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| 2021 First Nations Launch |
| Critical Design Review Report |
| For Wisconsin Space Grant Consortium |

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| --- |
| [School Name]  [Date] |

Please use this template as a guide to writing your team design reports. The headers (and bullets) outline the minimum information required. For continuity across teams, do not re-order the sections. You can however, add more information or sections when deemed necessary, or further detail is required.

There are some unique formatting features to this template. Please learn and utilize them. You may add to the formatting, but do not delete any existing formats.

Any [square] bracketed text is expected to be filled by your team. Bulleted text is expected to be deleted/replaced with your content.

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# Team Information

Team Name: [insert team name]

School Name: [insert school]

Faculty Advisor: [insert advisor name]

Faculty Co-Advisor: [insert co-advisor name]

Student Team Lead: [insert team lead name]

Safety Lead: [insert safety lead name]

Team Members: [insert / list team member names]

NAR/TRA Mentor: [insert NAR/TRA mentor name]

NAR/TRA Membership: [provide NAR/TRA membership number]

NAR/TRA Certification: [provide mentor certification level]

# Summary of Critical Design Review Report

## Launch Vehicle Summary

* Vehicle dimensions and mass
* Final motor selection
* Recovery system description
* Rail button size

## Payload/Challenge Summary

* Payload/challenge solution description

# Changes Made Since PDR

* Highlight Changes Made Since PDR
  + Changes to vehicle criteria
  + Changes to payload criteria
  + Changes to project plan
  + Changes to COVID-19 requirements

# Vehicle Criteria

## Design of Launch Vehicle

* Identify which of the design alternatives from PDR were chosen as the final components for the launch vehicle. Describe why those alternatives are the best choices.
* Demonstrate that the designs are complete and ready to manufacture/procure.
* Discuss the integrity of design.
  + Suitability of shape and fin style for mission.
  + Proper use of materials in fins, bulkheads, and structural elements.
  + Sufficient motor mounting and retention.
* If airframe build/manufacture has begun, include pictures of assembly, manufacturing and joining steps (especially sealed components that can no longer be examined once joined).

## Recovery Subsystem

* Identify which of the design alternatives from PDR were chosen as the final components for the recovery subsystem. Describe why those alternatives are the best choices.
* Describe the parachutes, harnesses, bulkheads, and attachment hardware.
* Include any diagrams, drawings, schematics, sketches, images.

## Avionics Subsystem

* Describe the avionics bay that will be used to deploy the recovery system.
* Discuss the number of altimeters (is the system redundant), and include a description of the altimeters.
* Describe the avionics sled material, avionics bay layout, the size/location and number of vent holes.
* Describe the switch to be used to power on the electronics from the outside of the vehicle.
* Include any diagrams, drawings, schematics, sketches, images.

## Motor Selection

* Describe final motor selection.
* Describe motor retention system.

## Mission Performance Predictions

* Show flight profile simulations, altitude predictions with simulated vehicle data, component weights, and sim­ulated motor thrust curve.
* Show stability margin and simulated Center of Pressure (CP)/Center of Gravity (CG) relationship and locations (using simulations).
* Calculate the expected descent time (using simulations) for the rocket and any section that descends untethered from the rest of the vehicle.

# Safety

## Launch Concerns and Operation Procedures

* Submit draft of final assembly and launch procedures, including:
  + Avionics preparation checklist.
  + Recovery preparation checklist.
  + Final assembly checklist.
  + Setup on launcher checklist.
  + Troubleshooting checklist.
  + Post-flight inspection checklist.
* These procedures/checklists should include specially demarcated steps related to safety. Examples include:
  + Warnings of hazards that can result from missing a step.
  + PPE required for a step in the procedure (identified BEFORE the step).
  + Required personnel to complete a step or to witness and sign off verification of a step.

# Payload/Challenge Criteria

## Design of Payload/Challenge Solution

* Identify which of the design alternatives from PDR was chosen for the payload. Describe why that alternative and its components were chosen.
* Review the design at a system level.
  + Include specifications for each component of the payload, as well as the entire payload assembly.
  + Describe how the payload components interact with each other.
* Demonstrate that the design is complete.
* If applicable, discuss the payload electronics with special attention given to safety switches and indicators. Include:
  + Drawings, diagrams, schematics, images
  + Batteries / power
  + Switch type and locations
* Provide justification for all unique aspects of your payload (materials, dimensions, placement, etc.).
* Describe the interfaces between the payload and the vehicle.
  + Discuss the integration of the payload.
  + Describe the deployment of the payload in detail (if applicable).
  + Include any drawings, diagrams, schematics, images.
* If payload build / manufacture has begun include pictures of assembly, manufacturing and joining steps.

# Project Plan

## Project Budget

* Provide an updated line item budget with market values for individual components, material vendors, and applicable taxes or shipping/handling fees.
* Provide an updated funding plan describing sources of funding, allocation of funds, and material acquisi­tion plan.

## Project Timeline

* Provide an updated timeline including all team activities and expected activity durations. The schedule should be complete and encompass the full term of the project. Deliverables should be defined with reasonable activity duration. GANTT charts are encouraged.

# Appendix

* Use the Appendix section if needed to show checklists, budget tables, timelines, MSDS data, and any other large sets of data that would disrupt the flow within the document.