



VERTICAL LANDING ROCKET COMPETITION SPECIFICATIONS DOCUMENT

VERSIONS

Version	Date	Description	Changes
1.0		2024 Initial Version	-
1.1		Update	<ul style="list-style-type: none">- Competition Schedule Item number has been changed- Updates have been made regarding the number of competitors- Updates have been made in the Ethics and Other Rules Section
1.2		Update	<ul style="list-style-type: none">- Competition Timeline Table updated



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1. DEFINITIONS

- **CONSULTATION AND EVALUATION BOARD:** Responsible for determining the competition rules, conducting technical checks at the competition site, and making decisions regarding competition results and awards. It is appointed by TÜBİTAK SAGE to plan, coordinate, and execute the TEKNOFEST Vertical Landing Rocket Competition.
- **RECOMMENDATION:** Statements that are not rules but are useful for safe flight, determined by the Competition Consultation and Evaluation Board.
- **THRUST SYSTEM:** Refers to the system that provides thrust to the rocket.
- **VERTICAL LANDING ROCKET:** A rocket capable of landing vertically on the target area by controlling thrust.
- **SOFT LANDING:** The vertical descent speed of the vertical landing rocket is in the range of 0-2 meters per second.
- **STATIC MARGIN:** The ratio of the distance between the rocket's center of pressure and center of gravity to the rocket's diameter.
- **TARGET AREA:** The area where the rocket will land.
- **COLD GAS THRUST SYSTEM:** A system that generates thrust using high-pressure gas without combustion. The cold gas thrust system can consist of a high-pressure tank, flow direction control, flow pressure control components, and sensors.
- **PRESSURE TANK:** The container used in the cold gas thrust system to store pressurized gas.
- **FILLING INTERFACE:** A pneumatic connection element that allows air filling into the pressure tank.
- **FLIGHT CONTROL SYSTEM:** It is a system consisting of electronic hardware and software that processes data collected from sensors on the rocket, manages it and sends control signals to actuators.
- **SUSPENSION SYSTEM:** This system includes an electrically driven hook attached to a drum, a secure separation connector, and a rope. It is the arrangement where the vertical landing rocket is suspended, and free fall is achieved using an automated winch.
- **SAFE SEPARATION CONNECTOR:** The connection point that activates the flight control system when the rocket is detached from the suspension system.
- **MAPA:** A metal fastening element placed on the Vertical Landing Rocket, allowing it to connect to the suspension system.
- **CONSULTANT:** An individual with expertise in cold gas propulsion systems who guides teams.

- **REUSABILITY:** The ability of the rocket or rocket modules to perform their tasks again after launch without requiring any modifications or interventions.

2. INTRODUCTION

TEKNOFEST, the Aviation, Space, and Technology Festival, has been organized annually since 2018 to create awareness in aviation, space, and technology fields, supporting young people interested in these areas, encouraging them to research future technologies, and familiarizing them with professional design processes.

The Vertical Landing Rocket competition was first organized as part of TEKNOFEST in 2022. This competition holds the distinction of being the world's first Vertical Landing Rocket Competition powered by a Cold Gas Thrust System.

In this competition, teams will establish a connection between their rockets and the crane system provided by the Advisory and Evaluation Board. After the rocket is released, they will aim for a controlled descent to the target area using the Cold Gas Thrust System.

The purpose of the competition is to provide participants with knowledge about Cold Gas Thrust Vertical Landing Rockets, which are part of our country's Technological Advancement Roadmap for the next 10 years, and to develop their ability to design collaboratively with team members from different disciplines.

While designing their projects, the participants in this competition will also work with a system engineering vision;

- Determining the general technical requirements related to the system to be designed,
- Detailing the general system requirements at the subsystem and component levels before proceeding to the detailed design stage,
- Creating the necessary work packages during the design and production stages,
- Coordinating and optimizing design information with relevant discipline teams (aerodynamics, avionics, structural integrity, and teams responsible for cold gas propulsion system),
- Executing the production, procurement, integration, and launch preparation processes for prototyping the design,
- Ensuring the verification and validity of the resulting prototype (by validating the designed system's intended mission through analysis, simulations, and testing),
- Completing all processes related to project management principles from the very beginning of the process (receiving the specifications) until the end (the rocket's landing).
- Applications for the Vertical Landing Rocket Competition will be made through the official website of TEKNOFEST Aviation, Space, and Technology Festival Technology Competitions (www.teknofest.org) until the application deadline specified in the competition calendar. All finalist teams who qualify for the competition will be awarded a Participation Certificate.

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3. REQUIREMENTS AND PROCESSES

3.1. GENERAL REQUIREMENTS

The Vertical Landing Rocket Competition is summarized by the visual representation in Figure 1.

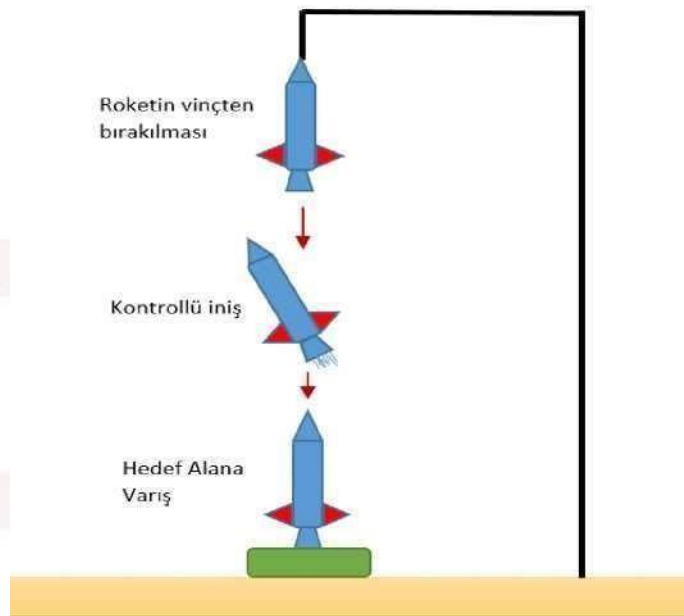


Figure 1 - Visual Explanation of Vertical Landing

3.1.1. It is expected that the participants design a rocket that meets the requirements specified in the Competition Specifications (including rocket flight control system design, landing gear design, nozzle design, valve and controller selections, etc.), manufacture the rocket, and successfully achieve Vertical Landing to the target area using the pressurized tube provided to the finalist teams by the Advisory and Evaluation Board.

3.1.2. The initial altitude of the rocket will be 9 meters. The rockets are expected to achieve a soft landing by maintaining an approach speed of 0-2 m/s (soft landing condition).

3.1.3. Thanks to a soft landing, all subsystems of the rocket must be recovered in a reusable manner after landing.

3.1.4. Students and/or graduates studying domestically or abroad in associate, undergraduate, and graduate programs are eligible to participate in the competition.

- 3.1.4.1.** Teams must include at least 1 student from Mechanical Engineering/Aerospace Engineering and at least 1 student from Electrical/Electronic Engineering (undergraduate and/or graduate).
- 3.1.4.2.** Teams may have a maximum of 1/4 ratio of graduates.
- 3.1.5.** Mixed teams formed from different educational institutions can participate in the competition.
- 3.1.6.** Participation to the competition is mandatory as a team.
- 3.1.7.** Teams must consist of at least four (4) and at most eight (8) members.
- 3.1.8.** A team member, who participates in the Vertical Landing Rocket Competition, cannot be a member of another team.
- 3.1.9.** Each team can participate in the competition with a minimum of 1 (one) and a maximum of 2 (two) advisors. Advisors must meet the following criteria:
- 3.1.9.1.** In teams, there must be at least 1 (one) and at most 2 (two) academic personnel with a minimum of a doctoral degree working in Engineering and/or Technology Faculties as Advisors.
- 3.1.9.2.** 2. The person who will be in the team as a consultant must be added to the team by selecting the 'Member' role in the CMS (KYS) system.
- 3.1.9.3.** As Advisors in teams, at most 1 (one) personnel who graduated from Engineering and/or Technology Faculties and have at least 10 (ten) years of professional experience in the relevant field can participate.
- 3.1.9.4.** An Advisor can provide consultancy to only one team participating in the Vertical Landing Rocket Competition.
- 3.1.9.5.** The academic personnel, who will serve as Advisors to the teams, must upload a document to the system along with the Preliminary Design Report (PDR) stating that they are employed as an instructor/academician at the relevant educational institution and have been assigned as an Advisor for the competition team by the institution.
- 3.1.9.6.** Graduate personnel who will serve as Advisors must upload their resume and most recent graduation diploma to the system along with the Preliminary Design Report (PDR).
- 3.1.9.7.** Academic personnel and Graduate personnel (if any) who will serve as Advisors must upload an electronically signed copy of the commitment document stating that they will fulfill their advisory duties along with the Preliminary Design Report (PDR). The wet-signed copy must be submitted to the Advisory and Evaluation Board in person or by an e-mail.

- 3.1.9.8.** In case of requesting a change of Advisor, a written application must be made to the Advisory and Evaluation Board, including the documents related to fulfilling the Advisor Criteria specified in this section, and approval must be obtained from the Advisory and Evaluation Board.
- 3.1.9.9.** All communication between teams and the Advisory and Evaluation Board will be conducted through the Academic Advisor, and any question/objection/request not conveyed by the academic advisor will not be accepted.
- 3.1.9.10.** If the team qualifies for a ranking and becomes eligible for an award, 10% of the awarded amount will be equally distributed to the Advisor(s) (the remaining 90% of the award will be equally paid to the team members).
- 3.1.10.** Accommodation and transportation for the teams and advisors who qualify for the trial launch will be covered by TUBITAK.
- 3.1.11.** Applications made after the deadline will not be evaluated.
- 3.1.12.** Participants will prepare necessary engineering calculations, reports, presentations, and other relevant documents by the standards determined by the Advisory and Evaluation Board.
- 3.1.13.** Teams will be requested to submit the **Preliminary Design Report (PDR), Critical Design Report (CDR), and Launch Preparation Report (LPR)** in sequence after the application deadline.
- 3.1.14.** Reports prepared by teams will be evaluated by the referees, and the teams deemed suitable for the next stage will be determined.
- 3.1.15.** The final submission dates for the reports are as specified in the competition schedule.
- 3.1.16.** In case of detecting ethical violations such as plagiarism or copying, the report will not be considered for evaluation.
- 3.1.17.** For each stage, teams will have the opportunity to appeal the evaluation results within 2 (two) days from the announcement date via the application system. Appeals will be evaluated by the Advisory and Evaluation Board, and the results will be communicated to the teams within 3 (three) days from the date of appeal. Second appeals will not be accepted.
- 3.1.18.** Participants will participate in the competition by reading and confirming all explanations and participation conditions regarding the competition before making an application (the application will be considered as an indication that the participant approves the rules).

- 3.1.19.** Cash prizes will be awarded to the first three teams that meet the award-winning criteria. The award-winning criteria and prize amounts are explained in the relevant section.
- 3.1.20.** It is the responsibility of the teams to transport the competition vehicles to the trial launch and the competition area.
- 3.1.21.** The Advisory and Evaluation Board has the authority to limit the number of members present at the competition area during trial launch and the Competition for any reason. In case of such limitation, the Advisory and Evaluation Board will provide the necessary information.
- 3.1.22.** Under any circumstances, TÜBİTAK SAGE and/or the Advisory and Evaluation Board are not responsible for any injury or damage arising from any component/subsystem/system/product that is designed/developed/produced/tested by the participants.
- 3.1.23.** TÜBİTAK SAGE and/or the Advisory and Evaluation Board are not responsible for any harm caused by the participants to third parties during the application and/or competition process.
- 3.1.24.** T3 Foundation and/or the Advisory and Evaluation Board are not responsible for ensuring that teams prepare and implement their systems by the laws of the Republic of Turkey.
- 3.1.25.** The Advisory and Evaluation Board reserves the right to make any changes to this specification and competition documents (Report Templates, Calendar, required documents for submission, etc.).
- 3.1.25.1.** The Competition Specifications and Competition Documents are available in the section related to the Vertical Landing Rocket Competition on the website www.teknofest.org.
- 3.1.25.2.** Updates/changes to the Competition Specifications and Competition Documents are tracked/maintained with a Revision Number.”
- 3.1.25.3.** During the Competition Process, it is the responsibility of the participants to follow any updates to the Competition Specifications related to the web address mentioned.
- 3.1.26.** Applications from teams that do not meet the conditions specified in this section will be considered invalid.

3.2. TECHNICAL AND DETAILED REQUIREMENTS

In this section, detailed technical requirements related to the Vertical Landing Rocket, which will be used as the Competition Vehicle, are defined.

3.2.1 Teams that qualify for trial launch by TÜBİTAK SAGE will be provided with a Cold Gas Thrust System in the form of a Pressure Cylinder (9 Liters). Details regarding the pressure cylinder will be provided before the Preliminary Design Report.

3.2.1.1 Teams that have participated in previous years and received the Pressure Cylinders must submit them to TÜBİTAK SAGE before the Critical Design Report to retest the Sealing/Safety.

3.2.1.2 Each team is entitled to receive only one Pressure Cylinder.

3.2.1.3 Teams must design their systems specifically for the pressure cylinder provided by TUBITAK SAGE. Designs based on other systems will not be accepted.

3.2.1.4 In inspections conducted during trial launch and/or before/during the Competition, new Pressure Cylinders will not be provided to teams with the damaged cylinders.

3.2.2 Teams can participate in the competition with a maximum of three identical Competition Vehicles.

3.2.2.1 Separate Pressure Cylinders will not be provided/used for each Competition Vehicle. Each team is entitled to receive only one Pressure Cylinder.

3.2.3 The use of flow control valves at the outlet of the pressure cylinder is not recommended. Flow control valves will only be used directly before the nozzles to control thrust.

3.2.4 The use of a flow distributor/manifold at the outlet of the pressure cylinder is expected.

3.2.5 Each team has the right to make up to three launches during the trial launches and the Competition insofar as circumstances permit during the time interval.

3.2.5.1 During the Trial Launches and the Competition, teams that have damaged the Cold Gas Thrust system (rendering the pressure tank unusable again) during the first and/or second launch will not have the right to a second and/or third launch.

3.2.5.2 During the Trial Launches and the Competition, priority will be given to teams making their first launch over teams making their second and/or third Launch.

3.2.5.3 During the Trial Launches and the Competition, priority will be given to teams making their second launch over teams making their third launch.

3.2.5.4 During the Trial Launches and the Competition, if teams apply to use their first, second, or third launch trials within the time intervals specified in the Daily Time Plan announced by the Advisory and Evaluation Board on the Trial Launch and/or Competition Day, the Competition Duration may be extended for them to carry out their launches on that day.

3.2.5.4.1 Trial Launches and the Competition will take place between 09:00 and 17:00.

3.2.5.4.2 If teams prepare their Competition Vehicles without conducting any design/integration/testing activities after 17:00 and enter the Shooting Order, they will be allowed to make their first, second, or third launches.

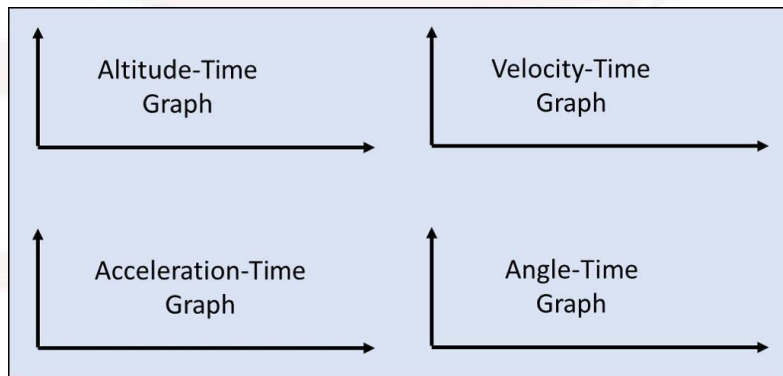
3.2.5.4.3 Each team will be allowed to make only one Launch after 17:00.

3.2.6 For vertical landing rockets to be considered successful, all of the following conditions must be met:

1. Soft landing conditions must be achieved.
2. Vertical landing must be performed to the target area.
3. Rocket integrity must be maintained.

3.2.7 After each Launch, participating teams must submit the shooting data and graphs shown in the table below to the Advisory and Evaluation Board in Excel format. Launches for which shooting data and relevant graphs are not submitted will not be **evaluated**.

(**** Team) Practice/Competition		Launch No:**	Date: **/**/2024	Time: **. **
Time (seconds)	Altitude (meters)	Descent Speed (meters/second)	Acceleration (meters/second^2)	Euler Angles (degrees)



3.2.8 Teams that qualify for Trial Launches will be provided with one Pressure Cylinder Filling Coupling by TÜBİTAK SAGE. This coupling will be mounted on the Competition Vehicles in a way that does not require any activity (disassembly/assembly, etc.) from outside, allowing easy access/filling and

connection to the corresponding coupling. Details regarding the coupling and corresponding coupling will be explained before the Preliminary Design Report.

- 3.2.9** Teams that qualify for Trial Launches will be provided with 1 (one) Safe Separation Connector by TÜBİTAK SAGE. The Competition Vehicle must have a connection interface for the safe separation connector. Details regarding the corresponding connector will be explained before the Preliminary Design Report.
- 3.2.10** Teams that qualify for Trial Launches will be provided with 1 (one) eye bolt by TÜBİTAK SAGE. The Competition Vehicle must have a connection interface for the hoisting ring. Details regarding the hoisting ring will be explained before the Preliminary Design Report.
- 3.2.11** To enable Emergency Gas Venting on the Competition Vehicles, an Emergency Venting Line/System must be available both manually and electronically via remote control on the Competition Vehicle.
- 3.2.12** On the day of the Trial Launches and the Competition, the rockets must be fully assembled, and ready for the leakage tests and gas filling at the competition area.
- 3.2.13** There are no restrictions on the rocket's structural design. Each team can participate in the competition with their original design. The rocket mass **must not exceed 40 kg**.
- 3.2.14** Rockets must be structurally robust to withstand vertical landing and potential impact loads. The cylinder head must be oriented opposite to the landing direction to ensure that pressure cylinders are safe against impact.
- 3.2.15** Only aluminum and composite bodies are allowed in the competition (the use of PVC or similar polymer materials, compressed paper/craft and stainless steel as the main rocket body is prohibited).
- 3.2.16** The rocket's chassis, connection points, or components must not build by PLA or resin materials that is printed on 3D printers.
- 3.2.17** To ensure rapid control of all systems, the Competition Vehicle must be designed and manufactured as a highly modular and quickly integrable system.
- 3.2.18** The flight control electronic hardware (avionics) can be either original or a commercial system.
- 3.2.19** All decision-making parameters should be based on data read from sensors for flight control and operation
- 3.2.20** Teams are expected to perform active control through their control drive systems.

3.2.21 The rocket propulsion system must be triggered in a way that it will not hit the crane/ceiling after free fall from the moment it separates from the crane.

3.2.22 During Trial Launches;

3.2.22.1 At any time during the competition, if any system connected to the rocket (including actuators and the Cold Gas Thrust System) becomes unintentionally active when the flight computer is running, the team will be allowed to rectify the error until the end of the day.

3.2.22.2 If any system connected to the rocket (including actuators and the Cold Gas Thrust System) becomes unintentionally active while the Competition Vehicle is attached to the crane and/or during attachment to the crane (before the start of free fall), the team will be allowed to rectify the error until the end of the day.

3.2.23 During the competition;

3.2.23.1 At any time during the competition, if any system connected to the rocket (including actuators and the Cold Gas Thrust System) becomes unintentionally active when the flight computer is running, the team will not be allowed to continue the competition (the previous team's score will be preserved).

3.2.23.2 If any system connected to the rocket (including actuators and the Cold Gas Thrust System) becomes unintentionally active while the Competition Vehicle is attached to the crane and/or during attachment to the crane (before the start of free fall), the team will not be allowed to continue with the launches (the previous team's score will be preserved).

3.2.24 Li-Po or different types of batteries can be used in the system. However, teams using Li-Po batteries must use a 'Li-Po Safe Bag' and ensure the safe installation of the batteries in the system.

3.2.25 Teams are responsible for the safety of the batteries used.

3.2.26 In the Competition Vehicles, there will be a mechanical on/off switch between any power source (battery, supercapacitor, etc.) and the first electronic circuits they supply power to. When the mechanical switch is turned off, the power supply element will not be connected to any system component (including LED indicators, power converters, regulators, etc.).

3.3. GENERAL SAFETY REQUIREMENTS

3.3.1 Competing teams will receive training on the operation rules and occupational safety measures related to the Cold Gas Thrust System (including working with pressure cylinders). Teams that do not attend the training will not be allowed to continue in the competition.

3.3.2 Competing teams will receive safety training before Trial Launches and the Competition, and attendance at the training and orientation program will be mandatory. Teams that do not participate in the training and orientation will not be allowed to continue in the competition.

3.3.3 Rockets must not use any propulsion technology other than the cold gas thrust system.

3.3.4 Materials, hardware, and processes used in design and manufacturing must not harm human health and the environment.

3.3.5 The design should be simple and robust (resilient to noise effects and uncertainties) to minimize human error.

3.3.6 Planning and risk reduction efforts must be carried out for the design, manufacturing, and testing processes, and these efforts must be documented in the relevant design reports.

3.3.7 During the development of the rocket and fieldwork, elements that could jeopardize system/launch area safety must be identified, and necessary precautions must be thoroughly planned and executed.

3.4 THE TRIAL LAUNCH AND COMPETITION PROCESS

3.4.1 Teams that pass the Launch Preparation Report stage will be eligible to participate in Trial Launches.

3.4.2 Teams that are successful in the Trial Launches will be eligible to participate in the Competition.

3.4.3 Trial Launches and the Competition will take place at the TÜBİTAK SAGE Campus between 09:00 and 17:00.

3.4.4 The Trial Launches and Competition Schedule are part of the General Competition Schedule.

3.4.5 During the Trial Launches and the Competition, participants will not be allowed to leave the Competition Area without the approval of the Advisory and Evaluation Board.

3.4.6 The rules to be followed during Trial Launches and the Competition will be communicated to the teams during the Orientation Program held before the Trial Launches and the Competition.

- 3.4.7** During Trial Launches and the Competition, teams must follow the guidance and instructions provided by the Advisory and Evaluation Board and the referees appointed by TÜBİTAK SAGE.

4 COMPETITION STAGES AND CRITERIA

4.1 PRELIMINARY DESIGN STAGE

- 4.1.1** Teams will prepare a Project Plan, Project Budget, Control List, and Personnel List (including Team Captain and Team Advisor) and present this information in the Preliminary Design Report.
- 4.1.2** (Intentionally Left Blank)
- 4.1.3** Competing Teams will upload documents related to the requirements for consultants specified in Section 3.1.10 along with the Preliminary Design Reports.
- 4.1.4** Teams must demonstrate in the Preliminary Design Report that their rocket designs meet the technical requirements.
- 4.1.5** To prove compliance with the technical requirements, a Compliance Matrix will be created and presented in the appendices of the relevant design reports.
- 4.1.6** The architectural components of the design, including interfaces, must be defined.
- 4.1.7** In the Preliminary Design Report, teams must have completed the CAD design of the rocket they plan to manufacture and describe their systems in detail based on this design.
- 4.1.8** Using design programs, aerodynamic definitions (design, center of pressure, aerodynamic coefficients) and center of gravity must be determined. At this stage, a detailed mass budget for all subsystems is expected.
- 4.1.9** The criteria for material selection and the compatibility of these choices with the system should be included in the report.
- 4.1.10** Teams are obliged to submit the Preliminary Design Report on the date specified in the competition schedule.

4.1.11 Supporting materials such as the design program outputs, CAD design files, etc. should also be submitted along with the report.

4.1.12 A “Basic Level” block diagram showing the structure of the avionics system should be prepared in the Preliminary Design Report. This block diagram should show the connections between all electronic cards in the system, including sensor and actuators.

4.1.13 In the Preliminary Design Stage, guidance, autopilot, and navigation algorithms should be explained at a fundamental level using block diagrams. All system block diagrams should describe input-output relationships and their interconnections.

4.1.14 Teams can access the Preliminary Design Stage template (PDR) through the website.

4.1.15 Teams are expected to present all requested information in the Preliminary Design Stage completely and in the relevant sections. Information not presented in the correct sections will not be considered for evaluation.

4.1.16 The information, analyses, and evaluations requested by the Consultation and Evaluation Board for presentation in the Preliminary Design Report (PDR) should be provided in a grammatically correct, easily understandable, and coherent manner.

4.1.17 Teams that successfully complete the preliminary design will proceed to the critical design stage.

4.1.18 The Consultation and Evaluation Board may request additional information/documents beyond the specified information mentioned above.

4.2 CRITICAL DESIGN STAGE

4.2.1 In the Critical Design Stage, critical design reports should provide detailed information on the design specifics, structural analyses, computational fluid dynamics (CFD) analyses, flow control analyses, and other numerical calculations. For example, in CFD analyses, details of the solution grid, boundary conditions, convergence criteria, fluid properties, obtained results, and interpretations should be shared.

- 4.2.2** Teams should demonstrate, through necessary analyses and test results, that their designs are ready for final manufacturing, integration, and testing in the critical design report (CDR).
- 4.2.3** Teams must complete the detailed design of the rocket using a 6-Degree-of-Freedom simulation model they will develop.
- 4.2.4** Simulation processes should be iterative, and the stages the rocket design goes through should be explained in the CDR with cause-and-effect relationships.
- 4.2.5** Detailed Computer-Aided Designs (CAD), including integration videos from the CAD program used, are need to be prepared. Every detail mentioned or not mentioned in the report should be visible in the CAD design.
- 4.2.6** System integration should be explained in detail and supported by CAD visuals.
- 4.2.7** The manufacturing details of components such as the body, landing gear, cold gas propulsion system, avionics, etc., should be provided in detail (including where they will be manufactured, manufacturing methods, and materials used).
- 4.2.8** Comprehensive time, manufacturing, and test plans should be thoroughly prepared or updated.
- 4.2.9** Proof of the design's producibility and analysis/test results should be presented to the Consultation and Evaluation Board.
- 4.2.10** CAD drawing files that support the report should also be delivered along with the report.
- 4.2.11** Information, analyses, and evaluations requested by the Consultation and Evaluation Board in the CDR, should be provided in a grammatically correct, relevant, easily understandable, and followable manner within the relevant sections.
- 4.2.12** Teams are expected to perform trade-off analyses for the systems they plan to use, list the essential and optional criteria for decision-making, and present the reasons behind the choices in the CDR
- 4.2.13** Results of Failure Modes and Effects Analysis (FMEA) will be presented in the CDR (Template documents will be shared with teams after the Preliminary Design Phase).

4.2.14 Additional requirements are listed below;

- Teams must deliver a data set for each subsystem, including design reports and technical drawings.
- Teams must provide assembly technical drawings that demonstrate the integration of components (body, landing gear, cold gas propulsion system, avionics, etc.). These drawings should include part numbering and material lists.
- Technical drawings should adhere to technical drawing rules and clearly show materials used and integration strategies.
- Teams should prepare assembly instructions.
- Design reports for subsystems should provide detailed information, including stress, thermal, and flow analyses (e.g., for flow analysis, details of the solution grid, boundary conditions, convergence details, fluid properties, and interpretation of results).
- The Consultation and Evaluation Board may request additional information or documents beyond what is mentioned above.

4.3 LAUNCH PREPARATION REPORT

4.3.1 In the Launch Preparation Report (LPR), teams should present all the preliminary analyses, simulations, and test results related to the successful launch of the rockets they have designed and manufactured.

4.3.2 Each team preparing the LPR is expected to present their reports online at a date and time that will be specified later. During the online presentation, the team captain and at least 2 contestants should attend to the meeting.

4.3.3 The LPR should include a list of the team's responsibilities in the launch area, along with safety precautions to be followed, and details about checks to be performed in the integration and crane system.

4.3.4 The control checklist should specify in detail which contestant will perform the Electronic System Check, Rope Connection Check, and Mechanical System Check.

4.3.5 Completion of the system design and manufacturing is expected.

4.3.6 Success Criteria:

- The portion of the cold gas propulsion system, excluding the part to be tested with the Pressurized Tube, should be in working condition.
- Rocket integrity must be maintained, avoiding any shape deformities or disconnections.
- The guidance, navigation, control, and avionics systems should be operational.

The evaluation of success criteria will be based on test results, recorded data during the testing process, and video recordings.

4.3.7 Teams must participate in the competition with the Competition Vehicle they present at the end of the LPR.

- After the PLR, any updates made to the Competition Vehicles will be documented and submitted to the Consultation and Evaluation Board before the Trial Launches to obtain an official approval.

5 EVALUATION CRITERIA IN THE COMPETITION

5.1 GENERAL SCORING

At the end of the competition, evaluation will be conducted out of 100 points, and the distribution of points is as follows:

• STAGE 1- PRE-COMPETITION EVALUTION (IMPACT FACTOR:0.4)		100
Preliminary Design Report (PDR)		%30
Critical Design Report (CDR)		%40
Launch Preparation Report (LPR) and Presentation		%30

• STAGE 2- COMPETITION STAGE (IMPACT FACTOR:0.6)		100
Performance in the Launch Trials and Suitability Assessment for the Competition		%30
Competition Performance		%70

5.2 REPORTING

During the competition evaluation process, teams will be required to submit reports explaining the status of their designs. The following reports are listed:

- Preliminary Design Report (PDR)
- Critical Design Report (CDR)
- Launch Preparation Report (LPR)

5.3 EVALUATION OF THE TRIAL LAUNCHES AND COMPETITION PERFORMANCE

For vertical landing rockets to be considered successful, the following conditions must be met using the Cold Gas Thrust System:

- Soft landing requirements must be fulfilled.
- The rocket must achieve a vertical descent to the target area.
- The integrity of the rocket must be maintained.

Teams that accomplish this task in their initial attempts will receive a **FULL SCORE** in the relevant evaluation. For each additional trial, there will be a 30% deduction.

During the assessment of competition performance, the following elements, provided as examples, will be considered:

- **Altitude Score:** Relates to the height at which the rocket is released.
- **Descent Velocity Score:** Pertains to the rocket's approach speed toward the target area.
- **Mass:** Concerns the mass of the lightest rocket that can be controlled without compromising structural integrity.
- **Structural Integrity:** Relates to the rocket's ability to descend to the target area without breaking apart, considering design and material choices.

5.4 SITUATIONS LEADING TO DISQUALIFICATION FROM THE COMPETITION

The technical and administrative criteria that the participating teams must adhere to during the competition are outlined in this document. This section summarizes the situations that will directly result in the disqualification of teams from the competition.

- 5.4.1** Teams must consist of a minimum of four (4) and a maximum of ten (10) members. If the number of contestants in a team is less than 4 or exceeds 10, the team will be disqualified.
- 5.4.2** The maximum number of contestants allowed to participate in Trial Launches and the Competition will be announced by the Consultation and Evaluation Board before the relevant stage. If more contestants than the specified limit attend the Trial Launches or the Competition, the team will be disqualified.
- 5.4.3** In case of requesting an advisor change, teams must submit a written application to the Consultation and Evaluation Board. The application should include documents demonstrating compliance with the Advisor Criteria mentioned in this section. Teams making advisor changes without obtaining approval from the board will be disqualified.
- 5.4.4** Team members who leave the competition area without permission during Trial Launches or the Competition will be disqualified.

- 5.4.5** Team members who do not participate in the administrative orientation sessions during the competition will be disqualified.
- 5.4.6** If ethical violations such as plagiarism or copying are detected, the participating teams will be disqualified. Additionally, the Team Advisor and all team members will be prohibited from participating in any activities or events within the Turkey Technology Team Foundation for a minimum of two (2) years. In such cases, any Pressure Vessels and other equipment (if provided) will be retrieved from the teams.
- 5.4.7** Teams that have participated in previous years and have been provided with Pressure Vessels must submit these Pressure Vessels to TÜBİTAK SAGE before the Critical Design Report to retest their Sealing/Security. Teams failing to make this delivery will be disqualified.
- 5.4.8** Any updates made to the Competition Vehicles after the Preparation for Launch Preparation Report (LPR) and/or Trial Launches must be documented and submitted to the Consultation and Evaluation Board for written approval. Teams arriving at the Trial Launches and/or the Competition without obtaining written approval will be disqualified.
- 5.4.9** Teams not following the directions and instructions of the referees during Trial Launches or the Competition will be disqualified.
- 5.4.10** Team members disrupting the peace and safety of the competition during Trial Launches, or the Competition will be disqualified. If the number of remaining Team Members falls below four (4) after disqualification, the entire team will be disqualified.
- 5.4.11** Teams knowingly providing incomplete or incorrect information to the Consultation and Evaluation Board and/or making updates to their vehicles without reporting them and obtaining approval before Trial Launches and/or the Competition (e.g., discrepancies in reported mass of the Competition Vehicle, differences in the propulsion system from the declared control system, etc.) will be disqualified.
- 5.4.12** Teams engaging in behavior that poses a safety risk during the launch will be disqualified from the competition.

6 AWARDS

6.4 PRIZES TO BE AWARDED

The awards stated in the table below show the total amount to be given to the teams that are entitled to receive awards; individual awards will not be made. First, second and third place awards will be divided equally according to the total number of team members (excluding the consultant) and deposited into the bank account specified by each person. Team consultants who are eligible to receive awards cannot benefit from the first, second and third place award amounts below. The awards to be given to consultants are also stated in the table below.

AWARD	1st Place Prize	2nd Place Prize	3rd Place Prize
TEAM	150.000 TL	120.000 TL	100.000 TL
ADVISOR	9.000 TL	7.500 TL	6.000 TL

7 ETHICS AND OTHER RULES

7.4 ETHICAL RULES

7.4.1 If any action, behavior, or statement that violates societal ethics is observed within the competition area or during the competition period (including report stages, evaluation processes, etc.), the individual(s) responsible for such actions will be disqualified from the competition. Legal proceedings will be promptly initiated, and their participation in any activities or events within the Turkey Technology Team Foundation will be prohibited for a minimum of two (2) years.

7.4.2 The following considerations apply to the language and tone used in all communication with the Consultation and Evaluation Board:

- Avoid rude language and behavior.
- Refrain from insults, threats, and offensive language.
- Do not directly or indirectly target competition officials or team members using social media platforms such as Facebook, X, Skype, Messenger, WhatsApp, YouTube, etc., and avoid any offensive remarks.
- Pay attention to proper writing rules and etiquette when submitting petitions and appeals.
- All communication related to the competition should be conducted through the T3 Foundation channels, and direct or indirect communication with the Consultation and Evaluation Board should be avoided.

7.4.3 Participants must avoid any actions, behaviors, or statements that could affect the operations and motivation of other teams within the competition area or during the competition period (including report stages, evaluation processes, etc.).

7.4.4 During launches, participants must not verbally or physically interfere with members of the Consultation and Evaluation Board, TÜBİTAK, TEKNOFEST officials, or auxiliary personnel. Failure to comply may result in the disqualification of the entire team.

7.4.5 Participants should behave considerately in accommodation areas, considering societal peace. Legal proceedings will be initiated against individuals displaying inappropriate behavior.

7.4.6 Teams are responsible for ensuring that equipment and materials used in the design and manufacturing process are adequately backed up or stored, considering all possible contingencies. Borrowing items from other teams is prohibited.

7.4.7 Participants must exhibit behavior that does not discriminate based on language, religion, philosophical beliefs, political thoughts, race, age, or gender. They should act impartially and according to the requirements of the competition.

7.4.8 Companies, institutions, or organizations contributing to the competition must ensure that the goods and resources they provide are used solely for the purposes and service requirements of the competition. Waste and extravagance should be avoided when using buildings, vehicles, and other public properties/resources during the competition. Efficient and prudent use of public goods, resources, labor, and facilities is essential.

7.4.9 Supporting efforts to streamline competition operations, meet needs effectively, enhance service quality, and increase overall satisfaction with the competition is crucial.

7.4.10 Officials within the competition area must avoid behavior that negatively affects or appears to influence their impartial and objective execution of duties. They should refrain from seeking personal benefits for themselves, their relatives, friends, or any related individuals or organizations. Legal proceedings will be initiated against those who behave otherwise.

7.4.11 Team members should be accountable for their responsibilities and obligations while performing their duties. Transparency and openness in corporate evaluation and audit processes are essential. Managers must take timely measures to prevent actions or behaviors inconsistent with their organization's purpose and policies, including addressing corruption. Proper training on ethical behavior principles should be provided to personnel, and adherence to these principles should be monitored and guided.

7.4.12 Team members should refrain from making binding statements, commitments, promises, or attempts beyond their authority while performing their duties. They should avoid providing deceptive or false statements.

7.5 OTHER RULES

7.5.1 Each team has the right to appeal through their Advisor. Appeals must be in writing and include the signatures of both the team captain and the team advisor.

7.5.2 Appeals must be submitted within 2 (two) days after the announcement of competition results. Otherwise, appeals will not be considered.

7.5.3 Appeals will be reviewed by the referee committee and resolved within 72 (seventy-two) hours.

7.5.4 After the announcement of evaluation results, authorized representatives from each team must submit their appeals and reasons in writing. Appeals are accepted via the website www.t3kys.com.

7.5.5 Teams must not publish their appeals via social media under any circumstances. Violation of this rule will result in disqualification from the competition.

7.5.6 While the competition topic is the result of the efforts of team members, it reflects the team's collective work. The team advisor will not be considered the sole owner of the work.

7.5.7 Teams that have utilized past year reports available on our website must indicate the source of their quotes. The acknowledgment should follow the quoted sentence.

QUOTATION FORMAT: *"Quoted Sentence(s)" (Year, Competition Name, Team Name)*

EXAMPLE QUOTATION: *"Failing to determine the location of earthquake victims in the debris is the most significant problem that slows down debris removal and search operations." (2020, Technology Competition for Humanity, Disaster Management, Team X)*

7.5.8 The Consultation and Evaluation Board reserves the right to cancel the competition if there are insufficient applications with the necessary technical knowledge and skills to participate.

7.5.9 Applications must be submitted online via the www.t3kys.com application system by February 28, 2024.

7.5.10 During the application period, the team captain registers through the system, correctly and completely enters the records of the advisor and team members and sends invitations to their emails if applicable. The invited member accepts the invitation by logging into the Application system under "My Team Information," and completing the registration. Otherwise, the registration will not be completed.

7.5.11 All processes related to the competition (Report Submission, Report Results, Appeal Processes, etc.) are conducted through the KYS portal. Teams must follow their processes via the KYS portal.

7.5.12 In relation to the competition, the competitor accepts and undertakes to participate in any kind of written or visual publicity, publications, social media and internet publications that may be made by T3 Foundation and/or TEKNOFEST before or after the competition. In addition, the contestant accepts and undertakes to make the relevant work available to the public within the framework of T3 Foundation's open source policy.

7.5.13 The competitor may apply for registration or protection before the Turkish Patent and Trademark Office or WIPO (World Intellectual Property Organization) within the framework of the Industrial Property Law No. 6769 and other legal legislation regulating Intellectual Property Rights.

7.5.14 If participants infringe the intellectual and industrial property rights of any product, they will be liable for any damages caused to the TEKNOFEST Vertical Landing Rocket Competition by the relevant team (including the advisor).

8 QUESTIONS ABOUT THE COMPETITION

Teams can ask questions about the competition through the Google Groups platform specified on the competition page at www.teknofest.org. Answers to these questions will be provided openly to all teams.

9 COMPETITION TIMELINE

The competition schedule for the 2024 TEKNOFEST Vertical Landing Rocket Competition is outlined below:

DATE	DESCRIPTION
29 February 2024	Final Application Deadline
18 March 2024 22.00	Preliminary Design Report Submissions
25 March 2024	Announcement of Preliminary Design Report Results
22 April 2024 17.00	Critical Design Report Submissions
29 April 2024	Announcement of Critical Design Report Results • Announcement of Teams Eligible for Material Support
22 July 2024 17.00	Delivery of Launch Preparation Report, • Completion of Prototype Manufacturing • Completion of Analysis • Completion of the Tests
29 July 2024	Announcement of Launch Preparation Report Results • Announcement of Teams Eligible for Trial Launches
August 2024	Trial Launches and Evaluation of Flight Readiness for Competition Vehicles
August 2024	Announcement of Teams Eligible for Participation in the Competition
To Be Determined	Competition Date / Location: ANKARA
To Be Determined	TEKNOFEST / Location:

