# Telemetry Range Support Aircraft (TRSA) Program: Providing the Navy with Next Generation TM and Range Support

**J. Kyle Roudebush, Jose Hernandez, Scott Kujiraoka and Kenneth Sanchez**
**NAVAIR-Point Mugu**

## ABSTRACT

The aircraft currently being used to support the Navy's mission of Telemetry Reception, Range Safety as well as Range Surveillance/Clearance are reaching the end of their useful life. As a result, there are ongoing efforts to procure a new aircraft and integrate these mission systems in order to continue the support of critical Naval Test Range operations. This paper will detail the current efforts being undertaken to upgrade a Gulfstream 550 to perform Range Support missions for the Multi-service Government Test Ranges.

## KEY WORDS

Airborne Telemetry, Range Support Aircraft, Airborne Command Transmitters

## BACKGROUND

NAVAIR relies on different kinds of Research, Development, Test and Evaluation (RDT&E) aircraft including Range Support Aircraft (RSA) for all users of NAVAIR ranges. At the Naval Air Warfare Center Weapons Division (NAWCWD), the RSA are considered key pieces of NAVAIRs RDT&E infrastructure for test items on the vast open-air/sea ranges at China Lake and Point Mugu, California.

Weapons and systems under test at these ranges often travel beyond the line-of-sight of ground-based instrumentation, therefore there is a need for airborne platforms such as the RSA to provide over-the-horizon range safety and clearance, telemetry tracking, relay and recording, missile destruct (if necessary), photometric tracking and recording, and other range management and support functions while far away from land-based systems. As a result, these aircraft have been an integral part of the ranges since their establishment in the early 1940s.

From the 1950s until today, there have been numerous types, models and series of RSA that have been developed, evolved, modified, and then stricken when the airframe's useful life was expended. In the early 1980s NAVAIR developed eight

NP-3D aircraft for use in the RSA role. These aircraft were re-worked versions of the original P-3A airframe. They were extensively modified for the Sea Range support mission. Three of these had sophisticated “billboard-type” telemetry antennas bolted onto the tail of the aircraft. In addition to telemetry systems, the aircraft included the ability to monitor communications, clear and monitor range safety hazards, control range boundaries, and coordinate all of the entities necessary for a live flight test event.

The current NP-3D billboard antenna systems operate only in the S-band frequency range for telemetry, are more than 30-years old, and both the antenna and the controlling computer system are degrading to the point where they will be inoperable in the near future. The single remaining billboard NP-3D, after many depot cycles, will soon reach the end of its airframe service life and is becoming critically unsupportable.

This unique airborne RDT &E system is the only long-range airborne system capable of fully supporting Navy, Air Force, Army and other Department of Defense (DoD) and non-DoD programs in the gathering and analysis of long-range telemetry data. Furthermore, frequency consolidation by the Federal Communications Commission (FCC) and the increased complexity and scope in testing for major programs of record require a significant growth in telemetry capability over the current limited S-band system.

Retaining the ability to collect decision-quality test data over long periods of time and distances, and ensuring the safety of aircraft systems, operators and the range is a critical piece in sustaining the range infrastructure. DoD and Navy strategic and tactical weapons systems continue to require test points beyond the line-of-sight of range control rooms – especially on vast sea ranges and over the open ocean. The ability to conduct range safety functions and hazard pattern control while airborne and away from DoD ranges (such as hypersonic weapons) is also a requirement.

## NEXT GENERATION RSA

A collaborative effort has been ongoing since 2006 to ensure all requirements for a replacement RSA are established. The acquisition team consists of AIR-5.0 Test & Evaluation leadership, AIR-2.0 Contracts, AIR-5.2 Ranges and AIR-5.1 test squadrons for mission equipment and airframe expertise, AIR-6.0 Logistics for sustainment, and Tactical Airlift Program Office (PMA-207) as the designated program manager for Commercially Derived Aircraft (CDA).–This project to develop a new RSA is divided into two phases: Phase I is for the procurement of a replacement RSA CDA airframe with common avionics and related range safety systems under PMA-207, and Phase II will provide the RSA CDA aircraft as government furnished property to a company chosen through a full and open

competition. This company will develop a tri-band (L, S and C) telemetry system, and procure and integrate the telemetry system along with additional mission equipment into the RSA CDA airframe. The telemetry effort will be paid for with Central Test and Evaluation Investment Program (CTEIP) funding via the Commercial Based aircraft Instrumentation and Telemetry System (CBITS) project.

CBITS originated as the Next Generation Range Support Aircraft (NGRSA) in FY2005. NGRSA transitioned into a T&E/S&T-managed risk reduction effort consisting of two projects, Airborne Telemetry Phased Array (AirPA) and Universal Beamforming Technology (UBT), both successfully completed in FY2015. Based on the successful progress of both T&E/S&T projects during FY2014, the Navy finalized the acquisition strategy for procurement of a Gulfstream G550 as the Telemetry Range Support Aircraft (TRSA) platform and CTEIP initiated the CBITS project into Phase 0.
CBITS will provide L-, S- and C-band multi-target telemetry tracking capability for a FY18 build and a FY21 Initial Operational Capability (IOC). The G550 AEW airframe was selected based on its size, weight, power, and cooling properties. It has the capacity to host robust telemetry systems and antennas – up to a total area of 125 square feet. This new, modern, phased-array telemetry system will have the capability to support major programs in complex, robust and dynamic test environments for the next 25 years.

## CURRENT STATUS

In FY2016, PMA 207 awarded the contract to procure the G550 Airborne Early Warning (AEW) aircraft with delivery of a “green” aircraft planned in the 4$^{th}$ Quarter FY2018. Navy PMA 207 also approved the acquisition strategy for the Phase II CBITS development and integration of all other aircraft mission systems with subsequent CTEIP CBITS milestone I approval to enter design. In October 2016 the CBITS Phase II Request for Proposal was released to industry.

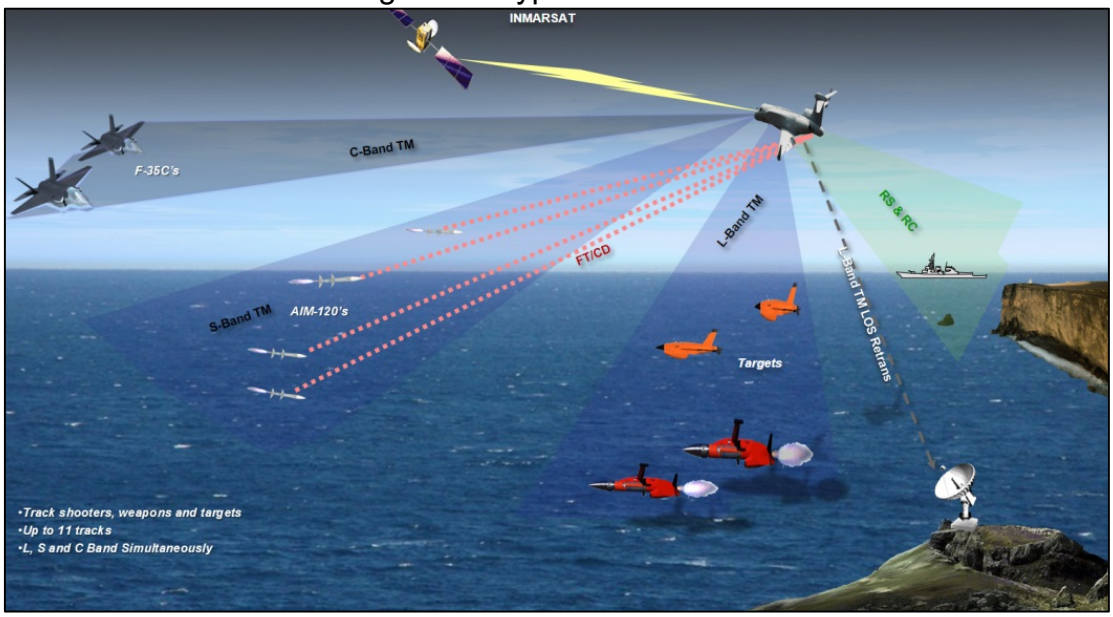
## RSA FEATURES

In FY2017, PMA 207 and the CBITS team completed Phase II source selection and the contract award is planned in the August 2017 timeframe. TRSA Initial Operational Capability (IOC) is scheduled for the end of FY2021.

The value of range data for RDT&E customers lies in the fact that it provides critical technical and performance data for systems under test – information such as velocities, accelerations, engine temperatures, fuel status, engine turbine speeds, and outer temperature – and enables real-time analysis and decision

making during complex test events. In addition, quality telemetry data supports rapid post-test failure analysis and critical milestone decisions. In order for the program to move forward and make the best time/money/performance-based decisions, it's hard to beat valuable decision-quality data from airborne telemetry.

Figure 1: Typical Test Scenario




As shown in Figure 1, test scenarios typically require simultaneous tracking of multiple assets in L-, S and C-bands to support complex and robust test scenarios. Telemetry now requires augmenting the existing L- and S-band spectrum with C-band for launch platforms and weapons in order to test long-range and supersonic/hypersonic threats beyond the line-of-sight. Figure 2 is an artistic rendition of what the TRSA will look like when completed.

Figure 2: Artistic Rendition of TRSA

## SUMMARY

The TRSA will eventually become the much needed replacement for the existing NP-3D aircraft at NAWCWD. This paper provided the background and status for the establishment of the CBITS and TRSA Programs.