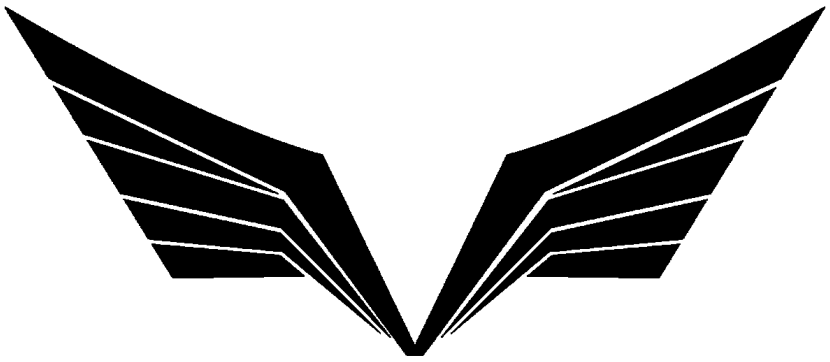

SUN DEVIL
ROCKETRY

Avionics Firmware Development Team

Quality Control Document

| | |
|---|---|
| Project: | Flight Computer Firmware |
| Part Number: | N/A |
| Drafted By: | Eli Sells |
| Project Engineer: | Eli Sells |
| Quality Assurance: | Allison Cheon |
| Chief Engineer: | Eli Sells |

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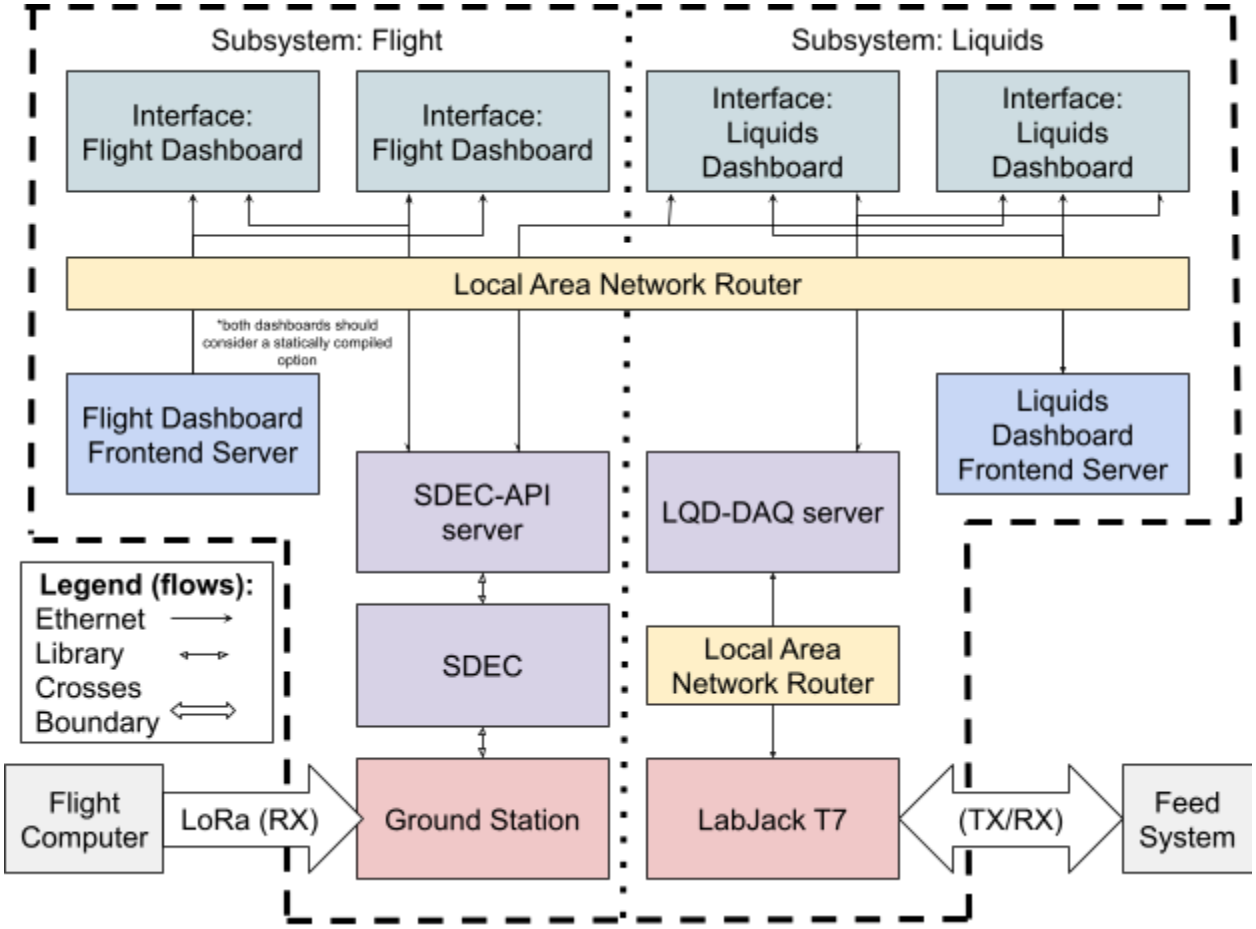
## 1. PROJECT OVERVIEW

The New Liquid Feed System is Sun Devil Rocketry's answer to the problems from the last generation. The proprietary hardware required long development times to add/remove sensors, and the data logging rate was incredibly unreliable.

This project is a distributed system with distinct hardware and software components. Contained within the system boundary are the following components:




1. User Interfaces
    a. Flight Dashboard
    b. Liquids Dashboard
2. Hardware Interfaces
    a. SDEC-API + SDEC

   b. LQD-DAQ
3. Hardware
   a. Ground Station
   b. LabJack T7
4. Network Interfaces
   a. Layer 3 network interface like a router or managed switch

## 1.1 QUALITY ASSURANCE PRACTICES

The primary guiding standard for this project is the SDR Software Quality Assurance Standard. This project is used in flight with the possibility of being used to affect flight dynamics, so it is certified to the highest "Flight Code" standard.

In addition to this minimum standard, each of the following components have agreed upon the following quality assurance practices:

### *1.1.1. FLIGHT & LIQUIDS DASHBOARDS*

The dashboards (Software Division) will employ the following practices:

- Regular scanning for issues/vulnerabilities in dependencies

### *1.1.2. LQD-DAQ*

The LQD-DAQ service will employ the following practices:

- No code review baseline exists. For compliance with the QA standard, a baseline will first be established with a full application review.
- Regular scanning for issues/vulnerabilities in dependencies
- Automated testing of major features

### *1.1.3. SDEC + SDEC-API*

SDEC and SDEC-API will employ the following practices:

- Regular scanning for issues/vulnerabilities in dependencies
- SDEC (library): Automated testing of major features

### *1.1.4. GROUND STATION*

The Ground Station will follow the QA standard with no modifications.

### *1.1.5. FULL SYSTEM*

The system as a whole will employ the following practices:

- Additional SQA audits of component level compliance by internal personnel.

## 2. SUPPORTING DOCUMENTATION

This section shall reference any documentation for the controlled article. This could be anything from formal design documents and procedural documentation to informal user's guides associated with the article.

| DOCUMENT | DESCRIPTION |
|---|---|
| NLFS Functional Hazard Assessment | A hazard analysis and list of mitigations for the firmware. |

## 3. REQUIREMENTS

The article's requirements are defined in the NLFS SysRD.

## 4. DEVELOPMENT READINESS

The project meets the requirements to begin development:

1. Requirements are defined
2. Quality assurance practices have been defined and agreed upon

**Date:** 9/2/2026
**Project Engineer:** Eli Sells
**Quality Assurance:** Allison Cheon

## 5. COMPONENTS

This section will provide a breakdown of this component's constituent parts.

"Separately Controlled Components" have their own part number and quality control processes. External/COTS components fall into this category if the supplier applies their own QA processes, although acceptance testing is encouraged.

"Components with Combined Control" get their quality control coverage from this project. Each component in this table is expected to have some requirement and test criteria later in the document.

### 5.1. SEPARATELY CONTROLLED COMPONENTS

| COMPONENT | PART NUMBER & VERSION | DESCRIPTION | QC STATUS |
|---|---|---|---|
| Flight Computer | PN: A0002<br>Ver: 2 | A software utility to determine if a number is even. | Grandfathered (QC not available for this custom part – has been in use for three years) |
| CMSIS | Unknown | Copied directly from auto-generated code in STM32 CubeMX, so a version is unavailable. | External |
| STM32H7XX Hardware Abstraction Layer | PN: N/A<br>Ver: 1.11.5 | Library provided by MCU manufacturer for hardware integration.<br><br>(Sha: 57ed86b4c358e2333a71fd895b17f1ccdb68739e) | External |

### 5.2. COMPONENTS WITH COMBINED CONTROL

| COMPONENT | DESCRIPTION | RELEVANT REQUIREMENTS | RELEVANT TEST PROCEDURES |
|---|---|---|---|
| mod | Hardware agnostic common libraries for SDR embedded code.<br><br>*(SHA: 06a190a3519b631e754835d169f439fb60368fe6)* | 3.1 | All emulator integration tests, error integration test. |
| driver | Drivers for peripherals on SDR embedded devices.<br><br>*(SHA: 23b6b3afe3b24fd12414aadb634c3e265eacfc8b)* | 3.1 | All emulator integration tests and all system tests. |

## 6. TEST PROCEDURES

Most procedures for this article are defined in code (see the test/ directory in Flight Computer Firmware and the _test/ directories in mod and driver).

Additional manual test procedures are defined (but not described) below.

| TEST PROCEDURE | REQUIREMENT(s) | TEST RESULT |
|---|---|---|
| Flash extract integration test: https://github.com/SunDevilRocketry/Flight-Computer-Firmware/issues/251 | 3.2, 3.2.1, 3.2.2, 3.2.3, 3.5, 3.6, 3.9 | N/A |
| Launch detect integration test: https://github.com/SunDevilRocketry/Flight-Computer-Firmware/issues/252 | 3.3, 3.3.1, 3.3.2 | N/A |
| Telemetry integration test: https://github.com/SunDevilRocketry/Flight-Computer-Firmware/issues/254 | 3.11, 3.11.1, 3.11.2, 3.11.3, 3.11.3.1, 3.11.3.2 | N/A |

## 7. TEST READINESS

The project has completed its initial development and is ready to enter the testing phase.

### 7.1. CHANGES SINCE PREVIOUSLY REVIEWED BASELINE

None apply.

### 7.2. APPROVAL

The project meets the requirements to begin testing:

1. Development is complete and all requirements have been implemented
2. Quality assurance practices have been followed, and an audit has been conducted on a random sample of constituent parts
3. Test procedures have been defined and all requirements will be tested by the procedure

**Date:**
**Project Engineer:** Eli Sells
**Quality Assurance:**

## 8. TEST RESULTS

The project has completed its test procedures and have produced the following results:

The results for the baseline version have expired, but would have been available at https://github.com/SunDevilRocketry/Flight-Computer-Firmware/actions/runs/25096175794. Future versions will need to archive the consolidated results artifacts.

| TEST PROCEDURE | REQUIREMENT(s) | TEST RESULT |
|---|---|---|
| Flash extract integration test: https://github.com/SunDevilRocketry/Flight-Computer-Firmware/issues/251 | 3.2, 3.2.1, 3.2.2, 3.2.3, 3.5, 3.6, 3.9 | PASS |
| Launch detect integration test: https://github.com/SunDevilRocketry/Flight-Computer-Firmware/issues/252 | 3.3, 3.3.1, 3.3.2 | PASS |
| Telemetry integration test: https://github.com/SunDevilRocketry/Flight-Computer-Firmware/issues/254 | 3.11, 3.11.1, 3.11.2, 3.11.3, 3.11.3.1, 3.11.3.2 | PASS |

## 9. FLIGHT QUALIFICATION

The project has completed all required testing and has passed with minor or no revisions.

### 9.1. CHANGES SINCE PREVIOUSLY REVIEWED BASELINE

Updates to automated test procedures to ensure full code coverage. Fixed a bug with the lora preset download feature.

### 9.2. APPROVAL

The project meets the requirements for flight:

1. Test procedures have been applied and have passed their acceptance criteria
2. A random sample of test procedures shows that they were performed as specified
3. No major design or production revisions have been made since test completion

**Date:**
**Project Engineer:** Eli Sells
**Quality Assurance:**
**Chief Engineer:**

## 10. QUALIFIED VERSIONS

| VERSION | QC Status |
|---|---|
| v2.4.0 | Flight Qualified - Grandfathered |
| v2.5.0 | Flight Qualified - Grandfathered |
| v2.6.0 | Flight Qualified - Grandfathered |
| v2.7.0 | Pending design review |