Advanced Detection of Electronic Counterfeits (ADEC)

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The Counterfeit Problem

- Counterfeit electronics jeopardize the performance, reliability and safety of electronic systems
- **Current screening capabilities are insufficient to detect counterfeit & maliciously modified parts**
- Insidious threat is being manufactured into systems

### Data from Round-Robin Results from Qualified Labs

<table>
<thead>
<tr>
<th>Lab</th>
<th>ID Counterfeit?</th>
<th>ID Authentic?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>D</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>E</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>F</td>
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<td>✓</td>
</tr>
<tr>
<td>G</td>
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<td>No conclusion stated</td>
</tr>
<tr>
<td>H</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>I</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>J</td>
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<td>✓</td>
</tr>
<tr>
<td>K</td>
<td>✓</td>
<td>✗</td>
</tr>
</tbody>
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### Current Industry Capabilities

- **Probability of Detection (Pd):** 82% [3]
- **False Alarm Rate (FAR):** 27% [3]
- **Time for Part Assessment:** 1 week or more

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Senate Armed Services Committee (SASC) found “Suspect Counterfeit Parts” in the multiple DOD systems and concluded:

- **Report Conclusion 3:** The DOD lacks knowledge of the scope and impact of counterfeit parts on critical defense systems.
- **Report Conclusion 4:** The use of counterfeit electronic parts in defense systems can compromise performance and reliability, risk national security and endanger the safety of military personnel.
- **Report Conclusion 7:** Weaknesses in the testing for electronic parts create vulnerabilities that are exploited by counterfeiters.
Advanced Detection of Electronic Counterfeits (ADEC)

External Monitor (Optional)

Touch Screen & GUI

ADEC Signature Analyzer

ADEC Screens for Three Classes of Counterfeits
1) Recycled Parts - Aged / E-Waste Reclaimed
2) Upmarked / Mismarked Parts
3) Intentionally Modified Parts (Hacking, Theft, and Espionage)

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Unintended Emissions
Application to Counterfeits

*All electronics give off unintentional radiated emissions*

- All electronics radiate electromagnetic energy that is characteristic of their function, design, and construction
- ICs can be characterized by emission signature analysis
- Anomalies within signatures indicate counterfeit devices
- Advanced Detection of Electronic Counterfeits (ADEC) program exploits these features
Recent Blind Pilot Testing

- Blind Pilot #1 (ADUM5241ARZ)
  - 7 parts supplied by third party
  - Accurately identified 2 parts as authentic and 5 parts as counterfeit
- Blind Pilot #2 (ATMEL AT89S52)
  - 5 parts supplied by third party
  - All 5 parts accurately identified by ADEC as counterfeit
  - 35 verified authentic parts procured from OCM accurately returned by ADEC system as authentic

Criteria Performance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Performance</th>
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</thead>
<tbody>
<tr>
<td>Pd</td>
<td>100%</td>
</tr>
<tr>
<td>FAR</td>
<td>0%</td>
</tr>
<tr>
<td>Specificity</td>
<td>100%</td>
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</table>
Cost Impact Assessments

Cost Impact Methodology - SAE International at December 2013 G19A Meeting

ADEC Cost Savings for Typical Aircraft (assumes only 50% efficiency improvement):

- **LRUs:** 100 + , Spares: 300
- Estimated Cost to Mitigate anticipated counterfeits is \( \frac{1.4M}{50} \times 400 = 11.2M \)
- **ADEC Cost Savings** is \( \frac{1.4M}{50} \times 400 \times 0.5 = 5.6M \). (assumes 50% improved test efficiency)

ADEC approach provides better than 50% efficiency improvement.

* Presented at the December 2013 SAE G-19A meeting by SAE International, Director, Washington Operations, Bruce Mahone in estimating cost savings for an approach that improves test efficiency by 50%.
Conclusion

• ADEC system and approach to counterfeit detection provides robust counterfeit electronics screening capability
• Work continues to expand the scope of the application space
• Phenomenology is proven to provide unique counterfeit detection opportunities