PAYLOAD DESIGN IDEATHON

RULE BOOK - 2025

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Payload Circuital Guidelines

Introduction

This document outlines the official circuital, mechanical, and operational guidelines for all participating in the competition. Adherence to these specifications is mandatory to ensure flight safety, system compatibility, and successful integration with the launch vehicle.

Telemetry and Communication

1. Frequency Band Restriction:
    a. Do not use the 868 MHz band for telemetry. This frequency is reserved for internal vehicle communication and interference is strictly prohibited.
    b. Allowed bands include 433 MHz or 2.4 GHz ISM bands, but teams must get preapproval.
2. Telemetry Configuration:
    a. Telemetry channel must be configurable.
    b. Transmission must be duty-cycled (no high-power continuous TX)
    c. Maximum TX power: +14 dBm (25 mW) unless pre-approved
    d. Teams must share:
        i. Frequency
        ii. Protocol
        iii. Power level
        iv. Antenna gain/directionality
    e. Teams should provide a configuration interface and documentation for changing telemetry frequency and data rate.
3. Redundant Data Logging:
    a. A local copy of all telemetry data must be stored onboard the Payload (e.g., on an SD card or internal flash).
    b. Data should be time-stamped, preferably synced to GPS time if available.

Power System

1. Battery Requirements:
    a. No LiPo batteries allowed under any circumstances.
    b. Use Li-ion batteries or other approved alternatives with integrated protection circuits that support:
        i. Overvoltage protection
        ii. Overcurrent protection
        iii. Thermal cutoff
    c. Battery packs must be rated for operation up to at least 60°C.

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i. The Payload's power system must support a minimum standby time of 90 Minutes, including:

1. Pre-launch wait time
2. Flight duration
3. Post-recovery data access window

d. Teams must validate this with a power budget or runtime test log

2. Battery Accessibility for Charging:
   a. The Payload's battery must be accessible for recharging without disassembling the Payload, even after full internal integration is complete.
   b. This may be achieved via:
      i. An external charging port, or
      ii. A removable battery module
   c. The charging interface should be clearly labelled, polarity-protected, and not interfere with any flight-critical system.

3. External Power Switch:
   a. A 30 cm long, shielded 2-core cable must extend from the Payload to connect to an external low-side switch (provided by the organizers).
   b. The ends of this cable must be left unterminated so that organizers can attach a 2pin GX16 connector during integration
   c. The cable must be shielded to reduce EMI and maintain power integrity.

Software and Fail-Safes

1. Startup Behaviour:
   a. On power-up, the system should automatically begin logging and telemetry transmission within 10 seconds.
2. Failsafe Protocol:
   a. Payload should be able to safely shutdown or enter standby on command from the ground if necessary.
   b. Include a watchdog timer or brownout reset to prevent lockup.

Submission and Testing

1. Testing and Handoff

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a. All systems must be tested and demonstrated to organizers 48 hours prior to the launch.
b. Teams must provide:
    i. Power consumption profile
    ii. Radio configuration iii. Pinout of external connector

2. Any Payload that risks interfering with main avionics will not be allowed on the rocket.

Structure Requirements

1. All electronics shall be enclosed and shielded from the environment. No electronics can be exposed except for sensors. There must be a structural enclosure.

2. Payload structure shall be built to survive 15 Gs of launch acceleration & 30 Gs of shock.

3. Electronic circuit boards must be hard mounted using proper mounts such as standoffs and screws. High-performance adhesives can also be used.
4. A 1kg/2kg/3kg payload flying aboard a 10 km suborbital mission
5. An audio beacon shall be installed on Payload as a recovery assist. It may be powered after landing or operate continuously.
6. Payload specifications: Payload outer diameter: 250mm
   Bulkhead outer diameter: 300mm

   Weight : 1kg/2kg/3kg +100g
   1kg/2kg/3kg – 300g
   Clamp dimensions:
   Bolts Specifications:
   - Bulkhead to clamp: M6 * 1.0 x 20 - 4N + 4N (upper & lower)
   - Clamp to payload: M6 * 1.0 x 10 - 8N
   - Bulkhead to main body: M6 * 1.0 x 40 - 8N

   Payload assembly contains Payload, Upper Bulkhead, Lower Bulkhead and Clamps. Payload will be attached to both the bulkheads in sandwich configuration, using 4 clamps to each. The payload should have 8 female M6*1 - 10mm threads to mount the clamps at the respective positions in the figures. Female threads should not be 3D printed, but inserting the nuts in the 3D printed structure is allowed as long as the 10mm thread length criteria is fulfilled. High performance adhesives to attach the nut is

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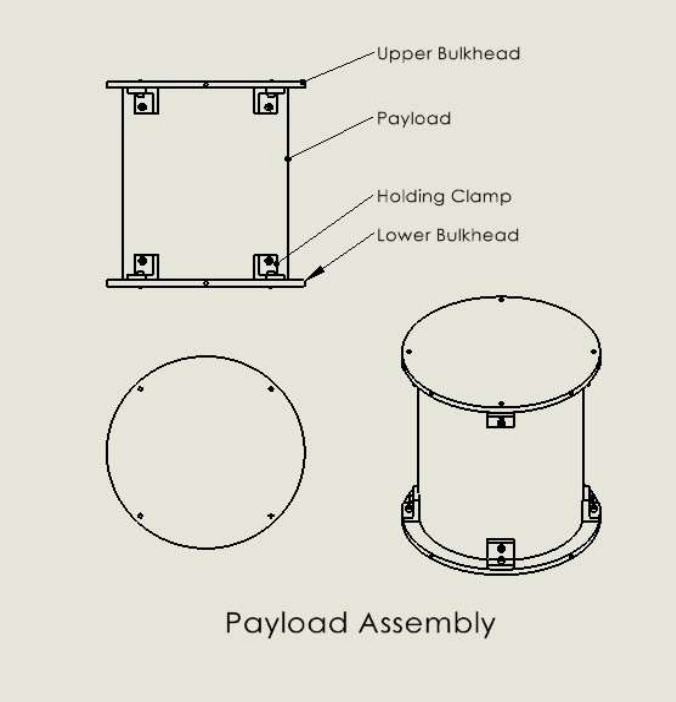

Figure 1

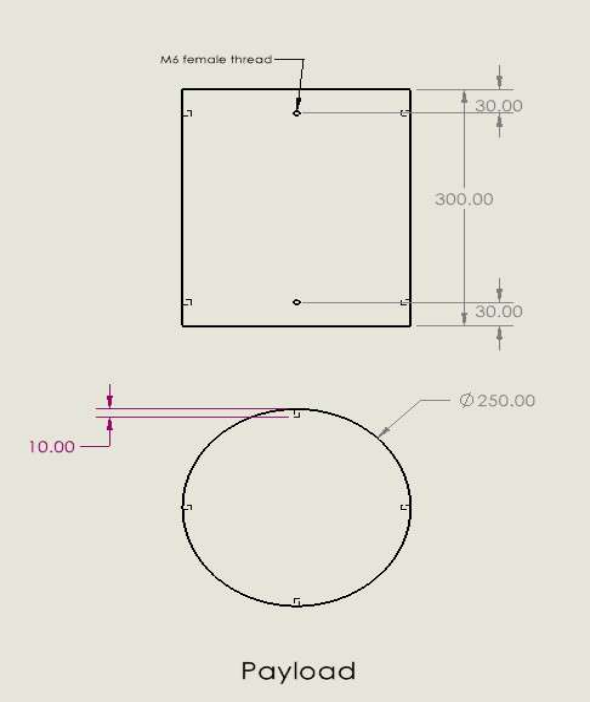

Figure 2

Mechanical subsystem

The mechanical subsystem should Include all major structural components, container mechanical configurations, electronic mounting, housing, material selection and interface definitions, thermal management etc.

The Key constraints in mechanical designs of Payload hardware and component selection should be mentioned in detail. Any major trade-off should be mentioned separately.

A detailed explanation of the Payload hardware shall be provided including the following points:

- Design & Simulations
- Methodology
- Placement of the various subsystems in the container

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The team should clearly mention the Mass of payload, container, sensors other than payload, and any other component used.

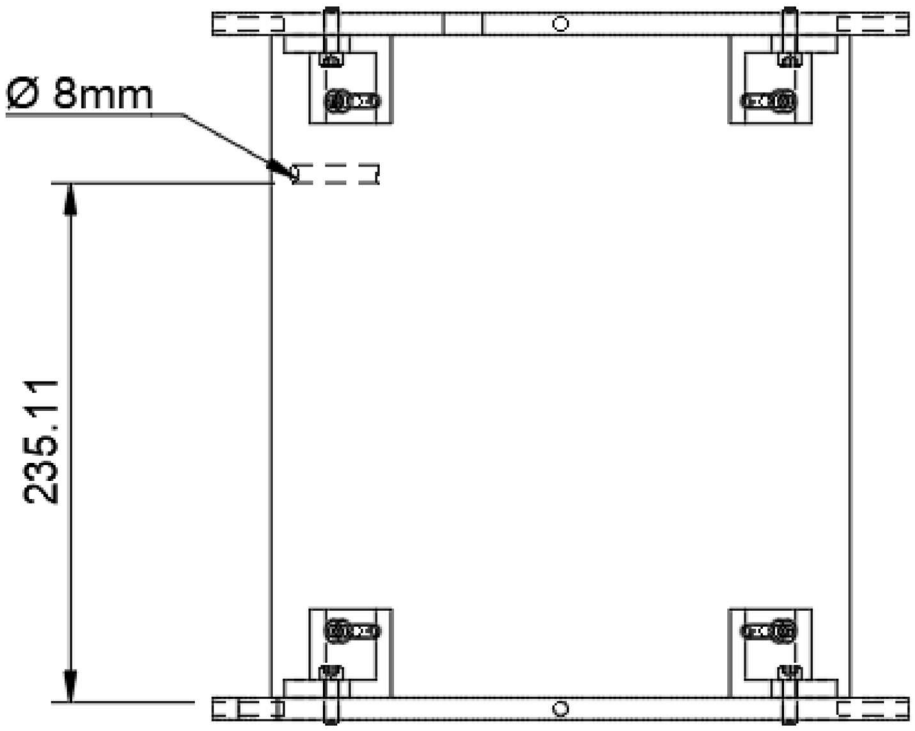

Figure 3

Additionally

An 8 mm diameter hole should be provided for the connector wire exit.

Conclusion

All teams are expected to carefully review and strictly adhere to the guidelines specified in this document across telemetry, power systems, software behaviour, structural integrity, and mechanical

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integration. These requirements are designed to ensure the safety of the launch operation, compatibility with the vehicle architecture, and reliability of each Payload during all mission phases—from pre-launch through recovery.
Before final handoff, each team must validate and document their system's compliance through rigorous testing and provide the necessary technical information to the organizers. Any deviation from these specifications must receive prior written approval.

This document should serve as a definitive reference throughout your Payload development process. By following these standards, teams will not only ensure successful mission participation but also contribute to the professional and safe execution of the overall launch campaign.