



Procedures and Guidelines

DIRECTIVE NO. 573-PG-8700.2.1
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Title: Design of Electronic Non-Flight Hardware

PURPOSE

This procedure establishes guidelines for the design of electrical hardware for non-spaceflight use. Employees will use this process in support of the design, analysis, verification, and review of GSFC products.

REFERENCE

GPG 8730.4 The GSFC Quality Manual
GPG 8700.1 Design Planning and Interface Management
GPG 8700.2 Design Development and Configuration Control
GPG 8700.3 Design Validation
GPG 8700.4 Technical Review Program

SCOPE

This procedure defines guidelines for design activities of non-spaceflight Product Design Team (PDT) members in the Applied Engineering and Technology Directorate (AETD) as well as any other PDT members providing non-spaceflight electrical support to GSFC projects covered by the scope of the GSFC Quality Management System.

DEFINITIONS

Electrical Non-Spaceflight Hardware - includes electronics at the circuit board, box, and rack levels as well as the electronics mechanical enclosure and harness, which is intended to be used as ground equipment in support of suborbital, balloon, or aircraft electronics, or spaceflight hardware.

AUTHORITIES AND RESPONSIBILITIES

AETD Employees

All AETD employees are responsible for adherence to this procedure.

Product Design Lead (PDL)

Since many steps of this procedure are noted as being optional, it is the responsibility of the PDL, in partnership with the customer, to determine and document in the design plan (see GPG 8700.1 and GPG 8700.2) which specific steps will be executed. Furthermore, guidelines contained herein may be waived at the discretion of the PDL and the customer due to extenuating circumstances such as limitations on time and/or resources, or by customer request. Such waivers must be documented.

IMPLEMENTATION

Note: All procedure steps are the responsibility of the Product Design Lead unless stated otherwise.

Requirements Definition

Generate/agree on electrical requirements with the customer and generate a written requirements document.

Initial Planning

The PDL ensures that the PDT is composed of individuals, both civil servants and contractors, with the required discipline skills.

Identify high risk items and develop a risk mitigation plan (optional, per design plan).

Develop a budget and a schedule for review and approval by functional management and the customer.

Initial Design

Develop interface control documents (ICDs).

Develop breadboard designs (optional, per design plan), which includes circuit design; timing, stress, thermal, and end-of-life analysis; breadboard layout design, and cabling design.

Develop packaging design, considering such aspects as space limitations, cooling, and structural requirements if the equipment is to be moved or shipped to alternate locations.

Develop drawing control procedures (optional, per design plan), considering such aspects as drawing numbering, library structure, and document distribution.

Initial Reviews

Perform one or more Peer Reviews of the initial design (see GPG 8700.4) to ensure both functional operation and safety to flight hardware.

Perform a parts review of the initial design to ensure its compliance with materials requirements if the equipment is to be used for flight hardware environmental testing.

Initial Fabrication

Identify and order long lead items.

Perform fabrication of breadboards (optional, per design plan).

Initial Testing

Generate and execute breadboard test procedures (as required by the design plan).

Participate in the project Preliminary Design Review (per customer requirements).

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Final Development

Design the final unit, including the circuit designs, board layout designs, and the enclosure design.

Participate in the project Critical Design Review and/or Safety Review (per customer requirements).

Fabricate the final cards and enclosure.

Generate (or modify) and execute the final card test procedures.

Box Level Activities

Integrate the final cards into the enclosure.

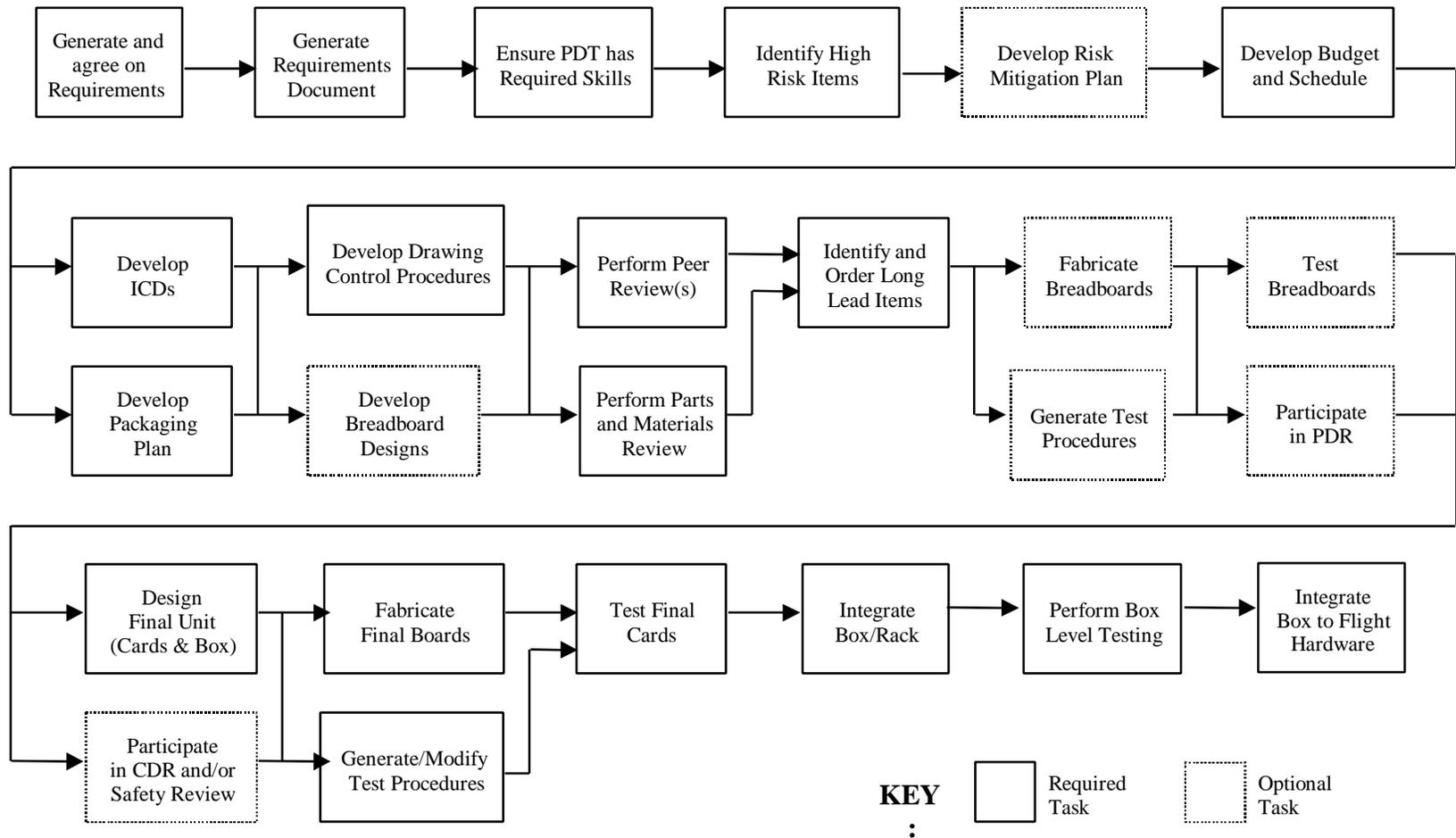
Generate and execute the box level functions and acceptance tests per the product validation plan (see GPG 8700.3).

Box Integration to Flight Hardware

The PDL and PDT participate, possibly significantly, in the development and execution of the box to flight hardware integration and test procedures.

FLOW DIAGRAM

Electrical Non-Flight Hardware Development Flow Diagram for Ground Support Equipment



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CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	08/27/1998	Initial Release