

Critical Design Review

Vehicle and Payload Experiment

Criteria

The CDR demonstrates that the maturity of the program's design is appropriate to support proceeding full-scale fabrication, assembly, integration, and test and that the technical effort is on track to complete the flight and ground system development and mission operations in order to meet overall performance requirements within the identified cost and schedule constraints. Progress against management plans, budget, and schedule, as well as risk assessment, are presented. (NPR 7120.5D p.30)

The panel will be expecting a professional and polished report. Please use Arial, size 12 font for your CDR Report. It is advised to follow the order of sections as they appear below.

Critical Design Review Report

I) Summary of CDR report (1 page maximum)

Team Summary

School name

Location

Teachers/Mentors

Launch Vehicle Summary

Size

Motor choice

Recovery system

Rail size

Payload Summary

Summarize experiment

II) Changes made since PDR

Highlight all changes made since PDR and the reason for those changes.

Changes made to Vehicle Criteria

Changes made to Payload Criteria

Changes made to Activity Plan

III) Vehicle Criteria

Design and Verification of Launch Vehicle

Flight Reliability confidence

Mission Statement, Requirements, and Mission Success Criteria

Major Milestone Schedule (Project Initiation, Design, Manufacturing, Verification, Operations and Major Reviews)

Review the design at a system level

- Updated drawings and specifications
- Analysis results
- Test results
- Preliminary Motor Selection

Demonstrate that the design can meet all system level functional requirements
Specify approach to workmanship as it relates to mission success
Discuss planned additional component testing, functional testing, or static testing
Status and plans of remaining manufacturing and assembly
Integrity of design

- Suitability of shape, fin style for mission
- Proper use of materials in fins, bulkheads, and structural elements
- Proper assembly procedures, proper attachment and alignment of elements, solid connection points, load paths
- Sufficient motor mounting and retention
- Status of verification

Safety and failure analysis

Recovery Subsystem

Suitable parachute size for mass, attachment scheme, deployment process, test results with ejection charge and electronics

Safety and failure analysis

Mission Performance Predictions

State the mission performance criteria

Show flight profile simulations, altitude predictions with real vehicle data, component weights, and actual motor thrust curve

Show thoroughness and validity of analysis, drag assessment, scale modeling results

Show stability margin, actual CP CG relationship and locations

Payload Integration

Ease of integration

Describe integration plan

Installation and removal, interface dimensions and precision fit

Compatibility of elements

Simplicity of integration procedure

Launch concerns and operation procedures

Submit draft of final assembly and launch procedures

Recovery preparation

Motor preparation

Igniter installation

Setup on launcher

Troubleshooting

Post flight inspection

Safety and Environment (Vehicle)

Identify Safety Officer for your team

Update the Preliminary analysis of the failure modes of the proposed design of the rocket, payload integration and launch operations, including proposed and completed mitigations.

Update the listing of personnel hazards, and data demonstrating that Safety Hazards have been researched (such as Material Safety Data Sheets, operator's manuals, NAR regulations), and that hazard mitigations have been addressed and mitigated.

Discuss any environmental concerns.

IV) Payload Criteria

Testing and Design of Payload Experiment

Review the design at a system level

- Drawings and specifications
- Analysis results
- Test results
- Integrity of design

Demonstrate that the design can meet all system level functional requirements

Specify approach to workmanship as it relates to mission success

Discuss planned component testing, functional testing, or static testing

Status and plans of remaining manufacturing and assembly

Describe integration plan

Precision of instrumentation, repeatability of measurement

Safety and failure analysis

Payload Concept Features and Definition

Creativity and originality

Uniqueness or significance

Suitable level of challenge

Science Value

Describe Science Payload Objectives

State the payload success criteria

Describe the experimental logic, approach, and method of investigation

Describe test and measurement, variables and controls

Show relevance of expected data, accuracy/error analysis

Describe the experiment process procedures

Safety and Environment (Payload)

Identify Safety Officer for your team

Update the Preliminary analysis of the failure modes of the proposed design of the rocket, payload integration and launch operations, including proposed and completed mitigations.

Update the listing of personnel hazards, and data demonstrating that Safety Hazards have been researched (such as Material Safety Data Sheets, operator's manuals, NAR regulations), and that hazard mitigations have been addressed and mitigated.

Discuss any environmental concerns.

V) Activity Plan

Show status of activities and schedule

Budget plan

Timeline

Outreach summary

VI) Conclusion

Critical Design Review Presentation

Please include the following information in your presentation:

Rocket flight stability in Rocksim static margin diagram

Thrust to weight motor selection in flight simulation

Rail exit velocity

Parachute sizes and descent rates

Test plans and procedures

Scale model flight test

Dual deployment avionics test

Ejection charge amount test

Payload integration feasibility

The Critical Design Review will be presented to a panel that may be comprised of any combination of scientists, engineers, safety experts, education specialists, and industry partners. It is expected that the **students** deliver the report and answer all questions.

The presentation of the CDR shall be well prepared with a professional overall appearance. This includes but is not limited to: easy to see slides; appropriate placement of pictures, graphs, and videos; professional personal appearance of the presenters; speaking clearly and loudly; looking into the camera; referring to the slides, not reading them; and communicating to the panel in an appropriate and professional manner.