SAND2014-18136PE

Pb-Free Solder Technology in Aerospace and Defense:

Small Satellite Technology and the Art of Miniaturization

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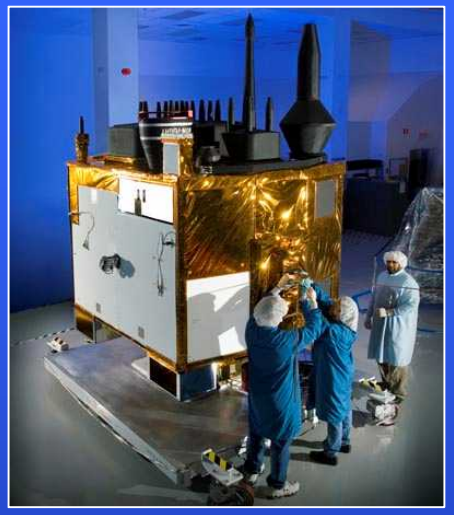
Sandia National Laboratories is a multi-program laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Miniaturization of Satellites

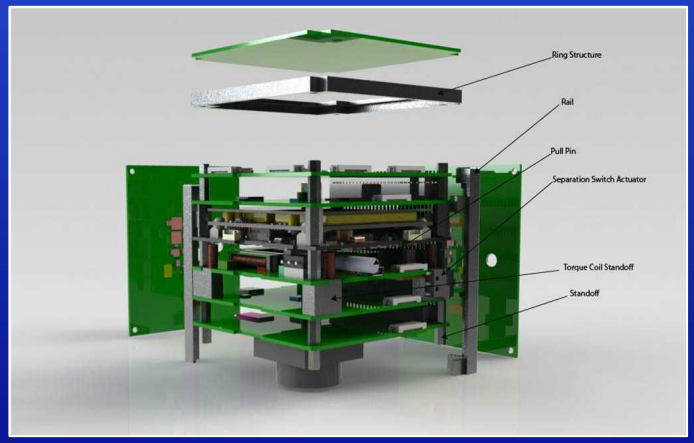
- Large, heavy, and expensive payloads are not required for all missions.



Courtesy: Boeing Corp.

- Small satellites – Cubesat™ can fulfill many mission objectives at a fraction of the cost.

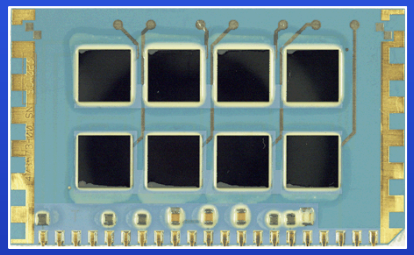
Courtesy: AMSAT-UK



"Give Them an Inch, and They'll Take a Mile"

- There is reason to believe that program sponsors will ask for more functionality and further reductions to size, weight, and power (SWaP) in future system.
- The industry faces the same historical challenges:
  - Miniaturization – feature sizes, interconnections, etc.
  - Thermal management
  - Power generation
  - Motion control

Multichip module (MCM)



- The promising approach is INTEGRATION and a reinvigoration of System-In-a-Package (SIP), embedded components, multichip modules (MCM).
- Emphasis is placed on *development* in order to quickly bring these technologies *from the bench top into orbit.*