

# 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](http://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](mailto: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 TECHNICAL 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,<br>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](mailto:studentprogram@aiaa.org).
- For technical questions about the RFPs, please contact the point of contact listed in the RFP.

## Request for Proposal (RFP)

# Extended-Range Gun-Launched Guided Projectile

## Need

The military services of the United States and its allies have a need for extended range gun-launched guided projectiles. While unguided conventional projectiles are in current inventories, the progressive reliance on artillery in modern warfare requires allies to reach further than their adversaries. Additionally, the guided capability allows for fewer rounds to be expended to neutralize targets without the need for large bombardments of emplacements or formations.

## Objective

The objective of this project is to design a guided projectile with ranges beyond current unguided rounds. Participants shall provide engineering analysis and total system design associated with this system. Designs will make use of existing artillery gun systems and command structures. Teams are discouraged from modifying existing gun systems, but if modifications are required teams shall provide detailed engineering analysis and justification for modifications. The teams shall determine a system concept that best satisfies mission requirements and goals. The teams shall describe their design process, the physical and performance characteristics of the final system design and its components, an operational concept, cost estimate, development plan, and necessary support equipment and other resources necessary to comply with the Technical Requirements.

## Technical Requirements

The overall requirement of this Design Competition is to develop a guided extended-range gun-launched projectile. Emphasis should be on maximizing system performance using existing gun systems.

Top-level requirements for the system are described below:

- The projectile must be capable of being launched from existing gun systems:
  - Threshold: Projectile must be compatible with existing 155 mm gun systems. (Projectile diameter must be 155 mm and length must not exceed 1 m.)
  - Objective: Projectile can be compatible with Navy 5-inch gun systems (projectile diameter 5 inches and length does not exceed 26 inches) or other existing smaller-caliber gun systems while also being compatible with existing 155 mm gun systems when using a sabot.
  - Size constraints need not apply post-launch.

2026-2027 Open Division Missile Systems Design Competition –  
Extended-Range Gun-Launched Guided Projectile

- Projectiles should make use of existing propellant charges.
- Projectiles should be capable of meeting the following performance metrics:
  - Range (launch to impact):
    - Threshold: 50 nautical miles
    - Objective: 75+ nautical miles
- Detailed warhead design is not required, but warheads shall be sized such that only a single flight vehicle is needed to neutralize a single target. Targets include:
  - Threshold: unhardened, fixed surface targets, such as buildings, radar sites, missile launchers, and parked vehicles and aircraft.
  - Objective: unhardened, moving surface targets, such as trucks or small boats.
  - Objective: air targets such as drones (class 3+), fixed wing aircraft, rotary wing aircraft, and missiles.
- The projectile may optionally include any seeker(s) that the team may determine are required to meet mission requirements. Detailed design of the seeker(s) is not required, but appropriate high-level sizing shall be performed.
- The projectile design may optionally include command data links for in-flight updates.
- The projectile, including energetics and/or propellants, shall be compatible with safe storage, transportation, and handling requirements for at least 10 years without maintenance. The projectile should be design to be a “wooden round” that can be employed immediately after removal from storage without any field assembly, fueling, charging, or other maintenance activities.
- Assume a production run of 2000 projectiles per year for 10 years, plus 100 projectiles for developmental testing.

For the purpose of determining technology availability and program planning, design and development starts October 2027, and the system initial operational capability (IOC) shall occur no later than December 2032.

Teams are encouraged to describe alternate designs and cost sensitivities for enhanced capability beyond the minimum requirements as well as suitability for the projectile system to be adapted to other missions and/or launch platforms.

Designs shall adhere to standard engineering practices for health, safety, and environmental impact. Where appropriate, teams shall evaluate performance

improvements offered by design choices versus cost, hazards to personnel, manufacturability, and maintenance considerations.

Where not specified, requirements shall be derived by the project team based on reasonable, justified assumptions that should be documented in the submitted proposal.

In case of conflicting or unachievable requirements, teams shall identify which constraints or requirements proved infeasible, clearly explain the trade-offs involved, and provide a solution that attempts to satisfy as many requirements as closely as is feasible.

The AIAA Missile Systems Technical Committee (MSTC) may be contacted with critical questions the team needs resolved to proceed with the project (see the Additional Information section below).

### **Data Requirements**

The team shall provide a final technical proposal documenting the design of the extended-range gun-launched guided projectile system clearly and concisely. The proposal shall include pertinent analyses and trade studies supporting the design decisions. A full description of extended-range gun-launched guided projectile solution is expected, including its performance capabilities and operational limits. Further details of proposal contents are described below.

#### **Concept of Operation**

The team shall formulate and describe a complete concept of operation, including a notional mission timeline. Additionally, the concept for all support equipment required for operation of the extended-range gun-launched guided projectile system and the number and function of personnel to operate the system shall be described.

#### **Performance Assessments**

Description of the design's capability for the performance requirements shall be provided. Data products shall include, at a minimum:

- A time history of the projectile trajectory (flight performance parameters), including as a minimum: altitude, range, fuel/propellant flow rate, weight, net thrust, lift, drag, velocity, angle of attack, and Mach number.

#### **Systems Analysis**

The teams shall describe design and analysis techniques, the system design process, data sources (references), assumptions, and derived requirements. Data products shall include, at a minimum:

## 2026-2027 Open Division Missile Systems Design Competition – Extended-Range Gun-Launched Guided Projectile

- Scaled drawing of the projectile system, including dimensions and center of gravity location as well as an inboard profile drawing illustrating sufficient volume for all necessary components and systems.
- Aerodynamic characteristics, stability, propulsion characteristics, and weight statement of the recommended design.
- Details on the design of the guidance, navigation, and control systems.
- Structural design and analysis, materials selection, and manufacturing techniques.
- Analysis results quantifying the aerothermal environment and showing that the design can survive relevant environments.
- The physical and performance characteristics of the preferred concept shall be compared to all requirements.
- Documentation of key trade studies and decisions including the methods and rationale for how the final concept was selected and why it best satisfies the requirements described in this RFP.

### Cost Estimate

The total cost of the complete system, to include acquisition, maintenance, and operating cost, shall be estimated and documented. The estimate should include the cost of the projectile (tooling, materials, labor, overhead, other expenses and reasonable profit), support equipment unique to the design, supplies to maintain the system, and any other costs. Unique equipment that cannot readily be used for other purposes must be included in the system cost, but the cost of equipment commonly used for other purposes need not be included. The cost estimation methods should be described with an appropriate level of detail, and evidence should be provided supporting the accuracy of the cost estimation methodology.

### Development Plan

A sequenced development plan shall be described to highlight activities (such as design, test and evaluation) needed to be ready to produce the new components needed for the system. This plan should include details of required ground testing, and a list of the facilities that would be utilized.

### Deliverables

A written final design report conforming to the submission guidelines is due for judging as specified in the AIAA design competition rules. The Imperial system of units shall be used in documentation (feet, lbs., etc.). Metric units (in parenthesis) alongside Imperial unit values are acceptable. The use of generative Artificial Intelligence (AI) is prohibited.

### Analysis Tools

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:

- i.) Available for inspection, download, and/or sale to all individuals and entities regardless of nationality as allowed by US export laws; or
- ii.) Generated personally by the students on the team without the use of codes falling under restriction i 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. The use of generative AI is prohibited.

### **Competition Timeline**

The timeline for the competition will be that posted on the AIAA Design Competitions web site: <https://aiaa.org/get-involved/university-students/design-competitions/>. Based on past competitions this timeline will likely be as follows, with specific dates TBD:

- August 2026: Teams may begin working on their design.
- February 2027: Teams submit roster and proposal information via online submission site.
- May 2027: Teams submit proposal via online submission site.
- August 2027: AIAA announces winners.

Additionally, teams are requested to contact the AIAA MSTC point of contact Peter Cross via email to [peter.g.cross@gmail.com](mailto:peter.g.cross@gmail.com) giving notice of planned participation in the competition at their earliest convenience.

### **Additional Information**

All technical questions pertaining to this RFP should be directed to the AIAA MSTC point of contact Peter Cross via email at [peter.g.cross@gmail.com](mailto:peter.g.cross@gmail.com) or the MSTC design competition subcommittee at [aiaaMSTC@gmail.com](mailto:aiaaMSTC@gmail.com).

Any updates to the RFP, as well as questions and answers related to the competition and RFP will be posted on the AIAA Engage “Missile Systems: Public Forum” website: <https://engage.aiaa.org/space-and-missiles/communities/community-home?CommunityKey=e7efeb09-17d2-4a1f-80f4-7451de96b516>

Teams have the option of requesting mid-term and/or final design reviews with MSTC. Design reviews are completely optional and have no bearing on competition scoring.