

# **Ultra-Long Duration Balloon Flight Software Configuration Management Document**

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## Signature Page

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**Disclaimer**

The controlled copy of this document is available on-line at <http://rfs.wff.nasa.gov/~code584/ULDBFlightSoftware/>. Printed copies of this document are for reference purposes only. It is the user's responsibility to verify that the version of any printed documentation matches the on-line version.

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## 1.0 Introduction

Recent advances in composite super-pressure balloon materials have greatly enhanced the prospects for very long duration balloon flights on Earth as well as possible use for planetary exploration. NASA is embarking on the development of technologies to support extended balloon missions lasting up to 100 days (~5 circumnavigations of the globe) above 99.9% of Earth's atmosphere.

The Ultra Long Duration Balloon (ULDB) objective is to develop a low cost, integrated, advanced, long duration balloon system which is technically feasible and within program cost constraints while maintaining the existing balloon program. The ULDB program is significantly different from the current balloon program in that the expected science return is significantly greater than current balloon missions. In other words, it is more than simply extending current experiments over a longer time period. This program also expects to use technologies currently available in the spacecraft missions and commercial arenas to improve performance while containing costs.

The purpose of the ULDB flight software effort is to process, monitor, and control data received and collected on the airborne instrumentation package. The flight software will facilitate all communications with the instruments on board and to the ground through continuous line of sight and over the horizon communications.

### 1.1 Purpose

This document describes the configuration control procedure for the products of the ULDB Flight Software Team.

### 1.2 Applicable Documents

This section lists the project and subsystem related to this effort.

#### 1.2.1 Project Documentation

The following ULDB project documentation is applicable and/or related to this document.

ULDB Design-To Requirements Document, revision 1.2, December 3, 1997,

<http://www.wff.nasa.gov/~uldb/documents.html>.

#### 1.2.2 Subsystem Documentation

The following ULDB Flight Software specific documentation is applicable and/or related to this document. These documents are available via the ULDB Flight Software page:

<http://rfs.wff.nasa.gov/~code584/ULDBFlightSoftware/>

[ULDB Flight Software Product Plan](#)

[ULDB Flight Software Requirements and Functional Specifications](#)

[Interface Control Document Between the ULDB Balloon-Craft Flight Computers and the ULDB Support Subsystems](#)

## 2.0 Overview

The goal of the ULDB Flight Software development effort is to provide reliable, state of the art flight software to provide the functionality required to perform all functions necessary for the successful operation of the ballooncraft during a mission. These functions include the receiving and routing of commands for the ballooncraft subsystems, the acquisition, downlink, and storage of ballooncraft housekeeping, science housekeeping, and science data, and limited onboard calculation and subsystem control.

The design approach is to use the Wind River Systems VxWorks<sup>®</sup> operating system and a multi-process design. The use of multiple processes enables the software to be more loosely coupled and more robust. Code will be written in C.

### **3.0 Configuration Control**

This section describes the configuration control that will be applied to each element of the ULDB Flight Software systems. The configuration items (CI) were defined in the ULDB Flight Software Product Plan.

#### **3.1 Operating System**

The Flight Software will run in conjunction with the VxWorks<sup>®</sup> Real Time Operating System, Version 5.4. A copy of the installed operating system will be archived as configured for each release.

#### **3.2 Software**

Each build/release of the flight software will have a unique version number. Each build/release will be archived on the ULDB Flight Software development server along with a copy of the configured operating system as mentioned in section 3.1.

A release notice will be issued when a major version or revision of the software is released. The release notice will include a description of the changes to the system, a list of the change requests addressed by the changes, a description of the elements of the system that were changed, and a description of the tests conducted to verify the changes.

#### **3.3 Process for Configuration Control of Change Requests**

Changes to archived or installed software following the initial delivery must be requested using the ULDB Flight Software Request for Change form on the ULDB Flight Software web page at <http://rfs.wff.nasa.gov/~code584/ULDBFlightSoftware/>. All changes will be reviewed by the ULDB Flight Software development team. An estimate of the schedule and budget necessary to effect the requested change will be made and presented to the ULDB Project management. Implementation of changes will be done according to the priority defined by the ULDB Project management.

Changes to the system software will be recorded in the ULDB Flight Software configuration control spreadsheet. A release notice will be issued when system software is changed.