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

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

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# 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