|  |
| --- |
| 2023 First Nation Launch |
| Flight Readiness Review Report |
| For Wisconsin Space Grant Consortium |

|  |
| --- |
| [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.

Delete this text box prior to submission.

**Table of Contents**

[1 Team Information 2](#_Toc120987625)

[2 Summary of Flight Readiness Review Report 3](#_Toc120987626)

[2.1 Launch Vehicle Summary 3](#_Toc120987627)

[2.2 Challenge Summary 3](#_Toc120987628)

[3 Changes Made Since CDR 4](#_Toc120987629)

[4 Vehicle Criteria 5](#_Toc120987630)

[4.1 Design and Construction of Launch Vehicle 5](#_Toc120987631)

[4.2 Recovery and Avionics Subsystem 5](#_Toc120987632)

[4.3 Motor Selection 5](#_Toc120987633)

[4.4 Mission Performance Predictions 6](#_Toc120987634)

[5 Challenge Criteria 7](#_Toc120987635)

[5.1 Design and Testing of Challenge Components 7](#_Toc120987636)

[6 Safety and Procedures 8](#_Toc120987637)

[6.1 Launch Operation Procedures 8](#_Toc120987638)

[7 Project Plan 9](#_Toc120987639)

[7.1 Test Plan 9](#_Toc120987640)

[7.2 Requirements Compliance\*\* 9](#_Toc120987641)

[7.3 Project Budget 9](#_Toc120987642)

[7.4 Project Timeline 9](#_Toc120987643)

[8 Appendix 10](#_Toc120987644)

# Team Information

Team Name: [insert team name]

School Name: [insert school]

Faculty Advisor: [insert advisor name]

Co-Advisor (if applicable): [insert advisor name]

Student Team Lead: [insert team lead name]

Safety Lead: [insert safety lead name]

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

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

NAR/TRA Certification: [provide mentor certification level]

Team Members: [list team members and roles]

# Summary of Flight Readiness Review Report

## Launch Vehicle Summary

* As-built vehicle dimensions and mass
* Launch day motor selection
* Recovery system description
* Rail button size

## Challenge Summary

* Summarize approach to satisfying the challenge requirements
* Provide materials selection
* Provide methods selection

# Changes Made Since CDR

* Highlight Major Changes Made Since CDR
  + Major changes made to vehicle criteria
  + Major changes made to challenge criteria
  + Major changes made to project plan

# Vehicle Criteria

## Design and Construction of Launch Vehicle

* Describe any major changes in the launch vehicle design from CDR and explain why those changes are necessary.
* Describe all components that enable vehicle to be launched / recovered safely.
  + Show all structural elements (such as airframe, fins, bulkheads, attachment hardware, etc.)
  + Include pictures of all fabricated or cots hardware
    - Show details such as bulkhead joints / fillets, airframe tube fit / alignment, fin alignment, centering ring fillets, fin fillets, motor retention, eyebolt / shock cord attachments, switches / vent holes, rail button attachment / alignment
* Prove that the vehicle is fully constructed and fully document the construction process (pictures).
  + Describe the vehicle assembly, show the fit and finish.
* Include schematics of the AS-BUILT rocket. There is a good chance dimensions have changed slightly due to the construction process.
* Discuss how and why the constructed rocket differs from earlier models.

## Recovery and Avionics Subsystem

* Describe the as-built and as-tested recovery system.
  + Structural elements (such as bulkheads, harnesses, attachment hardware, etc.).
  + Electrical elements (such as altimeters/computers, switches, connectors).
  + Redundancy features.
  + Parachute sizes and descent rates
  + Include any diagrams, schematics of the electrical and structural assemblies.
  + Rocket-locating tracking devices
* Discuss the suitable parachute sizes, attachment scheme, deployment process
  + Discuss the ground test results with ejection charge and electronics (if applicable)

## Motor Selection

* Describe the final motor selection
* Describe the motor retention

## Mission Performance Predictions

* Show flight profile simulations, altitude predictions with simulated vehicle data, component weights, and simulated motor thrust curve.
* Show stability margin and as-built Center of Pressure (CP)/Center of Gravity (CG) relationship and locations (from simulations).
* Calculate the expected descent time (from simulations) for the rocket and any section that descends untethered from the rest of the vehicle.
* Calculate the drift (from simulations) for each independent section of the launch vehicle from the launch pad for five different cases: no wind, 5-mph wind, 10-mph wind, 15-mph wind and 20-mph wind.(MARS Only)\*\*

# Challenge Criteria

## Design and Testing of Challenge Components

* Present the final components as fabricated
  + Include the COTS components. Discuss:
    - The final materials used to fabricate each component
    - The final methods used to fabricate each component
    - The final approach to ensure all components interface and fit properly during vehicle assembly
  + Show that all components are complete (CAD, part / assembly images)
* Include results of Challenge Requirements Methods: Item 3 (Moon) or Item 3-4 (Mars), as applicable.
* Discuss how and why the constructed vehicle differs from earlier predictions if applicable.
* You may include 3D CAD renderings if desired

# Safety and Procedures

## Launch Operation Procedures

* Provide detailed procedures and checklists for the following (at a minimum):
  + Avionics preparation checklist
  + Recovery preparation checklist
  + Final assembly checklist
  + Setup on launch pad
  + Troubleshooting
  + Post-flight inspection
* These procedures and 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

# Project Plan

## Test Plan

* Show that all testing (component and functional) is complete and provide test methodology and discussion of results not covered in CDR.
* Discuss whether each test was successful or not.
* Discuss lessons learned from the tests conducted.
* Discuss any differences between predicted and actual results of the tests conducted.

## Requirements Compliance\*\*

* Review and update the verification plan.
  + Describe how each Competition Handbook requirement was verified using testing, analysis, demonstration, or inspection.

## Project Budget

* Update the final 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 source of funding, allocation of funds, and a material acquisition plan for any items that have not yet been obtained.

## Project Timeline

* Update the final schedule. Although build should be near complete at this stage, include a timeline of any remaining or critical activities between now and launch weekend if applicable

# 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