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Aviation Security Human Factors Test and Evaluation Master Plan for the Airport Demonstration

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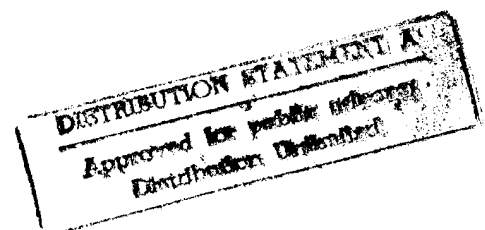
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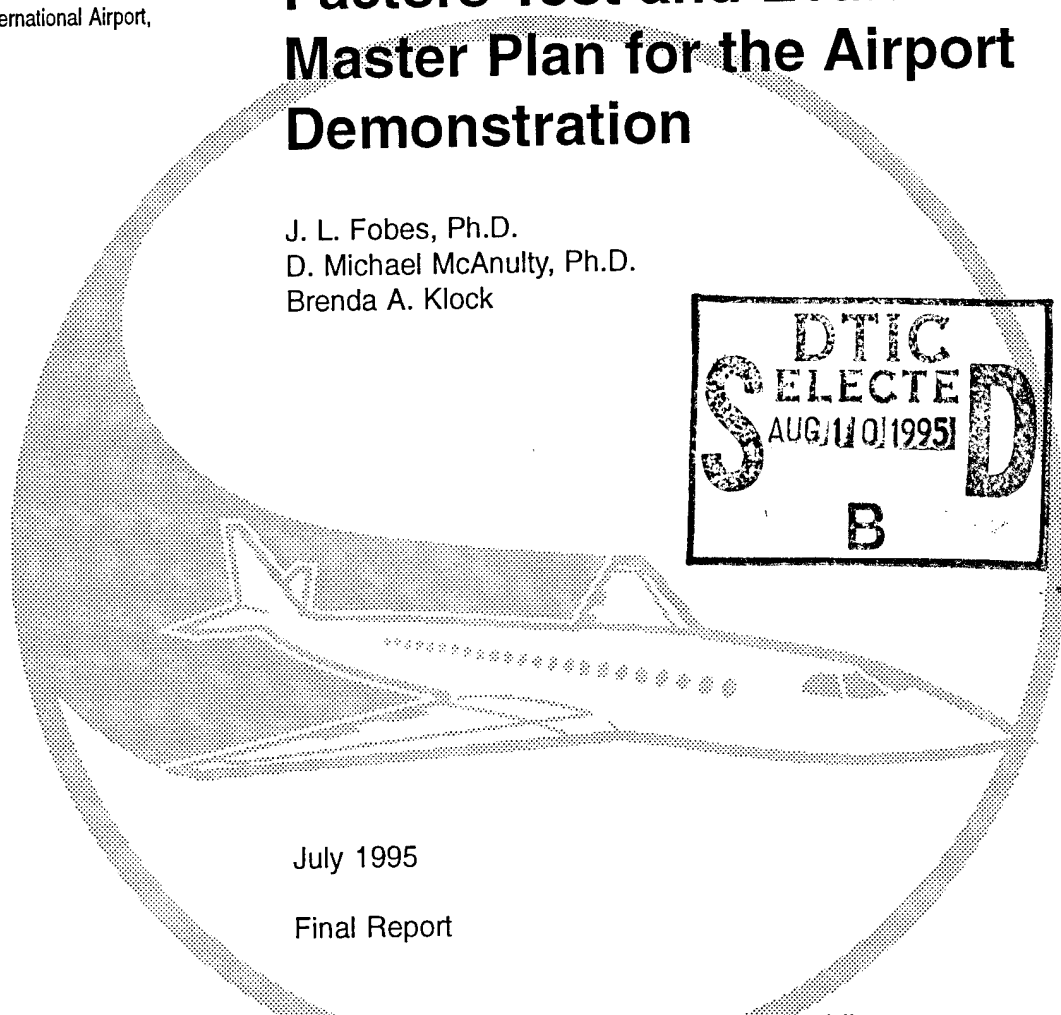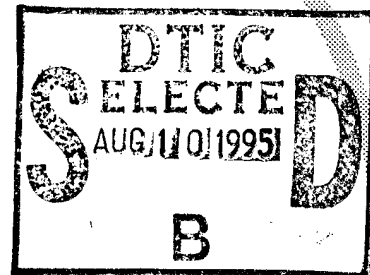
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Final Report

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16. Abstract
This planning document describes 36 RDT&E activities designed to assess the operational effectiveness of a suite of prototype systems for enhancing screener proficiency on conventional and computed axial tomography X-ray inspection systems. Prototype equipment under test include screener selection test batteries, interface improvements, a connection device, trainers, and performance testing systems. Host platforms, including the InVision CTX 5000, the EG&G Astrophysics TnT, and the Safe Passage International Limited's Vocation Station Safe Passage System 40, will be used to improve the inspection of carry-on and checked baggage at selected airports during operational demonstrations.

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GLOSSARY

BIS
The **Baggage Inspection System** is the specific, informal name of the overall EDS utilizing the CTX 5000 X-ray inspection subsystem. The BIS is designed to protect civil aviation consumers and commercial interests from terrorists and other criminal action perpetrated through *checked* baggage. It includes all materials, equipment, facilities, procedures, training, manpower, special agreements, logistics support, threat containment and disposal provisions, safety, health, and technical data necessary to install and operate.

BIS-CO
This item has similar elements to that above except this system is configured to inspect **carry-on** baggage using the CTX 5000.

CAT
Computed Axial Tomography X-ray equipment represents a general category of dynamic X-ray equipment in which the X-ray source(s) and collector(s) revolve about the baggage taking multiple cross-section slices. The resulting display image is a more detailed, mass-density mapping of X-ray attenuation in each voxel based on the photoelectric effect. InVision's CTX 5000 is the only member of this category under evaluation at the issuance of this TEMP.

CD
The **Connection Device** is a universal interface linking any TIP system to any CX in use.

CTI
A **Combined Test Item** is a digitized image of a cluttered bag *with* a threat article(s). Both the bag with its threat are fictional and digitally characterized images, and are designed to work in concert with CAT and CX operation.

CX
Conventional X-ray equipment represents a general category of static, single and dual-energy X-ray equipment which all generate a qualitative mass-density mapping of X-ray. Example: EG&G Astrophysics E-SCAN X-ray System.

CXIS
Conventional X-Ray Inspection System represents the overall inspection system using CX equipment to inspect *checked* baggage. It includes all materials, equipment, facilities, procedures, training, manpower, special agreements, logistics support, threat containment and disposal provisions, safety, health and technical data necessary to install and operate.

CXIS-CO
This system has similar elements to that above except this system is configured to inspect **carry-on** baggage using CX equipment.

EDS — The **Explosives Detection System** is the automatic baggage screening equipment component of the BIS. An EDS is a decision support system that delivers alarm and cueing information supporting alarm resolution by screeners.

FTI — **Fictional Threat Images** are threat images that can be superimposed upon an actual bag image using real-time projection techniques in conjunction with on-line CX baggage screening displays. Only the threat image is fictional, the bag image is not.

IED — An **Improvised Explosive Device** is a threat object or article.

Off-line — Off-line refers to a training activity typically away from the screener's checkpoint job site *or* while the screeners are not performing their job.

On-line — On-line refers to activity that is simultaneous with the screeners' performance on-the-job at the checkpoint.

PD&I — **Procurement, Distribution, and Installation** are a logical grouping of specific preparatory tasks for the Airport Demonstrations.

PETS — **Proficiency Enhancing Techniques for Screeners** encompass all prototype techniques in this TEMP that seek to enhance screener proficiency. PETS include screener selection test batteries, interface improvements for the CAT system, SPEARS Off-line Training Modules for CX and CAT, and SPEARS On-line Testing/Training Modules for CX and CAT.

Real-time — Real-time refers to a standard rate at which events actually occur. Real-time is in contrast to off-line training and/or testing.

SPEARS — **Screener Proficiency Evaluation And Reporting System** consists of an Off-Line Training Module and On-Line Testing/Training Module. The latter module is also known as TIP and includes a performance monitoring capability.

TIP — **Threat Image Projection** is the on-line component of SPEARS that provides real-time training and testing designed to work in concert with CX operation. TIP uses either CTI or FTI.

ACRONYMS

AAR	FAA Aviation Security Research & Development Division
ACS	FAA Civil Aviation Security
AEIC	Additional Evaluation Issue and Criteria
aka	also known as
AvSec HF	Aviation Security Human Factors
β	Screener Decision Criteria (Beta)
BIS	Baggage Inspection System
CAT	Computer Axial Tomography
CBT	Computer Based Training
CD	Connection Device
COIC	Critical Operational Issues and Criteria
COTR	Contracting Officer's Technical Representative
COTS	Commercial-off-the-Shelf
CTIC	Critical Technical Issue and Criteria
CTI	Combined Test Item
CX	Conventional X-ray
d'	Operator Sensitivity
DT&E	Development Test & Evaluation
EDS	Explosive Detection System
ERAU	Embry Riddle Aeronautical University
FAATC	Federal Aviation Administration Technical Center
FOT&E	Follow-on Operational Test and Evaluation
FTI	Fictional Threat Image
GSC	Galaxy Scientific Corporation
HF	Human Factors
IED	Improvised Explosive Device
IEDDS	Improvised Explosive Device Detection System
IOT&E	Initial Operational Test and Evaluation
ITS	International Total Services
LLNL	Lawrence Livermore National Labs
MNS	Mission Need Statement
OT&E	Operational Test & Evaluation
P_d	Probability of Detection
P_{fa}	Probability of False Alarm
PD&I	Procurement, Distribution, and Installation
PETS	Proficiency Enhancement Techniques for Screeners
PM	Program Manager
QA	Quality Assurance
R&D	Research and Development
RDT&E	Research Development Test and Evaluation
RPD	Research Project Directive
SPEARS	Screener Proficiency Evaluation And Reporting System
SPIL	Safe Passage International Limited
T&E	Test and Evaluation
TBD	To Be Determined
TEMP	Test and Evaluation Master Plan
TEP	Test and Evaluation Plan
TIP	Threat Image Projection aka SPEARS On-line Testing/Training Module
TnT	EG&G Astrophysic's Training and Testing System

1.0   INTRODUCTION

This document describes the Research, Development, Test and Evaluation (RDT&E) of four **Proficiency Enhancement Techniques for Screeners (PETS)** as well as one custom interface, called the Connection Device (CD), in support of Civil Aviation Security (ACS) Research Project Directive (RPD) #127.   The test and evaluation (T&E) portion of this program encompasses at least 20 unique activities that culminate in Airport Demonstrations at Category X airports.

PETS seeks to examine, enhance, and improve screener performance on two types of X-ray baggage inspection hosts: Conventional X-ray (CX) and Computed Axial Tomography (CAT) X-ray explosive detection systems (EDS).   PETS consists of screener selection test batteries, interface improvements, training, and performance testing modules. The latter two techniques are called **Screener Proficiency Evaluation And Reporting System (SPEARS)** devices.

The results of the test activities described by this Test and Evaluation Master Plan (TEMP) will serve to support deployment and regulation decisions by defining a comprehensive plan to address, resolve, and report critical issues.

Section 1 of this document covers the background, purpose, and scope of the RDT&E program with emphasis on operational test and evaluation (OT&E) including a brief summary of key activities.   Section 2 describes the key systems under test as well as test issues. Section 3 describes the program management structure, funding, and responsibilities. Section 4 defines the key test activities to resolve the critical parameters and issues identified in Section 2, and Section 5 lists referenced documents.

1.1   Background

Current systems do not meet the threat.   Currently, the most effective defense against bombs in carry-on and checked baggage is hand inspection combined with conventional X-ray inspection, which is labor intensive and costly.   CX systems and their current training programs, which rely on quick interpretation of complex two dimensional images of baggage, may not be adequate to detect artfully concealed explosives.

Recent actions bring focus. As a result of studies and terrorist actions, the United States Congress passed the Aviation Security Improvement Act of 1990 (Public Law 101-604), directing and empowering the Federal Aviation Administration to accelerate its research, development, and implementation of key technologies to improve civil aviation security. The President's Commission on Aviation Security and Terrorism (reference 5.e) and the General Accounting Office (references 5.c and 5.d) have reviewed FAA progress in this area on numerous occasions, and have recommended greater focus on human factors and training to leverage and complement advanced technology.

Enhancing the human element. Screeners are critical participants in aviation security. Though new equipment will automate some aspects of the baggage inspection process and provide the screener with better information, overall inspection effectiveness will remain dependent upon the proficiency of the screener. Similarly, enhancing the proficiency of the screener may improve the effectiveness of *current* inspection systems. In June 1991, the Aviation Security Human Factors Program was created to augment the Aviation Security Research and Development (R&D) Division's detection equipment development initiatives by focusing its efforts on improving the performance of the equipment operators referred throughout this document as *screeners*.

ACS Direction. Direction stems from ACS Mission Need Statement (MNS) #163 seeking to:

- "<u>Maximize</u> the capability of civil aviation security personnel to detect threats and deter terrorist acts and

- <u>Optimize</u> human performance through advanced human factors (HF) engineering to improve methods of screener selection, interface improvements, training, performance testing, and motivation."

1.2   Purpose

The overall objective of this test and evaluation effort is to assess the operational effectiveness of a suite of prototype systems that seek to enhance the proficiency of the human screener for CX and CAT host systems. The five specific research objectives are as follows:

    a. Collect and analyze empirical data on screener performance using X-ray systems.

    b. Obtain and assess commercial-off-the-shelf (COTS) devices for a prototype CX SPEARS.

    c. Develop a CAT SPEARS prototype.

    d. Develop new processes, procedures and technologies for improving screener performance.

    e. Develop proficiency-based taxonomy, guidelines, and criteria for selection and training.

1.3   Scope

To accomplish the objectives stated in section 1.2, this TEMP defines and outlines 36 unique activities that encompass the full research, development, test and evaluation spectrum for each

of the following four PETS as well as for a Connection Device (CD) to support threat image projection. These techniques, and the device to be developed and tested, are listed in section 1.3.1. Section 1.3.2 defines the key activities of a general project analysis followed by a summary of specific activities in section 1.3.3 and a description of how they map to the research objectives in section 1.3.4.

1.3.1 Connection Device (CD) and Enhancement Techniques

This project primarily seeks to improve screener productivity through the use of the following new techniques and a CD resulting in potentially eight different test items. The first two and last two items of this list (a, b, d, and e) constitute PETS, and the third item (c) is *enabling* equipment for the SPEARS On-line Testing/Training Module, also known as the Threat Image Projection (TIP) System.

    a. Screener Selection Test Batteries for both CX and CAT systems;

    b. Interface Improvements for the CAT system;

    c. CD for CX systems;

    d. SPEARS Off-Line Training Modules for both CX and CAT systems; and

    e. SPEARS On-Line Testing/Training Modules (TIP) for both CX and CAT systems.

1.3.2 Key Activities

The RDT&E program involving these developmental items (Section 1.3.1) will consist of four distinct activity categories. The latter three represent the major test, evaluation, and support activities. Their scope is defined below:

1.3.2.1 R&D: Research and Development

This activity includes concept exploration, requirements analysis, specification preparation, issue identification and resolution, engineering design, and prototype assembly.

1.3.2.2 DT&E: Development Test and Evaluation

This quality assurance activity tests for compliance to technical functional requirements as specified and/or limited operational effectiveness in a controlled, benign environment at the vendor's facilities. Only FAA-witnessed or formal DT&E activities are indicated on the table.

1.3.2.3   PD&I: Purchase, Distribution, and Installation

This activity involves the purchase, distribution, and installation of test articles at Category X airports to support OT&E.

1.3.2.4   OT&E: Operational Test and Evaluation

This testing, which is also referred to as the Airport Demonstrations, has two phases, *initial*, and *follow-on*, which support the operational effectiveness evaluation of selected test items.

- **Initial OT&E** (IOT&E) is the first test phase which evaluates the test item under realistic or *nearly* realistic operational conditions at operational sites. It includes certified screeners and FAA test baggage and/or passenger baggage in real-time as well as digitized bag images off-line. For this program, both CX and CAT related systems will undergo IOT&E, but only CX system will undergo **Baseline Testing**. Baseline Tests define the baseline or untreated screener performance to support comparative analysis and evaluation. All Baseline Testing will generally occur at the *same* time with an expected test duration of one week or less per airport. The conduct of CAT SPEARS IOT&E will be coincident with the Baggage Inspection System (BIS)-EDS Demonstration.

- **Follow-on OT&E** (FOT&E) will consist of deployment and testing of the test items at a larger diversity of selected Category X airport sites for CX systems only.

1.3.3 Summary of Key Activities

As a whole, this Human Factors (HF) project encompasses 36 RDT&E activities as shown in Table 1.3-1. The unique test items, derived from Section 1.3.1, are on the left with their scope on the right. The performing organization is identified at the corresponding junction. Table 1.3-2 spells out the key acronyms identifying the performing organizations used in Table 1.3-1. Of these thirty-six activities, eight pertain to R&D; six to DT&E; eight to PD&I; and fourteen to OT&E.

The Host column shows which type of X-ray inspection system the items will be designed to support. At present, the specific host from the CX category is EG&G's E-SCAN X-ray inspection system, and the specific host from the CAT category is Imatron-InVision's CTX 5000 X-ray inspection system.

The darkly shaded areas in the table show activities completed as of the publication of this TEMP, while the lightly shaded areas represent the test and evaluation focus activities. The activities in the table that are blank are either not to be performed or are conducted without formal FAA witness.

Table 1.3-1 Summary of Key Activities

| # | Test Item | Host | Key Activities | | | OT&E * | | |
			R&D	DT&E	PD&I	Initial OT&E	Baseline Testing	Follow-on OT&E
1	Screener Selection Test Battery	CX	ERAU	ERAU	FAA	ERAU		FAA
2	Screener Selection Test Battery	CAT	ERAU	ERAU	FAA	FAA		
3	Interface Improvements	CAT	LLNL and InVision	LLNL and InVision	TBD	TBD		
4	Connection Devices	CX	TBD	TBD	TBD	FAA		TBD
5	SPEARS Off-line Training Module	CX	SPIL and EG&G		FAA	FAA	FAA	FAA/TBD
6	SPEARS Off-line Training Module	CAT	InVision	InVision	TBD	Air Carriers		
7	SPEARS On-line Test / Training	CX	EG&G		FAA	FAA	FAA	FAA/TBD
8	SPEARS On-line Test / Training	CAT	InVision	InVision	FAA	Air Carriers		

* *aka Airport Demonstrations*

Table 1.3-2 Expansion of Selected Acronyms

Acronym	Expansion
EG&G	EG&G Astrophysics
ERAU	Embry Riddle Aeronautical University
FAA	Federal Aviation Administration including service support contractors
InVision	Imatron-InVision, Incorporated
LLNL	Lawrence Livermore National Laboratories
SPIL	Safe Passage International Limited
TBD	To Be Determined

1.3.4 Objectives-to-Activities Mapping

The relationship of the five research objectives listed in Section 1.2 (a thru e) to the 36 activities shown in Table 1.3-1 is revealed by an overlay as shown in Table 1.3-3, *Objectives-to-Activities Mapping*. Table 1.3-4 displays Section 1.2 (a thru e) as a key to Table 1.3-3.

Table 1.3-3   Objectives-to-Activities Mapping

#	Test Item	Host	Key Activities					
			R&D	DT&E	PD&I	OT&E		
						Initial OT&E	Baseline Testing	Follow-on OT&E
1	Screener Selection Test Battery	CX	a,d,e	a,d,e	a,d	a,d		a,d
2	Screener Selection Test Battery	CAT	a,d,e	a,d,e	a,d	a,d		
3	Interface Improvements	CAT	a,d	a,d	a,d	a,d		
4	Connection Devices	CX	a,d	a,d	a,b,d	a,d		a,d
5	SPEARS Off-line Training Module	CX	a,b,c,d		a,b,d	a,b,d	a,b,d	a,b,d
6	SPEARS Off-line Training Module	CAT	a,b,c,d	a,b,c,d	a,b,d	a,b,d		
7	SPEARS On-line Test / Training	CX	a,b,c,d		a,b,d	a,b,d	a,b,d	a,b,d
8	SPEARS On-line Test / Training	CAT	a,b,c,d	a,b,c,d	a,b,d	a,b,d		

Table 1.3-4   Key to Table 1.3-3

a.   Collect and analyze empirical data on screener performance using X-ray systems.

b.   Obtain and assess commercial-off-the-shelf (COTS) devices for a prototype CX SPEARS.

c.   Develop a CAT SPEARS prototype.

d.   Develop new processes, procedures and technologies for improving screener performance.

e.   Develop proficiency-based taxonomy, guidelines, and criteria for selection and training.

2.0   SYSTEM DESCRIPTIONS

The following sections describe PETS and CD characteristics, interfaces, and critical parameters.

2.1   Systems Under Test

The list of PETS and CD in section 1.3.1 expands to eight unique test items as listed in Table 2.1-1 with its developer and system name. Many are currently unnamed. The right most column, displaying ¶, refers to the paragraphs to follow that describe each of the test items.

Table 2.1-1 Systems Under Test

#	TEST ITEMS	DEVELOPER	SYSTEM NAME	¶
1	Screener Selection Test Battery for CX	ERAU	TBD	2.1.1
2	Screener Selection Test Battery for CAT	ERAU	TBD	2.1.1
3	Interface Improvements for CAT	LLNL - InVision	TBD	2.1.2
4	Connection Devices for CX	TBD	TBD	2.1.3
5	SPEARS Off-line Training Module for CX	SPIL / EG&G	Safe Passage / TnT	2.1.4.1
6	SPEARS Off-line Training Module for CAT	InVision/ SPIL	TBD	2.1.4.1
7	SPEARS On-line Testing/Training Module for CX	EG&G	TnT	2.1.4.2
8	SPEARS On-line Testing/Training Module for CAT	InVision	TBD	2.1.4.2

2.1.1 Screener Selection Test Batteries

2.1.1.1   Description

This technique seeks a predictor of CX and CAT X-ray systems screener performance effectiveness. For example, among various candidate predictors, ERAU is measuring screeners on their ability to discern complex, graphical abstraction, such as hidden shapes. The end products of the RDT&E will include:

- A prototype test battery to include specifications for the hardware and software, protocols and administration procedures as well as scoring routines for generating selection decisions.

- A set of guidelines and recommendations for screener selection.

2.1.1.2   Development Approach

ERAU, under an FAA Aviation Grant, is developing a test battery for CAT and CX systems. In general, the development of the test battery involves the performance of the following tasks by Dr. Gibb and Dr. Garland.

- Predictor Test Tool. ERAU will design, develop, or use existing predictor tests that may have a relationship to screener performance and that can be evaluated through a predictive validation study.

- On the Job Performance Measure. Threat Image Projection performance measures will be used for predictive validity and reliability.

- Tool Validation. ERAU will conduct a validation effort in operational environments to determine the relationships among the possible predictor variables and performance criteria selected from the X-ray technology. TIP criteria used shall be indicative of success or failure at detecting targets. End products will include a prototype, hardware and software specifications, and supporting statistical analysis.

2.1.2   CTX 5000 Interface Improvements

2.1.2.1   Description

Interface improvements will include job aids and computer-human interaction such as information entry and feedback as well as enhanced displays and controls for the CTX 5000.

2.1.2.2   Development Approach

Dr. T. Bennett of LLNL will conduct a design audit of the CTX 5000 interface. The resulting critical human factors design issues will be resolved by InVision and tested by LLNL.

2.1.3   Connection Device

2.1.3.1   Description

The Connection Device is a universal TIP interface device or "Black Box" to permit various versions of TIP systems to operate on a variety of CX systems. It will be developed by one or more organizations to be determined and will be based in part on studies to be conducted by Lincoln Laboratories at Hanscom AFB.

2.1.3.2   Development Approach

An organization to be determined will survey existing CX systems and develop preliminary hardware and software requirements to link TIP devices to existing CXs.

2.1.4 SPEARS

The function of SPEARS is to perform initial and recurrent training, and to monitor screener performance. SPEARS consists of two parts, an *off-line* training module and an *on-line* testing and training module.   There are also types of SPEARS, CX SPEARS and CAT SPEARS. These systems will comply with the SPEARS functional requirements specification (reference 5.b).

2.1.4.1   SPEARS Off-line Training Module

2.1.4.1.1 Description

This off-line trainer provides computer-based training (CBT) that is not coincident with screener operations. In general, the module seeks to develop and maintain threat detection proficiency in a variety of training techniques.

2.1.4.1.2 Development Approach

SPIL and EG&G have already developed their systems for CX systems. SPIL developed the Vocation Station Safe Passage System 40 and EG&G's TnT operates as an off-line training system. AAR-510 recently completed its OT&E of these items and identified failures to meet critical issues which need to be addressed. The SPEARS off-line training module for the CAT will be developed by InVision and SPIL.

2.1.4.2   SPEARS On-Line Testing/Training Module (TIP)

2.1.4.2.1 Description

This on-line trainer and tester permits the assessment of screener proficiency and vigilance, and incidentally trains screeners to better detect Improvised Explosive Devices (IEDs). It does this by two different methods, Fictional Threat Images (FTI) and Combined Threat Items (CTI). FTI uses superimposition, electronically overlaying fictional images of threat objects onto CX images of actual passenger baggage, unbeknownst to the screener.   The image appears on the X-ray monitor as if a threat object actually exists within the passenger's bag. Screeners are then provided feedback on their ability to detect the FTI.   The CTI is a prefabricated image of a threat bag. The CTI can be electronically inserted onto the CAT or CX display monitors for the same purposes as the FTI.

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The purpose of the TIP is twofold. It exposes screeners to threat images on a routine basis to enable them to become more adept at recognizing threats. In addition, it enhances screener vigilance by unpredictably inserting fictional threats throughout the course of their duty cycle.

2.1.4.2.2 Development Approach

TIP exists for the CX host, called EG&G's Astrophysics Linescan Testing and Training (TnT) system, but needs to be developed by InVision for the CAT system. Both systems will be evaluated based on requirements published in the SPEARS: Human Factors Functional Requirements and Procedures Report (reference 5.b).

- EG&G Astrophysics Linescan® TnT System The TnT was developed by EG&G Astrophysics to train airport baggage screeners with Linescan X-ray equipment.

- Imatron Federal Systems-InVision, Inc. CTX 5000 Training System Imatron-InVision is developing a TIP for their CAT system based on the requirements in reference 5.b.

2.2 System Interfaces

Each of the 14 test plans as listed in Table 3.3-1 when completed will describe the system-to-system interfaces where appropriate.

2.3 Critical Parameters

2.3.1 Critical Performance Parameters

Critical performance parameters are addressed by issues discussed in section 2.3.2.

2.3.2 Critical Issues and Criteria

Critical issues are primary questions regarding operational, technical, or support capabilities that must be answered about each system under test before the system's overall value or effectiveness can be estimated. Criteria are the standards by which the issues are addressed. Measures of Performance will be defined in each individual test plan for each criterion. Thresholds embedded in some of the criteria are the minimum acceptable levels of performance required by a test article to perform its intended mission.

Table 2.3.2-1, on the next page, summarizes the top 15 Critical Operational Issues and Criteria (COIC), 23 Critical Technical Issues and Criteria (CTIC), and one Additional

Evaluation Issue and Criteria (AEIC). This *Issue Summary Table* is an index for the following tables (2.3.2-2 thru 2.3.2.13) which define the issues and criteria for each technique/device. Each of these three issue/criteria sets (COIC, CTIC, and AEIC) is sequentially numbered and shown in the *Issue* column indicating the numbered series relevant to each technique and device.

Table 2.3.2-1 Issue Summary Table

PETS and CD	Issues		Table #
CX and CAT Screener Selection Test Batteries	COIC (1 - 2)		2.3.2-2
Interface Improvements for CAT	COIC (3)		2.3.2-3
Connection Device	COIC (4)		2.3.2-4
CX- SPEARS Off-Line Training Module	COIC (5 - 6)		2.3.2-5
		CTIC (1 - 7)	2.3.2-6
		AEIC (1)	2.3.2-7
CAT-SPEARS Off-Line Training Module	COIC (7 - 9)		2.3.2-8
		CTIC (8 - 13)	2.3.2-9
CX-SPEARS On-Line Testing/Training Module	COIC (10 - 12)		2.3.2-10
		CTIC (14 - 19)	2.3.2-11
CAT- SPEARS On-Line Testing/Training Module	COIC (13 - 15)		2.3.2-12
		CTIC (20 - 23)	2.3.2-13

Table 2.3.2-2 COIC: CX and CAT Screener Selection Test Batteries

Issue #	Title	Description	Criteria
COIC-01	**CX**-Screener Selection Test Battery - Criterion-related validity	Can a battery of tests be developed which can be used to validly and reliably predict screener performance with CX?	• Screener performance on selection battery tests is significantly correlated with on-the-job performance measured by detection of FTIs and/or CTIs.
COIC-02	**CAT**-Screener Selection Test Battery - Criterion-related validity	Can a battery of tests be developed which can be used to validly and reliably predict screener performance with CAT?	• Same as above except only with CTIs.

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Table 2.3.2-3 COIC: Interface Improvements for CAT

Issue #	Title	Description	Criteria
COIC-03	CAT Interface Improvement - Design Impact	Are there any HF design features or other system characteristics that adversely affect the ability of screeners to operate the CAT SPEARS effectively and safely in operational and training settings?	• Investigative in nature.

Table 2.3.2-4 COIC: CX-TIP Connection Device

Issue #	Title	Description	Criteria
COIC-04	CX-TIP CD - Feasibility	Is it feasible to develop a device that is capable of connecting various FIP systems to various types of X-ray machines?	• No degradation in function listed in Table 3.3.2-10.

Table 2.3.2-5 COIC: CX - SPEARS Off-line Training Module

Issue #	Title	Description	Criteria
COIC-05	Effectiveness	Does the training enhance screener capability?	• Screener probability of detection (P_d) significantly increased after training. • Screener d' significantly increased after training • Screener probability of false alarm (P_{fa}) is not significantly increased after training.
COIC-06	Usability	Are there any software or hardware factors or procedural aspects that degrade training effectiveness?	• Investigative in nature.

Table 2.3.2-6 CTIC: CX - SPEARS Off-line Training Module

Issue #	Title	Description	Criteria
CTIC-01	Image Content	Do the images represent the range of current threats?	• 300 different, representative CTIs are available with representative cluttered bags • ≥ 2 different aspect angles for each threat • Degree of detection difficulty varies
CTIC-02	Customization	Can training be tailored to individual needs?	• Images can be selected for each screener as a function of threat category, difficulty, and aspect angle which are then archived along with the associated outcome (hit, miss, false alarm, correct rejection).
CTIC-03	Feedback	Is feedback provided?	• Screener is immediately informed on whether each threat object was correctly identified.
CTIC-04	Capability Summaries	Are training reports prepared?	• Training reports containing descriptive statistics and readily understandable interpretations are automatically generated to summarize records of the threats presented and the outcomes.
CTIC-05	Interoperability	Can the equipment communicate with remote computers?	• Additional FTIs and CTIs are received from remote sites. • The equipment will be able to transmit reports to remote sites.
CTIC-06	Security	Is access restricted?	• Only authorized screeners and supervisors can access certain aspects of the system.
CTIC-07	Multimodal	Is instruction provided in the visual and/or auditory modalities?	• Contents can be read by trainee • Contents can be read to trainee

Table 2.3.2-7 AEIC: CX - SPEARS Off-line Training Module

Issue #	Title	Description	Criteria
AEIC-01	CX-Training Module Reading Level	What reading capability is required for the training?	• Investigative in nature.

Table 2.3.2-8 COIC: CAT-SPEARS Off-line Training Module

Issue #	Title	Description	Criteria
COIC-07	Equipment Familiarization	Does the training enable screeners to operate the CTX 5000 equipment in general and the alarm resolution interface in particular?	• Investigative in nature.
COIC-08	Effectiveness	Does the training enhance screener capability to detect IEDs?	• P_d is significantly increased after training • d' is significantly increased after training. • P_{fa} is not significantly increased after training
COIC-09	Usability	Are there any software or hardware factors or procedural aspects that degrade training or operational effectiveness?	• Investigative in nature.

Table 2.3.2-9 CTIC: CAT-SPEARS Off-line Training Module

Issue #	Title	Description	Criteria
CTIC-08	Image Content	Do the images represent the range of currently IED threats?	• 300 different CTIs representing each of the 6 bulk types with IED components with representative cluttered bags are available
CTIC-09	Customization	Can training be tailored to individual screeners needs?	• Images can be selected for each screener as a function of explosive type which is archived along with the associated outcome (hit, miss, false alarm, correct rejection)
CTIC-10	Feedback	Is feedback provided?	• Screener is immediately informed on whether each threat object is correctly identified.

Table 2.3.2-9 CTIC: CAT-SPEARS Off-line Training Module (cont.)

Issue #	Title	Description	Criteria
CTIC-11	Capability Summaries	Are training reports prepared?	• Training reports, containing descriptive statistics and readily understandable interpretations are automatically generated to summarize records of threats presented and the outcomes.
CTIC-12	Security	Is access restricted?	• Only authorized screeners and supervisors access certain aspects of the system
CTIC-13	Multimodal	Is instruction provided in the visual and/or auditory modalities?	• Contents can be read by trainee • Contents can be read to trainee

Table 2.3.2-10 COIC: CX-SPEARS On-line Testing/Training Module

Issue #	Title	Description	Criteria
COIC-10	Insertion	Can FTI and CTI be automatically and unpredictably inserted on the interface display?	• The FTI and CTI appears no different that a real image of a bag that is currently in the X-ray system.
COIC-11	Vigilance	Do projected images enhance screener capability?	• Projecting fictional images increases P_d. • Projecting fictional images increases d'. • Projecting fictional images does not increase P_{fa}.
COIC-12	Usability	Are there any software or hardware factors or procedural aspects that degrade training effectiveness?	• Investigative in nature.

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Table 2.3.2-11 CTIC: CX-SPEARS On-line Testing/Training Module

Issue #	Title	Description	Criteria
CTIC-14	Image Content	Do the images represent the range of current threats?	• 300 different, representative CTIs and FTIs are available • ≥ 2 different aspect angles for each threat • Degree of detection difficulty varies
CTIC-15	Customization	Can performance monitoring be tailored to individual screener needs?	• Images can be selected for each screener as a function of threat category, difficulty, and aspect angle which are archived along with the associated outcome (hit, miss, false alarm, correct rejection) • FTIs and CTIs are automatically or manually selected for presentation based on time of day, checkpoint activity, or screener ID.
CTIC-16	Feedback	Is feedback provided?	• Screener is immediately informed on whether each threat object is correctly identified.
CTIC-17	Capability Summaries	Are performance reports prepared?	• Performance reports, containing descriptive statistics and readily understandable interpretations are automatically generated to summarize records of threats presented and the outcomes. • Supervisors are alerted when screener performance falls below operational requirements during a screening session.
CTIC-18	Interoper-ability	Can the equipment communicate with remote computers?	• Additional FTIs and CTIs are received from remote sites • Equipment is able to transmit reports to remote sites
CTIC-19	Security	Is access restricted?	• Only authorized screeners and supervisors can access certain aspects of the system

Table 2.3.2-12 COIC: CAT-SPEARS On-line Testing/Training Module

Issue #	Title	Description	Criteria
COIC-13	Insertion	Can CTI be automatically and unpredictably inserted on the interface display?	• The CTI appears no different that a real image of a bag that is currently in the system • No aspect of the interface reveals to the screener the use of a CTI in place of a 'real' bag image
COIC-14	Vigilance	Do projected images enhance screener capability?	• Projecting fictional images increases P_d. • Projecting fictional images increases d'. • Projecting fictional images does not increase P_{fa}.
COIC-15	Usability	Are there any software or hardware factors or procedural aspects that degrade training effectiveness?	• Investigative in nature.

Table 2.3.2-13 CTIC: CAT-SPEARS On-line Testing/Training Module

Issue #	Title	Description	Criteria
CTIC-20	Feedback	Is feedback provided?	• Screener is immediately informed on whether each threat object is correctly identified.
CTIC-21	Security	Is access restricted?	• Only authorized screeners and supervisors can access certain aspects of the system
CTIC-22	Image Content	Do the images represent the range of current threats?	• 300 different CTIs representing each of the 6 explosive types with IED components in representative cluttered bags are available • These CTIs differ from off-line training
CTIC-23	Customization	Can performance monitoring be tailored to individual needs?	• Images can be selected for each screener as a function of explosive type which is archived along with the associated outcome (hit, miss, false alarm, correct rejection) • CTIs are automatically or manually selected for presentation based on time of day, checkpoint activity or screener ID

2.3.3 Minimum Operational Interference

The test and evaluation activities will not:

- Compromise security; nor

- Cause undue hardship for air carriers or significant interruptions to flow of personnel or baggage within the airport.

2.4 Completion Criteria

Each of the evaluations can be completed when the criteria in Table 3.4-1, Activity Completion Criteria Checklist have been fulfilled.

Table 2.4-1 Activity Completion Criteria Checklist

DATE COMPLETED	CRITERIA
	1. System acquisition, installation, operation, and maintenance are accurately and completely documented.
	2. Manpower/staffing is in place.
	3. All personnel are fully trained.
	4. Equipment and computer programs are installed, tested, and are fully operational
	5. Procedures are fully documented and verified.
	6. The laboratory or test site is configured properly and incorporates all necessary facilities and support.
	7. All safety, maintainability, and operability considerations have been identified and documented.

3.0 PROGRAM MANAGEMENT

The program sponsor is ACS-1 and overall program management is performed by the Aviation Security Human Factors Program Manager. The primary participants are InVision, LLNL, air carriers, ERAU, a TIP Connection Device Vendor, and support contractors including Galaxy Scientific Corporation (GSC) and DCS, Inc. InVision and ERAU will be in a Cooperative Research Agreement with the FAA. LLNL operates under an interagency agreement with AAR-510. The organizational relationships are shown in Figure 3-1. The shaded boxes identify the focus and contents of this HF TEMP under the direction of Dr. J. L. Fobes.
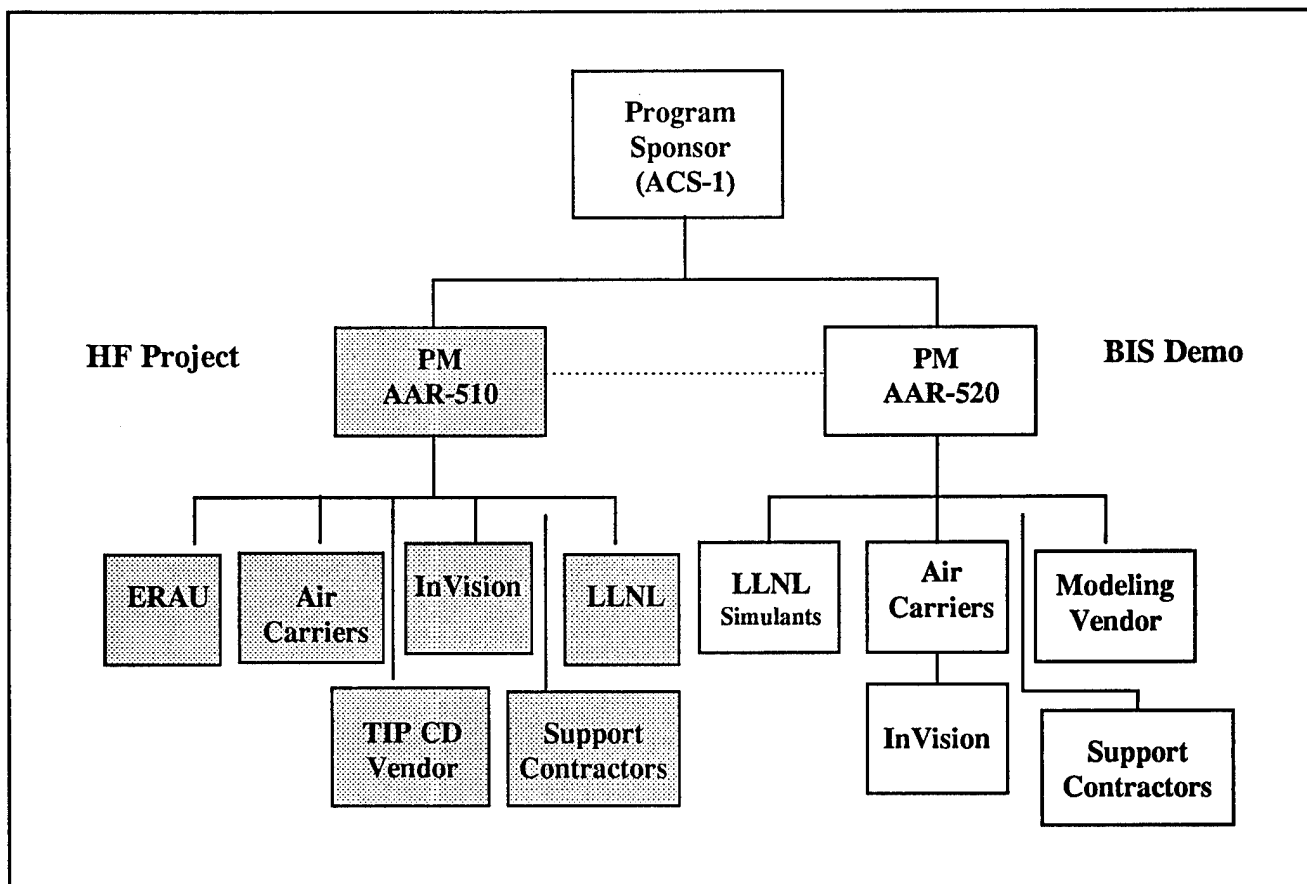

Figure 3-1. Program Management Structure

3.1   Management

This section describes the organizations, roles, and responsibilities for the R&D, DT&E, PD&I and OT&E activities as shown in Table 3.1-1.

Table 3.1.1-1 RDT&E Responsibilities

Organization	Responsibilities
ACS/ACP	• Sponsors Program • Provides requirements and overall direction • Approves TEMP
AAR-510	• Provides overall program management • Provides funding • Directs and witnesses DT&E of CAT SPEARS Off-line Training Module and SPEARS On-line Testing/Training Module (TIP) • Witnesses testing of CAT Interface Improvements and Connection Device • Directs and witnesses OT&E and Airport Demo of SPEARS Off-line Training Module • Directs and witnesses SPEARS On-line Testing/Training Module • Prepares and issues specifications and purchase orders and deploys SPEARS for both CX and CAT system • Coordinates planning and test requirements with BIS Demo Program Manager & Test Director • Conducts OT&E for CDs and CAT Interface Improvements
TBD	• Develops and tests Connection Device
ERAU	• Develops and evaluates screener selection test batteries for both CX and CAT systems • Conducts OT&E Screener Selection Test Batteries for both CX and CAT systems
InVision	• Executes design changes, conducts lab testing, and implements changes • Develops and tests the TIP for the CAT system • Develops and tests the SPEARS Off-line Training Module for the CAT system (with SPIL)
EG&G / SPIL	• Develops and provides SPEARS for CX
LLNL	• Conducts human factors audit, analyzes interface requirements, and recommends improvements for the CAT • Participates in CAT DT&E activities
Air Carriers	• Receives, coordinates, and installs SPEARS in airports • Conducts OT&E and Airport Demo of both SPEARS test items for CX and CAT systems

3.2 Test Resources

3.2.1 Funding

Funding and programming to accomplish key taskings is shown in Table 3.2.1-1 Funding Profiles. The use of the term "Grant" reflects a general contractual category. The type of grant to be used is a Cooperative Agreement.

Table 3.2.1-1 Funding Profiles

#	Programming	FY96	FY97	FY98	Row Total
A	InVision Grant	$	$	$	$
B	ERAU Grant	$	$	$	$
C	LLNL Interagency Agreement	$	$	$	$
D	Connection Device	$	$	$	$
E	AAR-510 Support Contracts	$	$	$	$
F	CX SPEARS CBT	$	$	$	$
G	CX SPEARS TIP	$	$	$	$

	Column Total	$	$	$	$

3.2.2 Personnel

The following is a list of the categories of personnel required to conduct testing activities shown in Table 3.2.2-1 Table 3.2.2-2 shows their primary duties and responsibilities. The term *vendor* is used to denote any of the fundees to include InVision, ERAU, LLNL, EG&G, or others to be determined. The term *AAR-510* is used to include this organization's technical support contractors, GSC and DCS, Inc.

Table 3.2.2-1 Site Personnel Support

Title	DT&E	OT&E
Program Sponsor	ACS-1	ACS-1
Program Manager	AAR-510	AAR-510
Test Engineer(s)	AAR-510/Vendor	AAR-510/Air Carrier
Equipment Operator(s)	AAR-510/TBD	Air Carrier
Baggage Handlers	TBD	Air Carrier
Logistics Coordinator	AAR-510	AAR-510
Response Force Personnel	N/A	Airport Authority
Screeners	TBD	Air Carrier
Technicians	Vendor	Air Carrier/Vendor

NOTE: N/A means "not applicable

Table 3.2.2-2 Responsibilities of Key Personnel

Job Title	Duties/Responsibilities
Program Sponsor	• Sponsors Research Project Directives for security systems research, engineering, and development • Provides security system requirements, tasking, and overall review of AAR-500 efforts • Reviews AAR-500 funding allocations
Av Sec HF Program Manager AAR-510	• Coordinates funding for projects/activities • Provides laboratory facilities for PETS testing • Coordinates with FAA Headquarters, Washington, DC • Has overall approval/authority over all Human Factors including PETS activities • Coordinates with higher level FAA and airport management on airport test activities • Manages schedules and budgets for Human Factors • Reviews/approves human factors PETS activities performed by vendors, grantees, and/or contractors • Prepares and publishes final test plans, reports, and other documentation on Human Factors PETS • Supervises/directs test team members in conduct of laboratory and field site tests • Oversees data collection, reduction, evaluation, and reporting activities of test team members • Ensures adequate manpower resources are available for training/testing
Test Engineer(s)	• Collects training, performance proficiency, and interface data during testing • Prepares and executes test plans/procedures • Ensures test subjects are interviewed or complete questionnaires at completion of testing • Ensures data collection sheets and questionnaires are turned in at completion of testing • Performs test data reduction, evaluation, and reporting tasks • Provides guidance/assistance to screeners during conduct of tests as required • Briefs Program Manager as appropriate on any problems occurring with the testing
Equipment Operator(s)	• Sets up, operates, and makes minor adjustments/repairs to equipment during testing • Prepares and reports on equipment problems/discrepancies during test

Table 3.2.2-2 Responsibilities of Key Personnel (Cont.)

Job Title	Duties/Responsibilities
Baggage Handler(s)	• Transports bags/test articles from storage facility to test area prior to testing and returns items to storage after testing • Loads/removes bags from conveyor belt/x-ray machine at direction of Logistics Coordinator
Logistics Coordinator	• Oversees handling, transporting, storing, and coordination of test baggage • Ensures bags are returned to proper source • Ensures operability and provides test support equipment (e.g., hand-held radios and wands) to test subjects • Ensures availability of and escorts test subjects to test site or training facility • Arranges for test simulants and configures bags with IEDs • Oversees baggage handler activities
Response Force Personnel	• Provides support during PETS testing in accordance with Alarm Resolution procedures • Participates in test briefings/debriefings as required
Certified Screeners	• Serve as subjects during tests • Participate in test briefings/debriefings as required by Test Director • Participate in post test interviews and completes questionnaires as appropriate
Technicians	• Install and checks-out equipment/software at laboratory or test site • Troubleshoot, repair, and replace defective hardware/software as required • Maintain records of activities and briefs Test Engineer(s) on equipment/software repair/replacement status as appropriate

3.2.3 Contracting Management

Within AAR-510, Dr. J. L. Fobes provides technical oversight responsibility and quality assurance for all seven HF contract activities listed in Table 3.2.1-1.

3.2.4 Test Articles and Tools

The PETS will be hosted on and/or evaluated with CX and CAT X-ray inspection systems as identified earlier. Standard threat articles within the TIP database will be created based upon standard test articles being developed for the BIS Demo for comparative analysis.

3.2.5 Support Equipment

Support equipment will be defined in the test plans for each individual test.

3.3   Test Data and Products

Test data deliverables are listed in Table 3.3-1.   The term *TIP Module* is used to mean *Testing/Training Module* throughout this table.   Item #29 is the final research report that synthesizes all findings and addresses the intended end products for RPD #127.   The intended two end products of this research project are:

- Final SPEARS system(s)
- Establishment of criteria for selection, training, proficiency, and assessment for CX and CAT screeners

Table 3.3-1 Data Items

#	Data Items	From	To	Due Date
1	DT&E Plan, Screener Selection Test Battery for CX	ERAU	AAR-510	
2	DT&E Plan, Screener Selection Test Battery for CAT	ERAU	AAR-510	
3	DT&E Plan, Interface Improvements for CAT	LLNL	AAR-510	
4	DT&E Plan, CD for CX-TIP	TBD	AAR-510	
5	DT&E Plan, SPEARS Training Module for CAT	InVision	AAR-510	
6	DT&E Plan, SPEARS TIP Module for CAT	InVision	AAR-510	
7	OT&E Airport Plan, Screener Selection Test Battery for CX	ERAU	AAR-510	
8	OT&E Airport Plan, Screener Selection Test Battery for CAT	ERAU	AAR-510	
9	OT&E Airport Plan, Interface Improvements for CAT	LLNL	AAR-510	
10	OT&E Airport Plan, CD for CX-TIP	TBD	AAR-510	
11	OT&E Airport Plan, SPEARS Training Module for CX	TBD	AAR-510	
12	OT&E Airport Plan, SPEARS Training Module for CAT	TBD	AAR-510	
13	OT&E Airport Plan, SPEARS TIP Module for CX	TBD	AAR-510	
14	OT&E Airport Plan, SPEARS TIP Module for CAT	TBD	AAR-510	
15	DT&E Report, Screener Selection Test Battery for CX	ERAU	AAR-510	
16	DT&E Report, Screener Selection Test Battery for CAT	ERAU	AAR-510	
17	DT&E Report, Interface Improvements for CAT	LLNL	AAR-510	
18	DT&E Report, CD for CX-TIP	TBD	AAR-510	
19	DT&E Report, SPEARS Training Module for CAT	InVision	AAR-510	
20	DT&E Report, SPEARS TIP Module for CAT	InVision	AAR-510	
21	OT&E Airport Report, Screener Selection Test Battery for CX	ERAU	AAR-510	
22	OT&E Airport Report, Screener Selection Test Battery for CAT	ERAU	AAR-510	
23	OT&E Airport Report, Interface Improvements for CAT	LLNL	AAR-510	
24	OT&E Airport Report, CD for CX-TIP	TBD	AAR-510	
25	OT&E Airport Report, SPEARS Training Module for CX	TBD	AAR-510	
26	OT&E Airport Report, SPEARS Training Module for CAT	TBD	AAR-510	
27	OT&E Airport Report, SPEARS TIP Module for CX	TBD	AAR-510	
28	OT&E Airport Report, SPEARS TIP Module for CAT	TBD	AAR-510	
29	RPD #127 Final Research Report	AAR-510	ACS	

3.4 Test Configuration Management

Each of the prototype developers will provide AAR-510 sufficient evidence to indicate that the configuration of their system under test is under control in accordance with each test plan and procedures. Sound configuration practices of documented baselines and modification management will be used.

4.0 TEST PROGRAM DESCRIPTION

4.1 Previous Testing

4.1.1 Improvised Explosive Device Screening Systems (IEDSS) T&E

OT&E at San Francisco International Airport in July/August 1994 investigated whether detection performance can be improved through computer-based training (reference 5.g). This study compared the effectiveness of enhanced and black & white X-ray-based IED detection systems in detecting simulated IEDs in *checked* and *carry-on* baggage. The findings are listed below:

- No significant difference in IED detection performance was exhibited between the enhanced and black & white X-ray-based IEDDSs.

- Screeners were better at detecting IEDs in *carry-on* baggage than in *checked* baggage based on P_d measure.

- Screener sensitivity (d'), but <u>not</u> P_d, was higher in *carry-on* bags than in *checked* bags using the enhanced display subsystem.

- Training resulted in improved performance (P_d and d'). The false alarm rate (P_{fa}) and screener decision criteria (β) did not change.

- No significant correlations were found between screener characteristics (color vision, visual acuity, and experience) and the performance measures of pre-training and post training P_d and d'.

4.1.2 T&E Report for Explosive Detection Device (CTX 5000) Alarm Resolution

Drs. James Connelly and J. L. Fobes directed a DT&E of screener alarm resolution performance using the InVision CTX 5000 at InVision's Foster City laboratory, August 10-11, 1994 (reference 5.h). Twenty-two test bags were configured with five simulated IED configurations from the Modular Bomb Set Kit and randomly inserted among 220 normal passenger bags. Four screeners (two InVision experts and two ITS novice screeners who

previously participated in an IEDSS T&E) each viewed the set of test bags. The findings are listed below:

- All four screeners were effective at identifying threats within passenger baggage by accurately resolving the CTX 5000 system alarms, while the false alarm rate was moderate for all subjects.

- The expert screeners were significantly faster at making decisions resolving alarms than were the novices, resulting in higher baggage throughput rates.

- Screener decision time was significantly shorter on identifying test (threat) bags than for normal (non-threat) passenger bags.

4.2 Test Activities

This section lists each of the T&E activities that encompass DT&E and OT&E, the issues they address as identified in Section 2.3.2, and who is responsible for their conduct. Table 4.2-1 displays six indexed DT&E activities and eight indexed OT&E activities as shaded using the tabular form from Table 1.3-1.

Table 4.2-1 Indexed Test Activities

#	Test Items	Host	Key Activities			
			R&D	DT&E	PD&I	OT&E
1	Screener Selection Test Battery	CX		1		1
2	Screener Selection Test Battery	CAT		2		2
3	CAT Interface Improvements	CAT		3		3
4	Connection Devices	CX		4		4
5	SPEARS Off-line Training Module	CX				5
6	SPEARS Off-line Training Module	CAT		5		6
7	SPEARS On-line Testing/ Training	CX				7
8	SPEARS On-line Testing/ Training	CAT		6		8

4.2.1 Developmental Test & Evaluation

DT&E is an iterative process of design, build, test, analyze, fix, and retest. It is conducted in a controlled, benign environment at the contractor's facilities to demonstrate that the engineering design and development process is complete. DT&E tests for compliance to engineering specification and ensures that the product is ready for government acceptance.

Six unique DT&E activities are planned for this RDT&E program to ensure that the prototype technique or device meets functional requirements and represents a mature design. Table 4.2.1-1 identifies the issues that each DT&E activity will address from Section 2.3.2 as well as the responsible agent for test conduct.

Table 4.2.1-1 DT&E Activities

#	Test Title	Issues Addressed	Issue Titles	Agent
1	DT&E, CX Screener Selection Test Battery	COIC # 1	• Criterion-related validity	ERAU
2	DT&E, CAT Screener Selection Test Battery	COIC # 2	• Criterion-related validity	ERAU
3	DT&E, Interface Improvements for CAT	COIC # 3	• Design Impact	LLNL and InVision
4	DT&E, CD for CX-TIP	COIC # 4	• Feasibility	TBD
5	DT&E, SPEARS Off-line for CAT	CTIC # 8 - 13	• Image Content, Customization, Feedback, Capabilities Summaries, Security, Multimodal	InVision
6	DT&E, SPEARS On-line for CAT	CTIC # 20 - 23	• Feedback, Security, Image Content, Customization	InVision

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4.2.2 Operational Test & Evaluation

All OT&E on this program is also known as the Airport Demonstrations. Operational testing has two phases, *initial,* and *follow-on,* which will assess the operational effectiveness of the test items. The primary difference between initial and follow-on is their scope. Only CX systems will undergo both OT&E phases, and only IOT&E will be performed on CAT systems. Though there are 14 separate tests spanning OT&E, the issues that are addressed are the same and are shown in Table 4.2.2-1 with the organization responsible for the conduct of the test. The last column is split to indicate responsibility for initial, baseline and follow-on testing.

- **Initial OT&E** (IOT&E) is the first test phase which evaluates the test item under realistic or *nearly* realistic operational conditions at operational sites. It includes certified screeners and FAA test baggage and/or passenger baggage in real-time as well as digitized bag images off-line. For this program, both CX and CAT related systems will undergo IOT&E, but only CX system will undergo Baseline Testing. **Baseline Tests** define the baseline or untreated screener performance to support comparative analysis and evaluation. All Baseline Testing will generally occur at the *same* time with an expected test duration of one week or less per airport. The conduct of CAT SPEARS IOT&E will be coincident with the BIS-EDS Demonstration.

- **Follow-on OT&E** (FOT&E) will consist of deployment and testing of the test items at a larger diversity of selected Category X airport sites for CX systems only.

Table 4.2.2-1   OT&E Activities

#	Test Title	Issues Addressed	Issue Titles	Organization Responsible for OT&E		
				IOT&E	Baseline	FOT&E
1	OT&E, CX Screener Selection Test Battery	COIC # 1	• Criterion-related validity	ERAU		FAA
2	OT&E, CAT Screener Selection Test Battery	COIC # 2	• Criterion-related validity	FAA		
3	OT&E, Interface Improvements for CAT	COIC # 3	• Design Impact	TBD		
4	OT&E, CD for CX-TIP	COIC # 4	• Feasibility	FAA		TBD
5	OT&E, CX SPEARS Off-line Training	COIC # 5 COIC # 6 CTIC # 1 - 7 AEIC # 1	• Effectiveness • Usability • Image Content, Customization, Feedback, Capabilities Summaries, Interoperability, Security, Multimodal • Reading Level	FAA	FAA	FAA
6	OT&E, CAT SPEARS Off-line Training	COIC # 7 COIC # 8 COIC # 9 CTIC # 8 - 13	• Equipment Familiarization • Effectiveness • Usability • Image Content, Customization, Feedback, Capabilities Summaries, Security, Multimodal	Air Carriers		
7	OT&E, CX SPEARS On-line Testing/Training	COIC # 10 COIC # 11 COIC # 12 CTIC # 14 - 19	• Insertion • Vigilance • Usability • Image Content, Customization, Feedback, Capabilities Summaries, Interoperability, Security	FAA	FAA	FAA
8	OT&E, CAT SPEARS On-line Testing/Training	COIC # 13 COIC # 14 COIC # 15 CTIC # 20 - 23	• Insertion • Vigilance • Usability • Feedback, Security, Image Content, Customization	Air Carriers		

5.0 REFERENCED DOCUMENTS

a. DOT/FAA/CT-95/31, BIS Test and Evaluation Master Plan, Baggage Inspection Systems - Airport Operational Demonstration Project, dated January 1995.

b. DOT/FAA/CT-94/65, SPEARS: Human Factors Functional Requirements and Procedures.

c. GAO/RCED-93-38, Jan 27, 1994, Aviation Security: Additional Actions Needed to Meet Domestic and International Challenges.

d. GAO/RCED-94-142, May 19, 1994, Aviation Security: Development of New Security Technology Has Not Met Expectations.

e. Executive Order 12686, The President's Commission on Aviation Security and Terrorism.

f. FAA/ACS Mission Need Statement #163 and Research Project Directive #127.

g. DOT/FAA/CT-94/112, Test and Evaluation Report for Improved Explosive Device Detection System (IEDDS) by J.L. Fobes, Ph.D. and Ronald J. Lofaro, Ph.D., December 1994.

h. DOT/FAA/CT-94/85, Test and Evaluation Report for Explosive Detection Device (CTX 5000) Alarm Resolution by J.L. Fobes, Ph.D. and J. Connelly, Ph.D., October 1994.