Circuit Card Assembly
Radiation Testing
Custom Hybrid, MCM and Module
Advanced IC Packaging Solutions
Single Board Computers
Trusted Accreditation
Cobham Circuit Card Assembly offers a full turnkey electronic manufacturing operation, including assemblies, modules, and systems complete with testing and conformal coating capabilities, in a domestic facility.

We support both consigned and turn-key procurement of customers’ Bill of Materials, qualify components where necessary, and Build-to-Print all volumes of boards.

Capabilities include surface-mount, through-hole, high pin-count Column Grid and Ball Grid Arrays.


Industry Standard Compliance

- Assembly processes for both ANSI-J-STD-001 including latest Space Addendum and NASA 8739
- ESD Compliant to ANSI-ESD S20.20 for assemblies and Integrated Circuits
- Colorado Environmental Leadership Program - Gold Leader
- Full ITAR compliance
Manufacturing Support Processes

- Turnkey or consigned manufacturing
  - Counterfeit Parts Control Program
  - Obsolescence and EOL parts management
  - Parts management to customer provided requirements (AVL, PAPL, PAMPL)
  - Component traceability by Lot Date Code or customer provided tracking process

- Incoming XRF screening for all Military and Space programs (pure tin and specialty metal detection)

- Component lead forming, part programming and post-delivery component level test screening as part of the assembly services

Manufacturing Expertise

- Automated surface mount and plated through-hole assembly
- Qualified Ceramic Column Grid Array (CGA) assembly
- Automated Optical Inspection (AOI), Solder Paste Integrity measurements (SPI) and Coordinate Measuring (CMM) for critical dimension measurements.
- 2D 360 degree rotational Real Time Xray
- Burn-in capabilities at assembly, module and box level
- Flying Probe
- System Level Board testing capable
- Shock, Vibration and Temperature
- Conformal Coating to Mil-I-46058 standards

Colorado Springs and Plainview sites - Category 1A Trusted Accreditation by DMEA
MIL-STD Radiation Effects Test Services

- Total Ionizing Dose (TID) RLAT (50 to 300 rads/sec)
  - MIL-STD-883 Test Methods 1019, Cond. A
- TID ELDRS (10 to 100 mrads/sec)
- Prompt Dose / Flash X-Ray Tests
  - MIL-STD-883 Test Methods 1020 and 1021
- Neutron Displacement Damage Tests
- Heavy Ion SEE Tests (SEL, SET, SEGR, SEU, SEB, SEFI)
- Proton SEE and Displacement Damage Tests

Single Event Effects Testing

- Design and development of test hardware and software
- Optimized test planning and management for efficient use of the cyclotron
- Comprehensive SEE test reports and data collection
- Tests can be designed to evaluate:
  - Single Event Latch Up (SEL)
  - Single Event Upset (SEU)
  - Single Event Transients (SET)
  - Single Event Burnout (SEB)
  - Single Event Functional Interrupts (SEFI)
  - Single Event Gate Rapture (SEGR)
    - EIA/JESD 57
    - ASTM F1192

Extreme High Dose Radiation for Materials and Mechanical Devices

Cobham RAD and Cobham RAD Europe offers a cost effective and efficient service to exposure materials and large mechanical devices to very high levels of gamma radiation. Certain industries, such as nuclear power generation, require hundreds of megarads to qualify materials, components, sensors, actuators, etc. Cobham can also assist with medical device radiation qualification requirements.

Device Screening and Element Evaluation

Cobham RAD offers comprehensive screening services for your flight devices, lot conformance, and individual die element evaluation.

Screening Test Method Capabilities

<table>
<thead>
<tr>
<th>Test Description</th>
<th>MIL-STD TEST METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesion of Lead Finish</td>
<td>2025</td>
</tr>
<tr>
<td>Bond Strength</td>
<td>2011</td>
</tr>
<tr>
<td>Burn-in</td>
<td>1015</td>
</tr>
<tr>
<td>Constant Acceleration</td>
<td>2001</td>
</tr>
<tr>
<td>Die Shear</td>
<td>2019</td>
</tr>
<tr>
<td>External Visual</td>
<td>2009</td>
</tr>
<tr>
<td>Hermiticity (Krypton 85)</td>
<td>2014</td>
</tr>
<tr>
<td>Internal Visual</td>
<td>2010</td>
</tr>
<tr>
<td>Internal Water Vapor</td>
<td>1018</td>
</tr>
<tr>
<td>Lead Integrity</td>
<td>2004</td>
</tr>
<tr>
<td>Lid Torque</td>
<td>2024</td>
</tr>
<tr>
<td>Mechanical Shock</td>
<td>2002</td>
</tr>
<tr>
<td>Moisture Resistance</td>
<td>1004</td>
</tr>
<tr>
<td>Physical Dimensions</td>
<td>2016</td>
</tr>
<tr>
<td>PIND</td>
<td>2020</td>
</tr>
<tr>
<td>Radiography X-ray (Digital)</td>
<td>2012</td>
</tr>
<tr>
<td>Resistance to Solvents</td>
<td>2015</td>
</tr>
<tr>
<td>Salt Atmosphere</td>
<td>1009</td>
</tr>
<tr>
<td>Solderability</td>
<td>2003</td>
</tr>
<tr>
<td>Steady State Life</td>
<td>1005</td>
</tr>
<tr>
<td>Temperature Cycling</td>
<td>1010</td>
</tr>
<tr>
<td>Thermal Shock</td>
<td>1011</td>
</tr>
<tr>
<td>Vibration Variable Frequency</td>
<td>2007</td>
</tr>
</tbody>
</table>

SEE Testing of memory devices, including NAND, SDRAM and DDR, is efficiently performed using our FPGA based test solutions. The majority of SEE tests are conducted using cyclotrons at either Lawrence Berkeley National Laboratory (LBNL) or at Texas A&M University (TAMU) and on occasion at Brookhaven National Laboratory (BNL).
Cobham RAD Europe - SEREEL2: Laser SEE Testing Systems

Cobham RAD Europe, in conjunction with MBDA, offers SEREEL2 for SPA and SEREEL2 for TPA.

What is SEREEL2?

Laser Single Event Effects (SEE) testing simulates the effects of space radiation by firing a laser beam at a semiconductor device and measuring the effect of each single pulse. An infrared camera can be used to image the location of the pulses in order to test the component before sending it into space. Companies can benefit from the SEREEL2 system to test 100’s of die for Single Event Effects (SEE) in their own facility, saving test and travel costs. Once good die are obtained, Cobham RAD Europe can assist companies with confirmation testing in our facilities or arrange for testing time. Cobham RAD will assist the customer after purchase to set-up the SEREEL2 for testing and offer consultations. A full warranty is included.

Microwave Cavity Filters

- Full Turn-Key capability. Design, assembly and test of single or multiplexer cavity type filters for space applications.
- Full functional testing to customer specification, to include passive intermodulation and High Power testing in a thermal vacuum chamber, while monitoring for any multipaction events.
- Legacy: GPSII and GPSIII SV1-SV9 Diplexers and Triplexers and many others.
Cobham Single Board Computers (SBC)

**Standard Gen 6 LEON 3FT SBC**

GEN 6 LEON 3FT 3U cPCI SBC is a flight ready TRL-8 board for LEO, GEO and Planetary Missions. Flexible Architecture, enabled for use of LEON 3FTs Microprocessors, including the UT699, UT699e, UT700. It supports up to 95 Dhrystone MIPS performance with up to a 132MHz System Clock. On board memory supported is 64MB of SRAM Memory and 32MB of NV Memory, along with two cPCI bus I/F connectors (Hypertronics) and two SpW connectors. IPC-6012 Class 3A compliance.

With our Electronic Manufacturing Service (EMS) experience on the LEAP board, and various flight board builds, Cobham can serve your needs with an off-the-shelf Single Board Computer (SBC) option specifically designed for Command and Control Applications.

<table>
<thead>
<tr>
<th>Gen 6 LEON 3FT Single Board Computer (SBC)</th>
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<tbody>
<tr>
<td>cobham.com/HiRel</td>
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</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Main Clock (MHz)</th>
<th>AMBA Clock (MHz)</th>
<th>Memory Access (MHz) / wait states (W-S)</th>
<th>Estimated DMIPS</th>
<th>SpW Clk (MHz)</th>
<th>Typical Power Consumption (W)</th>
<th>Estimated Power (W)</th>
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<tbody>
<tr>
<td>DS4350272-x00</td>
<td>UT699E</td>
<td>33</td>
<td>33 / 0 W-S</td>
<td>44.2</td>
<td>33</td>
<td>3.0</td>
<td>5.1</td>
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<tr>
<td>DS4350272-x01</td>
<td>UT699e</td>
<td>66</td>
<td>66 / 3 W-S</td>
<td>70.4</td>
<td>132</td>
<td>3.5</td>
<td>6.6</td>
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<tr>
<td>DS4350272-x02</td>
<td>UT700</td>
<td>33</td>
<td>33 / 0 W-S</td>
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<td>33</td>
<td>3.0</td>
<td>5.1</td>
</tr>
<tr>
<td>DS4350272-x03</td>
<td>UT700</td>
<td>66</td>
<td>66 / 3 W-S</td>
<td>70.4</td>
<td>132</td>
<td>3.5</td>
<td>6.6</td>
</tr>
<tr>
<td>DS4350272-x04</td>
<td>UT700</td>
<td>132</td>
<td>66 / 3 W-S</td>
<td>94.9</td>
<td>132</td>
<td>4.2</td>
<td>7.3</td>
</tr>
</tbody>
</table>

Conditions: cPCI active/Memory Access [Typ = no Access | Max = 50%]
All other IP Functions Disabled via Clock gating register.

**GEN VI Single Board Computer EM, FM Designations**

Several models of the GEN VI SBCs can be manufactured based on usage purpose, delivery schedule, mass, and cost. The following types of assemblies are identified:

a) Flight Modules (FM): Designated by a 3xx in the part number, the FMs are used in spacecraft final production. These units meet full specifications.

b) Engineering Model (EM): Designated by a 1xx in the part number, the EMs are flight-like units used in the flight design checkout, software development and qualification, upper assembly unit checkout and initial flight unit integration (pre-environmental). EMs meet full design specifications less the Flight Parts and board level environmental tests/screening.

Contact factory for other flows besides EM and FM, i.e. “Flight Lite”.

**Custom Single Board Computers Services**

- **Custom SBC Services**
  - Made-to-order SBCs
  - Custom SBC module design (PCB design and layout, components circuit design, timing closure, form factor and mechanical casing/shielding)
  - Custom test solution for qualification and volume production
  - Quick-turn Engineering Design Units (EDU) using lower cost HiRel or QCOTS components.
  - Customer specified HiRel or Space grade qualification

- **Standard SBC Modification**
  - Customer system tuning and adaptation
    - System Clock Frequency tuning and Power Management
    - Memory capacity customization
Advanced IC Packaging Solutions

Cobham offers advanced integrated circuit (IC) packaging, modelling and testing solutions for third-party ASIC and commercially-sourced die where the highest levels of reliability and performance are required along with stringent requirements in the areas of size, form-factor, power and thermal management. Building on a heritage of providing custom package solutions for the most demanding aerospace, defense, and medical IC products developed at Cobham, we have a proven capability to identify, select, and design a solution tailored to the unique requirements of your mission. Our flexible engagement model allows us to support a range of services from rapid prototyping of a small number of die for validation and characterization to full volume production in our DMEA accredited trusted facility.

Numerous package technology and process flow options are available: ranging from ceramic QML to organic commercial. System in Package (SiP) solutions leveraging 2.1D technology to place multiple die in a single package are available to enable smaller footprints, increased performance and the integration of die fabricated in different process technologies or wafer types.

A full suite of electrical, thermal, and mechanical modeling tools are used throughout the design process to ensure compliance with critical design points and constraints.

Package Technology Overview
- Commercial Organic Packages: Ball Grid Array (BGA) and Fine Pitch Ball Grid Array (FPBGA), Flip Chip Ball Grid Array (FCBGA), Quad Flat-Pack No Leads (QFN), Plastic Quad Flat Back (PQFP)
- HiRel Packages: Hermetic ceramic package technology - Ceramic Quad Flat Pack (CQFP), Ceramic Column Grid Array (CCGA), Land Grid Array (LGA), Pin Grid Array (PGA), Dual Flat Pack (DFP)
- QML-V certification per MIL-PRF-38535
- QML-Y (Class Y) facility certification per MIL-PRF-38535 representing the first Class Y certification awarded by the Defense Logistics Agency (DLA)
- QML qualified chip capacitor attach and solder column attach processes

Plug & Sense™ Packaging Examples
- Flip-Chip on Flex, Organic, or Ceramic assembly
- Stacked Sensor to ASIC design
- 4,096 Channel Bio-Sensor with 2 ASICs
- Two 512 Channel Flip-Chip ASICs plus Flip-Chip Bio Sensor

Advanced Package Technology
- QML stacked SRAM memory assembly
- QML MRAM magnetic shielding assembly
- Advanced Ceramic Flip-Chip assembly (Class Y)
- RF & digital logic integration in 2.1D Multi-Chip Module on Organic Substrates
- Wafer bumping on thin class III-V wafer substrates
Cobham, a supplier of standard products and custom microelectronic solutions offers Space and Military qualified assembly and test services meeting the requirements of MIL-PRF-38534 Class H & K.

Our MCM packaging technology enables our customers to realize the optimum Size, Weight and Power (SWaP) of their products by applying flip-chip, chip and wire, Chip-on-Board (COB), Surface Mount Technology (SMT) and Planar Magnetics. In many cases, more than one of these technologies are combined in a single module.

From DC to 40 GHz, Cobham can provide microelectronic packaging and test solutions for high speed digital, precision analog and RF/Microwave devices used in military, space and critical industrial applications.

**Cobham Offers**

- One stop solution for your microelectronic assembly, evaluation, test and screening requirements
- MIL-PRF-38534 compliant (Class H & K), ISO-9001 and AS9100 certified
- Customer furnished tooling - Cobham is experienced in integrating customer originated designs into a smooth, seamless high quality process
- Full turnkey and "design to spec" services for hybrid, SMT assemblies and boxes
- Vertically integrated die to box facility, Class 1,000, Class 10,000 and Class 100,000 manufacturing space
- High-reliability Chip-On-Board design and manufacturing services
- RF/microwave manufacturing services for high volume phased array antennas
- Value-added services such as radiation testing and characterization, classified testing and COTS/commercial upscreening
- Cobham HiRel products, such as FPGAs and ASICs, are available for vertical integration

**Production Capabilities**

- State-of-the-Art gold ball bonding:
  - 0.8 mil to 2.0 mil automatic gold ball bonding
  - Typical IC bond pad dimensions: 65µm; 50µm on special request
  - Typical IC bond pad pitch: 80µm; 75µm on special request
  - Standard operating procedure: Security Bump on Stitch
  - Specialized stand-off stitch allows inter-chip, high-speed ball bonding versus slower wedge bond processes
  - Large Area – 16” x 13” bondable area