

**FEDERAL AVIATION ADMINISTRATION**

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# FAA TECHNICAL CENTER LETTER REPORT

INVESTIGATION OF AIRPORT SURVEILLANCE RADAR (ASR)  
MOVING TARGET INDICATOR (MTI) ENHANCER PERFORMANCE

(Project Plan)

by

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## 1. INTRODUCTION.

### 1.1 PURPOSE.

The purpose of this project is to quantify any Airport Surveillance Radar (ASR) Moving Target Indicator (MTI) enhancer signal processing losses and target azimuth shifts resulting from adjustment of the MTI enhancer parameters to provide optimal non-synchronous interference rejection.

### 1.2 BACKGROUND.

Previous tests were conducted at the Federal Aviation Administration (FAA) Technical Center to determine the effects of pulse interference on ASR video processing modes (references 1 and 2). During these tests, a problem was identified with the capability of the ASR MTI enhancers to reject non-synchronous interference pulses when operating the MTI cancellers in the feedback mode. Due to the canceller design, a non-synchronous pulse can recirculate in the cancellers in the feedback mode resulting in the output of a train of synchronous pulses. When sent to the MTI enhancer, these pulses will integrate up into a visible target of finite run length. This project will result in the determination of the optimum MTI enhancer parameters for providing desired target detection while minimizing pulse interference.

### 1.3 DESCRIPTION OF EQUIPMENT.

The Technical Center's Terminal Facility for Automated Systems Testing (TFAST) ASR-7 and ASR-8 radars will be utilized for the project testing. Each radar will be calibrated to FAA specifications to represent typical field facility installations. Test equipment will be used to generate and record the interference signals and video processor responses to the interference.

## 2. TEST DESIGN.

The testing will consist of determining: 1. the optimum MTI enhancer parameter settings for interference pulse rejection; 2. any resulting MTI system sensitivity loss; and 3. the amount of resulting target azimuth shift. Tests will be conducted on the MTI enhancer when the cancellers are operated in 1 and 2 cascade canceller mode and each of the four feedback canceller modes. See the Test Diagram, Figure 1.

### 2.1 INTERFERENCE PULSE REJECTION CAPABILITY.

The object of this test is to determine the interference pulse rejection of the MTI enhancer as a function of the enhancer limit switch settings. The test design will consist of injecting limit-level interference pulses at 500 Hz. into the front end of the radar. A frequency counter set to the ratio mode will display the pulse count out of the video processor as the MTI enhancer limit switches are varied for each of the MTI canceller

modes. The data collected will be reduced to a graphic form to present the relationship of the MTI enhancer limit switches to interference pulse rejection.

## 2.2 MTI SYSTEM SENSITIVITY LOSS.

The object of this test is to measure the MTI system minimum discernible signal (MDS) level as a function of the MTI enhancer limit switch settings previously recorded. The test design will consist of injecting an MDS-level gated signal to simulate a point target into the front end of the radar. An oscilloscope will be connected to the output of the MTI video processor to display the enhanced MTI video in each previously mentioned MTI canceller mode. The MDS level will be recorded as a function of MTI enhancer limit switch settings. This data will be presented in a graphic form.

## 2.3 TARGET AZIMUTH SHIFT.

The object of this test is to measure the amount of target azimuth shift caused by changes in the MTI enhancer limit switch settings. The test design will consist of injecting a gated signal at the radar PRF into the radar front end. This signal will be at the MDS level for each combination of MTI enhancer limit switch settings and MTI canceller modes previously recorded. An oscilloscope will be connected to the output of the MTI video processor to determine the number of radar pulse repetition intervals required for the input signal to reach limit level in the MTI enhancer. This number will be recorded, and the data will be reduced to a table showing the target azimuth shift versus the MTI enhancer limit switch settings. This test may be repeated for input signal levels of MDS + 10dB, MDS + 20dB, and MDS + 30dB. Trends in data taken will dictate the necessity of completing all possible test combinations.

## 3. TEST DATA ANALYSIS.

From the data collected in the previous tests, it will be determined what the MTI enhancer limit switch settings should be for optimum target detection and minimum pulse interference when operating the MTI system in any of the feedback canceller modes. The expected target azimuth shift will also be determined.

## 4. RECOMMENDATIONS.

Based on the preceding tests and data analysis, recommendations will be made towards optimal MTI enhancer limit switch settings.

## 5. SCHEDULE.

Project Plan Complete	11/82
Tests Complete	2/83
Project Report	3/83

6. RESOURCES.

TFAST	40 hours
Manpower	$\frac{1}{2}$ man years
Contract Dollars	none

7. REFERENCES.

Kleuskens, Harold, Effect of Pulse Interference on ASR-8 Video Processing Modes, Report No. CT-82-100-44LR, 1982.

Grunwald, Thomas, and Kleuskens, Harold, Effects of Pulse Interference on ASR-7 Video Processing Modes, Report No. CT-82-100-66LR, 1982.

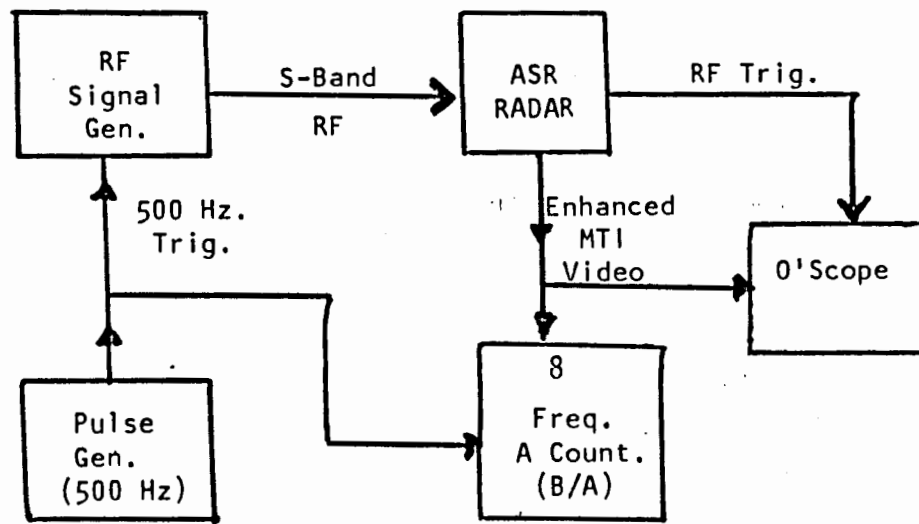


FIGURE 1. TEST DESIGN