



Technical Design Report (TDR) Maximum 180 points

Teams are required to submit a technical design report in English that describes the design of their LPV including novel creative methods for the AI guidance systems, propulsion system, and control systems, as well as strategies for their approach to the tasks. This paper should include the rationale for their design choices. Guidelines and scoring metrics for this report are below.

Paper Preparation Overview:

Each team is required to submit a TDR that describes the design of their vehicle, strategies for their approach to the competition, and rationale for design choices. Teams must follow the TDR instructions provided.

The TDR must be uploaded to the AIMM ICC Website via the provided weblink by Monday, April 8, 2024, at midnight to be eligible for full points, teams must submit their TDR by the deadline.

The outline of each section of the paper includes a scoring metrics table with guidance on scoring considerations that are provided to the judges during evaluations.

Format:

The format of the written paper shall adhere to the following guidelines:

- 6-page limit (excluding References and Appendices); Appendices cannot exceed 5 pages.
- 8.5 x 11 in. page size
- Margins \geq 0.8 in.
- Font: Times New Roman 12pt
- Header on every page including team name and page number
- Submitted in .pdf format

Formatting Scoring Metrics (Maximum Points: 10)

10 points	Paper follows page limit, and all formatting guidelines are followed. The document is professionally organized. All required sections are included and easy to identify. All grammar, punctuation, and spelling are correct. The style follows that expected of a scientific paper submitted for publication.
0 points	Formatting guidelines are not followed and the layout is unorganized.

Paper Contents:

The TDR consists of the following mandatory sections: abstract, technical content, Design Strategy, Testing Strategy, acknowledgements, references, appendices.

Abstract:

The abstract is a short summary of the main points in the paper. The abstract should summarize the linkage between overall competition strategy, design, and engineering decisions.

Abstract Scoring Metrics (Maximum Points: 20)

17-20 points	Abstract is engaging, lists the scope of the work, and provides a thorough summary of the paper.
13-16 points	Abstract provides an explanation on the scope of the work and provides an adequate summary of the paper.
9-12 points	Abstract provides an explanation on the scope of the work and provides a limited summary of the paper.
5-8 points	Abstract provides a basic summary of the paper.
1-4 points	Abstract section is included but does not serve the intent of an abstract. The abstract is treated as an introduction and provides no summary of the paper.
0 points	No abstract is included.

Technical Content:

The technical content of the paper outlines the goals determined for the competition, and strategy for the system design and the testing approach. This portion of the paper should not include detailed descriptions of components as it can distract from understanding the team’s underlying strategic thinking, design and engineering decisions, or novel contributions.

- **Competition Goals:**
The paper must include details on the team’s goals for the competition, including the plans for approaching the course and how the vehicle design relates to this approach. The course consists of multiple tasks with associated points for accomplished behaviors. The only required task is navigating through the start buoys. Teams may choose to attempt the other tasks and complete the tasks in any order. The more tasks a vehicle is designed and engineered to accomplish, the more complex the overall vehicle system will be.

Consider the trade-offs between system complexity and reliability. For example, teams have a limited number of working hours to prepare for the competition; this time could be spent adding additional capabilities or testing and improving the reliability of an existing capability. As system complexity grows, changes in subsystems can propagate in unmanageable ways when time is limited. Based on the system engineering talents of the team, include a description the team’s strategic vision.

Competition Goals Scoring Metrics (Maximum Points: 50)

41-50 points	Detailed description of the team’s strategic vision and how the vehicle design compliments their
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	goals. Detailed discussion on trade-off studies between system complexity and reliability during design development process.
31-40 points	The team's goals are clearly evident but not discussed in detail. Trade-off studies evident but lacking details.
21-30 points	Brief mention of team's strategic goals and/or trade-off studies.
11-20 points	Document hints at a goal for competition and/or trade-off studies.
1-10 points	Discussion of the team's vision is incoherent; rationale for competition goals is not discussed.
0 points	No mention of competition goals.

Design Strategy:

Given the strategy for success at the competition and the approach to managing complexity, the paper must include a description of the system design to meet the goals they established for the competition. Justification for design choices should be clear. Discuss how components and sub-systems were selected and integrated on the vehicle. Describe the experience in making both architectural/design decisions and system engineering decisions.,

This section should NOT include detailed component descriptions and/or specifications not of original design. The latter can be described in an appendix.

Design Strategy Scoring Metrics (Maximum Points: 40)

31-40 points	Provides in-depth explanations on design strategy and clearly identifies creative aspects of system. Creative design methodology is justified with required calculation steps and visual aids. Content clearly exhibits a Systems Engineering approach.
21-30 points	Provides explanations on design strategy and identifies creative aspects of system. Creative design methodology is justified with calculation steps and visual aids. Content hints at a Systems Engineering approach.
11-20 points	Provides some information on design strategy and creative aspects of system. Creative design methodology is supported with a few calculations. Content could be justified as a Systems Engineering approach.
1-10 points	Provides limited information on the creative aspects of system. Creative design methodology is hypothesized. No evidence to support application of Systems Engineering principles.
0 points	Creative aspects of design are not described.

Testing Strategy:

Testing and experimentation is a crucial step to preparing and innovating a system design that strongly correlates with a competitive performance in the arena. The paper must include the approach to a testing strategy, including various test plans, both in-water and in a lab setting. There is a strong correlation between in-water testing time and competitive performance in the arena.

Consider the time needed to thoroughly test to meet the determined goals. Additionally, consider the demands of design and engineering with those of testing and experimentation.

Testing Strategy Scoring Metrics (Maximum Points: 40)

31-40 points	Testing approach is presented in great detail, to include test strategy and plans. Component testing, sensor and control systems testing (bench tests and in-water) done in accordance with a test plan.
21-30 points	Testing approach is presented with sufficient detail, to include test strategy and plans. Documentation shows limited components, sensors, and control system testing (bench tests and in-water).
11-20 points	Testing approach is presented but not in detail. No mention of components or sensors testing.
1-10 points	Testing is done to a certain degree. No components and sensors are tested independently. There are no test plans.
0 points	No mention of testing or connection with the system design.

Acknowledgements:

Participating in the competition, as in all research projects, involves leveraging resources and support beyond the efforts of individual team members. This support can take many forms such as technical advice, labor, equipment, facilities, and monetary contributions. Acknowledging those who have supported efforts is important.

Acknowledgements Scoring Metrics (Maximum Points: 10)

9-10 points	Acknowledgements detail supporting personnel and their contributions as well as resources. Sponsors and their contributions are acknowledged.
7-8 points	Acknowledgements mention supporting personnel and their contributions as well as resources. Sponsors are mentioned.
5-6 points	Acknowledgements mention minimal supporting personnel and sponsors.
3-4 points	Acknowledgements indicate sponsors only.
1-2 points	Acknowledgements provide a general thank you but do not specify particular contributions.

0 points	No acknowledgements are included.
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References:

As with any technical publication, original ideas and content not generated by the paper's authors should be properly cited. The references should follow the IEEE Conference Proceedings citation style.

References Scoring Metrics (Maximum Points: 10)

9-10 points	All sources are thoroughly documented. The IEEE citation style is correctly utilized.
7-8 points	Some sources are noted and documented. The IEEE citation style is utilized.
5-6 points	Limited sources are documented and the IEEE citation style is utilized.
3-4 points	Minimal sources are documented and/or citations are not correctly listed.
1-2 points	Limited sources are documented but there is no adherence to the IEEE citation style.
0 points	No sources or citations are documented.

Appendices:

Appendices may be used to add clarification or details in addition to the TDR but may not exceed 5 pages. The Appendices do not directly have a weight bearing score but will be taken into account when accessing the total TDR for clarity and understanding.