With our suite of spacecraft services and technology, your team can build, test, launch and operate, all using the revolutionary XB CubeSats and Mercury, Venus and Saturn X-SAT Microsats.
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We are a complete end-to-end spacecraft company and a leading provider of turnkey small satellite solutions, including nanosatellites, CubeSats and Microsats. Our attitude determination and control components are one-of-a-kind, allowing for industry-leading precision pointing platforms.

Our affordable spacecraft systems and components are built for use in academic, commercial, and government missions and applications. With cost-efficient, flight-proven, high-performance, high-reliability spacecraft solutions, we are capable of supporting all types of space missions, from university-led science exploration to national defense satellite constellations.

The hardware that we deliver is robust, resilient and radiation tolerant. We have experience with missions that require secure communications, including Type-1 hardware encryption. Inside 100,000 square feet of state-of-the-art facilities, we craft cutting-edge spacecraft and subsystems which support LEO, GEO, Lunar and inter-planetary missions.

With high-volume manufacturing, highly integrated spacecraft buses, and flexible ground software, every stage of our process is designed to maximize your payload mass and volume on-orbit while minimizing your overall mission cost.
We are building over 60 spacecraft for academic, commercial, and government missions. With hundreds of flight articles delivered and dozens of spacecraft performing on-orbit, our work has spanned across components, full Attitude Control Systems for nano and microsatellites, and complete spacecraft avionics. To show you just what we're capable of, we've included a small sample of our missions:

**CUBESATS**

**RAVAN**
*Johns Hopkins University Applied Physics Laboratory (JHU/APL)*
- Objective: Successful demonstration of a radiometer which has now paved the way for constellation Earth radiation budget mission.
- BCT Providing: 3U Spacecraft Bus

**TROPICS NASA CUBESAT CONSTELLATION**
*MIT Lincoln Laboratory*
- Objective: Provides rapid-revisit passive microwave measurements over low-latitude tropical regions.
- BCT Providing: Constellation of seven 3U Spacecraft Buses

**AGILE MICROSATELLITE (AMS)**
*MIT Lincoln Laboratory*
- Objective: First-of-its-kind mission will demonstrate that a CubeSat can reliably operate in very low-Earth orbit.
- BCT Providing: 6U Spacecraft Bus

**ASTERIA**
*NASA’s Jet Propulsion Laboratory*
- Objective: Search for exoplanets via extremely accurate payload pointing.
- BCT Providing: XACT ADCS System for 6U Spacecraft Bus

**CIRCE**
*US Naval Research Laboratory and Defence Science and Technology Laboratory UK*
- Objective: Will utilize two CubeSats flying in tandem formation in low-Earth orbit to measure the ionosphere and radiation environment space from multiple vantage points.
- BCT Providing: 6U Spacecraft Bus

**CSIM**
*University of Colorado*
- Objective: Will measure solar spectral irradiance to understand how solar variability impacts Earth's climate and to validate climate model sensitivity to spectrally varying solar forcing.
- BCT Providing: 6U Spacecraft Bus
CUBERRT
Ohio State University and NASA
- Objective: Observes, detects, and mitigates radio frequency interference (RFI) for microwave radiometers.
- BCT Providing: 6U Spacecraft Bus

HALOSAT
University of Iowa and NASA’s Wallops Flight Facility
- Objective: Measures soft X-ray emissions from the halo of our Milky Way galaxy.
- BCT Providing: 6U Spacecraft Bus

H-SAT
L3 Harris Technologies
- Objective: Tested and characterized the performance of a payload in a circular, sun-synsynchronous low-Earth orbit.
- BCT Providing: 6U Spacecraft Bus

STARLING
NASA Ames Research Center
- Objective: Demonstration mission to prove out the capability of affordable, distributed spacecraft missions, or swarms, in low-Earth orbit.
- BCT Providing: 6U Spacecraft Bus

TEMPEST-D
Colorado State University
- Objective: Demonstration of radiometer that will provide temporal observations of cloud and precipitation process in a future constellation.
- BCT Providing: 6U Spacecraft Bus

ASCENT
Air Force Research Laboratory
- Objective: First demonstration of a CubeSat at GEO.
- BCT Providing: 12U Spacecraft Bus
LINK XVI
Viasat and the Air Force Research Laboratory Space Vehicles
- Objective: Will test as a network relay with the use of a Link 16 terminal on a small satellite in low-Earth orbit.
- BCT Providing: 12U Spacecraft Bus

MICROSATS

D2S2
Air Force Research Laboratory
- Objective: Demonstrate extraordinary mobility between orbital regimes in a small spacecraft with a useful space domain awareness payload.
- BCT Providing: Microsat Spacecraft Bus

GNOMES
PlanetIQ
- Objective: Commercial satellite constellation dedicated to weather, climate, and space weather.
- BCT Providing: Microsat Spacecraft Bus

R3D2
DARPA and Northrop Grumman
- Objective: To space-qualify a new type of Kapton membrane reflectarray antenna.
- BCT Providing: Microsat Spacecraft Bus

METHANESAT
MethaneSAT, LLC
- Objective: Will provide global, high-resolution quantification of methane emissions from oil and gas facilities, as well as measure surface-level methane emissions from other sources of human-triggered methane emissions.
- BCT Providing: Microsat Spacecraft Bus

OSAM-2
Made in Space
- Objective: A technology project developing the necessary additive manufacturing technology to build large-scale structures in space.
- BCT Providing: Microsat Spacecraft Bus
BLACKJACK

**DARPA**

- Objective: Will provide global persistent coverage through operation of one or more payloads from up to six DoD mission areas.
- BCT Providing: A low-Earth orbit constellation of 4-20 microsatellites
MarCO

Customer: NASA JPL
Destination: Mars
Objective: Accomplished a successful mission that tested out miniature spacecraft technology in deep space
BCT Providing: XACT

Lunar IceCube

Customer: Morehead State University
Destination: Lunar Orbit
Objective: Search for water ice on the Moon
BCT Providing: XACT

NEA Scout

Customer: NASA MSFC
Destination: Interplanetary
Objective: Flyby of an asteroid with solar sail propulsion
BCT Providing: 4 RWp015, Modified XACT, Solar Panels

BioSentinel

Customer: NASA Ames
Destination: Heliocentric
Objective: Detect, measure, and correlate the impact of space radiation in living organisms
BCT Providing: XACT

Lunar Flashlight

Customer: NASA JPL
Destination: Lunar Orbit
Objective: Map lunar south pole for volatiles
BCT Providing: XACT-50, Solar Panels

CuSP

Customer: Southwest Research Institute
Destination: Interplanetary
Objective: Heliophysics
BCT Providing: XACT

EQUULEUS

Customer: University of Tokyo and JAXA
Destination: Earth-Moon, L2
Objective: Trajectory control experiment in cis-lunar region, imaging of Earth’s plasmasphere, lunar impact flash observation, measurement of dust environment in cis-lunar region
BCT Providing: XACT-50

OMOTENASHI

Customer: AeroAstro
Destination: Lunar surface
Objective: Demonstration of a nano-lander
BCT Providing: XACT
**ArgoMoon**

**Customer:** Argotec  
**Destination:** Earth (6 months)  
**Objective:** Take historically significant photography of the EM-1 mission  
**BCT Providing:** XACT

**Earth Escape Explorer (CU-E3)**

**Customer:** University of Colorado Boulder  
**Destination:** Deep space  
**Objective:** Demonstrate deep space communications from a 6U CubeSat as part of the NASA CubeQuest Challenge  
**BCT Providing:** XB1 Avionics

**LunaH-Map**

**Customer:** Arizona State University  
**Destination:** Lunar orbit  
**Objective:** Mapping of hydrogen around Lunar South Pole  
**BCT Providing:** XB1 Avionics
Our family of XB Spacecraft offers complete end-to-end solutions for your mission needs. Featuring an extremely precise, highly powerful integrated spacecraft bus platform — ranging from a 3U CubeSat to an ESPA-Grande satellite — our versatile systems are built to accommodate any and all types of missions. With robust power systems, secure data handling, and resilient performance, our suite of solutions are time-tested and proven-reliable, even under the harshest of conditions. Get ready for a new era of peak-performance, cost-efficient spacecraft solutions.
**XB3 SPACECRAFT**

- **CLASS**: 3U
- **ENERGY STORAGE**: 6.8 Ah
- **SOLAR ARRAY POWER**: 28W - 42W
- **AVAILABLE PAYLOAD VOLUME**: 1.5U (typical)
- **POINTING ACCURACY**: ±0.003 deg (1-sigma) for 2 axes, 1 Tracker
- **ORBIT ALTITUDE / ORBIT LIFETIME**: LEO > 5 years | GEO > 2 years
XB6 SPACECRAFT

<table>
<thead>
<tr>
<th>CLASS</th>
<th>ENERGY STORAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6U</td>
<td>6.8-17 Ah</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POINTING ACCURACY</th>
<th>ORBIT ALTITUDE / ORBIT LIFETIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>±0.002° (1-sigma), 3 axes, 2 Trackers</td>
<td>LEO &gt; 5 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOLAR ARRAY POWER</th>
<th>AVAILABLE PAYLOAD VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>98W - 118W</td>
<td>4U (typical)</td>
</tr>
</tbody>
</table>
### XB12 SPACECRAFT

**CLASS**

12U

**ENERGY STORAGE**

6.8-17 Ah

**POINTING ACCURACY**

±0.002° (1-sigma), 3 axes, 2 Trackers

**SOLAR ARRAY POWER**

98W - 118W

**ORBIT ALTITUDE / ORBIT LIFETIME**

LEO > 5 years | GEO > 2 years

**AVAILABLE PAYLOAD VOLUME**

8U (typical)
# Cubesat Spacecraft Summary

<table>
<thead>
<tr>
<th>Class</th>
<th>XB3</th>
<th>XB6</th>
<th>XB12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Available Payload Volume</strong></td>
<td>1.5U (typical)</td>
<td>4U (typical)</td>
<td>8U (typical)</td>
</tr>
<tr>
<td><strong>Pointing Accuracy</strong></td>
<td>±0.003 deg (1-sigma) for 2 axes; ±0.007 deg (1-sigma) for 3rd axis</td>
<td>±0.002 deg (1-sigma) 3 axes, 2 Trackers</td>
<td>±0.002 deg (1-sigma) 3 axes, 2 Trackers</td>
</tr>
<tr>
<td><strong>Pointing Stability</strong></td>
<td>1 arc-sec over 1 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Orbit Knowledge</strong></td>
<td>4m, 0.05m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Interfaces</strong></td>
<td>Serial, LVDS, Spacewire, HDLC or SPI available</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Onboard Data Storage</strong></td>
<td>4GB with expandable beyond for the 6U and 12U (by adding the high speed data recorder)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Energy Storage</strong></td>
<td>6.8 Ah</td>
<td>6.8 – 17 Ah</td>
<td>6.8 – 17 Ah</td>
</tr>
<tr>
<td><strong>Solar Array Power</strong></td>
<td>28W - 42W</td>
<td>98W - 118W</td>
<td>98W - 118W</td>
</tr>
<tr>
<td><strong>Propulsion</strong></td>
<td>Multiple electric and chemical propulsion systems available</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High Current Capability</strong></td>
<td>Unregulated up to 60W</td>
<td>Unregulated up to 120W</td>
<td>Unregulated up to 120W</td>
</tr>
<tr>
<td><strong>Uplink</strong></td>
<td>Nominal 100 Kbps, CCSDS formatting</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Downlink</strong></td>
<td>Up to 4 Mbps</td>
<td>Up to 20 Mbps</td>
<td>Up to 20 Mbps</td>
</tr>
<tr>
<td><strong>Orbit Altitude / Orbit Lifetime</strong></td>
<td>LEO &gt; 5 years</td>
<td>GEO &gt; 2 years</td>
<td></td>
</tr>
</tbody>
</table>
Blue Canyon Technologies can provide generic Engineering Development Units (EDUs) to aid in the development of customer payloads. These EDUs offer the ability for new customers to prove out the interfaces between their payload and the XB1 spacecraft well before the flight units are brought together, lowering technical and schedules risks for the program.

The generic EDUs contain all of the interfaces, both data and power, that will be available on a flight program.
### XB1 EDU

<table>
<thead>
<tr>
<th><strong>Mechanical Configuration</strong></th>
<th>EDUs are housed in durable aluminum chassis. Mechanical configuration is not flight-like</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Interfaces</strong></td>
<td>14 x 2.5V LVDS Pairs, 8 x 3.3V Single Ended IO. Preferred protocols: UART, SpaceWire, RS422, RS485</td>
</tr>
<tr>
<td><strong>Onboard Data Storage</strong></td>
<td>4 GigaBytes of payload data</td>
</tr>
</tbody>
</table>
| **Power Interfaces**         | 1 Switched 3.3V @ 3.2A  
1 Switched 5.0V @ 3.2A  
6 Switched unregulated 12 @ 4.8A  
*Combined current not to exceed 10A* |
<p>| <strong>Mission Simulations</strong>      | BCT’s Real Time Dynamics Processor is included with all EDUs to provide software simulations of mission operations |
| <strong>RF Interface</strong>             | BCT Software Defined Radio available as an option |
| <strong>GPS Interface</strong>            | GPS Receiver and Antenna available as an option |
| <strong>Energy Storage</strong>           | No batteries are included in EDU. Battery inputs can be simulated with GSE input |
| <strong>Solar Array Power</strong>        | No solar arrays are included in EDU. Solar Array inputs can be simulated with GSE input |
| <strong>Sensors and Actuators</strong>    | EDUs do not contain reaction wheels, torque rods, star trackers, IMUs, or sun sensors |</p>
<table>
<thead>
<tr>
<th><strong>CLASS</strong></th>
<th><strong>ENERGY STORAGE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>8” launch vehicle interface (optional 11.32” available)</td>
<td>10.2 Ah</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>POINTING ACCURACY</strong></th>
<th><strong>ORBIT ALTITUDE / ORBIT LIFETIME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>±0.002° (1-sigma), 3 axes, 2 Trackers</td>
<td>LEO (≥ 5 years), GEO (≥ 2 years), Deep Space (≥ 2 years)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SOLAR ARRAY POWER</strong></th>
<th><strong>PAYLOAD VOLUME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>48W/wing, 96W max</td>
<td>14.0” X 17.0” X 17.0” (launch dependent)</td>
</tr>
</tbody>
</table>
**X-SAT**

**VENUS CLASS**

<table>
<thead>
<tr>
<th>CLASS</th>
<th>15” launch vehicle interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>POINTING ACCURACY</td>
<td>±0.002° (1-sigma), 3 axes, 2 Trackers</td>
</tr>
<tr>
<td>SOLAR ARRAY POWER</td>
<td>THEA, two wing: 384W, THEA, one wing: 192W</td>
</tr>
<tr>
<td>PAYLOAD MASS CAPABILITY</td>
<td>90 kg</td>
</tr>
<tr>
<td>ENERGY STORAGE</td>
<td>10.2 Ah</td>
</tr>
<tr>
<td>ORBIT ALTITUDE / ORBIT LIFETIME</td>
<td>LEO (≥ 5 years), GEO (≥ 2 years), Deep Space (≥ 2 years)</td>
</tr>
<tr>
<td>PAYLOAD VOLUME</td>
<td>20.5” X 16.4” X 27.0” (1 array), 17.0” X 16.4” X 27.0” (2 array), Larger volume available depending on launch vehicle</td>
</tr>
</tbody>
</table>
**CLASS**
24” launch vehicle interface

**POINTER ACCURACY**
±0.002° (1-sigma), 3 axes, 2 Trackers

**SOLAR ARRAY POWER**
Hyperion 15, two wing: 1000W
Hyperion 15, one wing: 500W

**PAYLOAD MASS CAPABILITY**
200 kg

**ENERGY STORAGE**
40.8 Ah or 54.4 Ah

**ORBIT ALTITUDE / ORBIT LIFETIME**
LEO (≥ 5 years), GEO (≥ 2 years), Deep Space (≥ 2 years)

**PAYLOAD VOLUME**
30.0” X 30.0” X 40.0” (typical)
Larger volume available within rideshare envelope and in dedicated launch vehicle fairings
# MICRO SAT SPACECRAFT SUMMARY

<table>
<thead>
<tr>
<th>CLASS</th>
<th>X-SAT (MERCURY CLASS)</th>
<th>X-SAT (VENUS CLASS)</th>
<th>X-SAT (SATURN CLASS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Launch Vehicle Interface</td>
<td>8&quot; (optional 11.32&quot; available)</td>
<td>15&quot;</td>
<td>24&quot; (2 Trackers)</td>
</tr>
<tr>
<td>Pointing Accuracy</td>
<td>±0.002° (1-sigma), 3 axes, 2 Trackers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar Array Power</td>
<td>48W/wing, 96W max</td>
<td>THEA, two wing: 384W, one wing: 192W</td>
<td>Hyperion 15, two wing: 1000W, one wing: 500W</td>
</tr>
<tr>
<td>Payload Mass Capability</td>
<td>40 kg</td>
<td>90 kg</td>
<td>200 kg</td>
</tr>
<tr>
<td>Energy Storage</td>
<td>10.2 Ah</td>
<td>10.2 Ah</td>
<td>40.8 Ah or 54.4 Ah</td>
</tr>
<tr>
<td>Orbit Altitude / Orbit Lifetime</td>
<td>LEO (≥ 5 years), GEO (≥ 2 years), Deep Space (≥ 2 years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payload Volume</td>
<td>14.0&quot; X 17.0&quot; X 17.0&quot; (launch dependent)</td>
<td>20.5&quot; X 16.4&quot; X 27.0&quot; (1 array)</td>
<td>30.0&quot; X 30.0&quot; X 40.0&quot; (typical)</td>
</tr>
<tr>
<td></td>
<td>17.0&quot; X 16.4&quot; X 27.0&quot; (2 array)</td>
<td>Larger volume available depending on launch vehicle</td>
<td>Larger volume available within rideshare envelope and in dedicated launch vehicle fairings</td>
</tr>
<tr>
<td>Propulsion</td>
<td>Multiple electric and chemical propulsion systems available</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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We offer a wide range of high-performance, low-recurring cost, and rapid-response CubeSat spacecraft systems and components. 

Through our Star Tracker-based attitude control system, the BCT XACT has achieved the absolute highest-possible pointing accuracy across CubeSats, Nanosats, and Microsatellites alike.
Our XACT and FleXcore products are currently operating on-orbit, supporting numerous successful customer missions.

Get reliable, high-performance design compatible with a wide range of satellite configurations, all from the most accurate stellar-based attitude solutions. A powerful processing core coupled with our reaction wheel assemblies enable a new generation of peak-performance, cost-efficient miniaturized spacecraft.

**XACT-15**
No matter the mission, the XACT is up to the task. Our integrated attitude control solution enables CubeSats to point with the absolute highest accuracy — much higher than that of previously available models.

**XACT-50**
Larger reaction wheels and torque rods give your mission the same high-end tech from the XACT-15, with improved capability.

**XACT-100**
XACT-100 gives the largest CubeSats the ability to use our largest reaction wheels, while still maintaining a minimal form-factor.
FLEXCORE
It’s all the advantages of CubeSats, now inside Microsats. With our XACT-based electronics and control software, multiple external sensors, and larger actuators, your team has access to a high-performance, cost-efficient modular ADCS system that’s scalable to a wide range of bus sizes and mission requirements.

XACT ATTITUDE CONTROL SCALABLE TO SMALL SATELLITES
For a highly capable, cost-efficient attitude control system compatible with microsatellite-sized spacecraft, look no further than the BCT FleXcore. Boasting our integrated XACT-based architecture, and leveraging a powerful processing core with BCT’s Nano Star Trackers and Reaction Wheel assemblies, the BCT FleXcore is an extremely reliable and modular attitude control system compatible with all manner of configurations and missions.

FleXcore features 3-axis Stellar Attitude Determination in a micro-package. Built-in, flexible commanding allows for multiple pointing reference frames: Inertial, LVLH, Earth-Fixed, and Solar. Precise 3-axis control is provided by low jitter reaction wheels, torque rods and integrated control algorithms. Software is available to support simulation, system integration, and customization of the ACS functionality.

FEATURES INCLUDE:
• XACT-based electronics and control software with external sensors and actuators
• Low-cost and high-performance attitude control solution
• Modular system fits multiple missions
• Supports multiple Star Trackers
• Scalable to a wide range of bus sizes
• Compatible with BCT family of reaction wheels and torque rods
• Supports LEO, GEO, and Deep Space missions
## Attitude Control Systems Summary

<table>
<thead>
<tr>
<th>Feature</th>
<th>XACT-15</th>
<th>XACT-50</th>
<th>XACT-100</th>
<th>FLEXCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spacecraft Pointing Accuracy</strong></td>
<td>±0.003 deg (1-sigma) for 2 axes; ±0.007 deg (1-sigma) for 3rd axis</td>
<td>±0.003 deg (1-sigma) for 2 axes; ±0.007 deg (1-sigma) for 3rd axis</td>
<td>±0.003 deg (1-sigma) for 2 axes; ±0.007 deg (1-sigma) for 3rd axis</td>
<td>±0.002 deg (1-sigma), 3 axes; 2 Trackers</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>0.885 kg</td>
<td>1.23 kg</td>
<td>0.433 kg + 1.38 kg (wheels + torque rods)</td>
<td>Configuration Dependent</td>
</tr>
<tr>
<td><strong>Volume</strong></td>
<td>10 x 10 x 5 cm (0.5U)</td>
<td>10 x 10 x 7.54 cm (0.75U)</td>
<td>10 x 10 x 5 cm (0.5U) (not incl. external components)</td>
<td>&lt; 12.1 x 11.4 x 4.9 cm (not incl. external components)</td>
</tr>
<tr>
<td><strong>Electronics Input Voltage</strong></td>
<td>12V</td>
<td>12V</td>
<td>12V</td>
<td>5V and 28V</td>
</tr>
<tr>
<td><strong>Typical Data Interface</strong></td>
<td>RS-422</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Slew Rate</strong></td>
<td>Up to 10 deg/sec (4kg, 3U CubeSat)</td>
<td>Up to 10 deg/sec (14kg, 6U CubeSat)</td>
<td>Up to 10 deg/sec (25kg, 12U CubeSat)</td>
<td>Application Dependent</td>
</tr>
<tr>
<td><strong>Spacecraft Lifetime</strong></td>
<td>LEO &gt; 5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Momentum</strong></td>
<td>15 mNms</td>
<td>50 mNms</td>
<td>100 mNms</td>
<td>Between 0.5 and 8 Nms depending on which wheels are used</td>
</tr>
</tbody>
</table>

### Features Include:
- Precise attitude knowledge & control
- Complete ACS in a micro-package
- Low jitter Micro-Reaction Wheel design
- User-friendly software supports simulation, integration, and customization
Our star trackers are currently operating on-orbit, supporting numerous successful customer missions.

The industry-trusted Blue Canyon Technologies Nano Star Tracker (NST) is compatible across spacecraft platforms and suited for even the most challenging and sensitive missions. Extensive flight heritage and proven, best-in-class performance make our star tracker the ideal fit for standalone missions or constellations.

Our star tracker is qualified beyond GEVS level environments, giving our customers a low SWaP-C solution with stunning capabilities. The turnkey starlight-in, quaternion-out system integrates easily and comes with user-friendly documentation.

<table>
<thead>
<tr>
<th>ATTITUDE KNOWLEDGE</th>
<th>Gen3: 1 asec (cross boresight); 10 asec (about boresight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen2: 6 asec (cross boresight); 40 asec (about boresight)</td>
<td></td>
</tr>
<tr>
<td>OPERATIONAL RANGE</td>
<td>-20°C to +50°C (full performance)</td>
</tr>
<tr>
<td>SOLUTION RATE</td>
<td>5 Hz</td>
</tr>
<tr>
<td>SKY COVERAGE</td>
<td>&gt; 99%</td>
</tr>
<tr>
<td>LOST-IN-SPACE STAR IDENTIFICATION</td>
<td>&lt;4 sec (up to 1.5 deg/s)</td>
</tr>
<tr>
<td>FIELD OF VIEW</td>
<td>10 x 12 deg</td>
</tr>
<tr>
<td>POWER INPUT</td>
<td>5V or 28V</td>
</tr>
<tr>
<td>PEAK POWER</td>
<td>&lt; 1.5W @ 5V</td>
</tr>
<tr>
<td>MASS</td>
<td>0.35kg, 0.46kg, 0.85kg</td>
</tr>
<tr>
<td>VOLUME</td>
<td>10 x 5.5 x 5 cm, 17 x 8.5 x 7 cm, 25 x 10 x 10 cm</td>
</tr>
<tr>
<td>SUN KEEP OUT (HALF CONE)</td>
<td>45 deg, 22 deg, 17.5 deg</td>
</tr>
<tr>
<td>MISSION LIFE</td>
<td>LEO &gt; 10 years (standard shielding)   GEO &gt; 7 years (enhanced shielding)</td>
</tr>
</tbody>
</table>
FEATURES INCLUDE:

- Heritage exceeding 100 trackers
- Low SWaP-C
- Tracks stars down to 7.5 magnitude
- On-board star catalog (>20,000 stars)

- Lost-in-space star identification
- Shock test qualified
- EMI/EMC tested to MIL-STD-461
- User friendly RS-422 or RS-485 interface
Our Reaction Wheels are currently operating on-orbit, supporting numerous successful customer missions.

Brushless DC motors, ultra-smooth bearings, and an advanced lubrication system ensures low-jitter performance, and long life for your mission.

**DRIVE ELECTRONICS**

Flexible interface options include direct analog torque command as well as a digital command and telemetry option. Standalone control electronics drive up to four reaction wheels. RWp500, or larger, are driven by integrated drive electronics.
<table>
<thead>
<tr>
<th></th>
<th>RWP015</th>
<th>RWP050</th>
<th>RWP100</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Momentum</strong></td>
<td>0.015 Nms</td>
<td>0.050 Nms</td>
<td>0.10 Nms</td>
</tr>
<tr>
<td><strong>Max Torque</strong></td>
<td>0.004 Nm</td>
<td>0.007 Nm</td>
<td>0.007 Nm</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>0.130 kg</td>
<td>0.24 kg</td>
<td>0.33 kg</td>
</tr>
<tr>
<td><strong>Volume</strong></td>
<td>42 x 42 x 19 mm</td>
<td>58 x 58 x 25 mm</td>
<td>70 x 70 x 25 mm</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>10 - 14 VDC</td>
<td>10 - 14 VDC</td>
<td>10 - 14 VDC</td>
</tr>
<tr>
<td><strong>Power @ Full Momentum</strong></td>
<td>&lt; 1.0 W</td>
<td>&lt; 1.0 W</td>
<td>&lt; 1.0 W</td>
</tr>
<tr>
<td><strong>Design Life</strong></td>
<td>&gt; 5 years</td>
<td>&gt; 5 years</td>
<td>&gt; 5 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>RWP500</th>
<th>RW1</th>
<th>RW4</th>
<th>RW8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Momentum</strong></td>
<td>0.50 Nms</td>
<td>1.0 Nms</td>
<td>4.0 Nms</td>
<td>8.0 Nms</td>
</tr>
<tr>
<td><strong>Max Torque</strong></td>
<td>0.025 Nm</td>
<td>0.07 Nm</td>
<td>0.25 Nm</td>
<td>0.25 Nm</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>0.75 kg</td>
<td>0.95 kg</td>
<td>3.2 kg</td>
<td>4.4 kg</td>
</tr>
<tr>
<td><strong>Volume</strong></td>
<td>11 x 11 x 3.8 cm</td>
<td>11 x 11 x 5.4 cm</td>
<td>17 x 17 x 7 cm</td>
<td>19 x 19 x 9 cm</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>22 - 34 VDC</td>
<td>22 - 34 VDC</td>
<td>22 - 34 VDC</td>
<td>22 - 34 VDC</td>
</tr>
<tr>
<td><strong>Power @ Full Momentum</strong></td>
<td>&lt; 6 W</td>
<td>&lt; 10 W</td>
<td>&lt; 10 W</td>
<td>&lt; 10 W</td>
</tr>
<tr>
<td><strong>Design Life</strong></td>
<td>&gt; 10 years</td>
<td>&gt; 10 years</td>
<td>&gt; 10 years</td>
<td>&gt; 10 years</td>
</tr>
<tr>
<td><strong>Integrated Electronics</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Typical Data Interface</strong></td>
<td>RS-422</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Blue Canyon Technologies range of Control Moment Gyroscopes (CMGs) are built to provide your spacecraft with expanded agility necessary to navigate a successful mission.

BCT CMGs offer improved torque performance at lower power consumption versus reaction wheels. Leveraging BCT Reaction Wheel technology, the CMGs provide low-jitter and long-life performance for your mission.

**CONTROL AND DRIVE ELECTRONICS**

Flexible interface options include discrete CMG torque and momentum control to fully integrated spacecraft attitude control systems using up to 4 CMGs.
<table>
<thead>
<tr>
<th></th>
<th>CMG-8</th>
<th>CMG12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Momentum</strong></td>
<td>8 Nms</td>
<td>12 Nms</td>
</tr>
<tr>
<td><strong>Torque</strong></td>
<td>8 Nm</td>
<td>12 Nm</td>
</tr>
<tr>
<td><strong>Gimbal Axis Angular Range</strong></td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td><strong>Mass (kg)</strong></td>
<td>&lt; 10</td>
<td>&lt; 18</td>
</tr>
<tr>
<td><strong>Volume (cm)</strong></td>
<td>22 x 22 x 30</td>
<td>34 x 43 x 38</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>22-36 VDC</td>
<td>22-36 VDC</td>
</tr>
<tr>
<td><strong>Power, Full Momentum</strong></td>
<td>15W</td>
<td>20W</td>
</tr>
<tr>
<td><strong>Power, Maneuver</strong></td>
<td>30W</td>
<td>35W</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>RS-422</td>
<td></td>
</tr>
<tr>
<td><strong>Gimbal Maneuvers</strong></td>
<td>&gt;2 million</td>
<td></td>
</tr>
<tr>
<td><strong>Design Life</strong></td>
<td>&gt;10 years</td>
<td></td>
</tr>
</tbody>
</table>
Blue Canyon Technologies Drive Control Electronics (DCE) is a reaction wheel drive electronics assembly. The sensor/actuator suite includes the electronics to drive BCT reaction wheels and optionally BCT manufactured torque rods. The DCE is typically used with the p015, p050, and p100 reaction wheels (for other wheel options, contact BCT). These components are brought together by robust, configurable, and high-performance software.
**DCE**

<table>
<thead>
<tr>
<th><strong>Volume</strong></th>
<th>3.937 x 3.937 x .5 in</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mass</strong></td>
<td>160 g</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>10-14 V</td>
</tr>
<tr>
<td><strong>Power @ Full Momentum for 4 Reaction Wheels</strong></td>
<td>7.59 W</td>
</tr>
<tr>
<td><strong>Interfaces</strong></td>
<td>31-pin nano, USB-C, μHDMI</td>
</tr>
</tbody>
</table>
**SOLAR ARRAYS**

We offer configurations ranging from simple body mounted panels to multi-wing deployed arrays with the option to gimbal up to two arrays. Our standard arrays include 30% efficient cells and carbon fiber substrates, with custom options available.

*BCT 6U-H Triple Wing Solar Array*

80W - 118W per 6U/12U
**BCT 6U-V Double Wing Solar Array**
48W – 96W per 6U/12U

**BCT 3U Double Wing Solar Array**
28W – 42W per 3U
POWER SYSTEMS CAPABILITIES

Functionality is included for solar array input power, on-board or external battery, charge control, power regulation and distribution, and data acquisition. Additional features include: charge and distribution fault protection, modular architecture for storage and generation capability, and heater controllers for spacecraft use.

THEA MICROSAT
Solar Array
192W or 384W per spacecraft
# Nominal Parameters

<table>
<thead>
<tr>
<th>Solar Array Power (W)</th>
<th>3U</th>
<th>6U/12U</th>
<th>Venus-Class Microsat</th>
<th>Saturn-Class Microsat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Array Voltage (VDC)</td>
<td>16.8</td>
<td>19.2 or 38.4</td>
<td>38.4</td>
<td>38.4</td>
</tr>
</tbody>
</table>

## Features Include:

- Solar Arrays – Industry-leading 30% efficient solar cells, carbon fiber and honeycomb structures that pair with GNC for maximum performance
- Release Mechanisms – Flight-heritage resettable release mechanisms furnished and internally developed
- Solar Array Drive Assemblies – BCT-built solutions for 3U, 6U, 12U and Microsat spacecraft
Blue Canyon Technologies offers Simulators to serve a variety of needs, from mission analysis to hardware-in-the-loop testing. The GN&C Software Simulator is an executable that can run faster than real-time to support mission analysis and planning. The Real-time Dynamics Processor (RDP) is both a spacecraft simulator and command & telemetry interface to a unit under test. This combination of features enables test-like-you-fly capability at both the unit and spacecraft level. The RDP features an Ethernet port for communication with a test PC and a connection to the unit under test. The RDP can have its configuration modified and have software upgraded by the customer through the removable microSD card.

The common simulation solution in both the GN&C Software Simulator and the RDP offers a suite of sensor/actuator testing and simulations that allow the user to gain insight into the performance of the spacecraft under various expected and test cases that the real spacecraft may experience.
RDP

**TEST/GSE INTERFACE**
- Ethernet

**FLIGHT INTERFACE**
- RS-422 or RS-458,
  LVDS for simulation

**BCT SIMULATORS ARE ABLE TO PROPAGATE AND MODEL THE FOLLOWING:**

- Spacecraft dynamics
- All actuators
- All sensors
- Fault injection
Blue Canyon Technologies began developing its first Software Defined Radio (SDR) in 2018 and is now supporting its 3rd generation of SDR products.

As of September 2020, BCT has provided over 50 SDR products to 15 development programs, with 7 SDRs currently functional on-orbit.

Through its SDR products, BCT provides a reliable communication system for bi-directional Space to Ground and Crosslink applications, supporting a variety of data rates, modulation formats, message encoding formats, hardware and software encryption methods, and frequency bands.

The current generation of S-band and X-band products have supported a variety of missions. Data rates up to 20 Mbps are supported on existing programs, and SDR development enabling 100 Mbps is expected in late 2020. BCT is currently prototyping Ka-band functionality alongside a high data rate radio capable of transmitting up to 100 Mbps.

During the design process, each SDR design is analyzed for its susceptibility to proton and heavy ion radiation. Components are tested, and designs are updated to mitigate any ill-effects.

BCT SDR production tests include a full set of functional and environmental tests. Each SDR is characterized for RF performance, including TX power and quality, and RX sensitivity. Performance is measured as a function of temperature and each SDR is subject to multiple temperature cycles to expose any potential quality or performance defects.

BCT culture supports a rapid development to support mission needs and quick and thorough resolution of issues as they arise. The design and production environment at BCT is rooted in quality. Standard BCT process includes quality inspections at every stage of production. SDRs are designed, produced, and verified through test to ensure reliable on-orbit communication, resulting in a rapidly growing history of successful missions.
Flexible software defined radio (SDR) solutions are designed in-house. The radios combine tunable transmitter and receiver functionality into one compact design. The radios are perfect for small satellites looking for flexibility and high data rates – up to 100 Mbps.

They are compatible with Type-1 encryption modules such as the KI-55 and KI-103 and can support AES-256 GCM software encryption natively. Their form factor is compatible with various models to support CubeSats and Microsats. Qualified for LEO and GEO orbits.

BCT SDR products are designed for interoperability with industry standard ground networks such as KSAT, SSC, AFSCN, and NEN. Customization is available for most parameters in this document. Full product lines include L-band, S-band, X-band, and Ka-band radios.

**FEATURES INCLUDE:**

- Flexible software defined radio - uplink / downlink / crosslink applications
- High data rate (up to 100 Mbps)
- Flight proven full duplex radio integrated with BCT avionics
- Maximizes payload volume
- Supports configurations from 3U to ESPA
Prepare for your mission with our advanced testing facilities. As part of our standard suite of environmental tests, we perform random vibration and thermal vacuum testing. Additional test capabilities include: star simulators, wheel balance apparatus, solar array deployment support hardware, thermal cycle chambers, and a Helmholtz cage. To deliver the most reliable method of testing and operating for your mission, we use the same software to test our spacecraft as we do to operate the spacecraft on-orbit. This cohesion ensures the interfaces and ground databases are the same throughout the lifecycle of the mission.
FEATURES

• Provides scripts, C&T, and tools used throughout system test & operations
• Supports multiple missions and constellations
• Supports multiple ground stations and radios
• Automated and accessible

SCHEDULING

• Quickly and easily schedule tasks
• Autonomously schedule repeating tasks
• Autonomous constraint and resource de-confliction

AUTOMATED EXECUTION

• Task execution without the need of a full time operations team
• Automated notification of warnings and errors

MONITORING AND VISUALIZATION

• Access to telemetry anytime, anywhere, and from any device
• Automated analysis and quick access to spacecraft attitude, position, and health

CUSTOMER DATA DELIVERY

• Customizable packages of payload and telemetry data for delivery to customers
• Industry-standard secure delivery