Q-Sat MDR

Mission Definition Review

Names: Anton, Jasper, Joel, Taine, William
Team: Questionable Satellites
Date: 2024-10-14

MDR Outline

1. **Concept**
    a. Concept Definition
    b. Measures of Effectiveness
    c. Technical Schedule
    d. Requirements
2. **Solution**
    a. Design Solution Definition
    b. Concept of Operations
    c. Technical Measures of Effectiveness
    d. Interface Definitions
    e. Implementation Plans
    f. Validation Plans

1. Concept

Mission Concept

Concept Definition

The MOST RETRO PSAT

Measures of Effectiveness

Measure: Number of film shots taken during flight

Target: Take at least one photo

Technical Schedule

Timeline:

- 14th October - Mission Design Review (MDR)
- 26th November - 1st order due & Preliminary Design Review (PDR)
- 20th January- 2nd order due & Critical Design Review (CDR)
- February - Test Launch
- Start of March - Launch & Flight Readiness Review (FRR)

Requirements

External

- The film camera must fit into the rocket.
- No premature exposure of film on launch day.
- Successful recovery & development of film.
- Identifiable object(s) in photos.

2. Solution

Mission Design

The Camera

1/90 s

24 photo roll

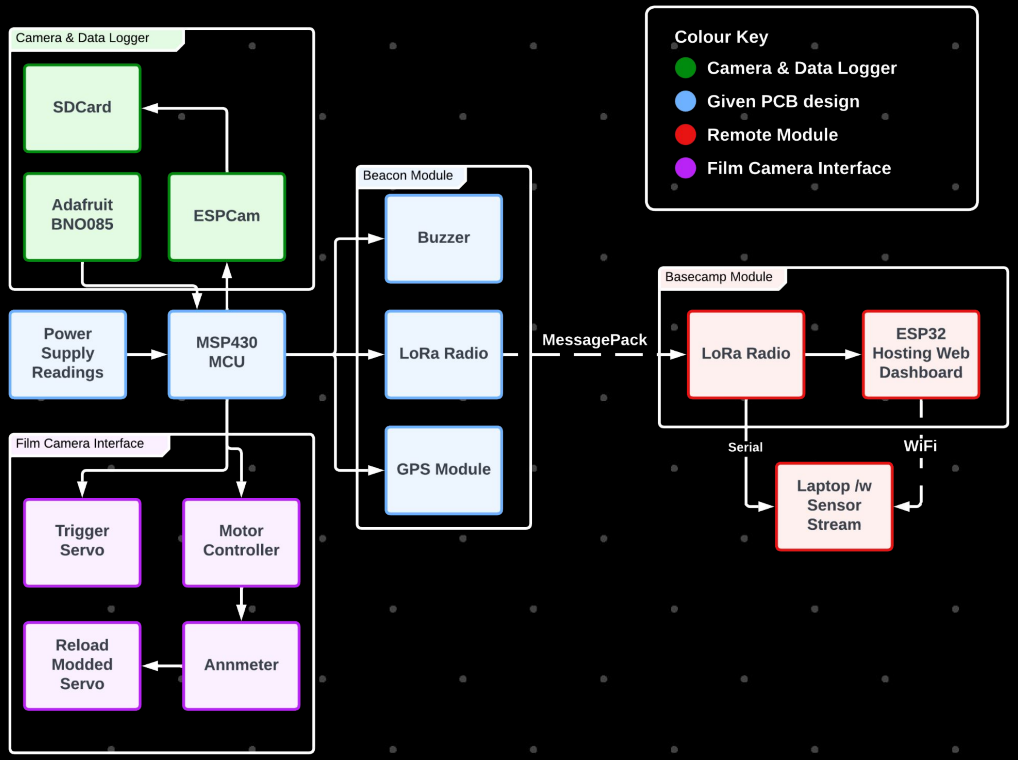
Aero System Options

1. Ring Fin
2. Secondary Chute or Streamer
3. Deployable Fins

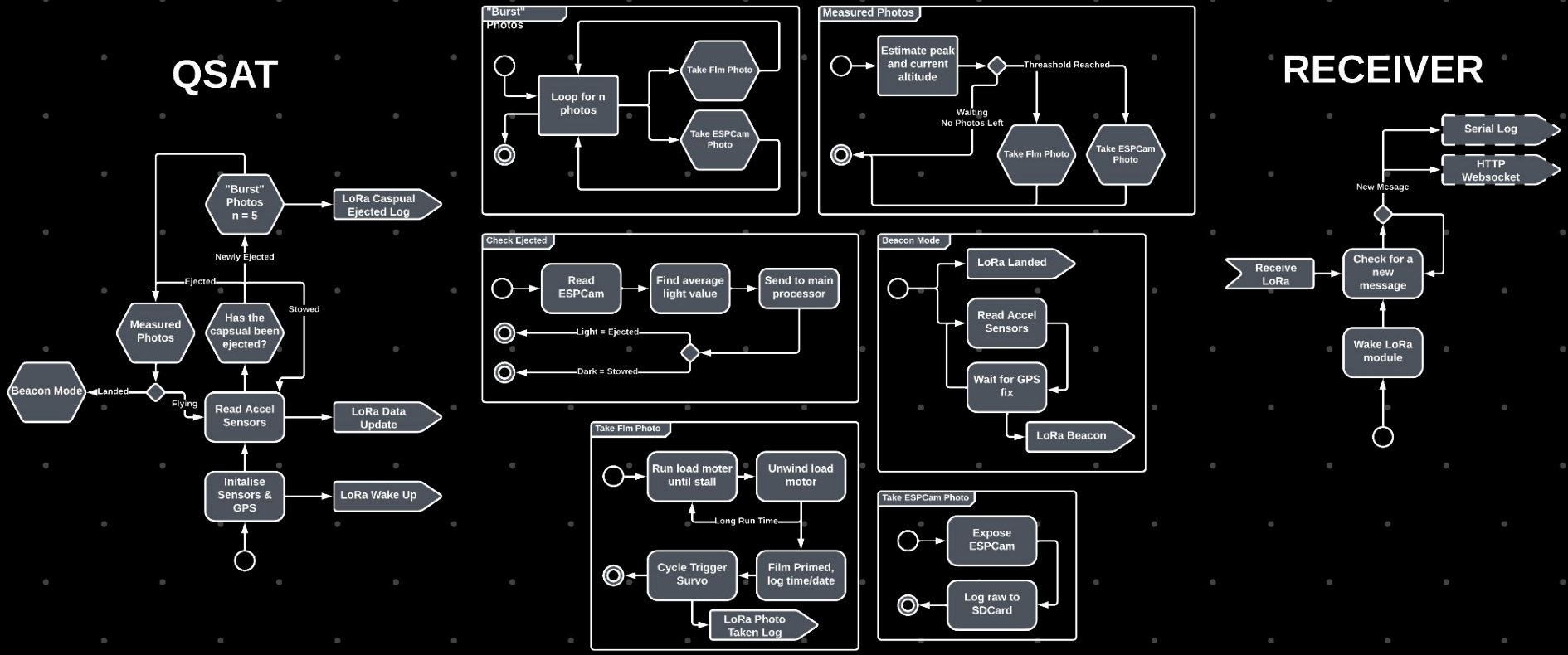
Design Solution Definition

- One member found a small film camera to take photos. We will mount it to a capsule & create a system to automatically take photos.
- There will be a lot of chaotic movement on descent, so some passive aero systems are required to try to stabilise the capsule.
- Photos will look best at apogee, but will have high motion blur at deployment. So the shutter will be programmed to fire at set times.
- Film must be contained onboard, and in the dark at all times. We will be removing the camera's viewfinder which means we cannot rely on the camera body to block all light.

Design Solution Definition



Concept of Operations

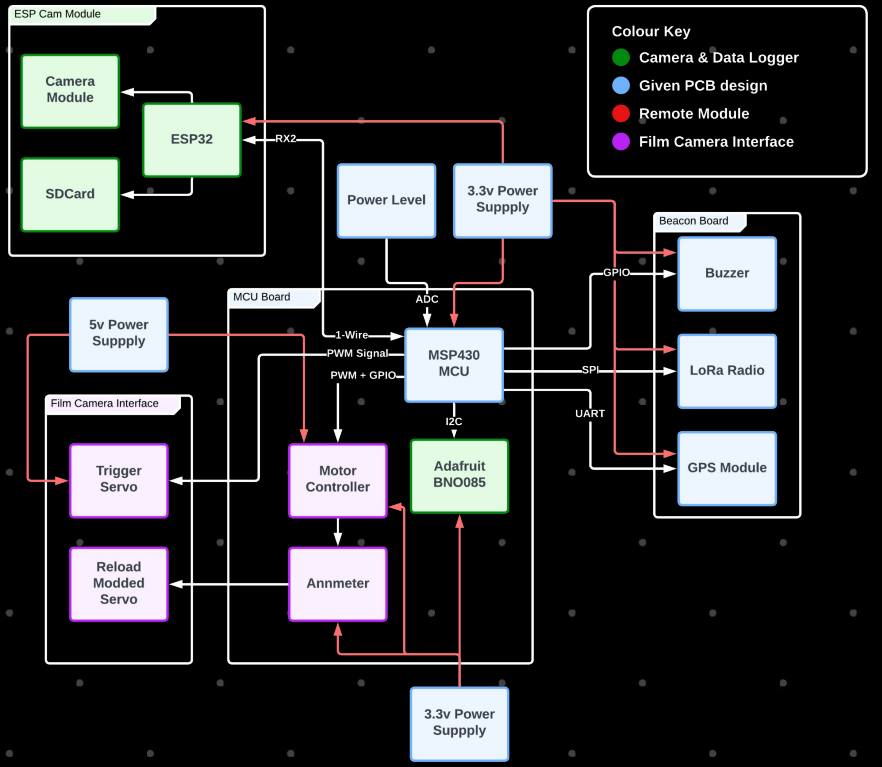


Technical Measures of Effectiveness

- Have we successfully taken a picture?
- Is the film recoverable/processable?
- How many film photos did we capture?
- Are the objects in the film identifiable?

Interface Definitions

- Mechanical Connections
  - Film Camera to body
  - Body to Cord
  - Aero to Body
  - Shutter Servo to Shutter
  - Loader Servo to Loader
- Mechanical to Electrical
  - Board to Shutter Servo
  - Board to Loader Servo



Implementation Plans

Design

- Prototyping Nov 1st - 8th
- Body CAD, NOV 1st - 5th
- Shutter & reload mechanism, NOV 1st - 5th
- 3D print Prototype NOV 5th-8th

- Design NOV 8th - 10th
- CAD V2, NOV 8th - 10th
- Electronics NOV 8th- 10th

Build

- Order 1 NOV 10th - 25th
- 3D Print - NOV 11th - 12th
- Electronics/Film install NOV 13th - 20th
- Aero Install NOV 21st - 25th

- Order 2 JAN 4th - 19th
- Body
- Electronics
- Aero

Validation Plans

- Initial CAD Model - Nov 5th
  - Aero - Anton
  - Camera - William
- 3D print prototype - Nov 8th
  - Mechanical Team
- Bench test camera with spare film - Nov 8th
  - Electronics Team
- Bench test of deployables - Nov 20th
  - Mechanical team
- Drop test inside engineering - final test with prototype (incase of RUD) - Nov 23rd
  - Whole Team

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