AIAA Design Competitions
Official Rules

ELIGIBILITY REQUIREMENTS

- All AIAA University Student members (hereinafter "students") are eligible and encouraged to participate. All student participants must have a current membership with AIAA to submit a report and to receive any prizes.
- At least one Project/Faculty Advisor must be an AIAA member.
- Students must submit their intent to participate and final report via the online submission site (www.aiaa-awards.org) to be eligible to participate. **No extensions will be granted.**
- More than one design may be submitted from students at any one school. At large student members may collaborate with each other even if they do not attend the same university.
- If a design group withdraws their final report from the competition, the team leader must notify AIAA Headquarters immediately.
- Use of the competition RFPs as part of an organized classroom requirement are eligible and encouraged for competition.
- Designs submitted must be the work of the students, but guidance may come from the Faculty/Project Advisor and should be accurately acknowledged.
- Prize funds will only be awarded if at least three valid final entries are received in the category.

SCHEDULE

- The schedule for AIAA Design Competitions will be posted to the Design Competitions program website each year by mid-August. The schedule posted to the program website is the final schedule unless otherwise stated.
- A general schedule may be found below:
    - **Mid-August**: RFPs posted to website
    - **Early February**: Intent to Participate and Team Roster submitted via online submission site
    - **Mid-May**: Final Design Proposal submitted via online submission site
    - **Mid-June**: Proposals accepted or denied for judging
    - **August-September**: Results announced and winners notified

CATEGORIES/SUBMISSIONS

The number and types of categories/competitions offered in any given year is at the discretion of the AIAA Foundation.

- **Team Submissions:** Team competitions will be groups of not less than three and not more than ten AIAA Student Members per entry, unless otherwise specified in the competition Request for Proposal (RFP).
- **Individual Submissions:** Individual competitions will consist of only one AIAA Student Member per entry.
- **Graduate Category:** Graduate students may participate in the graduate and open categories only. Graduate category entries must comprise at least 2/3 graduate students.
- **Undergraduate Category:** Undergraduate entries must be comprised of all undergraduate students. No graduate students may participate in the undergraduate category.
- **Open Division:** Both graduate and undergraduate students may participate in the Open Division. Teams can be a mix of any level. Individuals or teams may participate in this category.

Team Roster and Intent to Participate:

- Team Roster and Intent to Participate (basic proposal information) indicating interest in participating in the design competitions is required before submitting a final report.
- All Team Roster and Intent to Participate Forms must be submitted through the online submission system. This only asks for basic information about your proposal and team.
- Team Roster and Intent to Participate must include the competition of interest, proposal title, student's names, emails, AIAA membership numbers and expiration dates, faculty advisor(s) names, emails, and project advisor(s) names and emails. Incomplete forms will result in the Team or Individual being ineligible to compete in the competition.

Submission of Final Design Report:

- Each team or individual must provide an electronic (.pdf) copy of their design report as outlined below, or according to the RFP instructions, to the online submission site, https://www.aiaa-awards.org/a. Only the person who submitted the intent to participate may submit the final design report.

- An electronic copy of the report in PDF format must be submitted to AIAA using the online submission site referenced above. Total size of the file cannot exceed 25 MB.
- Electronic report files must be named (example): "year_[name of university]_Design_Report.pdf"
- A separate "signature" page must be included with your submission and include the following:
  - All student participants, their AIAA numbers and signatures.
    - Individual or team photos are highly recommended but not required. AIAA will collect a team photo for use in their promotional materials for the winning reports.
  - Faculty and/or Project Advisors, their signatures, and AIAA number(s) as appropriate per the Eligibility Requirements.
  - If the submitting team is comprised of at-large student members, each student member needs to include the name of the university he or she attends.
- Electronic reports should be **no more than 100 pages**, double-spaced (including graphs, drawings, photographs, and appendices) if it were to be printed on 8.5"x11.0" paper, and the font should be no smaller than 10 pt. Times New Roman, unless otherwise stated in the relevant competition RFP. Default margins should be 1" on all sides.
  - Any text that is not double-spaced will incur a page-count penalty of 1.75 pages for each improperly spaced page (or portion thereof), with a minimum penalty based on ½ page. For grading purposes, improperly spaced pages will be replaced by their penalized page-count equivalent.
    - Example: An 85-page report in which 40 pages are formatted with 1.5 spacing and 45 pages are correctly double-spaced will be counted as 115 pages for grading purposes, calculated as 45 (properly spaced pages) + 70 (40 × 1.75) = 115 pages (resulting in a report that is now over the limit and thus subject to penalties, including possible disqualification)
  - NO foldouts (11"x17") are acceptable
  - Team may adjust the landscape and portrait layout of a page at their discretion
- Failure to adhere to all the above formatting requirements may result in your report being penalized at the discretion of the judges.

- Minimum penalty will be 10% on the final score
- Maximum penalty will be disqualification

COPYRIGHT

- All submissions to the competition shall be the original work of the team members. Authors retain copyright ownership of all written works submitted to the competition. By virtue of participating in the competition, team members and report authors grant AIAA a non-exclusive license to reproduce submissions, in whole or in part, for all of AIAA's current and future print and electronic uses. Appropriate acknowledgment will accompany any reuse of materials. Winning reports will be posted on the AIAA website.

CONFLICT OF INTEREST

- It should be noted that it shall be considered a conflict of interest for a design professor to write or assist in writing RFPs and/or judging proposals submitted if (s)he will have students participating in, or that can be expected to participate in those competitions. A design professor with such a conflict must refrain from participating in the development of such competition RFPs and/or judging any proposals submitted in such competitions.

AWARDS

- The prize money provided for the competitions is funded through the AIAA Foundation. The monetary awards may differ for each competition, with a maximum award of $750. The award amounts will be listed on the AIAA Design Competitions program website once per year at the beginning of each cycle. One representative from the first-place team may.be invited by the Technical Committee responsible for the RFP to make a presentation of their design at an AIAA forum. A travel stipend may.be available for some competitions, with a maximum travel stipend of $750 which may be used to help with costs for flight, hotel, or conference registration to attend an AIAA forum.
- Paper certificates will be provided to each individual team member plus a faculty advisor and project advisor, only if the team or individual places first, second or third place. This does not include institutions/individuals from nations subject to US government sanction. It is the team's/individual's responsibility to provide an appropriate mailing address to AIAA HQ for the purposes of mailing these certificates.

- Participation certificates may be requested in writing to studentprogram@aiaa.org and they will be delivered in electronic format only. Teams may request participation certificates up to 01 October of the same year.

PROPOSAL REQUIREMENTS

- The technical proposal is the most important factor in the award of a contract. It should be specific and complete. While it is realized that all of the technical factors cannot be included in advance, the following should be included:
    - Demonstrate a thorough understanding of the Request for Proposal (RFP) requirements.
    - Describe the proposed technical approaches to comply with each of the requirements specified in the RFP, including phasing of tasks. Legibility, clarity, and completeness of the technical approach are primary factors in evaluation of the proposals.
    - Particular emphasis should be directed at identification of critical, technical problem areas. Descriptions, sketches, drawings, systems analysis, method of attack, and discussions of new techniques should be presented in sufficient detail to permit engineering evaluation of the proposal. Exceptions to proposed technical requirements should be identified and explained.
    - Include tradeoff studies performed to arrive at the final design.
    - Provide a description of automated design tools used to develop the design.
- All analytical modeling tools, data sources, computer codes, and technical resources used to generate, analyze, model and produce the design and associated report must be:
    - Available for inspection, download, and/or sale to all individuals and entities regardless of nationality as allowed by US export laws; OR
    - Generated personally by the students on the team without the use of codes falling under restriction or substantial material assistance by individuals or entities outside of the team.
- Teams are required to list all computer codes used along with the URL where they may be obtained under the conditions above (e.g. https://www.mathworks.com/products/matlab.html). Teams must agree to this provision when submitting their materials.
- The use of generative AI is discouraged in AIAA Design Competition submissions as these are learning focused competitions. Individual RFPs may prohibit AI, make sure to read the entire RFP for guidance.

- Please refer to the AIAA policy on the use of AI (https://aiaa.org/publications/publish-with-aiaa/ethical-standards-for-publication-of-aeronautics-and-astronautics-research/). Per the AIAA research and AI policy, all submissions to the competition shall be the original work of the team members.
- Consistent with the AIAA policy, if AI has been used in the creation of the design or report in any manner, a 1-page disclosure must be included with the report (NOT included in the 100 page count). Any usage of AI shall be covered in this disclosure.
- Teams should note that if the use of AI is observed or suspected in the submissions, judges may use their individual discretion in deciding whether the use of AI has been properly acknowledged and disclosed, whether it follows the AIAA policy listed above, and whether report evaluations and scoring will be impacted.

RULES, REGULATIONS, AND LAWS GOVERNING TECHINICAL REVIEW AND FINANCIAL AWARDS

- This competition is subject to all applicable laws, including US export control laws. US law prevents AIAA from awarding prize money to, or providing substantive feedback on entries from, persons residing in sanctioned countries. Currently those countries are Iran, Cuba, North Korea, Crimea, Sudan, or Syria, but these are subject to change. Furthermore, any persons or entities on the US Department of Treasury's Specially.Designated.Nationals.and.Blocked.Persons.List ("SDN List") may not participate. Therefore, AIAA will not accept submissions from residents of sanctioned countries or any individuals or entities from the SDN List. AIAA is not responsible for US export laws concerning the provision of technical feedback or prize money, and AIAA will not make any exceptions to this provision and will comply with all relevant US export laws.
- NON-HARASSMENT: Any faculty, advisor(s), student or student(s) found to be sending or directing harassing messages to any staff member, professional volunteer, or other competition participant regarding application of the Design Competition program rules is subject to a ban on themselves and their university's future participation in this AIAA program, up to and including a permanent ban. The determination of staff and volunteers regarding the application of U.S. government rules and regulations regarding financial awards, technical feedback and review are final.

- By participating in an AIAA sponsored activity, all participants, regardless of membership status, are subject to the AIAA Code of Ethics and the Anti-Harassment Policy.

BASIS FOR JUDGING

- The AIAA Technical Committee that developed the RFP will serve as the judges of the final reports. Unless other judging criteria are outlined in the relevant RFP, reports will be evaluated according to the criteria below. Please refer to the RFP for your competition to see if the criteria are different. Judges reserve the right to not award all three places. Judges' decisions are final, and candidates will be provided feedback via judging comments after the program has closed for the cycle. Points listed below are guidelines given to the judges. They are approximate as each competition varies slightly on its emphasis.
    - **Technical Content (40 points)**
        - This concerns the correctness of theory, validity of reasoning used, apparent understanding and grasp of the subject, etc. Are all major factors considered and a reasonably accurate evaluation of these factors presented?
        - Historical judging criteria
            - Requirements
            - Concept Selection
            - Quantitative Analysis of Selected Concept
            - Tools and Methods
            - Technical Soundness and Completeness
    - **Organization and Presentation (20 points)**
        - The description of the design as an instrument of communication is a strong factor in judging. Organization of written design, clarity, and inclusion of pertinent information are major factors.
        - Historical judging criteria
            - Overall neatness and style of report
            - Paper follows a logical flow, is easy for the reader to follow
            - Introduction clearly defines purpose of paper
            - Figures, graphs, tables are uncluttered and are easy to understand

- Proper grammar and spelling
- All previous relevant work cited
- Conclusions are concise and fully substantiated

- **Originality (10 points)**
  - The design proposal should avoid standard textbook information, and should show the independence of thinking or a fresh approach to the project. Does the method and treatment of the problem show imagination? Does the method show an adaptation or creation of automated design tools?
  - Historical judging criteria
    - Concepts considered show originality
    - Overall treatment and approach to the problem showed imagination
    - Unconventional approaches and concepts were considered
    - Innovation and creativity demonstrated during the design process
- **Practical Application and Feasibility (30 points)**
  - The proposal should present conclusions or recommendations that are feasible and practical and not merely lead the evaluators into further difficult or insolvable problems.
  - Historical judging criteria
    - Technical Feasibility
    - Economic Feasibility
    - Broader Impacts

- The following table highlights typical sections included in the design reports.
  - This table is for guidance only
  - This table is NOT comprehensive
  - This table does not guarantee any level of score
  - Judges typically expect these topics covered in the report and per the RFPs
  - The RFP requirements take precedence over this chart

	AIRCRAFT	SPACE	MISSILE
Executive Summary	X	X	X
Table of Contents	X	X	X
Nomenclature	X	X	X
List of Figures	X		
List of Tables	X		
Compliance Checklist	X	X	X

Introduction	X	X	X
SE-ConOps, Requirements, Schedule	X	X	X
Sizing/Vehicle Approach/High Level Trade Studies	X	X	X
Tools and Methods	X		X
Launch Facility Considerations			
Launch Platform Considerations			
Internal and External Configuration	X		X
Staging		X	
Propulsion	X	X	X
Power		X	
Aerodynamics	X		X
Performance/Orbital Mechanics	X	X	X
Stability and Control	X	X	X
Structures	X		X
Loads			
Mass Properties	X	X	X
Systems	X	X	X
Avionics/Guidance			X
Landing Gear			
Cost Analysis	X	X	X
Ordnance/Drop/Refill			
Targeting and Effectiveness			X
Acoustics, Survivability, Observability, Emissions, Environmental Considerations			
Development Plan and Manufacturing			X
Repair and Maintenance	X		
Conclusions	X	X	X
References	X	X	X
Appendices			

CONTACT DETAILS

- For more information about this program, please contact us at studentprogram@aiaa.org.
- For technical questions about the RFPs, please contact the point of contact listed in the RFP.

2026-2027 AIAA Undergraduate Team Space Design Competition

Human Mars Initial Base Camp

Background

On March 24, 2026, NASA hosted a special Ignition event, inviting representatives from industry and the international space community to NASA Headquarters to discuss the future of space exploration. At the event, NASA made a number of announcements, including that the United States would establish a Moon Base in the lunar South Pole region, using a phased iterative approach. The announcement clarified the agency's vision for scientific, technological, and economic development at the Moon and reinvigorated a national focus on crewed exploration of deep space.

NASA and international partners are planning these next steps of human exploration by establishing assets on the Moon, where astronauts will operate and test systems that are needed for deep space exploration. The lunar surface offers an excellent environment for testing the systems that are needed for extended exploration missions to other destinations like Mars. To support these missions, NASA is working with commercial partners to develop hardware to support missions on the lunar surface that are more ambitious than ever before. The first phase of this development effort will allow astronauts to gain operational experience spending weeks, rather than days, away from Earth. These missions will enable NASA to develop techniques and systems that will solve the challenges that astronauts will face when traveling to Mars and other exploration destinations.
This phased approach to build up capabilities on the lunar surface can serve as a blueprint for exploration on the Martian surface, however, due to the vast distance, travel time, and limited launch opportunities, the phased build up approach will be more constrained. Establishing long duration capabilities on the Martian **surface will require significant infrastructure build up that may take multiple years, with long periods of** autonomous operation and monitoring of pre-deployed systems. How and when to deploy certain systems in preparation for human explorers, remains a key strategic challenge for human Mars mission planning.

This Request for Proposal seeks innovative and strategic concepts and engineering designs for a phased approach for build up of an initial human Mars base camp in the late 2030s, to complement the announced Moon base efforts. This request for proposal seeks detailed design of pre-deployment of systems and concept of operation of these systems to prepare the initial Mars base for the first human expedition. The base should be designed initially to support a crew of 4 for a period of up to 30 Martian sols, with innovative phased approach to expand the support in future iterations.

Design Requirements and Constraints

- Designed a phased approach with building blocks to enable the establishment of an initial Mars base at an optimal landing site to maximize potential science return for human exploration of the surface
    - The base should be designed to support a crew of 4 for a nominal mission of up to 30-sols, not including crew gravity readaptation period
        - Assume the crew will remain in the lander (which is outside the scope of this RFP) during the gravity readaptation period (which can be up to 7-sols), and the 30-sol exploration period begin after the crew leaves the lander.
    - The location of the base should be chosen to maximize science return, crew survivability, and potential extensibility to enable future missions
    - The design should take into consideration the potential for the base camp to be expanded to accommodate more crew for longer durations in subsequent expeditions

    - The crewed portion of the mission will be explicitly outside the scope of this RFP; the RFP seeks to define the systems that are pre-deployed prior to the human landing and will not include the human ascent system.
    - Design exploration systems to allow crew to explore up to 100km away from the base camp.
- Design and define the end-to-end operation of this precursor Mars base buildup, including launch, orbit transfer, station keeping, and other maneuvers necessary to deliver the elements to the Martian surface
    - Discuss any strategic decisions on the order of operation in terms of landing, deployment, and commissioning of systems
- Design systems to support the crew for exploration duration, including crew cabins, power generation and distribution systems, mobility systems, logistics, food, water, etc.
    - Discuss how these systems are pre-deployed, what operations are needed to commission, integrate, and test for operational reediness for human arrival
    - Focus on the initial capabilities that need to be deployed to support 4-crew 30-sol missions, but discuss potential on-ramps for capabilities expansions for future missions
    - If additional assembly is required by the crew, detail the necessary tasks that are required after the crew lands to bring the base to full operational capabilities
- Mars landing is challenging, a phased approach for buildup can utilize landing capabilities of various payload sizes and mass.
- Perform trade studies on various mission designs at the architecture and system levels to demonstrate the fitness of the chosen mission and system design. Trades should include system architecture, existing launch vehicles, instruments, orbital mechanics, spacecraft subsystem level designs, and other mission level system trades, including analysis of single vs multiple assets. It is highly desirable to use technologies that are already demonstrated on previous programs or currently in the NASA technology development portfolio. Trades should be assessed on the basis of benefit, risk, and cost.
- Discuss selection of subsystem components and the values of each of the selections and how the design requirements or scientific objectives drove the selection of the subsystem.
- The initial cost for the Martian base camp shall not exceed $10 Billion US Dollar (in FY26) from the start of the program to the human expedition, including design development test and evaluation (DDT&E) and theoretical first unit (TFU) costs of all of the base camp elements for this initial phase.
- If advanced technology options are utilized in the design, the technology advancement cost must be included, all systems must be at appropriate technology maturation to meet the schedule
- The cost cap includes launch costs to deploy the initial base camp systems, but does not include the cost of the human expedition mission and its associated lander/ascent stages or the crew transportation systems
- The base camp must be ready to receive the first expedition crew no later than December 31, 2039

Deliverables

This project will require a multi-disciplinary team of students. Traditional aerospace engineering disciplines such as structures, propulsion, flight mechanics, orbital mechanics, thermal, electric power, attitude control, communications, sensors, environmental control, and system design optimization will be necessary. In addition, economics and schedule will play a major role in determining design viability. Teams will make significant design decisions regarding the configuration and characteristics of their preferred system. Choices

must be justified based both on technical and economic grounds with a view to the extensibility and heritage of any capability being developed.

The following is a list of information to be included in the final report. Students are free, however, to arrange the information in as clear and logical a way as they wish with the exception of a 5-page executive summary which must be place at the beginning of the report.

1) Requirements Definition – the report should include the mission and design requirements at the vehicle, system, and subsystem level. The requirements definition should demonstrate the team's understanding of the *RFP Design Requirements and Constraints* and lay the foundation for the design decisions that follow.
2) Concept of Operation – a detailed concept of mission operation should be included to describe all phases of the mission and to demonstrate the realization of the mission requirements in the *RFP Design Requirements and Constraints*. The report should show that the team has performed historical analysis of similar concepts to evaluate the merits and deficiencies of previous designs and demonstrate that alternative concepts were considered while providing justification for the chosen concept.
3) Trade Studies – the report should include the trade studies for the vehicle architecture, mission operations, and subsystem selections, and must discuss in detail how the system level requirement are developed from mission requirements by describing the pro and cons of each subsystem options. The report must discuss how each subsystem level decision is made, with description of the selection metrics and their associated weightings when appropriate and provide detailed discussions on how each decision impact system level metrics such as cost, schedule, and risk.
4) Design Integration and Operation – the report should discuss how the trades selected in section 3 are integrated into a complete architecture. This section should discuss design of all subsystems: structures, mechanisms, thermal, attitude control, telemetry, tracking, and command, electric power, propulsion, payload and sensors, and the mission concept of operations. Discussion on the extensibility of the overall system design and how it can support future exploration mission should be included. The report must clearly describe all the tools and methods utilized for the system and subsystem design and provide brief description of the inputs, outputs, and assumptions for the design. A discussion on the validation of the tools and methods must be included.
5) Cost Estimate – a top level cost estimate covering the life cycle for all cost elements should be included. A WBS should be prepared to capture each cost element including all flight hardware, ground systems, test facilities, and other requirements for the design. Estimates should cover design, development, manufacture, assembly, integration and test, launch operations and checkout, in-space operations, and final delivery. Use of existing/commercial off-the-shelf hardware is strongly encouraged. Advanced technology utilization must be fully costed with appropriate cost margin applied. A summary table should be prepared showing costs for all WBS elements distributed across the various project life cycle phases. The report should discuss the cost model employed and describe the cost modeling methods and associated assumptions in the cost model. The cost analysis should provide the appropriate cost margin based on industry standards.
6) Mission and operation summary – an integrated roll up of all the subsystems into a mass and power Work Breakdown Structure, showing mass and power budget, broken into subsystems, with description of the margin assigned to each system based on industry standards. A summary table should be prepared showing all mass, power, and other resource requirements for all flight elements/subsystems with the appropriate mass and power margins clearly labeled and discussed.

7) Schedule – A mission development and operation schedule should be included to demonstrate the mission meets the schedule deadline established in the RFP. Schedule margin should be applied to appropriate areas with funded schedule reserve detailed in the cost estimate. Any advanced technology assumption should have corresponding technology development schedules and costs associated with the technology and appropriate contingency plans should be discussed.

8) Summary and References. A concise, 5 page "Executive Summary" of the full report must be included and clearly marked as the summary at the beginning of the report. The executive summary should provide a clear sense of the project's motivation, process, and results. References should be included at the end. A compliance matrix, listing the page numbers in the report where each these section as well as the items identified under the *Design Requirements and Constraints* and *Deliverables* sections can be found, is mandatory.

Supporting Data

Technical questions can be directed to Patrick Chai (patrick.r.chai@nasa.gov) or studentprogram@aiaa.org