

SBIR Topic Number:
AF02-303

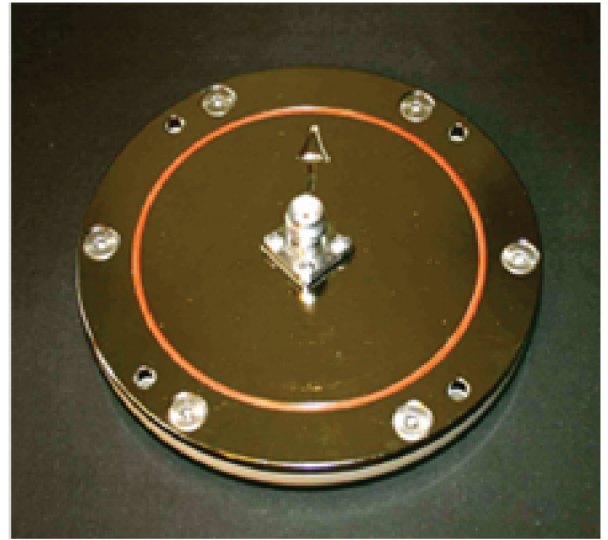
SBIR Title:
Improved Aeronautical
Global Positioning System
(GPS) Antenna Systems

Contract Number:
F04611-03-C-0032

SBIR Company Name:
Toyon Research Corporation
Goleta, CA

Technical Project Office:
Air Force Flight Test Center
Edwards AFB, CA

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR/STTR technology that met topic requirements and has outstanding potential for Air Force and DoD.



Left: Top View of Tri-Band GPS-Friendly Telemetry Antenna. Right: Bottom View of Antenna.

Tri-Band, GPS-Friendly Telemetry Antenna

- Air Force requirements for Tri-Band GPS-Friendly Telemetry Antenna:
 - ◆ Mitigation of interference to GPS receivers caused by telemetry transmitters
 - ◆ Ability to transmit on any frequency within three telemetry bands using a single antenna
- Tri-Band GPS-Friendly Telemetry Antenna enables “shift on the fly” between three telemetry bands
- Tri-Band GPS-Friendly Telemetry Antenna is capable of operation at lower L-band, upper L-band, and S-band telemetry frequencies simultaneously
 - ◆ Allows greater flexibility in placement of telemetry antennas on flight test aircraft

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Air Force Requirement

Two Air Force requirements motivated development of the Tri-Band Global Positioning System (GPS)-Friendly Telemetry Antenna. First, the Air Force desired the ability to operate telemetry transmitters in close proximity to GPS receivers on flight test aircraft, without degrading the operation of the GPS receivers. Second, the Air Force wanted to be able to transmit on any frequency within three telemetry bands using a single antenna.

SBIR Technology

The Tri-Band GPS-Friendly Telemetry Antenna is capable of operation at lower L-band, upper L-band, and S-band telemetry frequencies simultaneously. The transmit pattern at lower L-band also features a pattern null that can be pointed in the direction of vulnerable GPS receivers to reduce interference caused by telemetry signals. The direction of this null is indicated by an arrow engraved into its radome.

The antenna is flight-ready, and has been certified by an independent testing lab for operation at airspeeds up to Mach 2.0, at an altitude of 5000 feet.

Potential Air Force Application

The Tri-Band GPS-Friendly Telemetry Antenna can improve range operations in two ways:

First, the antenna allows instrumentation engineers more flexibility over the placement of telemetry antennas on flight test aircraft. Because the transmit pattern of this antenna is shaped to reduce interference to nearby GPS receivers, it can be installed in closer proximity to the GPS antenna(s).

Second, it allows range engineers to “shift on the fly” between the three telemetry bands: lower L-band (1435-1525 MHz), upper L-band (1755-1850 MHz), and S-band (2200-2400 Mhz). This capability will improve spectrum utilization and reduce frequency allocation conflicts between concurrent flight tests.

Moreover, the Tri-Band GPS-Friendly Telemetry Antenna will help Air Force engineers use the spectrum available for flight testing more efficiently, and it is hoped that the other military services will recognize the utility of this antenna as well. Toyon is contacting instrumentation engineers at various ranges to make them aware of this product.

Company Impact

Under this SBIR program, Toyon has gained experience in designing antennas that withstand the environmental stresses of supersonic flight. This is a capability that will be directly applicable across the firm’s antenna design business. Toyon also obtained a better understanding of flight test operations, range instrumentation, and component qualification.

Toyon is a nationally recognized small business supporting the Department of Defense and commercial industry. Since its inception in 1980, Toyon has successfully completed a broad range of highly complex systems analysis and technology development projects.

Toyon has five integrated product teams which represent its major technical strengths:

- Antennas and Radio Frequency (RF) Systems
- Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Systems
- Homeland Security
- Intelligence, Surveillance and Reconnaissance (ISR) Algorithms
- Missile Defense

Toyon sees potential Phase III procurement of this antenna as a valuable commercial opportunity, as well as a chance to gain name recognition for Toyon as a designer of unique, multifunctional antennas for military and commercial markets.



SBIR/STTR

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