# Preliminary Design Review Document

for the **Experiment**

by **Team**

| Prepared by: |  |
|--------------|  |
| Team Spokesperson | Date |
| Team Member | Date |
| Team Member | Date |

| Submitted: |  |
| Reviewed: |  |
| Revised: |  |

| Approved: |  |
| T. Gregory Guzik | Date |
| John Wefel | Date |
| Karen Johnson | Date |
| Brad Ellison | Date |
| Jim Giammanco | Date |
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Team XXXX

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1.0 Document Purpose

This document describes the preliminary design for the ZZZZZ experiment by Team XXXX for the ACES Program. It fulfills part of the ACES Program requirements for the Preliminary Design Review (PDR) to be held February 27, 2003.

1.1 Document Scope

This PDR document specifies the scientific purpose and requirements for the ZZZZZ experiment and provides a guideline for the development, operation and cost of this payload under the ACES Program. The document includes details of the payload design, fabrication, integration, testing, flight operation, and data analysis. In addition, project management, timelines, work breakdown, expenditures and risk management is discussed. Finally, the designs and plans presented here are preliminary and will be finalized at the time of the Critical Design Review (CDR).

1.2 Change Control and Update Procedures

Changes to this PDR document shall only be made after approval by designated representatives from Team XXXX and the ACES Program Office. Document change requests should be sent to Team members and the ACES Program Office.

2.0 Reference Documents

[Include and number the documents that provide background or supporting information and include in the write-up as references.]

3.0 Mission Objectives

[Describe what you plan to accomplish with your payload.]

3.1 Science Goals

[You should list the science goals you want to achieve and provide background information explaining the science.]

3.2 Technical Goals

[There may be particular technical accomplishment that you may want to achieve during your flight. List and explain these here.]

4.0 Payload Design

[Provide sufficient details about your payload so that the reviewers can get a clear picture of your payload design.]
4.1 Principle of Operation

[What measurements is your payload going to make? What techniques will you use to make these measurements? How do your measurements flow from your scientific and technical goals (i.e. a traceability matrix)?]

4.2 System Design

[What are the major components to your payload? What are your interfaces between components? What are your interfaces to the “spacecraft”?]?

4.3 Electrical Design

[Describe your electrical design including sensors, sensor interface, controllers, data acquisition, storage, telemetry and power supply system. An electrical schematic or two would probably be useful here. You should also include a power budget identifying the power consumption of each component and showing how your system will supply this power throughout the flight.]

4.4 Thermal Design

[What is the thermal environment you expect to encounter? What are the thermal operating ranges for components in your payload? How will you keep your payload in proper operating range? Are there any temperature dependent effects in your measurements that you will need to control or calibrate?]

4.5 Mechanical Design

[What does your payload look like? How will all components fit in the required size constraint? What is your weight budget and do you fit the weight constraint? What are the mechanical stresses you expect to encounter during flight? What mechanical design features have you incorporated to assure your payload will survive the flight?

NOTE: The ACES Program requires that you hold a 10% margin on your weight budget. Thus, as your weight cap is 1 kg your weight budget at this time should show a total of no more than 900 grams.]

5.0 Payload Development Plan

[What do you plan to do during development phase prior to payload fabrication? What outstanding issues can only be resolved by prototyping?]

6.0 Payload Construction Plan

[Here you describe your plans to go from design up to launch]
6.1 Hardware Fabrication and Testing

[What subsystems will you be fabricating in what order? What subsystem level testing will you be doing? How does parts availability affect your fabrication order?]

6.2 Integration Plan

[How will you assemble your subsystems into a working payload? What tests will you do to assure everything works properly?]

6.3 Software Implementation and Verification

[What is your flight software design? How will this software be implemented? How will you test your software to assure that it will work during flight?]

6.4 Flight Certification Testing

[What are the flight conditions you will encounter and how will you test your payload to assure that it will function under these conditions?]

7.0 Mission Operations

[This section describes your plans during launch, flight and subsequent data analysis.]

7.1 Launch Requirements

[Are there any particular requirements during launch operations (e.g. expendables, handling, calibrations, power)?]

7.2 Flight Requirements and Operations

[What is your anticipated flight profile? Are there any particular requirements during flight (e.g. duration, clear aperture)? What services do you need during flight (e.g. telemetry, position, altitude)? Will you need to command the payload? If so, what commands do you intend to send?]

7.3 Data Acquisition and Analysis Plan

[What data will be acquired by your payload? With what rate will you be acquiring data? How much data will be recorded on-board and how much will be telemetered down to ground? How will you analyze your data to obtain results that address your scientific goals? What data analysis software needs to be development?]
8.0 Project Management

[Describe the techniques that will be used to ensure meeting the experiments objective within the allocate schedule and budget. This should include discussion of project direction, authorization, communication, meeting, reviews, record keeping and monitoring.]

8.1 Organization and Responsibilities

[This section includes an Organization Chart and describes the team members and their responsibilities. Subsystem and subtask leaders and their authority level are identified. Contact information such as phone numbers and e-mail can be included here.]

8.2 Configuration Management Plan

[This section describes how the baseline design configuration will be documented and the techniques to be used to manage changes to this design during the life of the project. The process for requesting, reviewing and approving changes is identified here.]

8.3 Interface Control

[Describe the interfaces between subsystems as well as between the payload and “spacecraft” and the techniques to be used to control the definition of and changes to these interfaces.]

9.0 Master Schedule

[This section describes how you will organize and manage the effort associated with your payload. You may want to use Microsoft Project to organize your WBS, Staffing Plan and Timeline.

NOTE: While the PDR and FRR dates are fixed by the program you should identify in your schedule the date for your CDR.]

9.1 Work Breakdown Structure (WBS)

[The WBS is a list of all the work tasks, in hierarchical form, for the project. It needs to be comprehensive and forms the framework for all the project staffing, budgeting, assignments and scheduling.]

9.2 Staffing Plan

[List the individuals assigned to each WBS task and is used to determine if tasks are adequately staffed or if individuals are overloaded.]
9.3 Timeline and Milestones

This section includes a list of key milestones (and associated dates) for the project and a Gantt chart timeline. The timeline should be a weekly schedule organized by major WBS elements.

10.0 Master Budget

Here you show details on the costs associated with your project. Remember that your budget is capped at $500. In addition, the ACES Program office is requiring that you hold a margin (reserve contingency fund) of 10%. Thus, your actual planned expenditure at this stage must not exceed $450.

10.1 Expenditure Plan

In this section you describe and justify all the costs associated with your project. Along with the text description of your costs, also include a tabular budget. Microsoft Excel can be useful in generating and tracking your budget.

10.2 Material Acquisition Plan

Describe here how all material to be used by the project will be obtained. Include a list of each major item showing if it is to be bought, made in-house or acquired through existing supplies. Include quantities, order dates and need dates. Specifically call out any “long lead” items that must be purchased during the development phase.

NOTE: The ACES Program will supply foam code board, aluminized tape and bubble wrap for payload structure and thermal control.

11.0 Risk Management and Contingency

This section describes the major risks that have been identified that can cause significant impact to the project and prevent it from achieving its objectives within the allocated schedule and budget. List the programmatic and technical risks, assess their impact to the project and describe the plan to mitigate them.

NOTE: The ACES Program requires you to hold a 10% reserve in both your cost and weight budgets.

12.0 Glossary

Define any terms that are used in your document. See below for examples.

ACES  Aerospace Catalyst Experiences for Students
CDR   Critical Design Review
FRR   Flight Readiness Review
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