Target Characterization Testing

2014 NDIA Fuze Conference
July 7 - 9, 2015

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Agenda

- Program Overview
- Need
- Benefits
- How does it work?
- What is new?
- Design Description
- Specifications

Background

- Increased interest in defeating Unmanned Arial Vehicles (UAVs)
- We can't always hit them, so a proximity sensor is needed
- Proximity can be sensed optically or with rf
- RF sensors are typically less expensive with present technology

RADAR Basics

- RF proximity sensors are similar to RADAR systems
  - Limited number of range gates
  - Direction to target derived from Doppler
  - Low gain, broad beam antennas
- RADAR range equations for far-field RCS do not work in near-field encounters

$$R_{min} = \frac{2D^2}{\lambda}$$

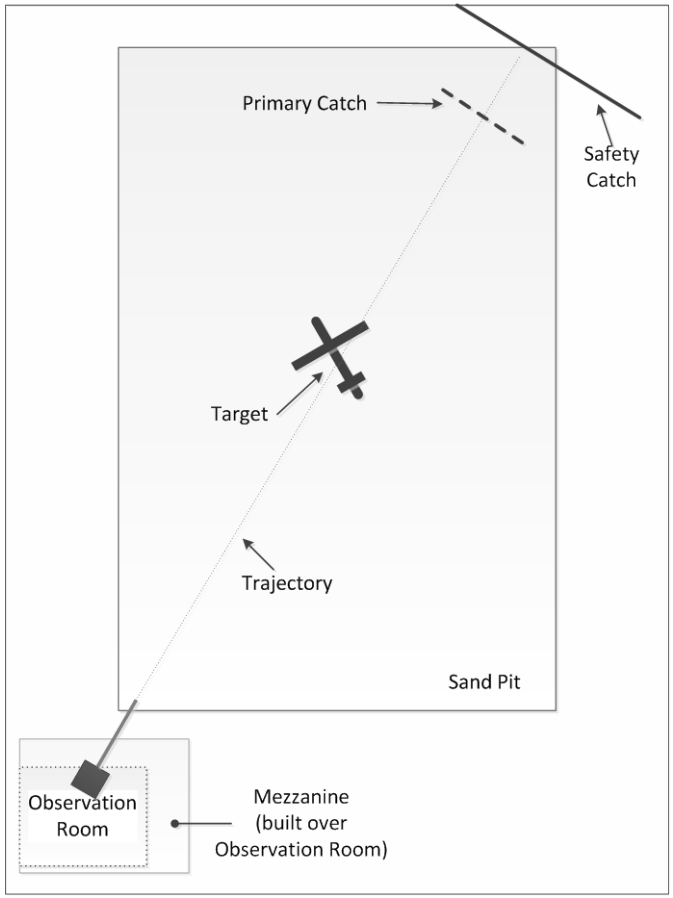
- 3 GHz
- 1 m target
- R_{min} 20 m

Target Modeling

- Calculate near field reflections
  - Based on RCS measurements
  - Based on physical characteristics
- Calculate effects on antenna impedance
- Math models need to be validated
- Near field measurements

Test Components

- Projectile
- Air cannon
- Catch net
- Target suspension fixture
- Cameras

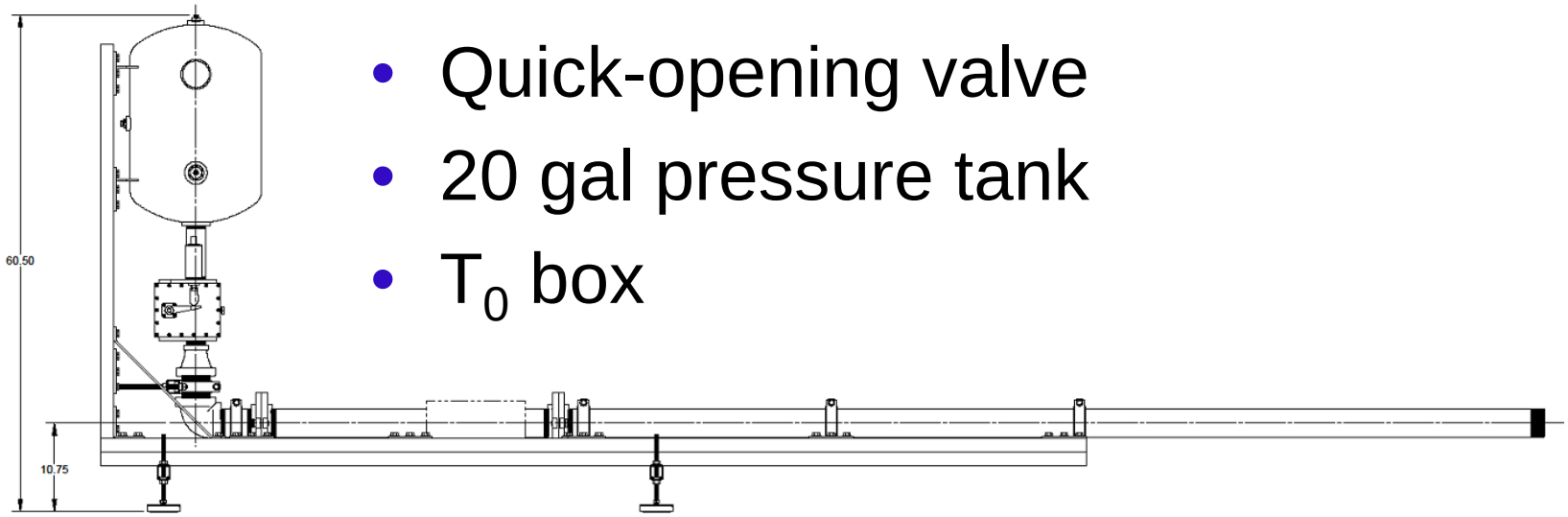


Test Projectile

- Conformal antenna
- FMCW transceiver
- 16-bit 20 Msample ADC
- Digital Data Recorder 16 Mbyte (400 msec)

Air Cannon

- 75 m/s to 100 m/s
- 3” x 10’ barrel
- Breach loader
- Quick-opening valve
- 20 gal pressure tank
- T_0 box

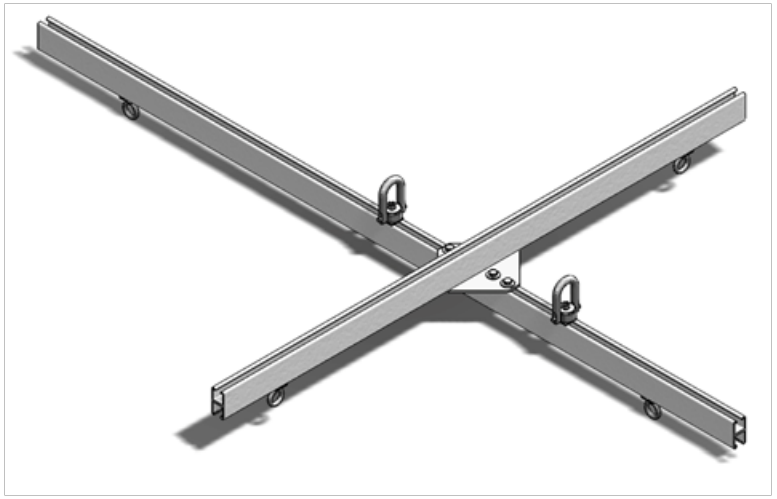


Catch Net

- High impact polyester
- Primary net 10’ x 10’
- Secondary 20’ x 30’
- COTS sports nets

Target Suspension

- Fuze Electromagnetic Research Facility
- Overhead trolley crane
- Fiberglass frame
- Adjustable tie points
- Guy lines for stability



Cameras

- Two high speed cameras
  - Miro
  - 1000 fps
- One aligned with trajectory
- One orthogonal to trajectory

Data Analysis

- Data will be collected from a variety of targets
- Analyzed to determine statistics of reflectivity
- Look for distinctive reflectivity characteristics
- Use collected data to evaluate detection algorithms
- Develop TDD performance specifications