

**TRAINING AND READINESS ACCELERATOR (TReX)
PROTOTYPE ACQUISITION APPROACH (PAA)
IN SUPPORT OF
ADA LTE Orientation Device**

Technical Supplement

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Table of Contents

1. Problem Statement.....	4
2. Objective.....	4
3. Demonstration Concept	4
4. GFI/GFE	4
5. Documentation	4
6. Specification.....	4
6.1. Components	5
6.2. Environmental	5
6.3. Position Location	5
6.4. Orientation	5
6.5. Communications - LTE	5
6.6. Operational	6
7. Schedule.....	6
7.1. Phase One	6
7.2. Phase Two	6
7.3. Phase Three	7
8. Data Package	7
9. LRIP Data	7
10. Glossary	8

1. Problem Statement

Currently, Combat Training Centers (CTCs) use laser based systems to replicate direct fire engagements. Laser based systems have limitations when the target does not have the Multiple Integrated Laser Engagement System (MILES) detectors such as United States Air Force (USAF) aircraft, Army aviation or Unmanned Aerial Systems (UAS). As a result, these weapon systems are not fully trained nor integrated into the CTC Rotation.

2. Objective

Determine if a commercial of the shelf (COTS) product or integration of COTS components will:

- a. Detect a trigger pull condition.
- b. Determine weapon orientation at trigger pull.
- c. Send over the Long-Term Evolution (LTE) network weapon orientation data (Azimuth and Altitude).
- d. Send over the LTE network weapon position location data (X,Y and Z).

The COTS item or integrated COTS components is call a LTE Orientation Device in this document. Over the NTC LTE network, the LTE Orientation Device will send position location, trigger pull and orientation data to the Combat Training Center-Instrumentation System (CTC-IS). The CTC-IS will send the data (as well as air platform data) to a constructive simulation. The simulation will determine if the engagement damaged the air platform. All of this will occur on the unclassified Nation Training Center-Instrumentation System (NTC-IS).

3. Demonstration Concept

This effort will not connect the LTE Orientation Device to a current CTC weapon system. If the demonstration is successful, a follow on Low Rate Initial Production (LRIP) effort that inserts the device into a CTC Air Defense Artillery (ADA) weapon system may be funded. During the demonstration, the contractor will use a tube as a mock Stinger/SA-14 weapon with LTE Orientation Device, battery, on-off switch and trigger pull. The final demonstration will occur at the NTC.

4. Government Furnished Information (GFI)/Government Furnished Equipment (GFE)

The Government will provide:

- a. SIM cards for the NTC network for the final demonstration.
- b. Changes to the CTC-IS to support the LTE Orientation capability.

5. Documentation: Instrumentation System (IS) – Tactical Engagement Simulation Systems (TESS) Interface Standard, PRF-PT-00552, Revision G

6. Specification

Note that specifications are based on Government assumptions on the current state of technology. As this is a prototype development, Government may change a

specification due to technical obstacles or cost drivers. Also, Government may end the demonstration due to cost or technology factors.

6.1. Components

6.1.1. LTE Orientation Device shall be integrated COTS components (T) or a COTS device (O)

6.1.2. The weight of the device (including LTE, GPS, battery and eCompass) shall not exceed 4 pounds.

6.1.3. The device shall fit inside a 2.6 inch (Inside Diameter) tube.

6.2. Environmental

6.2.1. The device shall operate at an outside temperature as low as 20 degrees F.

6.2.2. The device shall operate at an outside temperature as high as 120 degrees F

6.2.3. The device shall meet IP51 (Dust Protected / Dripping Water) standard or better.

6.3. Position Location

6.3.1. The device shall provide a position location consisting of the X, Y, and Z axis.

6.3.2. The device shall have an accuracy of 8 meters or less.

6.4. Orientation

6.4.1. The device shall provide altitude and azimuth direction.

6.4.2. The device shall have an orientation accuracy of 3 degrees or better.

6.4.3. Compass orientation shall require no more than the press of a switch and movement of the mock Stinger system for no more than 20 seconds.

6.5. Communications - LTE

6.5.1. The LTE device shall communicate with the CTC-IS using the IS TESS standard.

6.5.2. The device shall provide a position location message for its location every 30 seconds.

- 6.5.3. The device shall provide orientation data at trigger pull.
- 6.5.4. Latency (time starts at trigger pull on the mock Stinger; time ends when the message arrives at the CTC-IS low side gateway) shall be less than 500 milliseconds for 90% or more the messages.

6.6. Operational

- 6.6.1. Battery shall last (at 120 Fahrenheit) at least twenty-four (24) hours.
- 6.6.2. The weapon system shall have the following controls:
 - a. On – Off system. When turned on the LTE and Orientation device initializes.
 - b. eCompass calibration mode switch (if needed).
 - c. LED(s) showing: on/off status; and if the LTE Orientation Device is in not in LTE communications (at the NTC, some areas do not have reliable LTE communications; as the ADA engagement requires LTE communications, the operator needs to know when he is out of LTE communications).

7. Schedule

7.1. Phase One

- 7.1.1. Phase One tasks include:
 - a. Identification of risks.
 - b. Initial selection of hardware, general design, definition of the message flow between the device and the CTC-IS, and definition of cyber security issues and mitigation.
- 7.1.2. Phase One starts at contract kick off.
- 7.1.3. Phase One will end in an Initial Design Review where the above will be briefed and the government and contractor will assess program risks.

7.2. Phase Two

- 7.2.1. Assuming the government and contractor determines that the project has acceptable risk level, the project will enter Phase Two.

7.2.2. Phase Two tasks include the contractor will bread board the device and demonstrate passing position location and orientation to the CTC-IS surrogate. Bread board event will include Cyber Security controls across the NTC LTE network.

7.2.3. Phase Two will end with a Final Design Review where the contractor will provide bread board test results, issues, and risks to meet the full device specifications.

7.2.4. The government and contractor shall decide to repeat Phase Two, proceed to Phase Three or end the project.

7.3. Phase Three

7.3.1. Assuming the government and contractor determines that the project has acceptable risk level, the project will enter Phase Three.

7.3.2. In Phase 3, the vendor shall build five (5) each prototypes placed in the mock Stinger weapon system.

7.3.3. The contractor shall validate to the government that the mock Stinger meets the agreed capabilities.

7.3.4. The contractor will take the mock Stingers to the NTC for controlled tests against Army Aviation, USAF aircraft and UAS platforms.

8. Data Package

The contractor shall provide to the Government:

- a. All source code.
- b. List of library's used to build the executable.
- c. Description of the build environment used to build the executable.
- d. List of hardware and or components.
- e. PCB net list and lay out (as needed).
- f. System design and wiring diagrams.
- g. All connection points and pin outs.

9. LRIP Data

The contractor shall provide the following engineering assessments:

- a. Estimate of the minimum size the LTE Orientation Device could be manufactured.
- b. Estimate of the battery life of the LTE Orientation Device assuming 1) size constraint as listed in the specification. 2) Battery weights no more than two pounds; 3) Device is on no more than 8 hours a day; 4) 30 second updates and 10 trigger pulls during that 8 hours.
- c. Cost of producing 100 units.

10. Glossary

CTC	Combat Training Center
MILES	Multiple Integrated Laser Engagement System
USAF	United States Airforce
UAS	Unmanned Aerial System
COTS	Commercial of the Shelf
LTE	Long-Term Evolution
CTC-IS	Combat Training Center-Instrumentation System
NTC-IS	Nation Training Center-Instrumentation System
LRIP	Low Rate Initial Production
ADA	Air Defense Artillery
GFI	Government furnished Information
GFE	Government Furnished Equipment