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Test and Evaluation Plan for Image Scan Holding's Axis-3D X-ray Machine

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16. Abstract

This Test and Evaluation Plan describes the evaluation process for comparing screener performance with Imagine Scan Holding's AXIS –3D X-ray System and conventional X-ray machine technology. All data from this Test and Evaluation will be compiled and analyzed with results to follow in a Test and Evaluation Report.

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EXECUTIVE SUMMARY

This Test and Evaluation Plan addresses the Critical Operational Issues and Criteria for the evaluation of screener threat detection performance using stereoscopic and conventional X-ray displays. Threats such as Improvised Explosive Devices (IEDs) as well as guns and knives will be randomly inserted into carry-on baggage. Test participants, experienced screeners from surrounding major airports, will perform their normal duty of screening baggage on both types of displays. Measures of performance such as hit, miss, false alarm, and response time rates will be collected, analyzed, and summarized in a Test and Evaluation Report.

PREFACE

This plan was developed by the Federal Aviation Administration's Aviation Security Human Factors Program at the William J. Hughes Technical Center, Atlantic City International Airport, New Jersey in support of the Associate Administrator for Civil Aviation Security, ACS-1. Key FAA personnel supporting this plan are J. Michael Barrientos, Michael D. Snyder, Brenda A. Klock, Susan B. Monichetti, and Eric Neiderman, Ph.D., of the Aviation Security Research and Development Division, AAR-510, and Lyle Malotky, Scientific Advisor for the Associate Administrator for Civil Aviation Security, ACS-20. Key contractor support personnel are Melissa Dixon, Bill Maguire, Donald Hartman, and Terence Nelson of Federal Data Corporation.

ACRONYMS AND ABBREVIATIONS

ASL	Aviation Security Laboratory
c	Response Bias
COIC	Critical Operational Issues and Criteria
d'	Sensitivity Measure
FAA	Federal Aviation Administration
IED	Improvised Explosive Device
MOP	Measure of Performance
P_d	Probability of Detection
P_{fa}	Probability of False Alarm
TEP	Test and Evaluation Plan

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1. INTRODUCTION

1.1 Background

The first aviation security X-ray machine, manufactured by Bendix Corporation, was in use at Washington National Airport in 1972. Its purpose was to help screeners determine the contents of passenger baggage without having to open or tamper with items. During that time, the threat to aviation security was guns, knives, and grenades/pipe bombs which were fairly easy to detect with proper training and experience using conventional X-ray machines. Now, the threat has shifted to sabotage by bombing through more sophisticated objects like Improvised Explosive Devices (IEDs). An IED is composed of explosive material combined with the necessary bomb components hidden in innocent objects like portable radios making it more difficult for screeners to detect.

Today's X-ray machines have improved considerably with better imaging quality, faster throughput rates, and many added features to help the screener with the identification of objects. However, X-ray machines have been displaying three dimensional objects in two dimension, thus, the observer has to decipher objects and their spatial relationship to one another, then process this information back into a three dimensional mental model. The screeners' task relies heavily on the ability to observe, orient and focus attention, integrate information and stored knowledge from memory, visualize objects from partial information, perform mental rotation, and subsequently recognize familiar and unfamiliar objects (Neiderman & Fobes, 1997).

The FAA, working with the aviation industry, encourages the development of new equipment to improve aviation security for the traveling public and emphasizes human factors as critical to the success of these efforts. Various X-ray technologies have recently been developed to aid the screener identify "difficult-to-detect" threats such as IEDs. Image Scan Holdings, Ltd. of the United Kingdom has developed one such approach, three-dimensional X-ray (3D), available on their AXIS-3D X-ray machine, which displays a true stereoscopic X-ray image.

1.2 Scope

The objective of this test is to determine if 3D X-ray technology enhances screener threat detection performance with IEDs as well as guns and knives. This Test and Evaluation Plan (TEP) addresses the Critical Operational Issues and Criteria (COIC) and Measures of Performance (MOPs) for the evaluation of this system.

2. CRITICAL OPERATIONAL ISSUES, CRITERIA, AND MEASURES OF PERFORMANCE

The COICs and MOPs are those issues and criteria necessary to evaluate how well screeners perform using the system. The approach towards evaluating the capability of threat detection with a three-dimensional display is to test this system against conventional X-ray.

2.1 Issue 1 – Impact of Three-dimensional X-ray Display on IED Detection

Does the three-dimensional X-ray machine enhance screeners' ability to detect IEDs?

Criterion 1-1 Investigative in nature.

MOP 1-1-1 Operators' Probability of Detecion (P_d) for IEDs.

MOP 1-1-2 Operators' Probability of False Alarm (P_{fa}).

MOP 1-1-3 Operator's sensitivity (*d'*) for IEDs.

MOP 1-1-4 Operator's response bias (c) for IEDs.

2.2 Issue 2 – Impact of Three-dimensional X-ray on Weapons Detection

Does three-dimensional X-ray display enhance screeners' ability to detect weapons (guns and knives)?

Criterion 2-1 Investigative in nature.

MOP 2-1-1 Operators' Probability of Detecion (P_d) for weapons.

MOP 2-1-2 Operators' Probability of False Alarm (P_{fa}).

MOP 2-1-3 Operator's sensitivity (d') for weapons.

MOP 1-1-4 Operator's response bias (c) for weapons.

2.3 Issue 3 - Usability

Are there any software or hardware factors or procedural aspects that degrade system usability for screeners?

Criterion 3-1 Investigative in nature.

MOP 3-1-1 Human factors subject matter experts will evaluate usability issues listed in see Appendix B.

MOP 3-1-2 Deficiencies found through questionnaires, surveys, interviews, and debriefs with screeners.

3. LABORATORY TEST AND EVALUATION

Approval from the Institutional Review Board will be obtained prior to the conduct of this test. The Board ensures that human participants will be protected according to 45 CFR, Part 46 of 1981; 49 CFR, Part 11 of 1991; and FAA Order 9500.25, Protection of Human Research Subjects.

3.1 System Description

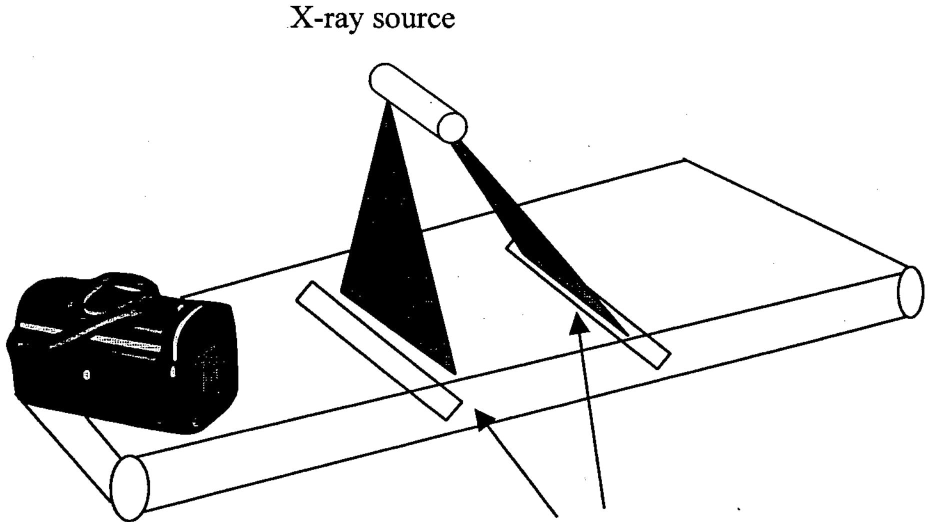

Figure 1. 3D Capture Process

The Axis-3D X-ray machine, manufactured by Image Scan Holdings, PLC of the U.K., offers the unique function of full stereoscopic 3D X-ray imagery. The system uses the patented SecureScan TM technology, which enables the conversion of conventionally scanned 2 dimensional (2D) X-ray data into 3D imaging in real time. Figure 1 illustrates the basic process of how the information is captured. As a bag goes through the conveyor over each detector array, the computer cross-examines the sensors as the X-ray beams slice the bag at two different cross sections and stores the resultant data. Each reading from the detector array effectively produces a 'slice' image of the bag over the detector at that instance in time. As the bag passes through the X-ray machine, a complete image, containing many slices, is stored on the computer for each of the detector arrays. The relationship between the two sets of stored images, the geometry of the X-ray detectors, and the source make it possible to reconstruct a full stereoscopic 3D representation of the bag. What is actually being displayed on the monitor are two separate, and slightly differing, images of the object being X-ray scanned (one for each eye). This is called disparity. The combination of the disparity and the polarized monitor and lenses allow for the fusion of the two images adding depth to the object being viewed.

3.2 Test Overview

This test will evaluate screener threat detection performance with full stereoscopic or 3D X-ray display. To determine this effectively, a comparison of 3D X-ray performance must be made with 2D X-ray performance on the same display platform, meaning the X-ray image resolution and features of the machine must be the same for both conditions. Each participant will be tested on both display methods. They will be randomly assigned to first scan 120 test bags on either the 3D or 2D display condition. Data collectors will record test participants' responses (hits, misses, false alarms, and response times). Then, they will assess the same 120 bag set on the other display condition.

The Axis-3D machine will be tested in combination with a second machine, the Rapiscan Dual X-ray machine, which provides two separate views of object being scanned (two different perspective images of the same object). The dual-view X-ray display will be tested in the same manner as the Axis-3D, that is, all test participants will be tested with the dual-view display as well as the standard conventional X-ray. This creates four test conditions: 1) Dual-view -On, 2) Dual-view -Off, 3) 3D -On, and 4) 3D - Off.

3.3 Test Site

Laboratory #1 of the Aviation Security Laboratory (ASL) at the FAA William J. Hughes Technical Center in Atlantic City, NJ will be the test site location.

3.4 Test Bags.

TABLE 1. BREAKDOWN OF TEST BAG SET BY BAG TYPE

Bag Type	***Comparison Bags***	***Test Bags***
70% rollaboards briefcases duffle/gym bags folding/hanging bags	21 rollaboards 21 briefcases 21 duffle/gym bags 21 folding/hanging bags	3 rollaboards 2 briefcases 2 duffle/gym bags 1 folding/hanging bags
20% backpacks purses overnight cases shoulder bags	6 backpacks 6 purses 6 overnight cases 6 shoulder bags	1 backpacks 1 shoulder bags
10% PC carrying case shopping bag make-up kit camera bags	3 PC carrying case 3 shopping bags 3 make-up kit 3 camera bags	1 PC carrying case 1 make-up kit
Total # of Bags	***108***	***12***

There will be a total of 120 test bags used for this study. Of the 120 bags, 108 representative passenger carry-on bags will be presented to each participant along with 12 bags containing a gun, knife, or IED. The bag set of 120 bags will be divided into four groups or sets of 30 bags (i.e. bag sets A, B, C, and D). This is one means to counterbalance the design of the test since all test participants will view the same bag set for all four-display conditions. Table 1 illustrates a breakdown of the threat and comparison bags according to bag type. The bag types, quantities, and ratios are identical to those used by Fobes and Barrientos (1997).

3.5 Test Participants

Sixteen screeners from Category X and Category 1 airports will participate in the study. They must be currently employed as an X-ray operator, 18 years of age or older, and not pregnant. Screeners used in the study will participate during their regularly scheduled days off and will be monetarily compensated for their participation. Each will be tested for all four conditions and will be randomly assigned to a test condition.

Because of the inherent dangers of handling explosives, four FAA explosive specialists from the ASL will participate in the study. They will be responsible for handling all test bags. Screeners or data collectors will be prohibited to touch or handle any items or equipment in the laboratory except for the X-ray machine and data collection items.

3.6 Threat Test Articles

3.6.1 Real Explosive Threats

Eight threat bags will contain a specific bomb type configuration. These explosives and their types of concealment are on file for reference with AAR-500. The threat articles will be randomly assigned and inserted into the bag set (see Appendix C).

3.6.2 Gun and Knife Threats

Four threat bags will contain a single gun or knife threat. These threats are on file for reference with AAR-500. The threat articles will be randomly assigned and inserted into the bag set.

3.7 Data Collection Forms.

Prior to the commencement of the study, human factors engineers will prepare data collection forms that will include the participant number, date, X-ray machine status (e.g., dual-view or Axis-3D -On or -Off), a listing of the bag numbers, and the screener's response.

Human factor engineers will also distribute a questionnaire to elicit usability information from the screeners (see Appendix A). In addition to acquiring screener comments on three-dimensional technology in general, the test directors hope to gain insight with any deficiencies found with the system.

3.8 Test and Evaluation (T&E) Milestones

Table 2 shows the milestones for planning and reporting the T&E.

TABLE 2. T&E MILESTONES

MILESTONES	DATE	RESPONSIBLE PARTY
IRB Approval	February 14, 2000	AAR 510
Write Health and Safety Plan	February 28, 2000	AAR-510
Approve TEP	March 3, 2000	AAR-510 & 520
Test Preparation (assemble IEDs real explosives /coordinate of test personnel/prepare test bags)	Mid-March 2000	AAR-520
Coordinate with Vendors	Mid-March 2000	AAR-510
Brief and Train All Test Participants (safety and X-ray machine operations)	Early April 2000	AAR-510
Run Test	Mid April 2000	AAR-510 & 520
Analyze Phase I Data	Late April 2000	AAR-510 & 520
Publish Results	May 2000	AAR-510 & 520

3.9 Laboratory Test Procedures.

The laboratory test will be conducted over a two-week span. Table 3 provides a tentative schedule of events.

TABLE 3. SCHEDULE OF EVENTS

Day	Date	Event
1	Monday, April 10th	Test overview and safety training for 1st week screeners (9 total)
2	Tuesday, April 11th	Participants 1 and 2
3	Wednesday, April 12th	Participants 3 and 4
4	Thursday, April 13th	Participants 5 and 6
5	Friday, April 14th	Participants 7 and 8
6	Monday, April 17th	Test overview and safety training for 2nd week screeners (9 total)
7	Tuesday, April 18th	Participants 9 and 10
8	Wednesday, April 17th	Participants 11 and 12
9	Thursday, April 18th	Participants 13 and 14
10	Friday, April 19th	Participants 15 and 16

3.9.1 Test Overview and Safety Training.

Before each test session, all participants will be brought to the ASL for an overview of the study, training on safety, and training of the operations and features of the Axis-3D machine. During this period, test directors will explain specific objectives, duties, and experimental procedures. All participants will have ample opportunities to ask questions during this time. Screeners who are willing to continue will then be asked to sign a consent form (see Appendix A) that states that they understand the risks involved and that they are willfully volunteering to participate.

Following the overview, an ASL Safety Officer will offer a safety training class to those consenting participants. This training will include evaluation routes, emergency telephone numbers, and a safety video. The test overview and safety training should take approximately 45 minutes.

3.9.2 X-ray Machine Training.

After the completion of safety training, the session will conclude with X-ray machine training provided by the manufacturer. A representative from Image Scan Holdings will show screeners how to operate each system, including specific machine functions such as 3D/2D zooming, organic and inorganic stripping, inverse video, and the like. Training will continue until each participant shows proficiency in operating the X-ray machines. Typical carry-on bags will be available for screeners to scan, thus giving them a hands-on opportunity to use the system.

3.9.3 Test Procedures.

The Axis-3D machine will be tested in combination with a second machine that provides a dual-view display, however, the TEP and results for each system will be published separately [2].

Two test participants will be tested each day. During a single trial, participants will assess the whole bag set (120 bags) with each X-ray machine display. Each participant will scan the entire bag set in the four display conditions. This bag set will be divided into four groups for order rotation purposes so that the order in which they are presented will be different for each participant for each condition. This is to eliminate order effect since test participants will be observing the whole bag set for each condition.

The order which participants will first screen with a display condition will also be counterbalanced. A Latin square design depicting treatment conditions is shown in Table 4. Each test condition should take approximately one and 15 minutes, with a maximum total of five hours to complete the entire test scenario.

TABLE 4. COUNTERBALANCED DESIGN FOR TREATMENT CONDITIONS

Screener	Dual View On		Dual View Off		3-D On		3-D Off	
	Machine Sequence	Bag Order	Machine Sequence	Bag Order	Machine Sequence	Bag Order	Machine Sequence	Bag Order
1	1	ABCD	2	DABC	3	CBAD	4	CABD
2	3	ADCB	4	BDCA	1	CDAB	2	BCDA
3	1	DBAC	2	CADB	4	ABCD	3	DBCA
4	3	CADB	4	CDAB	2	DBCA	1	ACDB
5	1	ACDB	3	ABCD	2	CDBA	4	BCAD
6	4	ADBC	2	BACD	1	DBAC	3	CDAB
7	3	BADC	1	ACDB	4	BDCA	2	DACB
8	2	CBDA	4	CABD	3	DCBA	1	DBAC
9	1	ACBD	4	BCDA	3	CABD	2	DCAB
10	3	BDCA	2	ABDC	1	BDAC	4	DABC
11	2	ABDC	3	ACBD	4	DABC	1	BACD
12	4	BCDA	1	CDBA	2	DCAB	3	BDAC
13	2	DACB	3	BDAC	1	ADCB	4	BADC
14	4	DCBA	1	CBAD	3	ACBD	2	CBDA
15	2	BCAD	1	DBCA	4	ABDC	3	CBAD
16	4	DCAB	3	ADCB	2	ADBC	1	CADB

3.9.4 Test Limitations and Impact.

Test location is a potential limitation for alarm resolution as laboratory testing does not offer the same distracters as in the airport environment. Conversely, the lab environment may also increase screener attention and motivation.

Also, the possibility of the memorization of specific bag and its content may occur since participants will view the bag set four times.

4. DATA ANALYSIS.

For quantitative data, human factors engineers will calculate P_d, P_{fa}, d', and $\underline{c}$ for each explosive type and X-ray machine condition. They will compare screeners' baseline performance (i.e., Dual-View and 3-D turned "Off") to their performance using the new technology (i.e., Dual-View and 3-D turned "On").

In addition, human factors engineers will summarize qualitative data from questionnaires and interview notes. Furthermore, they will analyze data from the usability evaluation and report any discrepancies found. Finally, human factors engineers will document the results of the data analysis in a final Test and Evaluation Report.

5. REFERENCES

Fobes, J. L., and Barrientos, J. M. (1997). *Test and Evaluation Report for Alarm Resolution With X-ray Screener Assist Technologies* (DOT/FAA/AR-97/59). Atlantic City International Airport, NJ: FAA William J. Hughes Technical Center.

Neiderman, E.C., and Fobes, J.L. (1997). *A Cognitive Model of X-Ray Security Screening: Selection Tests to Identify Applicants Possessing Core Aptitudes* (DOT/FAA/AR-97/63). Atlantic City International Airport, NJ: FAA William J. Hughes Technical Center.

Snyder, Michael D., Barrientos, J. M., and Fobes, J. L. (1999). *Test and Evaluation Report for the Rapiscan Dual View X-ray Machine* (DOT/FAA/AR-99/XX). Atlantic City International Airport, NJ: FAA William J. Hughes Technical Center.

APPENDIX A
CONSENT FORM

INFORMED CONSENT FORM FOR 3D X-RAY DISPLAY EFFECTIVENESS STUDY

I, ____, have received a briefing by the FAA about the purpose and procedures of the test and have been provided with the opportunity to ask questions. The test will require training on Image Scan Holding's Axis 3D X-ray system. The test also involves the screening of carry-on passenger baggage, some of which will contain actual explosives. Therefore, there is some risk involved. However, neither a live detonator nor any other explosive initiator will be present in the bags. I have also been informed of all safety precautions that will be taken to ensure all testing is carried out in a safe and secure manner. Training and testing will require approximately two days.

I also understand that the exposure to X-ray radiation will not exceed that in which I am normally exposed. In addition, I realize that I am required to wear a dosimeter that will be analyzed at the end of each month. I will be informed of any abnormally high radiation exposure amounts. I also understand that I will not be exposed to any toxic materials or devices.
As part of the data analysis, my data will be combined with that of other individuals and I will no longer be identifiable as a participant. I have been informed that my name will remain CONFIDENTIAL.

I have been informed that I have the right to withdraw from the test, and that the Test Director may terminate my participation in the interest of safety and the test. I also certify that I am at least 18 years of age and am NOT pregnant.

I have been informed that if I have any further concerns or questions, I may contact either of the Test Directors, Michael Barrientos at (609) 485-6825 or Michael Snyder at (609) 485-5388.

Signed: ________________________________

Date: ___/ ___/ 1999

Witness: ______________________________

Date: ___/ ___/ 1999

APPENDIX B
DEFICIENCY RATING SCALE AND USABILITY CHECKLIST

INTRODUCTION

The purpose of the Usability Rating Scale and Checklist is to serve as a tool in the evaluation of the Rapiscan Dual Plane and Image Scan Holdings AXIS 3D systems from a human factor's perspective. The criteria is that each system should enhance rather than impede screener's ability to identify objects in a piece of luggage, specifically possible threat objects (i.e., guns, knives, IEDs). User acceptance of the new systems is based on the following four user characteristics (1)

- Past system experience,
- Capability to perform their job faster, with fewer errors,
- Management's preparedness of the users to accept the new systems, and
- Relationship between user acceptance and age (more resistance among older workers).

USABILITY RATING SCALE

4.1.1 Severity	**Description**
Severe	THERE IS A HIGH PROBABILITY OF OPERATIONAL FAILURE, SEVERE DAMAGE, LOSS OF EQUIPMENT, AND INJURY TO OPERATORS.
Major	There is a high probability of degraded system performance, major damage to equipment, or discomfort to operators.
Moderate	There may be no measurable impact on system performance, though there is a measurable impact upon the performance of system components or sub-systems (including the human subsystem). Operators try to compensate for, or work around, system defects.
Minimal	There is no measurable impact on the performance of system components or subsystems (including the human subsystem), although operators' negative attitudes toward features to the system may be measurable.
Negligible	The problem has a negligible impact on short-term system performance. There may be no measurable impact on operator attitudes.
None	No problem or negative factor related to system performance is noted.

Human Factors Principle	Deficiency Rating	Comments
Data Entry		
1. Provide prompting for the required formats and acceptable values for data entries.		
2. Ensure that the computer will acknowledge entry of a designated position within 0.2 seconds.		
3. Provide software for automatic data validation to check any item whose entry and/or correct format or content is required for subsequent data processing.		
4. If data validation detects a probable error, display an error message to the user at the completion of data entry; do not interrupt an ongoing transaction.		
5. Ensure that control actions for cursor positioning are compatible with movements of the displayed cursor, in terms of control function and labeling.		
6. An explicit action is required to initiate the processing of critical information.		
7. For position designation on the X-ray display, provide a movable cursor with distinctive visual features (blink, shape).		
8. Make labels consistent; always employ the same labels to indicate the same kind of information.		
9. Each function has a unique input device that is well-marked with labels and/or icons.		
Data Display		
1. Reserve several lines of the screen of every display for status and error messages, prompts, and command entry.		
2. Use auditory displays, when appropriate, as a means of supplementing a visual display, or as an alternative means of data output in applications where visual displays are not feasible.		
3. Sufficient contrast shall be provided between displayed information and the display background to ensure that the required information can be perceived by the operator under all expected lighting conditions.		
4. Displays shall be located and designed so that they may be read by personnel in normal operation without requiring an uncomfortable, awkward, or unsafe position.		
5. User should have control of the quality of the displays without degrading the displays.		
5. Glare shall be minimized by proper crt placement and/or shielding.		
7. The preferred viewing distance from the eye reference point to a display should be at least 510mm (20 in.).		
8. Users should be able to control the amount, format, and complexity of displayed data, as necessary to meet task requirements.		

Human Factors Principle	Deficiency Rating	Comments
Sequence Control		
1. Ensure that control actions are simple, particularly for real-time tasks requiring fast user response; control logic should permit completion of a transaction sequence with the minimum number of actions consistent with user abilities.		
2. Allow users to take initiative and control their interaction with the computer; try to anticipate user requirements and provide appropriate user control options and computer responses in all cases.		
3. Ensure that sequence control actions are consistent in form and consequences; employ similar means to accomplish ends that are similar, from one transaction to the next, and from one task to another, throughout the user interface.		
4. Ensure that the computer acknowledges every control entry immediately; for every action by the user there should be some apparent reaction from the computer.		
5. Ensure that the speed of computer response to user control entries is appropriate to the transaction involved; in general, the response should be faster for those transactions perceived by a user to be simple.		
6. Allow users to make control entries as needed; a sequence of control entries should not be delayed by delays in computer response.		
7. The user, not the computer, shall control the pace of control entries by explicit action.		
8. When a function is activated, the function name should appear on the screen.		
9. Each menu display should permit only one selection by the user.		
10. When multiple menu options are displayed in a list, display each option on a new line, i.e., format the list as a single column.		
11. Display an explanatory title for each menu, reflecting the nature of the choice to be made.		
12. List displayed menu options in a logical order; if no logical structure is apparent, then display the options in order of their expected frequency of use, with the most frequent listed first.		
13. Provide a general menu of basic options as the top level in a hierarchic menu structure, a "home base" to which a user can always return as a consistent starting point for control entries.		
14. Keys controlling frequently used functions should permit single key action and should not require double (control/shift) keying.		
15. When function key activation does not result in any immediately observable natural response, provide users with some other form of computer acknowledgement.		
16. If a function is assigned to a particular key in one transaction, assign that function to the same key in other transactions.		
17 A zoom capability should be provided to enlarge critical display areas.		
18. Ensure that alarm signals and messages are distinctive for each class of events.		

Human Factors Principle	Deficiency Rating	Comments
User Guidance		
1. Design standard procedures for accomplishing similar, logically related transactions.		
2. Design display formats so that user guidance material is readily distinguishable from displayed data.		
3. Adopt task-oriented wording for labels, prompts, and user guidance messages, incorporating whatever special terms and technical jargon may be customarily employed in the users' tasks.		
4. Allow users to switch easily between any information handling transaction and its associated guidance material.		
5. Provide some indication of system status to users at all times.		
6. Ensure that every input by a user will consistently produce some perceptible response output from the computer; when a terminal is in use, its display screen should never be blank.		
7. When computer processing of a user entry has been delayed, inform the user when processing is completed, and provide appropriate guidance for further user actions.		
8. When the computer detects an entry error, display an error message to the user stating what is wrong and what can be done about it.		
9. Ensure that specific user guidance information is available for display at any point in a transaction sequence.		
10. In addition to explicit aids (labels, prompts, advisory messages) and implicit aids (cueing), permit users to obtain further on-line guidance by requesting HELP.		
Data Transmission		
1. Ensure that data transmission functions are integrated with other information handling functions within a system.		
Data Protection		
1. Whenever possible, provide automated measures to protect data security, relying on computer capabilities rather than on more fallible human procedures.		
2. When passwords are required, allow users to choose their own passwords.		

(1) Bailey, R. W., "Human Performance Engineering", Prentice Hall, New Jersey,1989.

APPENDIX C
THREAT ARTICLE DEFINITION SHEET
FOR CARRY-ON BAG

This material is 191 Restricted.

To obtain access, submit a written request
Citing this document and including a justification to:

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