportunities that are beneficial to the universities. Additionally, teams with involved faculty advisors tend to become more competitive in NASA competitions each year.

Special Eligibility Considerations

- An individual may join more than one team.
- A faculty advisor may advise more than one team.
- A university/college may submit more than one proposal.
- Team members may not be a federal employee acting within the scope of employment (including co-op/Pathways students with civil servant status).
- During times of an active Fall or Spring NASA internship, non-federal interns may participate in HuLC only if their active work/research/project is not directly related to their HuLC project. (e.g.: An intern who is conducting research on cryogenics *CANNOT* contribute to a HuLC Team).

Foreign Students/Universities

Foreign Nationals attending US Universities

Foreign Nationals (FNs) attending the proposing U.S.-based university/college can fully participate on a HuLC Team, and at the HuLC Forum, with several notable exceptions.

1. Due to prohibitive restrictions and ever-changing NASA security regulations, foreign nationals may not be approved to attend culminating HuLC Forum events that take place on-site at a NASA Center

2025 Human Lander Challenge (HuLC) Guidelines

(including tours). If Foreign Nationals are approved to attend events on a NASA Center, they will need to provide current passport information via their Forum Registration, ~1.5 months prior to the Forum.

2. Occasionally, the HuLC Forum includes supplementary recruiting events for companies who support the competition, and these companies are typically only able to hire U.S. Citizens or Lawful Permanent Residents. Neither NASA nor NIA have any control over these hiring conditions.

Foreign Universities

Eligibility is limited to universities/colleges in the United States. Foreign universities/colleges are not eligible to participate in the HuLC Competition.

Stipends and Prizes

Finalist teams will each receive \$9,250 in stipend funding to facilitate full participation in the HuLC Competition, including development of a technical paper, technical poster, and/or a design model or prototype demonstration (if applicable to team's proposed concept) and culminating in a presentation during the HuLC Forum in June 2025 at or near NASA's Marshall Space Flight Center in Huntsville, Alabama.

A total prize purse of \$18,000 will be disbursed between the top 3 placing teams as follows:

- First Place - \$10,000
- Second Place - \$5,000
- Third Place - \$3,000

Additional recognition awards may include Excellence in Systems Engineering, Best Technical Paper, Best Technical Poster, Best Prototype Demonstration, or other awards given at the discretion of the judging panel.

Dates and Deadlines

All deadlines must be met by 11:59 P.M. Eastern on the date specified below, unless otherwise indicated.

Date	Description
October 16, 2024	Deadline to Submit a Notice of Intent (NOI)
October 24, 2024	Deadline to Submit Questions for Virtual Q&A Session
November 7, 2024	Q&A Session for Interested Teams
March 3, 2025	Deadline to Submit a Proposal Package
April 3, 2025	Teams Notified of Selection Status
May 12, 2025	Deadline to Register and Pay for the HuLC Competition Forum
May 23, 2025	Deadline to Make a Hotel Reservation at the HuLC Group Rate
May 28, 2025	Deadline to Submit a Technical Paper
June 2, 2025	Deadline to Notify HuLC@nianet.org If Team Plans to Bring a Prototype to Forum
June 20, 2025	Deadline to Submit Presentation Chart Deck and Technical Poster Files
June 23, 2025	Team Check-In at the 2025 Human Lander Challenge Forum
June 24-26, 2025	2025 Human Lander Challenge Forum in Huntsville, AL

Notice of Intent (NOI)

Notice of Intent (NOI) Submission Deadline: 11:59 PM Eastern on October 16, 2024

Interested teams are strongly encouraged to submit a Notice of Intent (NOI) to compete by the deadline to stay informed of competition updates, and to ensure an adequate number of reviewers. Teams who submit NOIs by the deadline will be invited to participate in an exclusive Q&A session with the judges prior to the Proposal Package submission deadline. Visit the [Challenge Details Webpage](#) on the HuLC Competition Website to complete the brief [online NOI Submission Form](#).

The following information will be required or requested on the NOI submission form:

- University/College Name
- University/College or Industry Partners, if any
- Project Title, if known
- Contact Information for the Primary Faculty Advisor and two Student Team Leads
- Contact Information for Additional Points of Contact (PoCs), if applicable
- Synopsis of Proposed Concept
 - The synopsis is limited to 3,000 characters to provide a high-level overview of the proposed concept or potential concepts.

Note: NOIs are non-binding. We understand that NOIs are due early in the development process, and teams will still be in the process of fleshing out many of the details of their concepts. We fully expect that teams' concepts will change and evolve between the NOI and Proposal Package submissions, as in-depth research and analysis is conducted. Teams have the full flexibility to change ideas, concepts, and/or category selection as they work over the course of the semester. Information submitted in the NOI does not need to match the Proposal Package submission.

Proposal Package (Proposal Paper and Video) Guidelines

Proposal Package Submission Deadline: 11:59 PM Eastern on March 3, 2024

Robust proposals are expected to demonstrate significant progress in your design and analysis. The HuLC Judging Panel will be looking for mature mission concepts at the proposal stage. The proposal should reflect the total scope planned for the Technical Paper. All analysis results to-date (in summary form if necessary due to space limitations) should be included, leaving placeholders for analysis not yet completed. Please visit the [Challenge Details Webpage](#) on the HuLC Website to visit the [Proposal Package Submission Form](#).

Proposal Expectations

- Proposals should be 5-7 pages in length. Content beyond 7 pages will not be reviewed.
- Proposals should clearly articulate the innovation and design being proposed, including original engineering analysis planned and/or in progress. It will not be enough for teams to indicate they will address the requirements later in the Technical Paper.
- Submitting teams pledge that the team is the sole author of the submission, that the submission is wholly original, that it does not infringe on any copyright or any other rights of any third party of which the team is aware, and that the submission is free of malware.

The Proposal Should Include:

- Cover Page (not included in the page limitation) with the following information:
 - University Name
 - Project Title
 - Full Names of all Team Members with Academic Level (Undergraduate or Graduate) and Major
 - Graphic or Image of Part or All of the Proposed Concept (no hand-drawn sketches, please)
 - Faculty Advisor Signature of Review and Approval on the Cover Page
 - Note: *Submissions without a valid faculty signature will be deemed non-compliant and will not be reviewed.*
- [Quad Chart](#) (not included in page limitation)
 - Use the [HuLC Quad Chart Template](#) found on the “Proposal” section of the [Resources Webpage](#). The Quad Chart is a way for teams to display some standardized information that helps evaluators quickly compare many projects. For the HuLC Competition, teams must use the provided template to create a quad chart and insert the chart into their proposal. Quad charts must address:
 - The team’s major objectives and technical approach to the problem being addressed in their chosen cryogenics category
 - An image/graphic of part or all of the concept
 - Key design details and innovations of the concept
 - A summary of schedule and cost for the proposed solution’s path to adoption
- The body of the proposal should outline/include (Max of 7 pages)
 - Summary Statement/Executive Summary (Max of 150 words)
 - An overall summary of the innovative solution, including a title of the project, a synopsis of the specific cryogenic challenge being addressed, an overview of the proposed solution, and a statement of the impact the innovative solution will have on lunar exploration goals.
 - How does the proposed solution address NASA’s lunar exploration challenges? (Refer to [NASA’s Plan for Sustained Lunar Exploration and Development](#) and [NASA’s Initial and Sustained Artemis Human Landing Systems](#).)
 - How the proposed solution is applicable to cislunar space and lunar environments [[SLS-SPEC-159 NASA Cross-Program Design Specification for Natural Environments \(DSNE\) Revision 1](#)]
 - Indicate *WHY* you chose your solution / design / approach in terms of *VALUE* in the areas of potential mission / system impacts, technology readiness, affordability, programmatic implementation, and risk.
 - Detailed information on the verification and validation of the solution
 - Teams need to prove their analysis is correct and believable to the judges. They should clearly detail how they are solving what they set out to solve, and that they are solving the problem in the appropriate manner with the appropriate tools/equipment.
 - Capture risks associated with development, verification, and validation of the solution – and define mitigation plans for them.
 - Innovative approaches / capabilities / technology
 - Realistic technology assumptions, including realistic NASA Technology Readiness Level Definitions and justifications where appropriate

2025 Human Lander Challenge (HuLC) Guidelines

- Original analysis and engineering
- Detailed information about the work conducted in various trades, concepts, and technical analyses
- Key findings supporting the envisioned solution
- Adherence to the Design Constraints and Guidelines
- Mass and size estimates (as appropriate)
- A realistic budget assessment (including an assessment of cost margin) and **an explanation of the assumptions**. Use of analogs and NASA costing tools is strongly encouraged.
- Proposed path-to-flight project timeline for Development, Test, and Evaluation (DT&E) of proposed solution – assuming a mission to the Moon in the next 3-5 years
- Appendices (not included in page limitation)
 - Appendices are to be used for references and calculations *ONLY*. There is no preference in citation formatting, but references must be formatted uniformly and correctly. Just listing a link to the source is not acceptable.
 - **Judges are not obligated to look at the appendices.** Include important details in the body of the proposal paper to ensure they are reviewed.

Proposal Formatting Guidelines

Teams are responsible for the formatting and appearance of their proposal. Figures and tables should be legible without magnification. We recommend teams use image files with a minimum dpi of 150, with 300 DPI preferred.

- Proposals should be 5-7 pages in length. This includes all text that describes the concept and analysis plan, and any additional graphics, tables, and/or charts. (A well-conceived graphic can convey multiple pages worth of text and convey a deeper understanding of the problem and solution.)
 - The Cover Page, Table of Contents, Quad Chart, and Appendices do not count toward the minimum or the maximum page limitations.
 - Papers should be single spaced and single column.
 - Margins should be a standard 1" (2.54 cm) all the way around (top, bottom, left, and right).
- Use fonts common to Macintosh and PC platforms, (i.e., Times, Times New Roman, Helvetica, or Arial for text Symbol for mathematical symbols and Greek letters).
- Font size should be 11 or 12 pt. (including in all tables, charts, and graphs). **Any text smaller than this, including text in graphics or charts, may not be reviewed by the judges.**
- Proposals must be submitted as PDF files.

Tips From the Judges

- Read ALL the HuLC guidelines and requirements found in this Challenge Guidelines Document.
- Research and justify your assumptions. **An important part of conceptual design is the ability to make reasonable assumptions to address uncertainties and to understand the consequences of those assumptions.** Provide adequate analysis and documentation (i.e., support) for your expected outcomes.
- Do not simply include information found in Google searches. Analyze your research findings.

2025 Human Lander Challenge (HuLC) Guidelines

- Find a balance between sound technical analysis and revolutionary concepts. Innovation will be rewarded and is highly desired, but not at the expense of fundamentals.
- Start with a big picture view of your concept, rationale, and goals. Don't jump immediately into the details of design or tool development, etc. Find balance between accurately addressing the overall approach and supporting specific focuses within your solution. If you drill down and focus your research and engineering on a particular design element to validate, you will still need to provide sufficient relevance, connection, and context to the broader solution.
- A picture is worth a thousand words and can convey a lot of information. Pictures for the proposal are a plus. Show us your innovation! (The proposal should not contain any hand-drawn sketches of your solution).
- If results/details are not available yet or are still being finalized, it is still valuable to indicate that you will have them and how you are determining them, sources of validation, etc. If it is not mentioned, judges will assume it is not being addressed.
- Consult the technical resources provided by NASA and the Judging Panel and make use of published papers and reports available to you. See the Resources Webpage for a preliminary list of resources and recommended reading.
- Do not use lengthy appendices! Appendices are for citations and references only.
- Participate in the Q&A Session
- Utilize all available page space.
- Do not include hard-to-read figures, charts, or text in your proposal. Follow established font size requirements, because judges often will not read graphics or charts with font smaller than 11pt.
- Report quality will impact the judges' scoring. Poor grammar, typographical errors, etc. do not reflect well on your team.
- Submit all materials on time; late submissions will not be accepted.

General Video Formatting Instructions

As a part of the proposal submission process, teams will be required to include a 2-minute video. The intent is for the video to augment each team's proposal by including animation, graphics, or other creative ways of showcasing unique aspects of their proposed concept.

- Videos are limited to a maximum length of 2 minutes.
- Videos should be uploaded to YouTube, and teams will provide their video's YouTube URL on the online Proposal Package Submission Form. Other types of video files will not be eligible for consideration.
- Videos need to be publicly viewable via a link. Videos should be "Unlisted" or "Public" on YouTube.
 - Troubleshooting Tip: YouTube accounts sometimes need to be verified prior to being able to fully upload videos. If your video is stuck in the "processing" stage, check to make sure your YouTube account is verified.
- All team members should appear in the video, if possible. (Still images are also OK.)
- Your university name and project title should appear at the beginning of the video.
- Do not use music or images which may violate copyright law. You may use images created by NASA.
 - It is the responsibility of the team to follow copyright law. Neither NASA nor NIA can approve the use of copyrighted material.

Submitting the Proposal and Video

To upload your proposal and video (.pdf file and YouTube link), please visit the [Challenge Details Webpage](#) on the HuLC Competition Website to complete the [online Proposal Package Submission Form](#). Teams are encouraged to review the [Resources Webpage](#) on the HuLC website, which provides resources to assist in the development of the team's proposal.

No revisions can be accepted after submission, so please proof the proposal and video files very carefully before submission. If there are any technical problems with the content of the proposal or video (for example, the file was corrupted or a URL link was broken), we will try to contact a team member immediately, so it is very important that you provide up-to-date contact information on the Submission Form. **Late submissions will not be accepted**, and the Submission Form will close promptly at midnight.

The following information will be required or requested on the Proposal Submission Form:

- University/College Name
- University/College or Industry Partners, if any
- Project Title
- Chosen Theme Category
- Contact Information for Primary Faculty Advisor and 2 Student Team Leads
- Contact Information for any Additional Advisors, if applicable
- File Upload for PDF Proposal Document (Max File Size is 100 MB)
- File Upload for Standalone PDF [Quad Chart](#) (Max 100 MB)
- **NEW for 2025:** File Upload for High Quality Graphic Depicting Team's Concept:
 - Each team must upload a high-quality graphic (minimum 300 DPI) for use when mentioning the team's participation in HuLC. This image may be used on websites, in news releases, in social media posts, in promotional material, in NASA reports, etc.
- URL Link for Team YouTube Video (Must Be "Unlisted" or "Public")
- A 2-3 sentence synopsis of the proposed project that briefly highlights any innovations (Max 600 characters)
- **NEW FOR 2025:** [Completed Vendor Form \(W-9\)](#) and [ACH Form](#) uploads for the lead university/college (to be completed by the Accounting Department at the university/college) – for use if the team is a selected Competition Finalist
 - A completed [IRS W9 Form](#) from the lead institution is an acceptable substitution for the Vendor Form.
 - Both Vendor Form (or W9 substitution) and ACH form should be signed and dated within the past 2 years.
- Financial Point of Contact (PoC) information for an individual who will receive and process stipends – for use if a team is a selected Competition Finalist
 - The Financial PoC should be someone employed by the university who can receive and manage funds on behalf of the team. Student team members may not be Financial PoCs.
- Acceptance of the [HuLC Intellectual Property and Media Release Statements](#)

Proposal Evaluation Criteria

The [2025 HuLC Competition Proposal Package Scoring Matrix](#) can be found on the [Challenge Details Webpage](#) on the HuLC Competition Website.

The evaluation criteria used to evaluate proposal and video submission include:

- Technical Innovation (Max 40 points)
 - How innovative is the proposed solution?
 - How clearly articulated and motivated are the proposed solution's objectives?
 - How well does the proposed solution enable NASA's exploration goals and align with the HuLC Guidelines related to advanced cryogenics? (Refer to [NASA's Plan for Sustained Lunar Exploration and Development](#) and [NASA's Initial and Sustained Artemis Human Landing Systems.](#))
- Technical Credibility (Max 40 points)
 - Is the proposed solution appropriate for application and operation in cislunar space and lunar environments?
 - How feasible is the proposed solution in addressing risks posted by advanced cryogenic vehicles in terms of technical maturity, adherence to the HuLC constraints, and potential to directly contribute to resolving HLS challenges?
 - Has the team proposed a solution with system-level impacts, realistic assumptions, and rigorous technical analysis and design?
 - How feasible and thorough is the verification and validation for the proposed solution?
 - Are the risks associated with development, verification, and validation of the solution well captured and mitigation plans defined?
- Technical Management (Max 15 points)
 - Is the proposed development and implementation plan adequate and thorough, with a path-to-adoption schedule and milestones clearly defined and reasonable?
 - Are the estimated costs and any carried margins/uncertainties reasonable and reflective of the proposed solution's required technical development and maturity?
 - Does the proposed solution have a high likelihood of success?
 - How well written, organized, and communicated is the proposal?
- Video (Max 5 points)
 - Video highlights aspects of the team's concept(s) and/or increases understanding of the proposed solution.
 - Video content is aesthetic, organized, and flows. Ideas are communicated clearly, and viewers can easily follow the material.

Intellectual Property (IP) and Media Release

Proposers must acknowledge that they have read and agree to abide by the full [Intellectual Property and Media Release Statements](#). An **excerpt** is included below.

Intellectual Property - Summary

In addition to any rights granted to NIA, as applicable, recipients of monetary awards under the Human Landing System (HuLC) competition agree to grant to NASA and the Federal Government, as the source of awards funding, the Rights in Data and Patent Rights set forth in detail below. In summary, awardees agree to grant to NASA and the Federal Government (i) a license to use, distribute, reproduce, perform, display, and prepare derivative works, any data first produced by recipient in carrying out recipient's responsibilities under this award in which the recipient asserts copyright, or data for which copyright ownership was acquired under the grant for Federal purposes and to have or permit others to do so for Federal purposes only, and (ii) a license to practice or have practiced for or on behalf of the United States any invention of the recipient conceived or first actually reduced to practice in the performance of work under this award if recipient chooses to retain title to such invention, and NASA may elect to obtain title or patent such invention if recipient chooses not to do so, all as set forth more particularly in the below Rights in Data and Patent Rights provisions. (This is a summary of the Intellectual Property statement – please review the full [Intellectual Property and Media Release Statements](#) for more information.)

Media Release

The recipients of monetary awards under the HuLC competition (“Teams”) agree to give permission to be recorded, photographed and/or videotaped by or for NIA, NASA or their representatives or designees for the purpose of announcements and other outreach or informational purposes, including public announcements, external media coverage, and other promotional opportunities concerning the Challenge.

The Teams further give permission to NIA, NASA or their representatives or designees to use, reproduce, prepare derivative works, publish, distribute to the public, perform publicly, and/or publicly display all deliverables, including excerpts and any ancillary material, which may include each team participants' names, affiliations (schools), images, voice, and/or likenesses. NIA or NASA may distribute the materials, including excerpts therefrom, and any ancillary material through a variety of media in existence now or in the future, including but not limited to print, television, websites, radio, or any other means. NASA may also permit a third party to exercise NASA's rights, including but not limited to the right to display or distribute the recording, including excerpts therefrom, and any ancillary material, in any manner NASA deems appropriate.

The teams also understand that this permission to use each participant's name, image, voice and/ or likeness in such materials is not limited in time and team participant will not receive compensation for granting this permission. Teams acknowledge that NASA has no obligation to use any participant's name, affiliation, image, voice, and/or likeness in any materials produced by NASA, but if NASA so decides to use them, each participant waives the right to inspect or approve any such use. Teams hereby unconditionally release NASA and its representatives from any and all claims and demands arising out of the activities authorized under this Media Release.

Deliverables for Finalist Teams

Teams selected to receive funding and attend the onsite Forum are responsible for the following Project Deliverables, all of which must be releasable to the public with no copyrights asserted. **Additional details on these deliverables will be communicated to finalist teams after selection.**

2025 Human Lander Challenge (HuLC) Guidelines

- 10–15-page Technical Paper
- Technical Poster (for Poster Session conducted during HuLC Forum)
 - Teams must submit a digital poster file and bring a full-size printed poster for display during the Forum’s poster session.
- 25-minute Presentation, with an additional 20-minutes of Q&A at the HuLC Forum
- (Optional) Prepare a Prototype / Capability Demonstration to present at the HuLC Forum

All finalists’ technical papers, presentations, and posters will be posted and archived on the HuLC Website, and technical papers may be submitted through [NASA’s Technical Report Server \(NTRS\)](#). All work published to the RASC-AL website may be referenced by others, including future HuLC participants.

Resources

Please visit the [Resources page](#) on the HuLC website to find resources and information for developing your HuLC concept.

Contact Information

The Human Lander Challenge is sponsored by NASA’s Exploration Systems Development Mission Directorate’s (ESDMD’s) Human Landing System (HLS) Program Office and managed by the National Institute of Aerospace (NIA). **For HuLC inquiries, please contact the NIA HuLC Program Team at HuLC@nianet.org.**