The Evolution of the DSU-33 C/B Proximity Sensor, A Success in Customer-Contractor Partnership

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“I am always doing that which I cannot do, in order that I may learn how to do it.”

Pablo Picasso
Agenda

DSU-33 Overview

DSU-33C/B Development Goals

DSU-33 C/B Design Description
  • Approach
  • Technologies

Testing Completed

Performance

Questions
DSU-33 Description

System Description

• Radar Proximity Sensor

• Provides Height of Burst (HOB) fire pulse signal to the fuze for JDAM and GP bombs (FMU-139 & FMU-152A/B Fuzes)

Performance Parameters

• Height of Burst: 5 – 35 Feet (80%)

• Multiple Weapon Release: 2 or more

• Operational Life: 200 Seconds

• Storage Life: 10 Years
Circa 1970’s a desire arises to improve and combine the performance of the Mk 20 and Mk 43 Target Detectors

DSU-33/B is developed and evolves into the DSU-33A/B

1990-1995 Motorola produced DSU-33A/B’s for the U.S. Air Force

1998 DSU-33B/B JDAM design upgrade is completed

2000 ATK begins production of DSU-33B/B’s
DSU-33C/B Timeline

An advanced weapon and space systems company

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DSU-33C/B Development Goals

- DSU-33 C/B Performance ≥ DSU-33 B/B Performance
- DSU-33 C/B ICD = DSU-33 B/B ICD
- DSU-33 C/B UPC << DSU-33 B/B UPC
DSU-33C/B Development Objectives

Address Parts Obsolescence

Improve HOB Accuracy

Reduce the Material Cost
- Eliminate Parts
- Use Lower Cost Parts
- Lower the Cost of Current Parts

Reduce Labor Cost
- Fewer Parts to Assemble
- Easier to Assemble
- Less Rework
- Less Test Time
Customer – Contractor DFMA

When

• Prior to the PDR

Benefits

• Customer involvement

• Production involvement

• Disciplined look at design approaches and costs

• Cross-functional exchange of ideas

Results

• Improved ease of assembly

• Reduced Material Cost

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DSU-33B/B RF Design:

- 26 Components
- Discrete Oscillator Design
- Hand Assembled in Electronics Housing

DSU-33C/B RF Design:

- 7 Components
- GaAs MMIC Chip Transceiver
- Removable from Electronics Housing for Solder Reflow Oven
RF Tuning Curves Over Temperature

- **Frequency** vs. **Tune Voltage**
- **Cold** and **Hot** curves shown

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Electronics Reduced to One SM CCA

| B/B Electronics (3 Boards) | C/B Electronics (1 Board) |

DSU-33C/B CCA is Manufactured on an Automated Pick-and-Place Machine.

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DSU-33C/B Designed for Testability

B/B Test Interface

C/B Test Interface

DSU-33C/B Test Interface is More Reliable and User Friendly.

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DSU-33 Completed Testing

- Design Verification Testing
- Full Contractor Qualification
- Flight Testing
- First Article Acceptance Testing
DSU-33B/B Performance:

- Mean is more than 2.5 standard deviations away from nearest spec limit (Requirement is 2).
- 99.6% Between Limits
- 1,672 Units in Sample

DSU-33C/B Performance:

- Mean is more than 5 standard deviations away from nearest spec limit (Requirement is 2).
- >99.9999% Between Limits
- 1,845 Units in Sample
“If you think of standardization as the best that you know today, but which is to be improved tomorrow; you get somewhere.”

Henry Ford
QUESTIONS