

Flight Readiness Review (FRR)

Vehicle and Payload Experiment Criteria

The FRR examines tests, demonstrations, analyses, and audits that determine the overall system (all projects working together) readiness for a safe and successful flight/launch and for subsequent flight operations. It also ensures that all flight and ground hardware, software, personnel, and procedures are operationally ready.

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

Flight Readiness Review Report

I) Summary of FRR report (1 page maximum)

Team Summary

- School name
- Location
- Team official/Mentors

Launch Vehicle Summary

- Size
- Motor choice (Final)
- Recovery system
- Rail size

Payload Summary

- Summarize experiment

II) Changes made since CDR (1-2 pages maximum)

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

- Changes made to vehicle criteria
- Changes made to payload criteria
- Changes made to activity plan

III) Vehicle Criteria

Testing and Design of Vehicle

- Discuss flight reliability confidence. Demonstrate that the design can meet mission success criteria. Discuss analysis, and component, functional, or static testing.
- Describe proper use of materials in fins, bulkheads, and structural elements.
- Explain composition and rationale behind selection.
- Explain strength of assembly, proper attachment and alignment of elements, solid connection points, and load paths. (Looking for optimum assembly quality.) Show sufficient or exemplary motor mounting and retention.
- Discuss the integrity of design and that you have used analysis to improve design. Demonstrate the suitability of shape and fin style for mission.

- Specify approach to workmanship as it relates to mission success, including neatness of workmanship, quality of appearance, and attractiveness.
- Provide a safety and failure analysis, including a table with failure modes, causes, effects, and risk mitigations.
- Discuss full scale launch test results.

Recovery Subsystem

- Suitable parachute size for mass, attachment scheme, deployment process, test results with ejection charge and electronics
- Safety and failure analysis. Include table with failure modes, causes, effects, and risk mitigations.

Mission Performance Predictions

- State mission performance criteria
- Provide flight profile simulations, altitude predictions with real vehicle data, component weights, and actual motor thrust curve. Include real values with optimized design for altitude. Include sensitivities.
- Thoroughness and validity of analysis, drag assessment, and scale modeling results. Compare math analysis and models to measured values.
- Provide stability margin, with actual CP and CG relationship and locations. Include dimensional moment diagram or derivation of values with points indicated on vehicle. Include sensitivities.
- Provide a safety and failure analysis. Include a table of failure models, causes, effects, and risk mitigations.

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, including data demonstrating that safety hazards have been researched, such as material safety data sheets, operator's manuals, and NAR regulations, and that hazard mitigations have been addressed and accomplished.
- Discuss any environmental concerns.

Payload Integration

- Describe integration plan.
- Demonstrate compatibility of elements and show fit at interface dimensions.
- Describe and justify payload-housing integrity.
- Demonstrate integration: show a diagram of components and assembly with documented process.

IV) Payload Criteria

Experiment Concept

This concerns the quality of science. Give clear, concise, and descriptive explanations.

- Creativity and originality
- Uniqueness or significance
- Suitable level of challenge

Science Value

- Describe science payload objectives in a concise and distinct manner.
- State the mission success criteria.
- Describe the experimental logic, scientific approach, and method of investigation.
- Explain how it is a meaningful test and measurement, and explain variables and controls.
- Discuss the relevance of expected data, along with an accuracy/error analysis, including tables and plots.
- Provide detailed experiment process procedures.

Experiment Design of Payload

- Review the design at a system level, describe integration plan, and demonstrate that the design can meet all mission goals.
- Provide information regarding the precision of instrumentation and repeatability of measurement. (Include calibration with uncertainty.)
- Discuss the application of engineering, functionality, and feasibility.
- Provide flight performance predictions (flight values integrated with detailed experiment operations).
- Discuss flight preparation procedures.
- Specify approach to workmanship as it relates to mission success.
- Discuss completed component, functional, or static testing

Assembly

- Clear details of how the rocket is assembled.
- Integration and compatibility simplicity
- Structural integrity for flight
- Quality of construction

Safety and Environment (Payload)

This will describe all concerns, research, and solutions to safety issues related to the 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, including data demonstrating that safety hazards have been researched, such as material safety data sheets, operator's manuals, and NAR regulations, and that hazard mitigations have been addressed and enacted.
- Discuss any environmental concerns.

V) Launch Operations Procedures

Checklist

Provide detailed procedure and check lists for the following.

- Recovery preparation
- Motor preparation
- Igniter installation
- Setup on launcher
- Launch procedure
- Troubleshooting
- Post flight inspection

Safety and Quality Assurance

Provide detailed safety procedures for each of the categories in the Launch Operations Procedures checklist.

Include the following:

- Provide data demonstrating that risks are at acceptable levels.
- Provide risk assessment for the launch operations, including proposed and completed mitigations.
- Discuss environmental concerns.
- Identify individual that is responsible for maintaining safety, quality and procedures checklists.

VI) Activity Plan

Show status of activities and schedule

- Budget plan
- Timeline
- Educational engagement

VII) Conclusion

Flight Readiness Review Presentation

Please include the following information in your presentation:

- Motor choice
- Rocket flight stability in static margin diagram
- Thrust to weight motor selection in flight simulation
- Rail exit velocity
- Parachute sizes and descent rates
- Test plans and procedures
- Full scale flight test
- Dual deployment avionics test
- Ejection charge amount test
- Payload integration feasibility

The FRR 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 FRR shall be well prepared with a professional overall appearance. This includes, but is not limited to, the following: easy to see slides; appropriate placement of pictures, graphs, and videos; professional 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.