

Low-SWaP Precision Timing, Multi-Mission Payload



CACI's advances in low size, weight, and power (SWaP) precision two-way time transfer (TWTT) and oscillator modeling provide a leap forward in small-platform synchronization. Applications that previously required expensive frequency references or accepted a compromise in coherency performance can now incorporate laboratory-grade timing and long-term frequency stability with this technology. Our combination of proprietary processing and clock expertise is supported on multiple transport physical layers including a low probability of intercept/detect (LPI/D) radio frequency (RF) waveform using a software defined radio (SDR). This solution is agnostic to oscillator technology and can be scaled to support multi-clock ensembles.

The time and frequency stability performance provided by CACI's technology solution directly impacts missions that rely on multi-platform synchronization for remote sensing. It also serves as a GPS/GNSS-independent source of time and frequency that can be referenced to timescales such as Universal Time Coordinated (UTC). CACI's expertise draws from more than 20 years of experience building, integrating, and operating complex end-to-end collection, processing, and space domain awareness systems for the Intelligence Community, Department of Defense, U.S. combatant commands, and U.S. Government agencies.

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For more information on CACI's
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Features

- Sustained, secure, precise positioning, navigation, and timing (PNT) in GPS-denied environments
- Low SWaP, low-cost
- Space-qualified
- Advanced clock state modeling for flexible stability control and update rate
- Clock/oscillator agnostic
- Automatic node discovery and transfer scheduling for multi-node operations
- No dependence on master clock, applicable to ensemble architectures
- Built-in dynamics and reference frame corrections including Doppler and Sagnac effects

Benefits

- Standard 10 MHz and pulse per second (PPS) or unsteered outputs with real-time correction data
- Modular designs and machine learning (ML) algorithms for rapid signal changes and upgrades
- Custom options and features available
- Our TWTT solution is implemented on the same SDR platform that hosts our intelligence, surveillance, and reconnaissance (ISR) collection products. It is fully reprogrammable remotely including while on-orbit

CACI Alternative Positioning, Navigation, and Timing (APNT) – Highly Accurate and Uniquely Secure

CACI's low-SWaP TWTT delivers sub-nanosecond time synchronization accuracy using a LPI/D waveform for observable extraction and advanced clock state estimation for stability maintenance. Our TWTT features end-to-end validated time delivery and remote clock performance. ML algorithms track and continually improve clock accuracy in real-time. Private, changeable device registration provides security. Agile transmit/receive frequencies and scheduled space-ground transactions occur via a custom LPI/D waveform. Encrypted data traffic rides on the TWTT waveform for maximum efficiency.

Precision ISR

High speed analog-digital converter (A/D)-based ISR aided by sub-nanosecond timing can reduce error ellipses by orders of magnitude. Collection from multiple platforms combined with CACI's low SWaP timing technology provides tactical operators with precise timing and geolocation of adversary assets within minutes.

LPI and LPD

By employing frequency agility and a spread-spectrum short burst waveform our technology avoids detection and intercept. The low duty cycle also reduces power consumption. Burst communication techniques reduce the adversary's ability to predict, identify, track, and counter the PNT signal.

PNT – One Component of the CACI ISR Ecosystem

CACI's TWTT technology is designed for outstanding timing performance in CACI's tactical RF collection and processing solutions for ISR and SA missions. When coupled with our common operating picture solutions, CACI delivers a complete end-to-end architecture.

Ground, Airborne, High-Altitude and SmallSat Applications

Our low-SWaP low-cost implementation makes CACI's precision timing/APNT technology well-suited for multiple domains. Precision time is transferred within and between assets in each domain for a true multi-domain, multi-mission solution.

This material consists of CACI International Inc general capabilities information that does not contain controlled technical data as defined within the International Traffic in Arms (ITAR) Part 120.10 or Export Administration Regulations (EAR) Part 734.7-10. (PR ID356). (7/30/2021)



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