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Table 3. Identification Rates and Times

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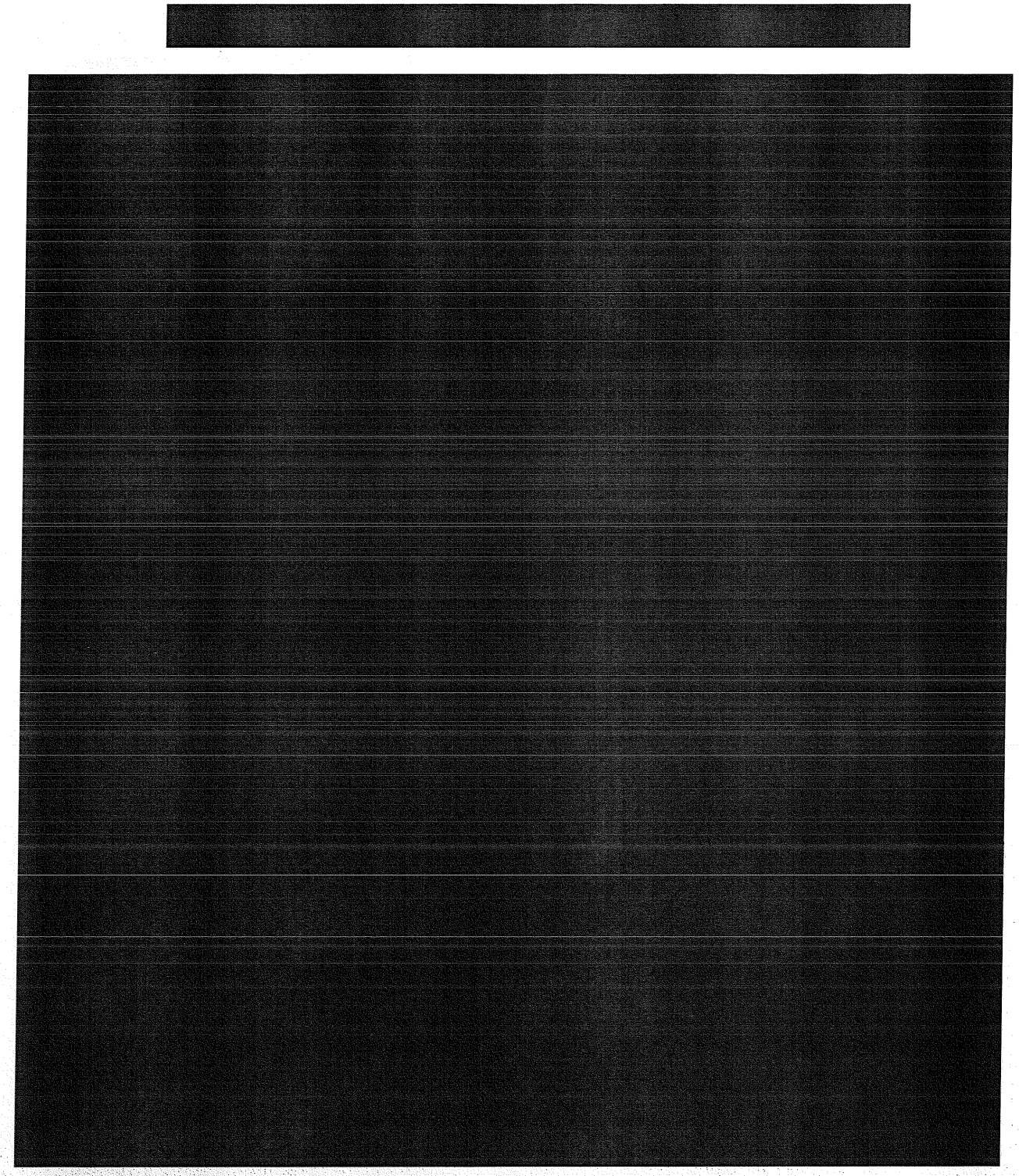

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5.2.1.3 MOP 2.3A & 2.3B

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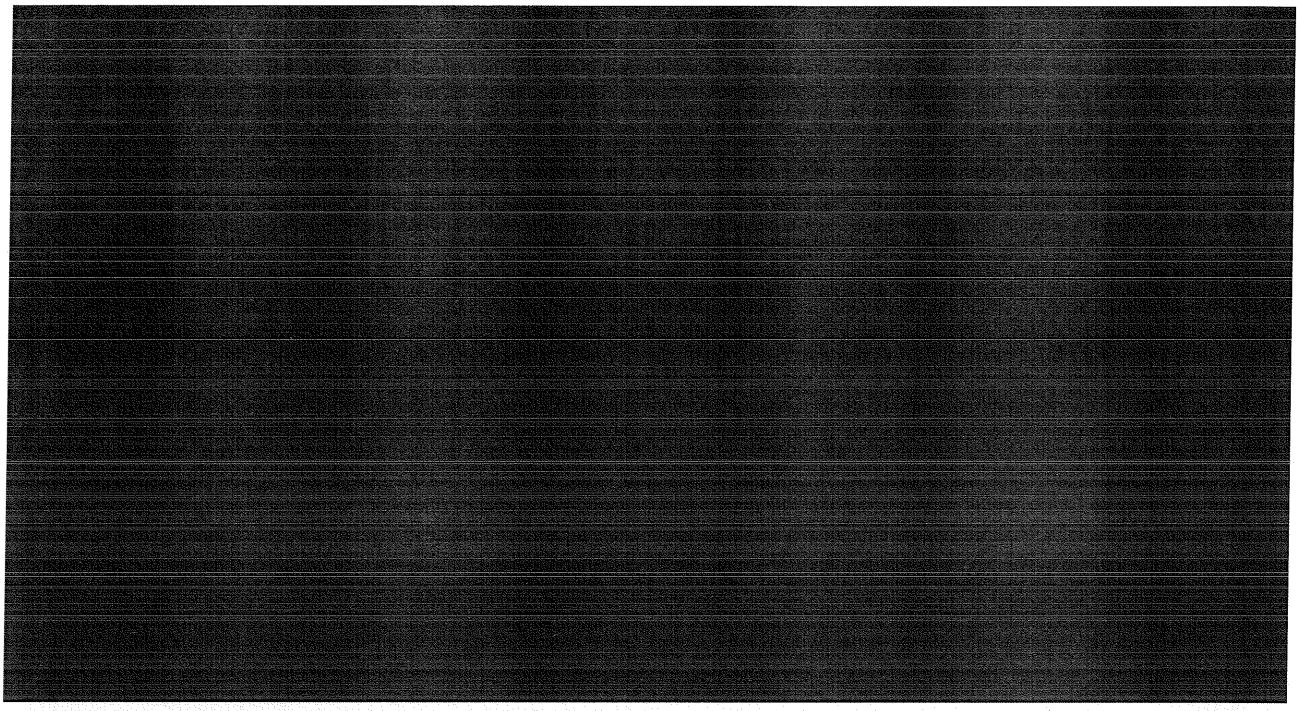

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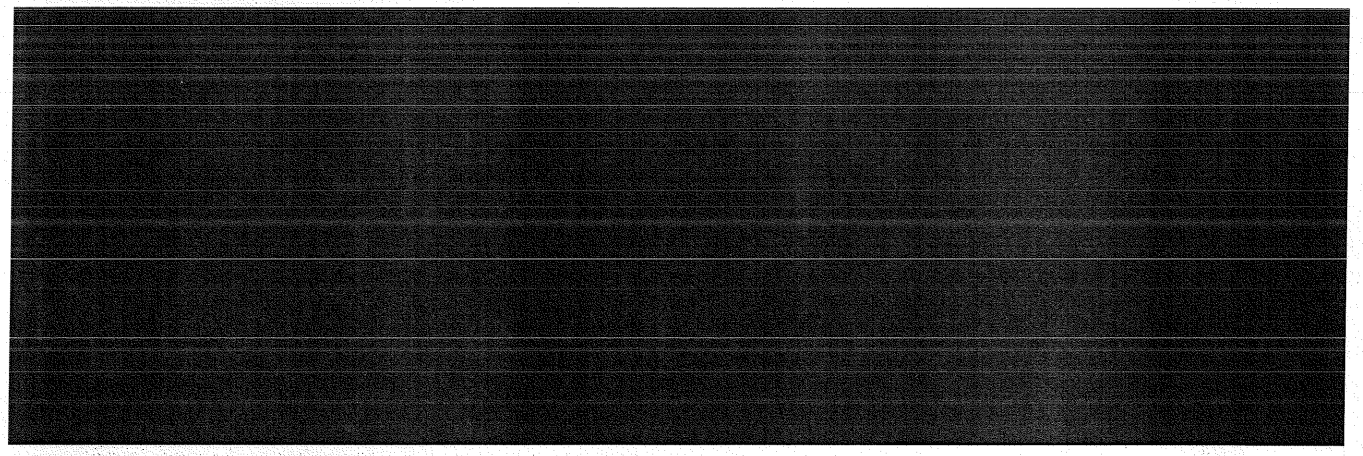

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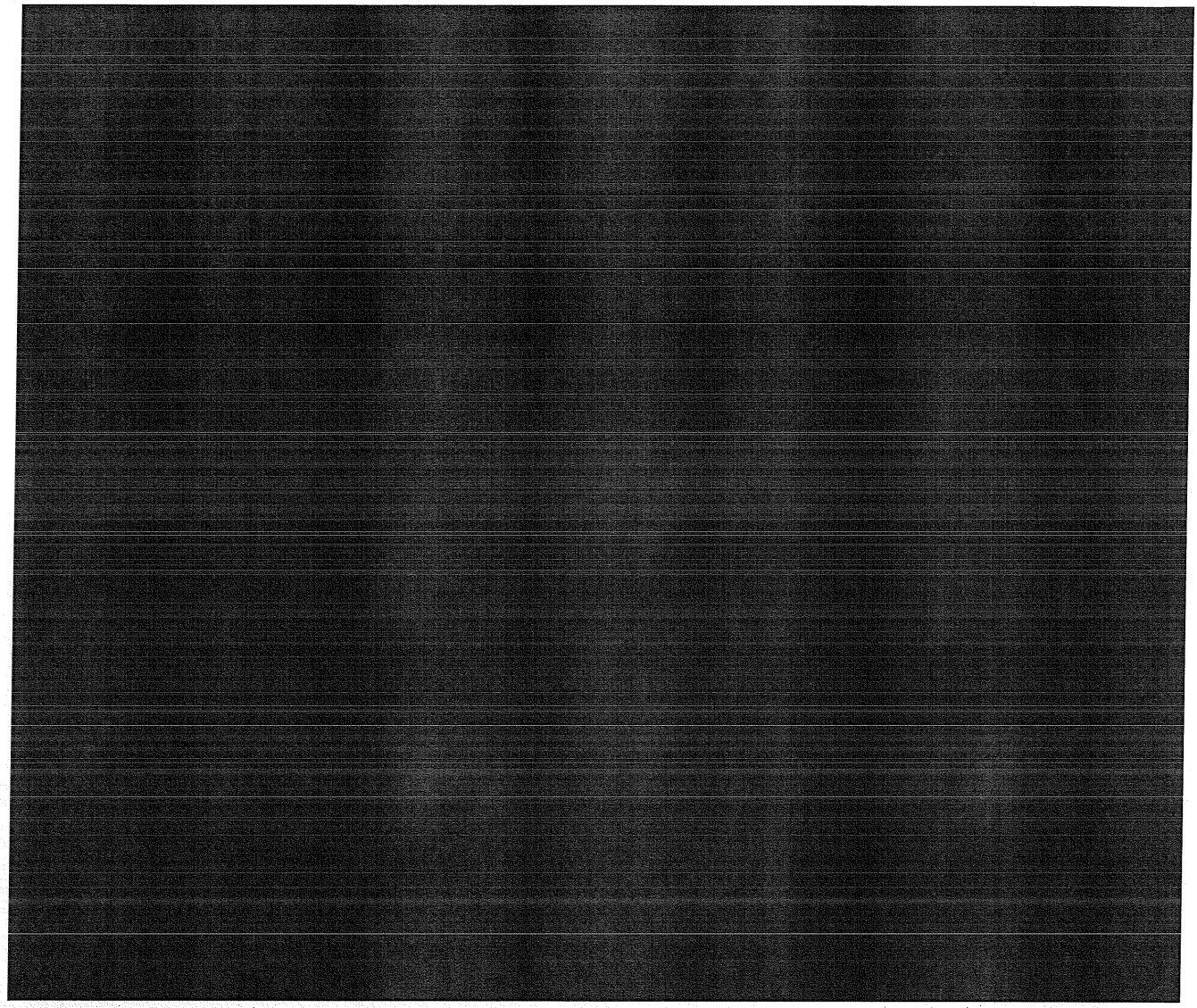

5.3 COI 3

This issue illustrates how the security enhancement impacts the airport security personnel.

5.3.1 MOE 3.1

This measure was designed to determine whether the security analysts in the SOC felt the system could be used effectively in its current state.

[redacted]

[redacted]

5.3.1.1 MOPs 3.1A, 3.1B, & 3.1C

[redacted]

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[redacted]

[redacted]

5.3.1.2 MOP 3.2

[redacted]

6. SUMMARY

[redacted]

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7. REFERENCES

NIST (2006). *NIST/SEMATECH e-Handbook of Statistical Methods*, http://www.itl.nist.gov/div898/handbook/, February 6, 2009.

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APPENDIX A – SFO SAT REPORT

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San Francisco International Airport Perimeter Security (APS)

Pilot Program

System Acceptance Test (SAT) Report

December 31, 2008

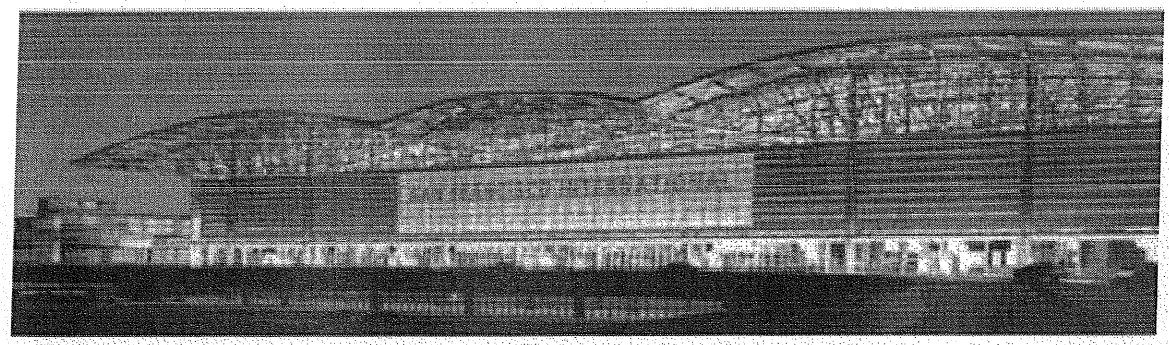

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Table of Contents

San Francisco International 1
Airport Perimeter Security (APS) 1
Pilot Program 1
System Acceptance Test (SAT) Report 1
SFO Airport Perimeter Security (APS) Pilot Program 1
System Acceptance Test (SAT) Report 1
1.0 INTRODUCTION 1
1.1 Overview of the System 1
1.2 Purpose of this Document 2
1.3 Objectives of the System Test 2
2.0 EXECUTIVE SUMMARY 3
3.0 TEST SCOPE 4
3.1 Test Scenario Descriptions and Parameters 4
3.1.1 Testing Descriptions and Parameter Inclusions 4
3.1.2 Testing Descriptions and Parameter Exclusions 5
3.2 Testing Scope 5
3.2.1 Baseline Testing 5
3.2.2 Operational Testing 5
3.2.3 User Interface (Functional) Testing 5
3.3 Testing Process 5
4.0 SYSTEM ACCEPTANCE TESTING (SAT) RESULTS 6
4.1 Site Acceptance Test (SAT) Results 6
[redacted] 7
Test Day 2, August 29, 2008 15
[redacted] 19
[redacted] 24
4.2 Functional Scenarios Test Results 29
4.2.1 Test Results for Scripted Functional Scenario 1 for CAD Display 29
4.2.2 Test Results for Scripted Functional Scenario 2 for CAD Display 32
5.0 TEST SCHEDULE 34
Appendix A – Requirements Matrix A-1
Appendix B – SFO Weather Condition B-1
[redacted]
Appendix D – Detailed Test Notes D-1

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List of Figures

Figure 1 SFO APS System Test Area..... 1

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Acknowledgements

The Airport Perimeter Security System team was formed in response to a call from the TSA for identifying unique technical solutions for enhancing the security of airport perimeters. Technology Service Corporation (TSC) (radar processing, track correlation, Common Operational Picture display), Intergraph (Integrated Computer-aided Dispatch processing and display), Vidient (Video Analytics) and Quatrotec (team prime, infrastructure support, project management) are the companies who formed the team. The team's test Director from TSC left to join Ross and Baruzzini and continued to support the program. The idea behind the team collaboration was to form an integrated "system of systems"; a distinctive amalgamation of layers of individual systems that, when combined, achieved a sum greater than the individual parts. The APS System installed and tested at San Francisco International Airport is the result of that integration effort, and the success of the system deployment rests with many individuals beyond just the immediate team members.

The APS team would like to thank SFO Aviation Security (AVSEC), in particular Kim Dickie, Assistant Deputy Airport Director, Operations & Safety -Airport Security, Lorraine Bockmier Security Operations Supervisor and the security analysts in the Security Operations Center for their generous time in support of all aspects of system integration and testing, and for providing valuable user feedback on the APS System performance and user interface.

The APS System involved the installation of a radar signal processor in the FAA ASDE-3 tower and the installation of cameras and fiber runs around the perimeter and through conduit under the AOA. The radar signal processor approval and installation would not have been possible without the wonderful support of regional and SFO FAA personnel. The team would like to thank Robin F. Wilkerson, Acting Manager Oakland ARTCC District and Richard Nessler, Manager, San Francisco System Support Center, Oakland ARTCC District for granting temporary approval to interface to the ASDE-3 radar system at SFO. In addition, the team is greatly indebted to the tremendous support of Roy Dickerson, SFO/FAA, who spent several weeks assisting in the transport of equipment up to, and down from the ASDE-3 tower. At the time of installation, the ASDE-3 tower elevator was out of service, so every ascension/descention involved negotiating a 30-foot ladder. Also, Roger Case and Bill Glatzel of the SFO Electric Shop were instrumental in providing infrastructure information, camera in-lab testing, and installation support to the team. The project would not have gone forward without the kind support of these gentlemen.

[redacted]

[redacted]

[redacted]

SFO Airfield Operations personnel, supported by Aviation Security (AVSEC), performed [redacted] The APS team would like to thank Joe Smith and Joe Orcutt, for driving through barriers in a menacing fashion and suspiciously loitering outside gates and fences at various locations around the SFO perimeter.

[redacted]

[redacted]

SFO Airport Perimeter Security (APS) Pilot Program

System Acceptance Test (SAT) Report

1.0 INTRODUCTION

This document is the Final System Acceptance Report describing the testing of the Airport Perimeter Security (APS) System at San Francisco International Airport (SFO). The APS System provides situational awareness to airport operations personnel responsible for monitoring the airport perimeter and Air Operations Area (AOA). The system integrates multiple sensors and correlates the data they provide for surveillance, track, assess, and identify potential perimeter security breaches. The APS system reports the pertinent information on a geo-referenced situational awareness Common Operational Picture (COP) display located in the Security Operations Center (SOC).

1.1 Overview of the System

The SFO perimeter presents a complex and challenging environment for threat detection. These challenges are related to large area volumetric search capability, well addressed by radar technologies, specific localized threat areas where electro-optical (EO) sensors may provide the optimum detection system, and challenging areas where thermal sensors may be optimal. The coverage and test area of the APS system includes the Airport [redacted] This area is depicted in Figure 1 below.

[redacted]

Figure 1 SFO APS System Test Area

[redacted]

The APS system integrates the following subsystems:

- Computer Aided Dispatch (CAD) System (Intergraph)
- Airport Surface Detection Equipment (ASDE-3) Radar (TSC)
- SmartCatch Intelligent Video (IV) (Vidient)
- Airport Security Display Processor (ASDP) and Common Operational Picture (COP) Display (Intergraph and TSC)
- GPS Enabled Friend or Foe Vehicle Identification (FFI) System (ID Systems)
- Thermal/IR/Visible sensors (SightLogic)

The combination of these sensor technologies provides a scalable and unique system capable of accessing threats in multiple-modalities, enabling greater probability of threat detection in all weather conditions, reducing false alarms, providing robust detection capabilities and redundancy. The combination and layering of these sensor technologies will result in a system that maximizes the strengths of the components while minimizing their individual limitations.

1.2 Purpose of this Document

The purpose of this document is to describe the approach used by the technology integration team (Quatrotec, TSC, Intergraph, Vidient, and ID Systems) and SFO to test the performance and functionality if the APS system. Wherever possible, the system tests were defined in a way to allow the application of objective metrics to assess the results.

1.3 Objectives of the System Test

The primary objective of the system test was to gather data in a fashion that would allow verification and validation of the APS system performance and functionality. In addition, the system testing aided in the identification, tracking, reporting, and resolution of issues and discrepancies between the system requirements and the APS system.

A summary of the System Requirements Performance and functionality with the scenarios can be seen in Appendix "A" Requirements Matrix and the end of the report.

2.0 EXECUTIVE SUMMARY

The SFO Airport Perimeter Security (APS) System was designed, installed, and tested at San Francisco International Airport during 2008. The intent of the system was to provide an integrated, scalable system as a perimeter security awareness tool to aviation security personnel.

Operational testing of the APS system as installed at SFO was conducted from 28 August 2008 through 5 September 2008. Testing consisted of executing scripted scenario tests, as described in the SFO APS System Test Plan, over a several week period. The overall assessment of APS System performance is summarized as follows:

Detailed APS System test results are documented in Section 4.0 of this document.

[redacted]

3.0 TEST SCOPE

The Test Report includes performance testing of the system against the specified requirements to determine system metrics such as Probability of Detection (PD), False Alarm Rate (FAR) and Nuisance Alarm Rate (NAR) [redacted] Testing against requirements consisted primarily of executing scripted scenarios as detailed in Section 3.1 Test Scenario Descriptions. These scenarios emulated different types of perimeter breaches in order to exercise the system responses to perimeter intrusions. The Test Report also includes the functional tests results that assessed the user interface (CAD and COP) displays against requirements.

3.1 Test Scenario Descriptions and Parameters

All testing took place only in the pilot test area. One of the most important functions the APS system is to determine the location (or coordinate) of a target. In this test Report, the location of a target determined by a GPS receiver is considered true coordinate information to gauge the radar measurements.

3.1.1 Testing Descriptions and Parameter Inclusions

The testing effort and a few basic assumptions are summarized in the following list:

[redacted]

2) The tests were conducted in a limited predefined area at SFO.

3) The system was on site, checked and prepared (the system settings was recorded) at the date and time for testing by the integration team, prior to the start of the test implementation.

[redacted]

5) Test recording equipment and personnel were available on site for the test duration.

6) Target location was accurately recorded using Global Positioning System (GPS) Receiver, independent from the APS System measurements.

7) Communication means among test objects/intruders and SOC were verified before the intruder testing can start.

8) SFO maps were used to mark the routes of the penetration.

[redacted]

[redacted]

[redacted]

3.2 Testing Scope

Testing of the SFO APS system consisted of several system-level tests: baseline testing, operational testing, and functional testing. Each of these types of test is described in the sections below.

3.2.1 Baseline Testing

The purpose of Baseline Testing was to identify and quantify the security capabilities of the current SFO security monitoring prior to the implementation of APS System. Results of these tests form the basis of comparison and served as a starting point during the APS system assessment to determine the potential level of security monitoring improvement provided by the APS system. During Baseline Testing, the test scenarios and parameters described in Section 3.1 were executed, and the response of the current system was recorded.

3.2.2 Operational Testing

Operational Testing was focused on capturing how well the APS system monitors, identifies, and reports perimeter intrusion events. Testing was performed by running scripted scenarios that mimic various perimeter intrusion events and recording the system response to the events. The test scenarios were designed to address specific system requirements, thereby allowing for traceability of system performance back to system requirements.

3.2.3 User Interface (Functional) Testing

Functional, or User Interface, Testing was performed to verify all functions of the CAD and COP display interfaces operated according to the system requirements.

3.3 Testing Process

Testing took place over 2-3 weeks that allowed for a variety of environmental conditions. The Test Director(s) was responsible for coordinating the execution of the tests, assisting in test set-up and the recording of test results.

[redacted]

4.0 SYSTEM ACCEPTANCE TESTING (SAT) RESULTS

The goal of System Acceptance Testing (SAT) of the Airport Perimeter Security (APS) was to capture how well the APS system monitors, identifies, and reports security perimeter intrusion events. Testing was performed by running scripted scenarios designed to simulate actual incursion events and recording the system response to the events. The scenarios were defined by SFO and APS team personnel and were designed to address specific system requirements, thereby allowing for traceability of system performance back to system requirements.

Prior to SAT, a Stakeholders' Meeting was held on August 30, 2008 to brief all potential stake holders and SAT participants on APS testing scenarios, goals, projected schedule, and requested SFO personnel participation. In addition, weekly Airport Perimeter Security (APS) Pilot Coordination emails were sent to all stakeholders informing them of the SAT testing status.

4.1 Site Acceptance Test (SAT) Results

The following perimeter vulnerabilities have been addressed in the system design. The Test Report addresses the operational testing necessary to demonstrate the successful enhancements that will allow for early detection and tracking of the following:

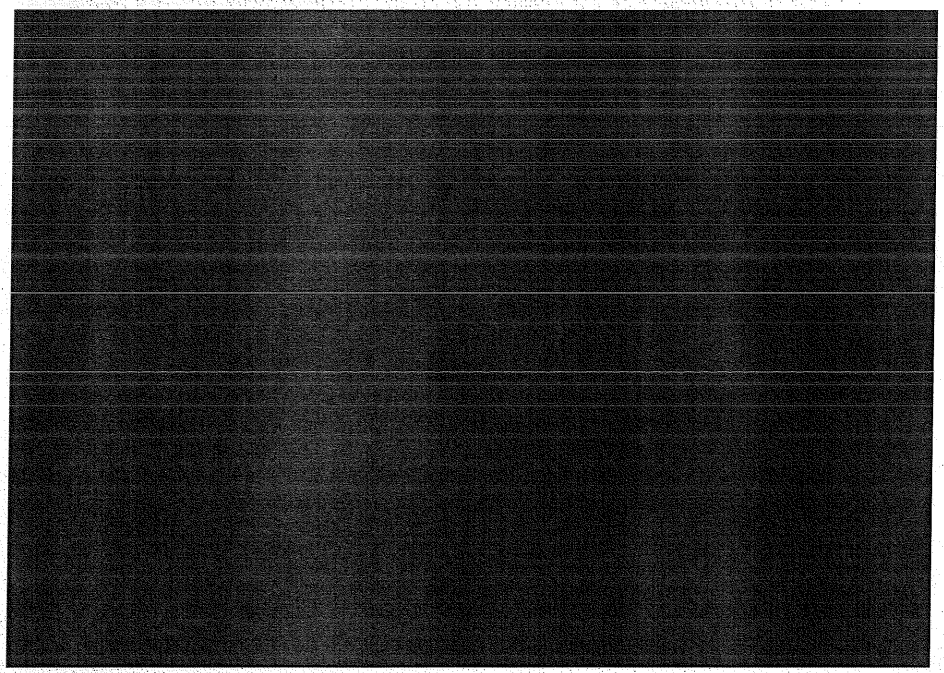
[redacted]

APS System Functional Performance Note: The APS system was designed to detect, track, and report the location of all watercraft within the range of the sensor systems. Target detections/locations are depicted in a geo-referenced fashion on the COP, and their threat level is visually defined by the shape and color of the icon. Blue squares represent low threat detections, orange diamonds are medium level alerts, and red

[redacted]

diamonds are high level alarms. (Low level threats warrant general awareness, medium level threats require monitoring, and high level threats require action.) In addition, the system's camera control logic implements a functional policy set forth by SFO and the system developers. The camera control policy stipulates that cameras *automatically* slew to and follow (slave to) alarms only. All other detections may be manually designated for cameras to follow, but it is not an automatic process. Therefore, the situational awareness information displayed on the Common Operational Picture (COP) depicts all water surface detections (targets of opportunity as well as planned scenario targets), and provides mandatory video of alarms. As a result on several of the COP screen captures (shown in figures starting on page 8 and after), several targets – other than test targets - may be displayed and there may not be video of any of the targets unless they are alarms. This is the way the system was designed to function. A clarifying comment on representation for display is the COP is the TSC display and the CAD display is from Intergraph.

COP Representations: Targets are shown as blue squares, orange diamonds, and red diamonds according to their threat level. In addition, video analytic detections are shown as red Xs. The four cameras shown on the COP display are color coded. Their footprints are shown as triangles originating from the location of the camera and pointing in the direction of the camera. The width of the camera footprint indicates the focal length, with wide triangles showing short-range camera focus and more narrow triangles showing the camera focus on distant objects.



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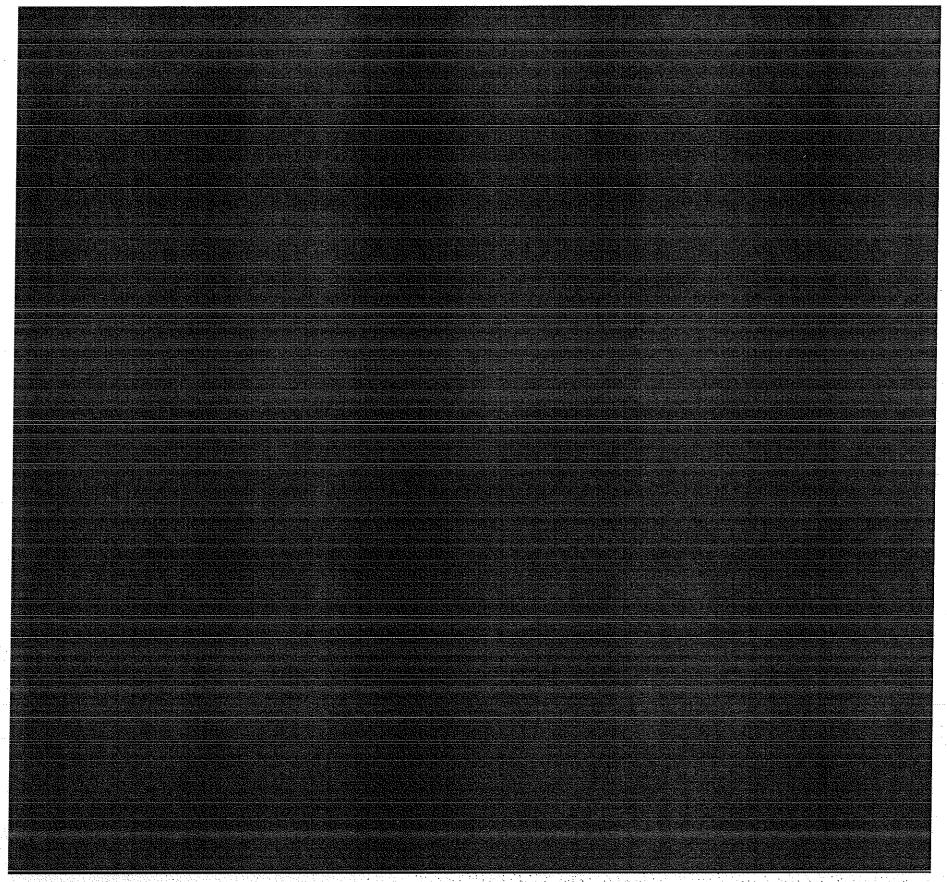

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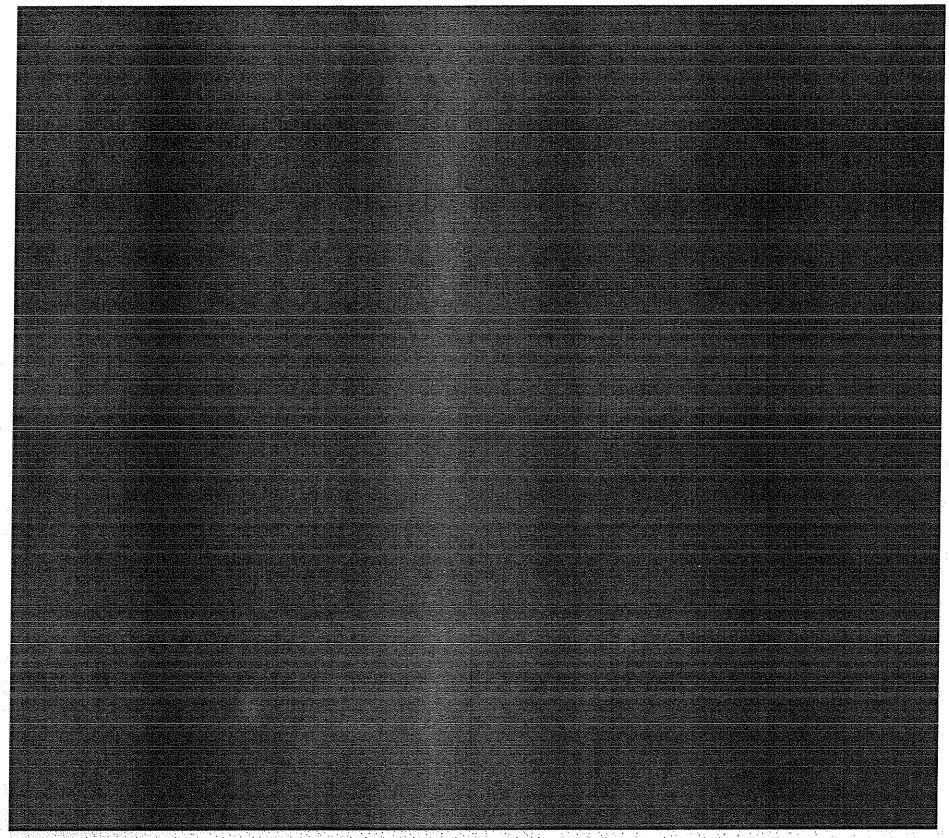

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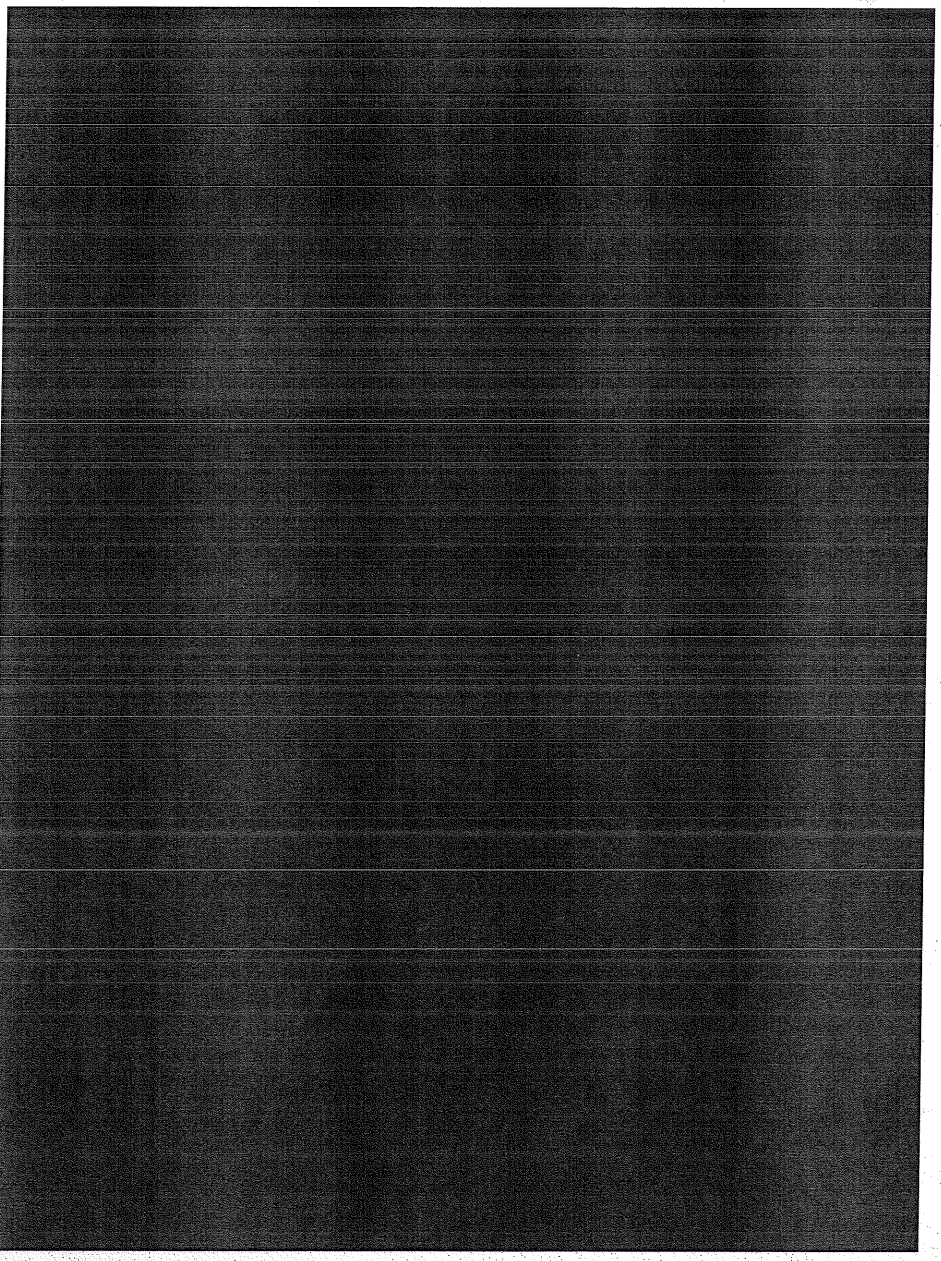

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