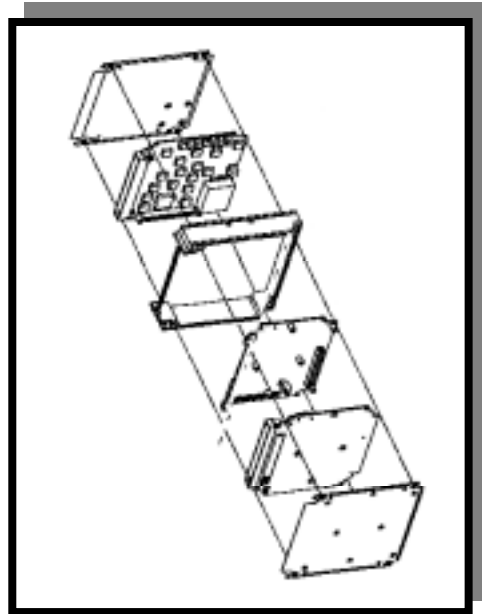


**Reliability
Assessment
Process
Improvement
Demonstration
(RAPID)**



ARC-210 Control Module

PROBLEM / OBJECTIVE

The objective of this effort was to demonstrate a Physics of Failure (PoF) modeling and simulation toolset that can predict the reliability of electronic circuit card assemblies (CCAs) early in development. This capability can reduce or eliminate test iterations during the manufacturing and engineering development phase and reduce sustainment costs after fielding.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

The analysis predicted solder interconnect failures for the leadless chip carriers (LCC) as the primary failure mechanism. The analysis predicted failures at about 830 cycles under accelerated temperature conditions (-50°C to 95°C) and 6.5 years under operational conditions. The independent AMSAA analysis correlated well with the University of Maryland analysis. The accelerated life testing showed the LCC interconnects was the predominant failure mechanism and the median time to failure was 967 cycles. Based on the two independent analyses and the actual test results, it was concluded that the CALCE model could accurately assess the reliability of an electronic assembly.

Industry Acceptance:

Although not a specific part of the RAPID project, Rockwell redesigned the ARC-210 control module to delete all the LCCs in the design. This was accomplished and transitioned to production at no cost to the RAPID project.

Implementation and Technology Transfer:

As a result of this project, Rockwell plans to use the CALCE model in all new designs and product upgrades. Also, as a spin off of the RAPID project, the CALCE model was demonstrated at the Defense Microelectronic Activity (DMEA). They also plan to use the model in future reengineering designs.

AMSAA has used the model in analyzing circuit cards in several Army systems including: Joint STARS ground station, Bradley Fire Support Team (BFIST) vehicle, Improved Chemical Agent Monitor (ICAM), Linebacker, Aviation Electronics Combat (AEC) modem, and Grizzly mine plow. The Air Force has also applied the model for F-22 and Comanche circuit cards. The RAPID project has been presented at several conferences including the Defense Manufacturing Conference.

Expected Benefits:

The reliability of the ARC-210 was increased from 371 hours to 1100 hours Mean Time Between Failure (MTBF) because of the elimination of the LCCs. AMSAA conducted a detailed study at the completion of this effort that determined that DoD would avoid \$27M in O&S costs.

TIMELINE / MILESTONES

Start Date: November 1996
End Date: December 1997

FUNDING

Army MANTECH Funding:

Army MANTECH investment: \$300K

Cost Sharing:

ESC Technology Application Office (ESC/CXT): \$500K

PARTICIPANTS

GRC International Inc
Rockwell
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