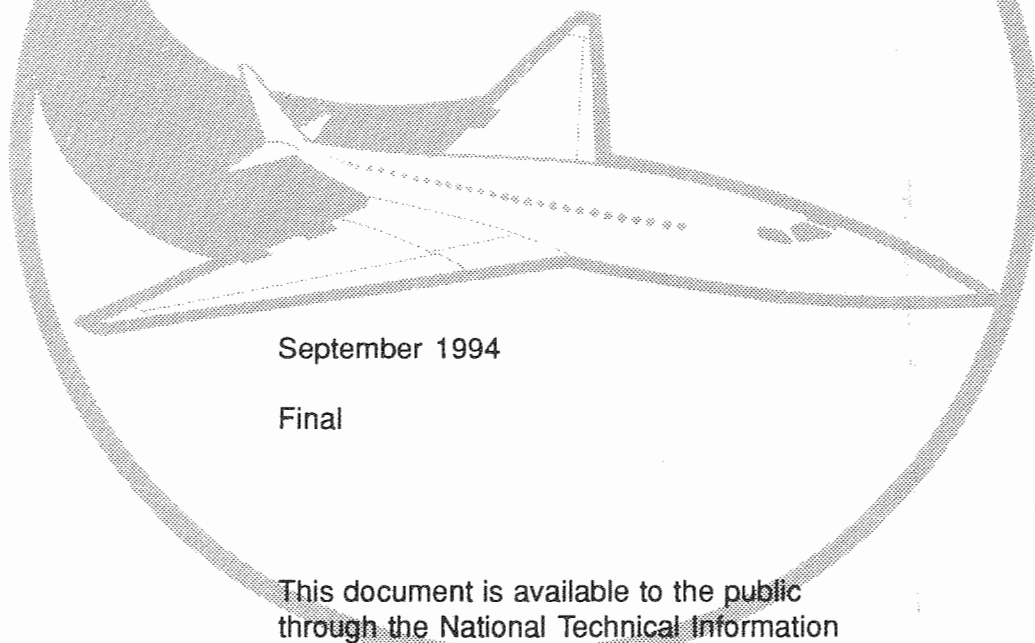


DOT/FAA/CT-94/65

FAA Technical Center
Atlantic City International Airport,
N.J. 08405

Screeners Proficiency Evaluation and Reporting System (SPEARS): Human Factors Functional Requirements and Procedures



September 1994

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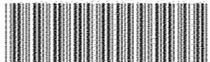


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DOT/FAA Screener proficiency
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16. Abstract The U.S. Congress has mandated that the Federal Aviation Administration (FAA) enhance airport security by improving the performance of the checkpoint screening process. The Aviation Security Research and Development Service at the FAA's Technical Center initiated a Human Factors (HF) Program in response to that mandate. The HF Program Manager, supported by the Department of Energy's Lawrence Livermore National Laboratory, developed a set of functional requirements for a Screener Proficiency Evaluation and Reporting System (SPEARS). The purpose of SPEARS is to enhance selection, initial training, recurrent training, and performance monitoring. Functional requirements specify the operating characteristics of this system. In developing the functional requirements, several specific goals were accomplished. This document presents the functional requirements for SPEARS.					
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LIST OF ABBREVIATIONS AND SYMBOLS

A/C	Air Carrier
ACSSP	Air Carrier Standard Security Program
ASHFP	Aviation Security Human Factors Program
ASIS	Aviation Security Information Seminars
ASRS	Aviation Safety Reporting System
ATA	Air Transport Association
CAI	Computer-Aided Instruction
CASFO	Civil Aviation Security Field Office
CASIS	Civil Aviation Security Information System
CBD	Commerce Business Daily
CFR	Combined Federal Regulation
CSS	Chief Security Screener
CTI	Combined Test Image
DOE	Department of Energy
DOT	Department of Transportation
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FSM	Federal Security Manager
HF	Human Factors
ICAO	International Civil Aeronautical Organization
IRS	Internal Revenue Service
ISD	Instructional Systems Design
OJT	On the Job Training
OTP	Operational Test Plan
SME	Subject-Matter Expert
SOP	Standard Operating Procedure
SPEARS	Screener Proficiency Evaluation and Reporting System
TI	Threat Image
TnT	Training and Testing
TSI	Transportation Safety Institute
UC-LLNL	University of California Lawrence Livermore National Laboratory

EXECUTIVE SUMMARY

The U.S. Congress has mandated that the Federal Aviation Administration (FAA) enhance airport security by improving the performance of the checkpoint screening process. Congress specifically recommended that Human Factors (HF) engineering technologies be brought to bear to improve the state of the airport security system.

The Aviation Security Research and Development Service (ACA) at the FAA Technical Center initiated a HF Program in response to that mandate. The HF Program manager, supported by the Department of Energy's Lawrence Livermore National Laboratory, has developed a set of functional requirements for a Screener Proficiency Evaluation and Reporting System (SPEARS).

The purpose of SPEARS is to enhance selection, initial training, recurrent training, and performance monitoring. Functional requirements specify the operating characteristics of this system. In developing the functional requirements, several specific goals were accomplished.

A function flow analysis of the checkpoint screening process was conducted. This analysis provided a framework for determining the x-ray screening task inputs and outputs from a systems analytic perspective. Identifications of these items are essential to determine the functional requirements.

A task analysis of the x-ray screening process was conducted. This systems analytic procedure ensures a thorough analysis of all the steps in the screening process. Furthermore, it can be used to determine workload choke points, training needs, and personnel requirements.

A thorough literature review of aviation security screening was conducted. Sources reviewed include (a) internal FAA documents, training materials, and operational test data; (b) academic references; (c) newspaper and magazine articles; and (d) Congressional hearings. Information in these sources was incorporated into a specification of high-level functional requirements. High-level requirements do not specify operating characteristics down to the motor-response level (i.e., picks up bag in left hand). Furthermore, it was recommended that the Department of Energy Human Factors Standards be used as source documents for specific guidelines. These standards were taken from military standards but adapted for civilian applications.

A series of structured interviews were conducted with over 40 aviation security personnel from the FAA, air carriers, and vendors. The interviews used a set of standard but open-ended questions and were reviewed and edited for redundancy. They are presented in the appendices of this document. Information from these interviews was incorporated into the functional requirements.

The last section of this document presents the functional requirements for SPEARS.

The University of Chicago Press is pleased to announce the publication of the first volume of the series, *The History of the United States*, by the distinguished historian, Dr. [Name]. This volume, which covers the period from 1776 to 1865, is a masterpiece of scholarship and writing. It is available in paperback for \$12.95 and in hardcover for \$24.95.

The second volume, *The Reconstruction Era, 1865-1877*, is also available in paperback for \$12.95 and in hardcover for \$24.95. This volume covers the period from the end of the Civil War to the beginning of the Reconstruction era. It is a masterpiece of scholarship and writing, and is available in paperback for \$12.95 and in hardcover for \$24.95.

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The seventh volume, *The Modern Period, 1977-1999*, is also available in paperback for \$12.95 and in hardcover for \$24.95. This volume covers the period from the end of the Vietnam War to the end of the century. It is a masterpiece of scholarship and writing, and is available in paperback for \$12.95 and in hardcover for \$24.95.

The eighth volume, *The Future of the United States*, is also available in paperback for \$12.95 and in hardcover for \$24.95. This volume covers the period from the end of the century to the future. It is a masterpiece of scholarship and writing, and is available in paperback for \$12.95 and in hardcover for \$24.95.

1. BACKGROUND AND PURPOSE.

1.1 BACKGROUND.

Passenger and carryon baggage screening is the most familiar and visible element of the U.S. Civil Aviation Security Program. Since 1973, airline passengers have been required to pass through metal detectors that screen for weapons and deadly or dangerous devices. Carryon baggage is x-ray screened. Consequently, any item that is carried on an aircraft must pass through some form of screening equipment.

Airline personnel often supplement screening by physically inspecting luggage and using hand-held wands to screen individuals. These methods have been chosen by the airlines, with Federal Aviation Administration (FAA) approval, to comply with Federal Aviation Regulations (FARs) Parts 108 (domestic carriers) and 129 (foreign-flag carriers). The requirement that air carriers provide passenger screening was enacted into law in Section 315 of the Federal Aviation Act, 49 U.S.C. 1356.

Screening teams typically consist of two to four screeners. One screener watches the x-ray monitor, while another watches the passengers and the metal detector. If present, other screeners assist with these functions. Additionally, a supervisor must be present at each security checkpoint. Checkpoints may consist of one or more screening stations.

These procedures were established by the FAA and air carriers in response to the substantial number of aircraft hijackings in the late 1960s. There has been a significant drop in hijacking attempts as a result of the passenger screening program.

During the 5-year period prior to the implementation of this program, an average of 27 hijackings occurred per year. From the inception of the program in January of 1973 through June of 1986, this average was reduced to 7.4 hijackings per year. In all but the 2 years in which the Cuban "Mariel" hijackings occurred (1980 and 1983, when the total numbers of hijackings were 21 and 18, respectively) the annual number has been well below the 1968 to 1973 levels.

The scope of the screening program is extensive—10,000 screeners are now employed at more than 1,200 checkpoints in 400 U.S. airports where screening is required. Over 1 billion passengers are screened yearly. The yield has been impressive—since 1973, over 37,000 firearms have been detected, and over 15,000 related arrests have been made. Since 1972, only one successful U.S. hijacking has occurred as a result of the use of a gun that passed through a screening checkpoint. The FAA has been able to identify 117 potential hijackings and related crimes that may have been prevented as a result of the screening program.

Thus, the present screening system has been effective in accomplishing its original purpose—preventing hijackings and other dangerous incidents aboard aircraft. It has worked not only because screeners can detect weapons, but also because the screening system itself is a deterrent. Potential hijackers perceive that it is difficult to rely on the deficiencies of the system, and that the chances of getting past a screening system undetected are small.

1.2 CURRENT INITIATIVE.

Public Law 101-604, The Aviation Security Improvement Act of 1990, provided direction to improve human performance within the aviation security system. One initiative that was established in response to the law, was the Aviation Security Human Factors Program (ASHFP) within the Aviation Security Research and Development Service (ACA) at the FAA Technical Center.

Since June of 1991, the program has expanded to encompass all significant human roles, responsibilities, activities, and impacts within aviation security. The program manages research that is designed to improve human performance in the aviation security system and advises FAA Headquarters on Human Factors (HF) in aviation security operations. It also fosters the development of technology by government, industry, and academia that benefits aviation security operations through enhanced HF. Additionally, the program performs proof-of-concept evaluations, and delivers information and recommendations that serve as references for FAA formulation of operational policies, guidelines, procedures, standards, and regulations.

Six broad areas pertaining to the aviation security system are being addressed at present: passenger and baggage screener performance, threat counteraction by security personnel and air crews, real-time collaboration with other government security offices, performance of security vendors, HF in airport design, and the reactions of the flying public and other airport customers.

In the FAA security program, the term HF is broadly defined to include all security system events, activities, and phenomena that significantly influence human behavior and performance. HF thus includes selection, training, performance certification and assessment, workload, motivation management, system design and procedures affecting human-machine interactions, perception, errors, performance variance, and health impacts.

1.3 SCREENER PROFICIENCY EVALUATION AND REPORTING SYSTEM (SPEARS).

The U.S. Congress has tasked the FAA to improve aviation security through careful consideration of HF techniques. A Department of Transportation (DOT) task force on aviation security concluded that human performance is "the critical element in the screening process."

The realization of the criticality of human performance in the security area was based on the assumption that engineering evaluations could readily determine the physical capabilities of screening equipment. As a result, the limiting factor in determining the effectiveness of the screening process was thought to be the ability of screeners to correctly recognize and identify threat objects embedded within x-ray images.

The point addressed here concerns the reasons why an object might pass undetected during checkpoint screening. If the physical characteristics of a threat object are within the sensitivity range of the screening equipment, then there are three possible causes for the failed detection: (a) lack of screener vigilance due to distractions or insufficient motivation, (b) lack of screener perceptual sensitivity—potentially due to inadequate training, or (c) that the complexity of the object's image is beyond the range of the perceptual capabilities of the screeners.

To improve screener performance, the FAA Technical Center initiated the SPEARS Program. The purpose of this program is to identify technology that will improve selection, initial training, recurrent training, and performance monitoring of checkpoint screeners.

Compared to traditional training approaches, the recently developed computer-assisted x-ray simulation training for screeners appears to accelerate the rate at which screening skills are acquired. Additionally, these training approaches appear to increase the achievable performance level for detection and identification of diverse threats that may be concealed in baggage.

For example, the capability to insert fictional Threat Images (TIs) into x-ray images of baggage promises to provide more flexible, realistic, and efficient assessments of screener performance than is currently attainable using hand-inserted test materials.

In general, computer-based technologies offer opportunities for more effective management, monitoring, and quality assurance in screening operations used by security companies, air carriers, and the FAA.

1.4 SUMMARY.

The overall purpose of SPEARS is to enhance screener selection, initial training, recurrent training, and performance monitoring, while improving checkpoint security administration. The purpose of this publication is to define the human factor functional requirements and procedures for SPEARS.

Just as *engineering* is defined as the science of making matter and energy more useful to humanity, *human engineering* can be defined as the science of making machines more useful to humanity (or to an individual). Functional requirements are defined as the set of characteristics that identify the manner in which a device or system can be used.

The functional requirements of SPEARS technology identified in this document will be used to assess the technology designed to improve checkpoint screener performance.

2. INTRODUCTION TO THE ANALYSIS AND DESIGN PROCESS.

2.1 OVERVIEW.

Through an Interagency Agreement between the Department of Energy (DOE) and the DOT, the FAA requested that the University of California Lawrence Livermore National Laboratory (UC-LLNL) prepare a functional requirements document for SPEARS. As part of that effort, UC-LLNL researchers accomplished the following:

- a. Conducted systematic interviews with a representative sample of personnel who represent the FAA Assistant Administrator for Civil Aviation Security.
- b. Conducted systematic interviews with a representative sample of personnel who represent the airlines and security companies that operate screening checkpoints.
- c. Analyzed, combined, and refined requirements obtained, taking into consideration appropriate engineering and HF practices and standards.

d. Referred to available documentation, demonstrations provided by industry, as well as industry interviews. Examined the extent to which identified requirements fit exemplar SPEARS equipment and systems that are already available.

e. Identified and resolved unanswered questions, contradictory requirements, and impractical (i.e., excessive or unnecessary cost items) requirements.

f. Prepared a system guidelines document that specifies functional requirements and procedures. The document also provides detailed definitions, descriptions, explanations, and checklists of required system functions to guide SPEARS developers and airline security users.

2.2 SPECIFICATION OF SYSTEM PERFORMANCE REQUIREMENTS.

2.2.1 Guidance Documents.

Five primary sources were used to identify the system performance requirements that were to be evaluated by UC-LLNL researchers:

a. The Interagency Agreement Number DTFA03-92-Z-00011 between the DOT and the DOE, specifying the deliverables that UC-LLNL was to provide to the FAA Technical Center.

b. The SPEARS Sources Sought Announcement Number DTFA03-92-20003, published in the *Commerce Business Daily* (CBD) on October 23, 1991. This document identifies some system characteristics.

c. The Civil Aviation Security Reference Material pamphlet Number 890925DMA609A, published by the DOT's Transportation Safety Institute (TSI).

d. The "Report of the Safety Review Task Force on Domestic Aviation Security Regarding Passenger and Carryon Baggage Screening," dated July 1987.

e. The Air Carrier Standard Security Program (ACSSP), dated July 23, 1993.

2.2.2 Systems Analysis and the Design Process.

The systems analysis and design process techniques used during the development of this document are shown in figure 1.

2.3 SUMMARY.

The process of identifying the initial functional requirements and the performance specifications have been described in the previous section.

A functional flow and task analysis of the checkpoint screening process was conducted using standard HF techniques. The findings of these analyses will be discussed in the following sections.

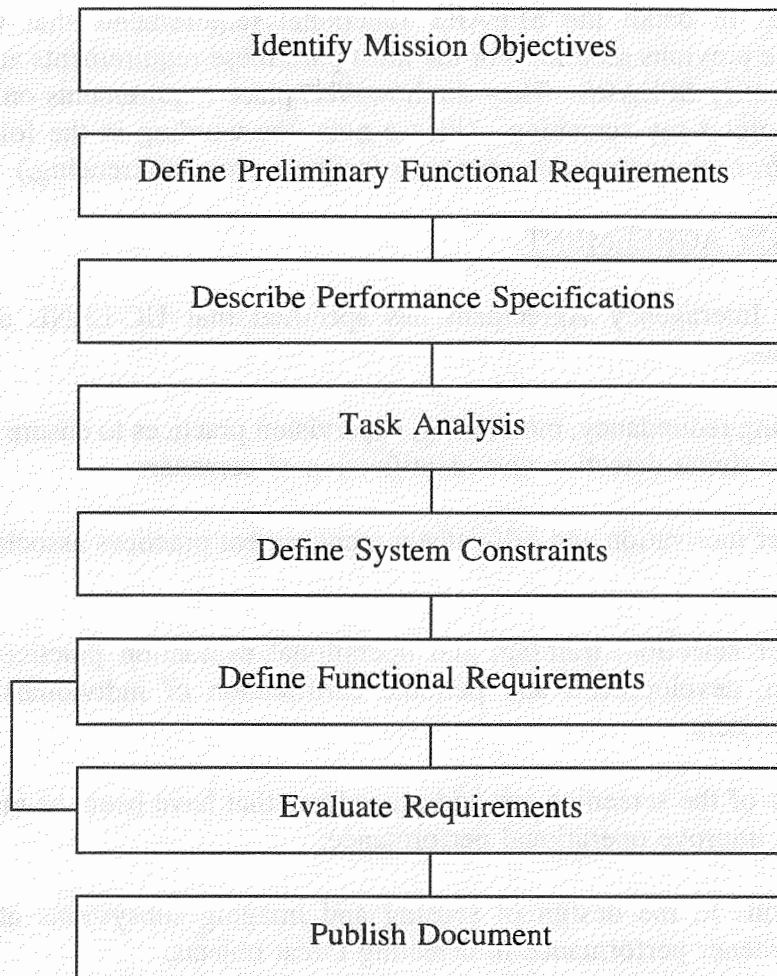


FIGURE 1. A GRAPHIC REPRESENTATION OF THE SYSTEMS ANALYSIS STEPS USED DURING THE DEVELOPMENT OF THIS DOCUMENT

System constraints were identified during interviews with personnel working in all job categories of the aviation security system, including the FAA, air carriers, security service contractors, and security equipment manufacturers.

3. ANALYSIS OF EXISTING SYSTEM REQUIREMENTS.

3.1 DEFINITION OF SYSTEM OBJECTIVES.

The primary objective of checkpoint screening is to prevent passengers who are carrying explosives, weapons, incendiaries, and other hazardous substances from gaining access to aircraft.

The purpose of SPEARS includes selection, initial training, recurrent training, and performance monitoring of checkpoint screeners. SPEARS technology is limited to screener operation of x-ray equipment.

This section discusses in detail the SPEARS functional requirements that were identified in the documents listed in the previous section. For the most part, these requirements are general in nature and do not specifically identify SPEARS. They do, however, place requirements on any technology that is developed for checkpoint x-ray screening. (Please note, the wording in the following paragraphs has been taken verbatim from the actual documents to facilitate cross-referencing.)

3.2 INTERAGENCY AGREEMENT.

The DOT and DOE Interagency Agreement has specified that UC-LLNL consider the following functional requirements:

- a. Screening redundancy, monitoring, supervision practices to ensure continuous operational alertness, and effective threat detection and identification of screeners.
- b. Screener motivation and self-esteem management practices associated with performance-based incentives.
- c. Screener selection, training, and operational evaluation practices that can be used to improve identification, development, and periodic certification of individuals so that they become consistently better screeners.
- d. Aspects of the screening job and procedures that have been, or may be, modified due to SPEARS functions to improve operational performance.
- e. Variations in the design of sensing and imaging subsystems at checkpoint sites that significantly affect screener performance in detecting threat objects.
- f. How screening performance is affected by system availability, reliability, and maintainability.
- g. How screening effectiveness in crowd-flow management can be influenced by the design of the airport environment in the vicinity of the passenger and baggage screening area.
- h. How screening effectiveness can be undermined if screening is not perceived by the flying public and airport customers as necessary, effective, and professional.

During the course of the data collection process, each of these requirements were considered and will be discussed in later sections.

3.3 CBD SOURCES SOUGHT ANNOUNCEMENT.

The FAA Technical Center published a Sources Sought request for SPEARS in the CBD on October 23, 1991. The following characteristics were identified at that time and the functional requirements were broadly divided into two categories, a training component and a real-time operational component.

Subject to future proof-of-concept findings and FAA policy decision, the SPEARS training component shall have the following characteristics:

- a. Capable of automatically training and operationally testing individual airport security screeners to detect weapons, explosives, and other dangerous devices.
- b. Capable of storing and managing multiple training lessons that provide beginning or advanced students with immediate constructive feedback based on training performance, and gradually allow students to progress toward increasingly difficult tasks in detecting and identifying diverse x-ray TIs.
- c. Trainee performance in relation to identified detection tasks shall be automatically measurable, recordable in a secure database, and accessible for analysis at each screening site and from remote locations to evaluate individual and group training histories and proficiencies.
- d. Training consoles shall be simultaneously operable at multiple airport screening sites and be used for proficiency-based screener selection, training, recurrent training, and operational testing.
- e. Training and operational test materials shall be readily and efficiently modifiable to include current TIs, reference information, and procedure guidelines disseminated by the FAA.

Subject to future proof-of-concept findings and FAA policy decision, the SPEARS real-time testing component shall have the following characteristics:

- a. The capability to allow for fictional TIs to be automatically and unpredictably (for screeners) inserted into baggage x-ray images at screening checkpoints.
- b. The capability for equipment to provide screeners with immediate feedback for decisions associated with such images, identify screener false alarms, and not disrupt the prevailing flow rate of passengers and bags through the checkpoint.
- c. At least 300 different TIs shall be conveniently available for insertion, with controllable image position and orientation in each bag.
- d. Images shall be selected for automatic appearance, either individually or in series, based at least on time of day, checkpoint activity, or screener identity.
- e. Screener proficiency for identified fictional images shall be automatically measurable, recordable in a secure database, and analyzable at screening sites and from remote locations to evaluate individual and group proficiencies.

Each of these requirements were considered by UC-LLNL staff and will be discussed further in later sections.

3.4 CIVIL AVIATION SECURITY REFERENCE MATERIAL OF THE DOT.

In TSI's Civil Aviation Security Reference Material No. 890925DMA609A, several functional requirements for checkpoints were identified that have implications for SPEARS technology. Regulatory requirements include the following:

- a. Air carriers are to maintain a complete copy or the pertinent portions of their approved security program or appropriate implementing instructions at each airport where security screening is being conducted and restrict their availability to those persons with an operational need-to-know.
- b. Air carriers are to establish a program for initial and recurrent training of system operators that includes training in radiation safety, the efficient use of x-ray systems, and the identification of weapons and other dangerous articles, including their components.
- c. A record of the radiation survey of each individual shall be maintained.
- d. Security directives shall be implemented within 72 hours after delivery.
- e. Recurrent training must take place every 12 months.
- f. FAA representatives will conduct unannounced tests of the x-ray screening process.
- g. Screeners should be made aware of other items which the air carrier considers dangerous.
- h. Screeners shall be trained in advanced screening techniques for use in specially designated high-threat areas.

Several of the items listed in the TSI training material do not directly relate to checkpoint screener performance. However, during the interviews with security personnel, these items were discussed and were recommended for inclusion in the list of functional requirements.

3.5 FUNCTION FLOW ANALYSIS OF THE CHECKPOINT SCREENING PROCESS.

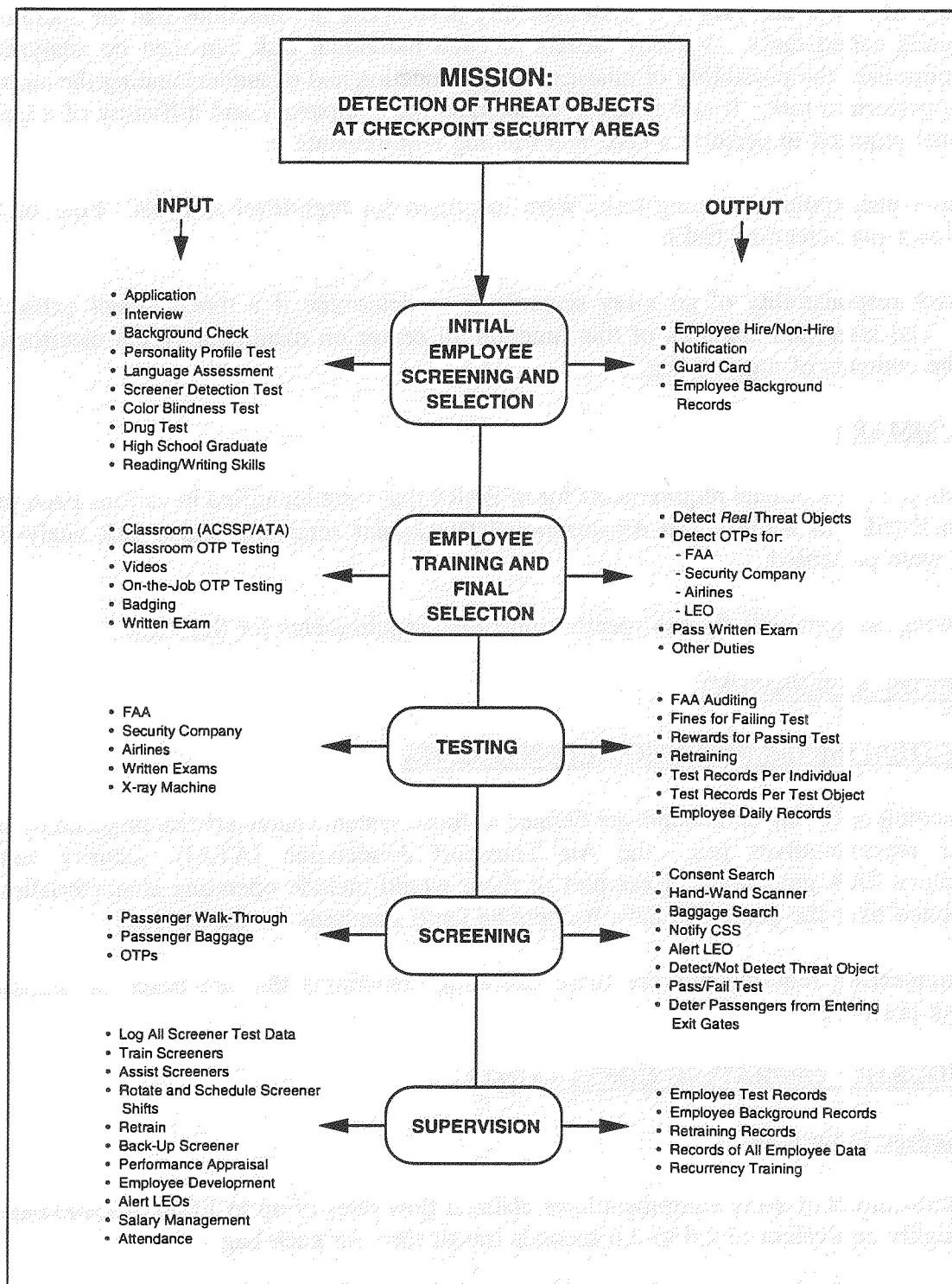
A function flow analysis describes the inputs and outputs of a process and provides the basis for any detailed analysis of a system and its functions.

Figure 2 shows a diagram of the flow of operations in a representative airport security service. As can be seen, the tasks included in the figure extend beyond the scope of those required for x-ray screening only. These additional operations are presented so that the x-ray screening task can be evaluated in context with the entire checkpoint screening process.

Attention should be directed to those tasks that require record keeping concerning training and performance. While these are not tasks that screeners normally perform, they are tasks that SPEARS technology should perform.

3.6 TASK ANALYSIS.

A high-level task analysis of the checkpoint screener's job is presented in Appendix A. This is considered a high-level analysis because tasks were not reduced to the individual motions that comprise the operation. Other tasks that screeners perform in addition to x-ray screening are also described.



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FIGURE 2. SHOWS AN ANALYSIS OF THE ORGANIZATIONAL CHECKPOINT OF THE SCREENING PROCESS
(This analysis was conducted to better understand the inputs and the outputs of the screening process in general, and the x-ray screening task in particular.)

The purpose of a task analysis is to systematically decompose the functions that an operator performs into sub-units called tasks. Various aspects of each individual task can then be analyzed. A task analysis minimizes the possibility of missing a major function and misunderstanding the amount of time it takes to perform a task. It also helps to understand the complexity and difficulty of a task, the type of personnel required to perform a task, and training requirements.

Eleven basic checkpoint screening tasks were identified for high-level analysis. Four of these were classified as x-ray screening tasks.

The primary responsibility of an x-ray screener is to determine if a threat object exists in carryon baggage. The identified subtasks of this function all center on manipulating the electronic image to identify the contents of a given bag.

3.7 SUMMARY.

In this section, the functional requirements for SPEARS that were identified in various FAA publications have been listed. In addition, an organizational checkpoint screening and a task analysis of X-ray screening were presented.

The following sections will discuss specific functional requirements for SPEARS.

4. NEEDS ASSESSMENT.

4.1 SYSTEM IMPLEMENTATION CONSTRAINTS.

X-ray screening operating constraints are defined as those system characteristics imposed by air carriers, air carrier representatives (e.g., the Air Transport Association [ATA]), security vendors, and non-regulatory FAA guidelines. Examples of these would include operating characteristics that have been instituted over the years and have become de facto standards for the industry.

Human engineering requirements are those operating constraints that are based on standard human engineering practices.

4.2 INDUSTRY OPERATING CONSTRAINTS.

4.2.1 Baggage Flow Rate.

Some manufacturers of x-ray equipment have claimed flow rates of up to 1,000 to 1,400 bags per hour. This is roughly equivalent to 2.6 to 3.6 seconds transit time for each bag.

General operating practices have been established that allow screeners to view, interpret, and make decisions about the contents of a bag in 5 seconds, which equates to approximately 720 bags per hour.

Based on interviews with U.S. security vendors and air carrier personnel, there is a subjective consensus that 5 seconds per bag is a reasonable compromise between baggage flow rate and handler rejection rate. This is also the standard viewing time for the British Department of Trade.

4.3 SCREEN CHARACTERISTICS.

Engineering standards relate equipment capabilities to system goals, while human performance standards relate operator capabilities to system goals. The importance of this distinction lies in the fact that a system will be limited by either equipment or operator capabilities. Designers should understand which is the limiting feature of a system—equipment or operator—then design to that requirement.

The only existing human performance standards that are related to system goals for x-ray screens are based on the ability of a screener to perceive the basic FAA test objects. There is a clear consensus within the aviation security community that while the test objects are supposed to represent threat objects, they are merely poor caricatures.

Screeners should not be able to determine whether a given threat object has been electronically inserted into a bag or is actually present. Any compromise in this requirement would completely degrade SPEARS objectives.

The functional requirements for x-ray screens should be stated in terms of both engineering and human performance standards. While human performance standards appear to be the most important for the effectiveness of the system, engineering standards provide certain cost-effective procedures for randomly evaluating the integrity of a checkpoint.

Based on interviews within the aviation security industry, human performance — that is, x-ray screener performance—appears to be the limiting factor in system performance.

4.3.1 Required Information.

The primary purpose of SPEARS is to enhance (a) screener selection, (b) initial training, (c) recurrent training, and (d) performance monitoring.

Secondary purposes include (a) identification and certification of the users (screeners and supervisors); (b) distribution of security information, directives, procedures, and policies; and (c) archiving training and performance data and analyses.

4.3.2 Initial and Recurrent Training.

The Training Syllabus. Current screener training syllabi are inadequate from an Instructional Systems Design (ISD) perspective.

Initial training is divided into two phases—classroom and on-the-job training. The ATA has established a very specific course of instruction for x-ray screening.

This plan does not address either the on-the-job phases of training or recurrent training. While both are important, perhaps the most crucial is the on-the-job phase. It is during this portion of the training that basic training concerning FAA Operational Test Plans (OTPs) takes place, as well as training concerning realistic threats and hazards.

For example, while screeners are required to search for stun guns, most will not see one until training is completed. This same problem applies to general hazardous materials such as toy rocket propellant.

Training methodologies. Different vendors have advocated the use of Computer-Aided Instruction (CAI). However, a clear methodological distinction exists between CAI and ISD. CAI simply means that a computer is used for instruction. By itself, it does not ensure that systems analytic techniques are used to design training courses.

On the other hand, ISD is a systematic approach to training that consists of, in its most rudimentary form, (a) establishing objectives using a quantitative framework, (b) training and testing (TnT), and (c) evaluating training effectiveness for potential syllabus improvement. ISD can be applied to any instructional technology.

Quantitative performance objectives. Current screener performance objectives are not quantitatively operationalized. It is assumed that such a criterion will ensure that screeners can then prevent passengers from carrying aboard aircraft explosives, incendiaries, weapons, and other hazardous materials. However, just because screeners can see a particular gauge wire does not mean that this image is useful in detecting, for example, toy rocket propellant, a non-metallic gun, or explosives.

The following is an example of a quantitative measure: "A screener should be able to detect a Colt .45 automatic pistol with a top view aspect angle of 10 degrees, in a viewing time of less than 5 seconds, over 80 percent of the time when the pistol is in a cluttered bag."

Clearly these types of screen standards are difficult to write, costly to test, and may not be comprehensive. All types of weapons and situations will not be covered. This is better than the current requirement, which merely states what gauge wire must be detected.

These screen standards will ensure that the x-ray imaging is useful in preventing general classes of threat objects and, just as important, will provide quantitative information on performance concerning specific threats.

4.3.3 Summary of Training Requirements.

SPEARS initial and recurrent training courses should be constructed using ISD techniques, and relying on the use of real TIs from objects belonging to all classes of objects classified as threats by the FAA, air carriers, and security vendors. Without a large library of specific images, quantitative performance-based training is impossible.

Further, SPEARS training courses should have the capability to be easily modified if course effectiveness is becoming degraded. The measurement of course effectiveness will be presented in the next section.

SPEARS should have the capability to image a wide range of all threat classes—including various types of weapons, incendiaries, explosives, and deadly/dangerous items and their components. This should be accomplished using the same types of screens used at the airports in which the screeners are working.

4.3.4 System Training Effectiveness and Efficiency.

Measures of system effectiveness, or efficiency (cost), describe the relationship between operator on-the-job performance to the amount of time or money it takes to train the operators to a specified skill level.

The measures of performance used in these calculations are the cornerstone of valid estimates of training effectiveness and efficiency, as well as ISD evaluations. For example, if on-the-job performance is measured using threat caricatures, the validity of the training and system effectiveness cannot be assessed with any success. This means that images of real threat objects should be electronically placed into real bags, using real-time imaging techniques.

Training effectiveness simply correlates performance scores with training scores. SPEARS should have the capability of using simple correlation statistics to provide estimates of training effectiveness. SPEARS should also provide a ordinal scale so that supervisors can easily interpret the ratio scale of the correlation statistic. For example,

$$T_e = r_{\text{training, job}}$$

where

T_e = training effectiveness, and

$r_{\text{training, job}}$ = correlation coefficient of training scores and on-the-job performance scores.

The nominal scale for training effectiveness will simply state and explain the numerical relationship of the correlation coefficient to the quality of the training.

Training efficiency simply relates training costs (which include materials as well as trainer and trainee salaries) to training effectiveness in a multiplicative manner. For example,

$$T_E = T_e \cdot T_c$$

where

T_E = training efficiency,

T_e = training effectiveness, and

T_c = training costs.

4.3.5 Performance Monitoring.

SPEARS should have the capability to record hits, misses, type II decisions (false positives), and correct rejections throughout a screener's employment career.

Daily testing should take place using images graded by image complexity. Standard statistical "staircase" presentation methodologies should be used. These techniques permit the training staff to gradually improve the performance of individual screeners by slowly exposing them to increasingly complex images. Such techniques, also called "errorless learning" procedures, are standard to CAI.

Records for individual screeners, checkpoints, airports, and security vendors should be continually updated and analyzed for various trends.

SPEARS should permit security vendors to establish various levels of competency which are published for all personnel to see. These training records will be used as inputs to the course evaluation process.

Additionally, summarized records should be available to the FAA, air carriers, and security vendors via standard telecommunications technologies, using moderately secure Data Encryption Standard techniques.

4.3.6 Access Certification.

SPEARS should have the capability to determine the employment status of each user. Graded levels of access to various software portions of SPEARS should be available. For example, screeners do not need to have access to general training records.

4.3.7 Procedures and Policy Updates.

Notification of time-critical security updates should take place during initial sign-on to SPEARS and become part of a screener's daily schedule.

Time-critical updates should be loaded into local SPEARS equipment via telecommunication technologies from the authority originating the document.

Consideration should be given to the following authorities: the FAA, the International Civil Aeronautical Organization (ICAO), airport operators, air carriers, and security vendors. FAA authorities include Federal Security Managers (FSMs); Civil Aviation Security Field Offices (CASFOs); Civil Aviation Security Information System (CASIS), if appropriately modified; and FAA Headquarters and Technical Center security personnel.

4.3.8 Passenger Profiling.

SPEARS will have the capability to notify checkpoint screeners of special passenger profiling notices and procedures.

Time-critical updates concerning passenger profiling should be loaded into local SPEARS equipment via telecommunication technologies from the authority originating the document. See the previous section for additional information.

4.3.9 FAA Testing Requirements.

Currently, CASFO agents are required to conduct unobtrusive screener testing. If this requirement is going to be maintained, special consideration should be given to the location of the SPEARS equipment with respect to the x-ray machines.

4.4 HUMAN FACTORS ENGINEERING REQUIREMENTS.

Human Engineering Standards. In general, the spirit of the DOE's *Human Factors Engineering Design Criteria* Volume I, *General Criteria*, and Volume II, *User-Computer Interface*, should be considered during design. These standards apply to a wide range of situations and have been modified from rigorous military standards for reasonable implementation in a civilian setting. The DOE human engineering standards will be made readily available to any interested security vendor for consideration.

Another excellent source of design guidelines that have been developed for human-machine interfaces located in environments similar to SPEARS is the *Computer-Generated Display System Guidelines*, Volume 1, *Display Design*, EPRI NP-3701, published by the Electric Power Research Institute. This document provides specific recommendations on factors such as environmental conditions, viewing distances, screen contrast ratios, and specular glare.

Again, it is not meant to be implied that these standards carry the weight of regulations for FAA programs. Their recommended use is to provide a common framework for implementing the use of HF engineering standards in the design of SPEARS.

Measurement. Performance should be defined in quantitative terminology. Instead of a performance goal stating that "a screener should be able to detect weapons," the goal should be stated in terms of what specific weapon images screeners should be exposed to, including weapon components and the types of orientation. Additionally, the frequency of exposure to certain classes of images will be given for each threat category, specific object type, and orientation.

Numeric performance standards should be established for each category listed above. It is only in this way that ISD techniques can be implemented.

4.4.1 System Efficiency.

The Transport Development Center of Canada, the Canadian equivalent of the DOT, has recommended the following measure of performance for X-ray screening systems:

$$E = \frac{\log (FAR)}{\log (PD)}$$

where

E = efficiency,

$\log (FAR)$ = Log of the False Alarm Rate, and

$\log (PD)$ = Log of the Probability of Detection.

The rationale for using the log transform of these values is that it is assumed, as in other detection-type measures, that there are ceiling and basement effects that tend to make the data look like an exponential function. The transformation then tends to produce an efficiency that is constant at least over some limited range.

The false alarm rate was defined by the Canadians in the same way we would define a screener request to have a bag physically searched.

The probability of detection figure could be developed for each category of weapon or for the whole system. Probability of detection is computed by dividing the number of weapons detected by the total number of weapons that pass through a checkpoint. Of course, these data would be developed from SPEARS tests because there would be no information on the total number of actual weapons that are passed through the checkpoint.

In their work, the Canadians set threshold values of 90 percent for the minimum level of detection, and 10 percent for the false alarm rate. These values correspond to an efficiency of 21.9. Efficiency is useful for comparing the probability of detection among different classes and levels of threats.

4.4.2 Screen Characteristics.

The most important requirement is that the SPEARS screen be as similar as possible to the screens used at the airport in which the screeners are working. Given that there are a variety of x-ray machines in service throughout the country, this may necessitate tailoring systems to each airport.

If this is not possible, it should be demonstrated through the use of field tests that the screens proposed by a given SPEARS vendor will be effective in reducing training time.

As indicated in previous sections, current standards for x-ray machine screens merely state that a particular gauge wire be visible. This is not to say that certain engineering requirements should not be maintained. These standards are useful in that they provide a cost-effective approach to rapid calibration of a device.

Screen standards, or, for that matter, all system standards that have a human component should be stated in terms of the operational goals of the system.

As implied in previous sections, performance-based standards will ensure that the x-ray imaging is useful in preventing general classes of threat objects and will provide quantitative information on performance concerning specific threats.

In the section on training, it was concluded that all types of weapons and situations will not be covered because all situations cannot possibly be anticipated. However, such performance-based standards are better than the current ones, which merely state that a particular gauge wire need be detected or, that OTPs will ensure detection of a stun gun.

4.4.3 Input and Output Devices.

Screener Body Position and Orientation. Screeners should be able to view and operate the SPEARS screen from either a sitting or standing position, depending on their preference.

The viewing angle should be adjustable so that the screener can easily change positions during a duty cycle. The ability to change from a sitting to standing position has been shown to be an important factor

in minimizing the effects of fatigue. These considerations should apply to both supervisor and screener stations.

TnT Menus. TnT menus used for operation of SPEARS should be secure from unauthorized use. Vendor personnel should have the capability, using standard telecommunications techniques, to lock out personnel who have been removed from active work status.

If performance testing is taking place at the x-ray screening station, screeners should be able to recognize that fact clearly and quickly after they have been presented with a test. This test notification should occur following successful as well as unsuccessful recognition of a test threat object. Using the video records, the test trials can then be reviewed as required by vendor training personnel.

Automatically Formatted Training. SPEARS should have the capacity to generate sequences of threat objects. These automatically generated test sequences should be based on the performance history of an individual screener. With this capability, the system can emphasize those areas in which a screener is weak.

Manually Formatted Training. SPEARS should have the capability to easily set up a sequence of test objects. With this capability, a supervisor could quickly develop a tailored training session for an individual screener.

TnT Reports. Screeners should have access to their personnel TnT reports. These reports should indicate that they are at one of several performance levels, and the quantitatively based performance levels should be modifiable based on local requirements. Performance levels will be discussed in more detail in the following section.

4.4.4 Incentive Programs.

There are two types of reward systems that should be integrated into SPEARS. One is primarily directed at inner-directed motivational incentives, and the other focuses more on socially based recognition.

As performance data is developed by SPEARS, both during training as well as during normal duty, a time-based personal record of detection scores should be available to each screener. This information should include areas where performance is weak, as well as showing those areas where screeners are strong.

Individual vendors should have the capability to tailor these ability classifications to their individual needs. These graded job classifications, based on SPEARS scores, should be made public by means of some visible recognition system.

4.4.5 System Relationships and Interoperability.

SPEARS should be fully integrated into the X-ray systems that exist at any given airport. With such a capability, testing and training could be accomplished on the same machines. It is extremely important that the type of imagery used during training is the same as that viewed during normal duty.

4.5 GENERAL HUMAN FACTORS PLAN FOR SPEARS.

4.5.1 Human Factors Perspective.

In the training materials provided with the SPEARS equipment, it should be clear that the vendor had identified previous HF discrepancies associated with checkpoint screening. This will help assure that the vendor's design concept specifically included HF issues.

4.5.2 General Guidelines and Tradeoffs.

The written documentation provided with SPEARS should indicate that the design team has considered the screener to be a vital subsystem in the security process.

It should also be clear in the associated background material that specific considerations were given to the design of the interfaces that include summaries of tradeoff options. This type of information will ensure that specific consideration was given to evaluating different types of human-machine interfaces.

4.6 ANALYSIS OF FUNCTIONS, SYSTEMS, AND TASKS.

4.6.1 Organize Checkpoint Security System.

The equipment documentation and training publications should clearly indicate that a systems analysis of the checkpoint process was conducted. This documentation should include task functions and analyses. An analysis of different task scenarios and workload conditions should also have been given specific consideration.

4.6.2 Specific Analysis Guidelines.

The associated SPEARS documentation should clearly identify all interfaces and action sequences. Information and response requirements should be clearly documented. Specific information needed to perform detection, alerting, searching, and verification of objects should be identified.

4.7 SPEARS CHECKPOINT DESIGN CONSIDERATIONS.

4.7.1 Identification of Specific Problems.

Specific recommendations should be provided for the environment in which SPEARS should operate. Considerations should be given to issues concerning (a) access to instruments for normal use and maintenance, (b) associated storage space, (c) personnel and passenger traffic, (d) ambient lighting recommendations, (e) noise guidelines, and (f) climatic conditions.

4.7.2 General Guidelines.

Specific information should be provided identifying architectural and engineering constraints that might exist with SPEARS equipment. For example, configurations for determining floor space requirements should also identify an area for personnel operations. Specific information should be provided on the actual positioning of SPEARS with respect to the x-ray machine itself.

Standing, sitting, or sit-stand configurations should be identified and adjustments for operator viewing profiles should be identified. All necessary administrative work, training, and testing configurations should be identified.

4.8 PANEL DESIGN CONSIDERATIONS.

4.8.1 General Objectives.

Documentation provided with SPEARS should indicate that specific attention has been paid to the tradeoff analyses concerning such factors as (a) the association of controls and displays, (b) the discriminability of controls and displays, (c) the appropriateness of hierarchical, heterarchical, or mimic displays, and (d) inadvertent control activation.

4.8.2 Specific Considerations.

Documentation should indicate how color was used to clearly associate specific controls and displays. Strategies that were used to minimize inadvertent control activation should also be identified.

Information provided with SPEARS should specify how labeling was established so that it was within the educational background of the screeners. This should include the instrument coding conventions. Concerns given to the requirements for spatially separating instruments should also be identified.

4.9 ALARM, ALERT, AND ANNUNCIATOR DESIGN.

4.9.1 Specific Objectives.

Information should be provided with SPEARS that identifies the considerations that have been given to the design of the types of logic approaches that were used in the alarm, alert, and annunciator system. For example, alert messages should be provided for the total system, individual components, and individual parameter values. This type of information is useful in troubleshooting equipment problems.

Documentation for the conventions used for audible, visible, and annunciated messages should also be available.

4.10 DISPLAY AND CONTROL DESIGN SPECIFICATIONS.

4.10.1 General Considerations.

Documentation provided with SPEARS should clearly indicate design considerations given to such items as (a) the difficulty of reading controls and displays, (b) the direction of display and control movements, (c) the amount of movement in display and control relationships, and (d) the time of movement in display and control relationships.

If scales are used in the displays for screening or data representation, specific attention should be paid to how that information is presented. Documentation provided with SPEARS should indicate how these judgments were made.

4.10.2 Specific Considerations.

If baggage imagery is scaled by enlargement, controls and scaling should be properly identified. Documentation provided with SPEARS should also indicate how these judgments were made.

If hard-copy printouts are provided with the SPEARS equipment, special documentation should be provided detailing operation, location, and maintenance requirements. Documentation should be provided in the software that carefully details various printing options.

The use of text versus "point-and-click" selection as a form of control activation should be considered carefully. The rationale for implementation of these types of control strategies should be documented.

4.11 SUMMARY.

The basic, functional requirements for SPEARS have been presented in this section and the de facto requirements that have resulted from existing standards and usage have also been highlighted.

The emphasis here is that quantitative, operationally based functional requirements should be the norm. That is, minimum screen requirements should not be stated in "engineering terms." Functional characteristics should be described in concrete terms that represent the abstract goals of the system. It has also been recommended that part of the functional requirements for SPEARS should include documentation about how various HF issues have been addressed. The intent of this requirement is to help focus the development efforts.

5. SPEARS FUNCTIONAL REQUIREMENTS AND TEST METHODOLOGY CONSIDERATIONS.

5.1 INTRODUCTION.

Testing of SPEARS should be conducted in two distinct phases. The first phase involves controlled evaluation in a laboratory-like setting. Testing during this phase will examine whether the system's technical requirements have been met.

The second phase involves an operational evaluation of the system in the field. The primary purpose of this phase is the evaluation of the system's operational effectiveness and suitability.

5.2 SYSTEM DESCRIPTION.

As indicated in earlier sections, SPEARS is a training, testing, and performance monitoring system for airport security x-ray screening systems.

There are some ancillary functions that SPEARS should perform. For example, SPEARS' non-x-ray screening functions include validating personnel authorized to use the system. Testing should include all capabilities of the SPEARS system, as well as its suitability to be integrated into the whole checkpoint screening process.

5.3 CRITICAL ISSUES AND CRITERIA.

In this section, the primary methods for testing and evaluating SPEARS criteria will be presented and described. It should be realized that there is no suitable performance baseline to determine whether SPEARS is useful in training better screeners.

The primary reason for this is that no suitably empirical baseline of the effectiveness of the current system has been established. Secondly, the performance of the current checkpoint system is based on the ability of screeners to detect the FAA test objects, not actual threat objects. A third reason why there can be no real baseline for SPEARS is that checkpoint screeners are very sophisticated in terms of current testing methods. That is, it is extremely difficult to ensure that a screener is not aware that FAA testing is taking place. A fourth reason why establishing an adequate baseline is difficult is that it would be almost impossible to have consistent test images presented to a screener. The manual insertion of only a threat object into luggage would preclude systematic testing.

This is not meant to be an exhaustive list of reasons why a suitable baseline cannot be determined. Additionally, this list is not meant to indicate that the utility of SPEARS cannot be empirically established. It can be, but it cannot be compared reasonably to the current system using screener performance alone as the basis for comparison. These issues are discussed in the following sections.

5.3.1 Issue 1.

Does training with TIs improve screener performance?

CRITERION 1.1. The primary SPEARS training system operates "off line."

METHOD 1.1.1. Levels of screener performance will be determined by scores on different image complexity categories.

METHOD 1.1.2. Performance status will be categorized into specific classes.

METHOD 1.1.3. Subject-Matter Experts (SMEs) will determine the performance level required for each class of screeners. Combined Test Images (CTIs) contain a fictional image of a bag containing a threat object. Performance level will be based on a percentage of CTIs identified correctly from specific CTI complexity classes.

METHOD 1.1.4. SPEARS will automatically record the progression through the different performance levels.

METHOD 1.1.5. Average rates of progression for all screeners will be determined.

CRITERION 1.2. SPEARS should be designed so that screener curricula can be tailored for individual screener skills.

METHOD 1.2.1. Training and performance records will be maintained for each screener.

CRITERION 1.3. The curricula should be modified easily to meet the security needs of individual airports.

METHOD 1.3.1. A group of SMEs will determine subjectively whether the curricula can be modified easily to meet their needs.

CRITERION 1.4. The training should be based on basic ISD principles.

METHOD 1.4.1. Training material will clearly document the implementation of ISD principles.

METHOD 1.4.2. A panel of ISD SMEs will subjectively evaluate the implementation of each curricula.

CRITERION 1.5. A library of CTIs should exist to provide training that increases in complexity.

METHOD 1.5.1. Image complexity will be determined by a panel of SMEs established by the FAA.

METHOD 1.5.2. Each airport will have a library of CTIs.

METHOD 1.5.3. SPEARS software will have the capability of storing CTIs categorized by image complexity.

METHOD 1.5.4. Training progression will be determined by standard “staircase” or “titration” methodology. Once an image is correctly identified by a screener, beyond chance levels, more complex images will be presented.

CRITERION 1.6. Security personnel should be able to present a minimum of three aspect angles of individual TIs, in any order of presentation required for training.

METHOD 1.6.1. Records of all presentations will be maintained. Data items will include TI and aspect angle, as well as screener performance data.

CRITERION 1.7. Statistically based training reports should be presented in easily understood terminology.

METHOD 1.7.1. A group of security SMEs will subjectively evaluate the statistical terminology to determine if they understand the report’s conclusions.

CRITERION 1.8. Training reports should be available to both on-site and off-site security personnel.

METHOD 1.8.1. Measures of central tendency and variability will be evaluated.

METHOD 1.8.2. Both nonparametric and parametric inferential statistics will be reported, as appropriate.

METHOD 1.8.3. Interpretations and reports of statistical descriptions and analyses will be presented in common English terms.

METHOD 1.8.4. A variety of graphical presentation modes will be available to represent the data.

METHOD 1.8.5. Data items will be readily transferable to standardized statistical programs for further analyses.

METHOD 1.8.6. Statistical analyses will be sensitive to the fact that the data is highly interdependent and based on repeated measures within subject designs.

METHOD 1.8.7. Statistical analyses will report the confidence levels of the test used.

CRITERION 1.9. The training curricula and reports should be able to be modified so that different levels of performance and personnel categories can be established by individual air carriers and security vendors.

METHOD 1.9.1. Each curriculum will contain at least 75 percent of the test imagery approved by the FAA.

METHOD 1.9.2. Records of the modified curricula, including images used, will be maintained for evaluation by the FAA and air carriers.

CRITERION 1.10. Training curricula should be established to train supervisors in how to use the system.

METHOD 1.10.1. A training syllabus will be provided to instruct supervisors in using the modules for modifying curricula and training reports.

METHOD 1.10.2. The training syllabus will be based on ISD principles.

METHOD 1.10.3. Training SMEs will evaluate the ISD-based training syllabus.

CRITERION 1.11. Training curricula should be established to train trainers to train screeners.

METHOD 1.11.1. A training syllabus will be provided to instruct trainers in using the modules.

METHOD 1.11.2. The training syllabus will be based on ISD principles.

METHOD 1.11.3. Training SMEs will evaluate the ISD-based training syllabus.

CRITERION 1.12. Training curricula should be established to train personnel in how to troubleshoot and maintain the hardware and software.

METHOD 1.12.1. A training syllabus will be provided to instruct operators of SPEARS in using the modules for troubleshooting problems with hardware and software.

METHOD 1.12.2. The training syllabus will be based on ISD principles.

METHOD 1.12.3. Training SMEs will evaluate the ISD-based training syllabus.

5.3.2 Issue 2.

Can TIs be electronically inserted into x-ray images alone, or as part of a bag image during the normal screening process?

CRITERION 2.1. The TI must, in all aspects, appear to be in a piece of baggage that a passenger placed on the conveyor belt.

METHOD 2.1.1. During laboratory and operational testing, 98 percent of all TIs will be completely within the baggage into which they are projected.

METHOD 2.1.2. During laboratory and experimental testing, 98 percent of all TIs will appear perceptually to be a part of the contents of the baggage into which they are projected.

CRITERION 2.2. The TIs must represent a range of real threat objects, as well as deadly/dangerous items.

METHOD 2.2.1. A group of SMEs will subjectively evaluate whether or not the images in the test libraries represent real threat objects.

METHOD 2.2.2. The complete image presented (TI and baggage) must be recorded and stored for later evaluation, if necessary. The importance of this item was emphasized by several screeners, supervisors, and CASFO agents.

METHOD 2.2.3. At least 300 TIs and 300 CTIs will be available for automatic or manual insertion in baggage images.

METHOD 2.2.4. Images will be categorized at least as explosives, weapons, and other deadly/dangerous items.

METHOD 2.2.5. Weapons will be categorized at least as short- and long barreled, knives (various sizes), sharp objects (various types), and bludgeons (various types). Components will also be categorized.

METHOD 2.2.6. Explosives will be categorized at least as to type and component function.

METHOD 2.2.7. Hazardous items will be broken down by various threat categories.

CRITERION 2.3. Individual air carriers and security vendors should have the capability to modify the TI to meet requirements at specific airports.

METHOD 2.3.1. Each site will have the capability to insert new images, as required, into the library.

CRITERION 2.4. The TI library should have the capability to be easily updated from remote sites.

METHOD 2.4.1. Each site will have the capability to receive new images electronically within 72 hours of a library change notice.

CRITERION 2.5. Security personnel should be able to present a minimum of three aspect angles of individual TIs, in any order of presentation required for training, testing, and performance monitoring.

METHOD 2.5.1. Data items will be reported for all aspect angles presented.

METHOD 2.5.2. SPEARS will have the capability to present different aspect angles, both automatically and manually.

METHOD 2.5.3. Records of all presentations will be maintained. Data items will include TI, aspect angle, and screener performance data.

5.3.3 Issue 3.

Can SPEARS be used to measure and monitor detection rates for TIs and CTIs during real-time screening in an operational environment?

CRITERION 3.1. The primary SPEARS performance monitoring system operates “on-line.”

METHOD 3.1.1. Levels of screener performance will be determined by scores on different image complexity categories.

METHOD 3.1.2. Performance status will be categorized into specific classes.

CRITERION 3.2. SPEARS should record the hit, miss, type II decision (false positive), and correct rejection TI and CTI rates for individual screeners.

METHOD 3.2.1. Laboratory and operational testing should be conducted using different passenger flow rates.

METHOD 3.2.2. Bias should be computed for individual screeners. This signal detection statistic will help determine the decision-making strategies of screeners.

METHOD 3.2.3. Performance will be evaluated during different times of a duty day.

METHOD 3.2.4. Environmental conditions, such as screen glare, temperature, and operational conditions (e.g., high or low passenger flow rate) will be indicated with each test.

CRITERION 3.3. Supervisors should have the capability to easily examine detection rates for individual screeners, pooled across threat categories.

METHOD 3.3.1. During real-time operations, supervisors can examine detection rates by individual screeners for the current shift.

METHOD 3.3.2. During real-time operations, supervisors can examine detection rates by individual screener for past shifts.

CRITERION 3.4. Supervisors should have the capability to easily examine detection rates for individual threat categories, but pooled across screeners.

METHOD 3.4.1. During real-time operations, supervisors can examine detection rates by individual threat category for the current shift.

METHOD 3.4.2. During real-time operations, supervisors can examine detection rates for TIs by individual threat category for past shifts.

CRITERION 3.5. SPEARS can alert supervisors when performance of a screener is degrading during a shift or across shifts.

METHOD 3.5.1. Designated vendor security personnel can be notified, discretely, of a screener detection rate that falls below operational requirements.

CRITERION 3.6. Training curricula should be established to train supervisors to troubleshoot the system.

METHOD 3.6.1. A training syllabus will be provided to instruct operators of SPEARS in using the modules for troubleshooting problems with hardware and software.

METHOD 3.6.2. The training syllabus will be based on ISD principles.

METHOD 3.6.3. Training SMEs will evaluate the ISD-based training syllabus.

5.3.4 Issue 4.

Are there any HF, design features, or other system characteristics that adversely affect the ability of screeners to operate SPEARS effectively and safely in training and operational settings?

The design of SPEARS will be in accordance with HF standards established by the military or other government agencies.

The DOE has a set of draft HF engineering standards for equipment and computer-user interfaces. These standards were based on military standards, but adopted for civilian use. It is specifically recommended that the DOE draft standards be used for SPEARS development.

It was indicated earlier that SPEARS system integration evaluation would be a primary part of the evaluation process. Systems integration issues will be subsumed under this issue.

CRITERION 4.1. SPEARS design should meet or exceed the DOE HF engineering design standards, as appropriate.

METHOD 4.1.1. Item-by-item reconciliation reports for HF standards will be developed for SPEARS software and hardware.

METHOD 4.1.2. Reconciliation reports will specify which HF standards have not been met.

METHOD 4.1.3. The system will record how each discrepancy was resolved.

CRITERION 4.2. SPEARS should improve the overall performance of the airport security checkpoint system.

METHOD 4.2.1. SPEARS' efficiency under different environmental conditions shall not be statistically different.

METHOD 4.2.1. FSM and CASFO SMEs will subjectively determine if SPEARS degrades regulatory compliance.

CRITERION 4.3. SPEARS should not degrade the performance of current x-ray screening performance.

METHOD 4.3.1. SMEs will subjectively determine if the overall performance of the x-ray screening process is degraded.

METHOD 4.3.2. Different security performance metrics will be used in the overall performance evaluation.

CRITERION 4.4. Screeners participating in the SPEARS test should have skills similar to those of the majority of screeners at that airport.

METHOD 4.4.1. SMEs in the field of personnel demographics will determine if test participants represent local populations.

CRITERION 4.5. Screener performance should not be negatively impacted by the SPEARS design.

METHOD 4.5.1. At sites where SPEARS and the current system are both implemented, SMEs will conduct an overall subjective comparison of checkpoint security.

METHOD 4.5.2. Different security performance metrics will be used in the overall performance evaluation.

5.3.5 Issue 5.

Can SPEARS communicate with x-ray machines and off-site computers?

CRITERION 5.1. SPEARS will operate with x-ray machines used at the airports where SPEARS is implemented.

METHOD 5.1.1. SPEARS will insert TIs and CTIs into x-ray images sent from screening machines.

METHOD 5.1.2. SPEARS will be able to receive additional TIs and CTIs from remote sites.

METHOD 5.1.3. SPEARS will be able to send reports to remote sites.

5.3.6 Issue 6.

Can SPEARS validate the authorization of personnel who use the system?

CRITERION 6.1. SPEARS should have the capability of allowing only those personnel to operate the system who are currently authorized to use the system.

METHOD 6.1.1. Secure log-on procedures should prevent unauthorized personnel from using SPEARS.

CRITERION 6.2. SPEARS should keep records of demographic information on personnel who used the system.

METHOD 6.2.1. Basic demographic information should be recorded in personnel histories.

METHOD 6.2.2. Statistical comparison of demographics and performance data will be made by SPEARS.

5.4 SUMMARY.

In this section, an overview of SPEARS operational test methodology was presented. Various test issues were discussed.

General guidelines and approaches were presented for evaluating SPEARS.

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Appendix A Screeners Interviews

PRE-BOARDER SCREENER INTERVIEW

1. *Why did you choose this line of work?*

The schedule fit with mine, opening when I needed it.

It sounded interesting.

My relative suggested it.

2. *Describe your work as a screener.*
(Language assessment—Do they understand what their job responsibilities; primary and secondary goals of the job?)

I look for dangerous objects.

I do hand-wanding, monitor x-ray machine, do baggage searches, and hand-search passengers.

3. *What training did you get concerning the general aspects of your job?*
(Test objects versus passenger courtesy, air transportation security)

We learned how to detect FAA test objects and a little about other threat objects.

A little about how to be nice to passengers. We were told to keep things moving.

The FAA seems to be better at how they deal with you if you fail a test. Training done by floor supervisors at some airports. There are no special trainers at those airports. At other airports, CSSs (Chief Security Screener) not directly involved so they are not really in touch with it.

Basically we teach them how to physically run the machine, then work on test objects (FAA). Then we work on other threat objects—go to walk-through metal detector and show them how to wand, then we put them on with more experienced screeners.

Did not do any training in classroom on hazmats. Did some on floor.

We like the TnT system—intimidated at first, but the challenge of staying alert throughout the shift is good and we like it.

With the TnT system, once a second image comes in, you can't go back to previous one—so if a screener misses one during a busy time, they can't go back to that image to diagnose what the problem was. We don't know if it was the test item or test/bag combination that produced the problem.

4. *What initial training did you get concerning threat objects in general? (What is a threat; who is a threat?)*

We saw a videotape. They showed us the test objects and then they worked with us on-line.

When a couple of screeners at JFK were asked what the air carrier could do to help them do their job better, they said that flying is the air carrier's job and that security and handling passengers—even passengers with an attitude—was their problem. So let them as professionals handle it. The screener didn't complain about rude passengers and took the problem on as their own responsibility.

We get 12 hours of classroom training in the syllabus from ATA. But, there is no syllabus for on-the-job-training so training at different airports has to be different.

Some vendors have a nice script for their initial training courses. They were just using their common sense concerning how to conduct systematic training, but this was the exception. Maybe we should train trainers about the philosophy of training.

Basically they used the classic technique of "Teacher does, then student does, and then teacher critiques."

Training is conducted by just putting different objects on the belt, then in a case, then with real passengers. They are told that if they see anything dark that they don't recognize, then they have to call for a bag check and go with the bag checker to visually identify the object.

5. *How long was your initial screening concerning threats? (Hours, days)*

Two days.

6. *What kind of on-the-job-training do you get concerning threats? (What techniques were used; what is a threat; who is a threat?)*

It lasts 3 days to a week, working with a supervisor until the supervisor is satisfied that the screener knows the FAA test objects and "other" threats that the company wants them to know. There is no standard set of objects among airports.

We get recurrent training every 6 months, mostly on procedures. If we miss a test item, the supervisors go over the circumstances (how the object was positioned during the scan and what other objects were around it).

Wanding is taught by a supervisor who challenges them to find it on him.

7. *How well prepared are you to detect FAA threat objects?*

We are pretty good at those objects.

Sometimes, an air carrier doesn't do an FAA test and we complain.

(The screeners don't see getting tested on different objects as getting better at a wider range of test objects. They only see that the air carrier is not doing what they are supposed to do—FAA mandated training.)

8. *How does the company help you to screen as many objects as possible without having to stop and actually check a bag?*

Cycle us every 15 minutes, shouldn't make us stand up, train us on FAA objects every 15 minutes so each one gets tested once an hour.

9. *How important is it to detect threats, compared to getting passengers through the checkpoint?*

Most companies seem to stress the issue of threat detection. Because the x-ray machine maximum throughput rate is determined a priori, getting bogged down isn't so much of an issue. But, if someone is checking too many bags, management does talk to them. But, there does not seem to be any established minimum throughput rate.

Our most important goal is detecting the FAA test objects. This works to the detriment of detecting other threats.

10. *How well are you prepared to detect other types of threats? (What kind of threats objects are the easiest; what are the hardest?)*

Not real well—actually they recognize that they don't know whether they are prepared or not.

Here are a couple of general problems: Screeners are asked to turn on all computers, but they typically don't check what was behind the computer in the bag.

Concerning passengers in wheelchairs—screeners should ask them to walk through, if they can. Such passengers should not be put through physical search automatically. Screeners can't check a person in wheelchair very well.

11. *Were you trained to determine if someone is suspicious? (What did the training consist of?)*

No.

12. *What do you think was left out of your training and that you would like to see put in it? (Other types of threats?)*

Better video tapes to see how screeners miss things. Better training on real threat objects.

TESTING

1. *How realistic are the test objects? (Do you think that they represent what you actually see, or think you will see?)*

Not very realistic.

Some of the testing is tricky—don't know when FAA is coming.

Most of the time it is pretty obvious when an FAA test is being conducted.

2. *Have you ever found a threat object, and if so what was it?*

Guns, stun guns, mace, flammables, drugs, knives.

3. *How well do you think friends do their job?*

Pretty good—on FAA test objects.

Most said that they thought their friends were pretty conscientious and took their job seriously. The bad ones get weeded out by management pretty quickly.

4. *Describe the tests that are used to determine how good you do your job as a screener?*

It is pretty easy to tell when a test is taking place.

5. *How could the testing be more effective?*

Do not put test pieces in a bag by themselves.

We should not know the people who do the testing.

Use real threat objects.

6. *Are threat objects, other than the FAA test objects, tested?*

Sometimes—but they tell the air carrier to stop it because it is not fair.

The rules of the game should be adhered to.

7. *Do you usually know when you are going to be tested, and how?*

All but one said yes. They also said that if they saw several FAA people around, they usually knew that there was going to be a test.

Air carriers should not put pressure on individual screeners.

8. *Are you usually tested when things are slow or when they're busy?*

Usually tested when it is slow. The testers don't want to interfere with the screeners' job but that's a bad time to test. The screeners thought they should be tested when they are the busiest.

INCENTIVES AND AWARDS

1. *Did you ever get an award for finding a threat object, what kind, and why?*

They were only rewarded for detecting guns.

They were not rewarded specifically for getting the FAA OTPs.

2. *How does the incentive system work? Does it work well? Why?*

The screeners get \$25 for a gun and nothing for anything else.

They thought that this reward was ridiculously low. They thought that the level of the reward for a gun was a joke for how serious an offense it is.

They receive a training certificate, but no special award for doing well in training.

Only one organization used different screener skill levels as an incentive.

3. *Did you ever get an award for anything else, and what was it?*

No.

4. *What other types of incentives would you like to see on the job?*

Receive a reward for detecting objects other than FAA objects.

One company gave "110 percent" pin for continuing high performance. It could be taken away if performance slacked off.

EQUIPMENT

1. *What do you like about color image displays?*

Most thought that color displays made them more effective screeners. There were no training tapes on color displays.

2. *What do you like about the black and white displays?*

Most of the complaints focused on the older black and white machines and not on the fact that the display was black and white.

The newer black and white displays got generally very favorable reviews.

3. *Do you like to look at the objects on the screen from different views?*

“ZOOM” is nice feature, but it isn’t in current training systems.

The machines should have brightness and contrast controls.

The training systems should be just like the ones they are going to work on.

4. *How long do you think you should be at a screening station at a single time?*

The consensus was that 15 to 20 minutes was just right. The problem was that when things got busy, they were to cycled to the other stations—which is the time when they should be cycled.

Appendix B
FAA and Vendor Security Managers' Interviews

SPEARS FUNCTIONAL REQUIREMENTS DOCUMENT SECURITY MANAGERS' INTERVIEW
PROTOCOL

1. *There have been no aviation terrorist acts (if skyjacking is excluded) in the U.S. To what extent do you believe that this is the result of the current aviation security system?*

The aviation security system is only one leg of the anti-terrorist support system. Some of it comes passively from the fact that we have not been targeted directly. There are two types of aviation security threats: the criminal and the terrorist. Some of the reduced risk is the result of skyjacking becoming no longer popular. There is really no place to go with a skyjacked plane. We are good, but not to the extent of stopping a dedicated, suicidal terrorist.

During national crisis, level four is necessary. Access can be limited and screeners have a better chance of doing their job successfully. There are fewer distractions, viewer bags, and better opportunity at detections. Level four should be standard for future airports. The business pressure to have level four as standard now, however, is just unrealistic.

We have visual and physical deterrents in place. Terrorists know that there are other targets that are much easier to attack than a single airplane and would have a more serious impact. We can improve; the system has been accomplishing the goals it set out to do (no Lockerbies on my watch).

Also, countries are less willing to accept terrorists—they know that they might be next and are more willing to cooperate.

We've been lucky. If a dedicated terrorist wanted to, he could get through. Due to flaws in walk-through detectors, there are several open areas (between thighs and around ankles).

Terrorists don't target an airplane because it's an airplane, except for hijacking. So they probably will take the path of least resistance.

They did it in New York (World Trade Center) because terrorists had an infrastructure there. Otherwise, it could have been anywhere.

Our system is not effective against hardened terrorists.

2. *In a general sense, the goal of preboarding security is to prevent terrorist access to aircraft. What are the tasks, in order of importance, that prevent this access?*

The appearance of a security system is critical. Having good equipment is important, but people make the system work.

The biggest threat is a bomb—most deadly. We are hardened, though not impervious. We are no longer the path of least resistance for a terrorist or criminal.

Two-screening process going on at the same time—one directed at detection of threats on passengers, the other directed at detected objects in carryon and checked baggage. Each gets at a different level or type of threat. Each needs to be treated separately.

The system keeps honest people honest. It does okay at keeping “criminals and crazies” out.

We are fortunate that we have not been targeted. Terrorists not putting their brightest people out there in the field. Have to remember this: the Achille Lauro is a good example. Swedish passports for Arab terrorists?

3. *Rank the tasks you listed, in order of effectiveness.*

It depends on what you're talking about. Screeners are trained to detect FAA test objects. For the most part they are good at this. They are moderately effective against other threats. Airport design can have an impact on how effective they are. In one airport, passengers can easily distract a screener from their task.

The important question here is how are we to measure effectiveness—number of targeted items detected (e.g., guns, mace, hazmats)?

Technology is not the most important issue in terms of effectiveness for some things; but for certain things, like standard guns, it is.

When things are high tech, like certain kinds of explosives (organics) or gun and bomb components—then the human element becomes important—because, in the near term, the technology is not going to be able to detect this stuff.

The system is only as good as the screener is—must put focus in this area.

The challenge of Lockerbie is to address the new generation of explosives and other terrorist tools.

How do we measure the effectiveness of an organization? Well, look at the standard things that are common to a healthy organization—teamwork, sick days, squabbles, lateness, taking constructive criticism, gun counts. Just ask their boss how well they are doing their job.

4. *How effective in identifying contraband is the current generation screening equipment? Be specific.*

It depends on where you are. Some of the equipment is quite good. The walk-through metal detectors have a wide range of effectiveness. Some x-ray equipment is good against organic compounds and facilitates the job.

Hazmat training is not highlighted. If safety is an issue, then we need to understand how to train for various hazmats—explosives, compressed gases, rocket propellants.

How do we measure effectiveness now?—Testing of FAA objects by FAA company and air carrier.

5. *How effective are the screeners in identifying contraband? See above.*

The current test objects are a tacit admission that we are not ready to protect the public.

Even CSSs are treated like scum by air carrier—like they don't know what they are doing. They do see themselves as professionals.

6. *What are the strengths and weaknesses of initial screener training? How adequate is the record keeping?*

It needs to be updated. Many old images.

Must emphasize that taking the “constructive approach” to failures in detecting a pH test object is important. Must have some training for FAA agents. Some old-timers are good at understanding what vendors need to do to enact new training. New agents may need some training in what training and management of training is all about.

Should change to state-of-the-art explosive training. For example, Israelis concentrate on certain types of initiators and power sources. Training should be directed at these components.

We are good at detecting FAA test objects—training and equipment is directed at this goal. But, is this the goal that we want to achieve?

There is no focus on real threat objects. Use monthly detection reports as part of evaluation system.

Should have a library of tapes that we can use and cycle through recurrent training—experienced screeners get bored—need something to keep them motivated. The tapes should be directed at the how and why of detecting hazardous materials—as well as actual “threats.”

The effectiveness of the system is now based on monthly reports of “FAA tests.” These include vendor, air carrier, and FAA tests. But, people know the testers—so how effective can this be?

The test objects define training—how effective can this be?

The problem is making training standardized. There are a lot of good trainers out there.

Need more flexibility in testing and dealing with failures. System is pretty rigid. It is not good at reinforcing people for doing good work. (Have FAA send out letters.) It is set up for punishing for failures, but it is not set up for praising good work.

7. *What are the strengths and weaknesses of recurrent screener training? How adequate is the record keeping?*

No syllabus. Need vignettes of different scenarios. Needs to be systematized.

Better oversight of training is needed. Ask the question, "What do we want them to detect?" And then address it systematically.

There is no breadth in the test objects.

The basic dogma is that screeners should be detecting firearms, explosives, and incendiaries. The current training syllabus is not balanced in addressing these items. Should clearly operationalize how to train for these performance goals. Make the training goals concrete, so that they are something that people can do.

Reconfigure training to address component threat. And give CASFOs a way to test for it.

Focus on hazmats. The first time they see a stun gun is on the job. Nothing in training about these items.

Toy rockets, propellants, and wires do not show up—even the organics.

The English have an airport authority. Training is centralized, so devices for training can be implemented quickly.

There is no mechanism for distribution of good training ideas.

In fact, because ideas are proprietary to various companies, they do not want to spread around their ideas. The FSM is bound not to tell other companies.

Why not set up a quasi-government agency, like the postal service, to provide security to airports?

Like anywhere, physical needs have to be addressed, lighting at Dulles, air-conditioning at Orlando. Fit of uniforms. If company is not going to take care of basic needs, they certainly aren't going to take care of more important ones.

CASFO should get involved, and FSM too, with bitch sessions with vendors.

8. *Most of the training is conducted using traditional classroom and on-the-job techniques. In what ways would automating the process improve training?*

Knowing the goals and how people are progressing towards them is critical. We have no idea right now. We will be able to set up several grades of certification, which would be good for motivation. If someone starts to fall off, we would know how to get them back on track—either in their total performance or just in how they are doing that day. We would be able to transmit problems between airports to standardize performance.

Good trainers are critical—but, there are not enough of them to go around. Maybe automation will help solve this need.

9. *Without identifying any individual or company, describe the most serious lapse in the preboarder screening process of which you are aware.*

No way to determine if wands are really working. No good calibration procedure available for field. Just a simple thing such as battery life-time is a problem.

A whole plane boarding, then the company calling ahead to have them checked. The walk-through metal detector being turned off.

On FAA test, screener wouldn't go into bag because it had feminine items. Why were there any there—bag should have been empty. So, now, only senior screener (CSS) will do physical search.

No mechanism to pass information on local problems from CASFO to CASFO. Should set up incident database.

Typically when computers are tested, that portion of the bag where the computer was sitting is not examined.

Show that there is a unified picture (vendor and FAA) to air carrier. Not one air carrier representative has come to my meetings. Indicative of how important they think the security function is.

10. *Without identifying any individual or company, describe the most serious lapse in the preboarder screener performance of which you are aware.*

People falling asleep after several hours on position.

11. *Vigilance can be affected, positively and adversely, by a variety of influences. Describe some of these influences in terms of the equipment (such as displays and ergonomics) and work schedules such as shift and duty cycles).*

Monitoring where their performance level is at. Improving self image of the screener. Pay—a little better would help. Public information would help.

We must know how to evaluate performance. Current indicators (number of guns detected, for example) indicate that performance has been pretty stable over the recent past. Maybe these types of indicators are the best we can do—something like keeping an eye on the number of tickets that a policeman writes.

Current testing of training is not evaluating the way that CSSs are actually training screeners. Screeners know that detection of FAA test objects is only part of their job—though they believe it is the most important role. The other part of the job is to detect hazardous material, guns, stun guns, and other safety-related items (toy rocket propellants). So, after initial OJT (On the Job

Training) has proved a screener can detect the FAA test objects, then they train them for other material. Typically this is done by standing next to a trainee, telling them anytime they see a dark object that they don't recognize, stop the belt, and physically go and open the bag to determine what it is.

If we can test individuals more effectively, we will improve vigilance.

The dynamics of people's complaints have really changed over the years. First it was primarily "why bother me?" to "why did you miss this item?" Good—but passengers' attitudes could be improved. Air carrier could include screening on the in-flight video. Educate passengers in what it takes to go through screening.

12. *Electronic imaging is being considered as an important technique in training and performance control (unobtrusive monitoring). What advantages or disadvantages do you foresee using this technology?*

Nothing but positive comments. Increase competitiveness. Just knowing where you are at and that you are improving is important.

Use Shagian's new test objects as an interim solution.

FAA should get involved in training the vendors and air carriers in training in general. Some help is needed in this area. It is just too spotty from airport to airport whether they will have a good trainer or not.

FAA should provide air carrier with performance standards. How well do they manage their security companies—how do the A/Cs (Air Carriers) set up goals and test?

ASIS (Aviation Security Information Seminars). Fifteen topics offered to airports and air carriers. There is a workbook—ask Phil about it. Only one in the country. No mechanism to tell others about it.

13. *Interactive management-worker relationships are thought to be core to a quality organization. How might screener-supervisor relationships be helped or harmed by the new SPEARS technology?*

That management is interested in what they do and how they perform as individuals.

Maybe an incident-reporting system, much like ASRS (Aviation Safety Reporting System), is needed to standardize performance and alert the industry to potential threats and weaknesses in the system.

Right now, training and testing goals are so broad that they create the conditions for confrontation between CASFOs and vendors. Each must use their own discretion for implementation of the goals—these differ from place to place.

CASFOs are told to interpret ACSSP in a certain way by Headquarters. They have very little leeway.

Air carriers further fragment system by putting out their own guidelines. FSM further fragments system by interpreting it in their own fashion.

This fragmentation, or ill-defined testing goals, sets system up for confrontation.

FAA and air carrier should be providing ISD type training materials—concrete stuff.

14. *What are the punitive and positive factors used by security management to enhance worker performance?*

In many places it is really negative. If you miss something you are fired, instead of trying to identify where the system has failed them as a worker.

Increase public awareness to help screener's image. Change the way screener's vie with themselves. Not just peons who get yelled at.

Reward for more than just FAA test objects and guns. Give monetary awards for superior service. Implement a tiered system of excellence. Now use "x-ray specialist" designation. For 1 year (?) without a failure and good attendance and performance.

FAA should look to see why failure occurred, then get at that cause poor motivation is not just an individual screener's responsibility.

The whole system is contentious because each level is implementing its own interpretation of explosives, incendiaries, and firearms.

We should better define what it is we want them to detect. This will have ripple effect back to training by making the training goals more concrete (operationalized).

15. *How do security managers convey to screeners the relative importance of identifying threat objects on one hand, and maintaining a high passenger flow on the other hand?*

Not really too much of a problem coming from management. Problems come from passengers who view screeners as incompetents and just delaying them. Passenger education would help. Better signs for multilingual passengers. Better human-factored information and signs.

There seems to be no major problem with A/C putting pressure on vendors or screeners. Variable speed belts may be of help to new trainees and for times when traffic is so high that the throughput of bags must be slowed down.

FSM is interested in systemic problems. For example, study violation history and see if there is a common thread that runs through the history.

Recurrent training takes place if someone is away from the job for 20 days—just a company policy.

16. *Currently, one way the FAA regulates the industry is by imposing fines for failure to detect one of several test objects. Some say the objects are not realistic, but at least they know what the FAA is testing. How will this problem be dealt with if a wide variety of electronic images are used?*

Would aid in working with the industry to identify not only that a problem exists, but what is the source of the performance problems.

The “kinder, gentler” FAA approach seems to be successful. However, there seems to be a wide range of capabilities in the agents to implement this policy. Training in this area is needed.

CASIS computes violations. But it is not a relational database. It is not like an ASRS reporting “incidents” that will exempt reporter from a violation.

There is no newsletter.

Can’t have too much information.

Have a “lessons learned” database.

Need coordination point for information collected—and a dissemination system.

17. *How will regulations have to be modified to meet the changes SPEARS technology will bring about?*

What is a passing grade for a screener? Who owns the data? How will that data get to the FAA? What will the new training (initial and recurrent) standards be? Are there any selection criteria that can be established?

If all airports don’t get SPEARS at the same time, what will regulations look like in the interim? There can be a better system for training of screeners and for implementation of the current regulations, even if SPEARS were never to be implemented.

Screening has fallen between the cracks. Falcone does airports and Noyes does air carriers. Nobody does screening.

Local FAA has to pass “data” up the system—but, what about passing resulting intelligence back down? Then let the FSM decide what is important to his local area.

No set procedure for FSM to disseminate threat information around the country.

Noyes passes information to air carrier. Falcone passes information to airport. Where does the vendor fit in?

They have to implement the threat information.

No standard procedure for sitting down and actually assessing the risk to determine what threat level they should go to. There are SOPs (Standard Operating Procedures), but it is tough to go from those guidelines to actually determining concretely what the threat is.

18. *Should the FAA have access to the details of individual training data, or merely whether an individual screener is proficient or not? Why or why not?*

FAA needs to have access to it to analyze the state of the performance of a security vendor. Should know how well individual screeners are doing. Don't need to know the names of individuals. Pass the information back to vendors about how well they are doing. Don't have to tell other companies about what their competitors are doing.

Most people in the field don't have a problem with giving data to the FAA about individuals—or for that matter, even details about their system performance. ATA collects performance data and sends out collated reports to the A/Cs now.

19. *Should the information available to the SPEARS training equipment be accessible, on-line, to the FAA?*

Yes, but some sort of moderate level of security will be necessary. This would be ideal. But we need to identify what "real-time" really means (milliseconds or hours). This will have big impact on cost of implementation.

Rigid nature of policy (like 107.14—card reader) set up without any field input from field.

20. *What type of displays appear to be most usable by screeners? (Black and white, color)*

Need to be able to better interrogate the screen—zoom and contrast are important. Color is useful for alerting in areas that may not have been scrutinized.

21. *Currently, training involves the use of real, physical objects which are examined on the screen, then inspected visually by a screener. With the technology that is currently under consideration, there may not be any physical correlation to the images screeners observe. Will the inability to actually confirm what they see on the screen (by examining the physical object) affect screeners' ability to rapidly process passengers? Why?*

Must have at least the photograph of what the actual contents look like. Preferably let the screener electronically identify what is giving them problems so this can be documented.

Need to update images as new intelligence information comes in, not just updating at the vendor's discretion. This may not be as easy as it sounds, depending on what system is used to store the images (CD versus tape, for example).

22. *Do screening stations need to have communications with central observation stations? Why?*

To monitor the level of performance of a screener to see if one needs to be changed or shifted.

Having central oversight helps in overall performance of the system. Cuts down on the number of people that are needed to accomplish proper quality control and see where mistakes are happening for actual passengers' baggage.

23. *How often should FAA, air carrier, and security vendor testing be conducted?*

Every day, if done electronically. It should be done throughout the day to help screener keep alert. Must emphasize that this is to help them do a better job. If performance starts to drop off, then it must be assumed first that the system is failing the screener and not that the worker is inherently bad at his or her job.

24. *What time of time frame do you believe that it will take to implement SPEARS technology at the designated airports?*

Probably it won't happen all at once. Must have different set of regulations for the smaller airports.

With 400 airports and 1600 checkpoints it will be years. We must be prepared for a fallback position if SPEARS is not implemented.

25. *If all airports are not going to be receiving SPEARS technology at the same time, what type interim programs would enhance the current level of screening?*

Systematic training with physical test objects that have been updated. Utilize systems approach to instruction. Set goals, operationalize them (define concretely), then standard training implementation (trainer do, student do, trainer critique).

Training should include FAA agents on how to recognize lapses, ineffective training, and testing procedures.

26. *What type of interim changes in regulations would enhance the interim screening programs?*

Help agents identify why a given problem has occurred and how to address the problem. Is it a training issue? Is it a management issue? How would the training be improved? How would the management issues be addressed?

Have the two-bag rule enforced. Probably can't limit access to airports on a routine basis. This has been tested in various places. It has too much of an adverse impact on businesses, because of the way current airports are designed. This should be examined—maybe exclusion could be implemented at some airports, or parts of airports, without an adverse impact.

Better operationalization of training and testing rules.

27. *What types of changes in the ACSSP, on a near- or long-term basis, should be made to the ACSSP as the result of SPEARS technology?*

Update initial training syllabus. Generate a recurrent training syllabus that is effective. Look at ACSSP systematically, with respect to basic goals—firearms, explosives, incendiaries. Need another look at what are hazardous materials.

This should be a living document. Update it regularly with good table of contents. Do it something like the CFRs (Combined Federal Regulations) are done—issued every year.

28. *How will SPEARS technology impact management practices of security vendors?*

Improve how management deals with screeners. Be more responsive to the regulator. Make them more efficient and cost effective.

If SPEARS is not bought, what is the fallback position? We don't have one. Business as usual. Positive bag match, while expensive, is cost effective in the long run in minimizing lost baggage.

Will have to "weight" images in terms of risk. FAA must set level of performance soon.

Return to original testing philosophy is coming. Not test to be punitive. Test to improve system. So provide ways to improve bad performance.

Will have to provide SPEARS to 1600 checkpoints at 40 airports.

FAA must specify the type of data that SPEARS should collect. Where should data reduction be done at?

Regulate vendor, not air carrier. Do it directly.

Changes restrictions on testing of FAA objects. Let CASFOs be more creative. Do it like a terrorist would do it.

Now approach problems with screener's performance on a proactive basis.

Should CASFO dictate to vendor on how to improve their performance?

Passenger profiling should just use data in air carrier data banks—maybe also NCI database. It does not want to get into bank accounts—what about the IRS (Internal Revenue Service)?

Change the list of minimum items that should be screened for. Right now, CSSs are determining what screeners should be trained to look for.

A menu of tests should be available for CASFOs. This is particularly important for situations where (or when) SPEARS is not implemented. Having a series of different tests (as opposed to standard test objects) would improve system.

ACSSP will need to be changed.

Value in automated data is that it will provide data that is not now available.

FAA should be involved in in-service training designs. Get involvement of air carrier in system.
Maybe air carriers should see themselves as part of the system.

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