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# **ARGUS EDS Test and Evaluation Master Plan**

**Short Title "ARGUS TEMP"**

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May 2001

Test Plan

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<b>16. Abstract</b> <p>This master plan outlines the test and evaluation activities required to develop the ARGUS Explosives Detection System (EDS) and the organization required to support that effort. The plan identifies 40 verification requirements, their method of verification, and assignments. The Grantees are responsible for certifying compliance; the program outlined herein formally verifies compliance. That is, regardless of the approach to verification identified in this TEMP for any particular requirement, the vendor is to certify that it has been satisfied prior to any evaluation by the FAA. The FAA will provide further verification of many requirements and, as required by statute, formal certification of specific effectiveness requirements.</p> <p>The plan identifies seven (7) test and evaluation activities to take the EDS from development testing through system testing and technology transition to a procurement ready status. FAA Certification Testing is an important part of the testing needed because no system can be fielded that has not passed that testing. However, it is only one of the seven events. Most of the requirements for the ARGUS EDS are not related to FAA Certification. Most of them apply to the suitability of the system for use in its intended operational environment by its intended users in accordance with its established procedures. These suitability requirements address such issues as initial and recurring cost, ease of operation, availability of quality documentation, system reliability and availability, data collection for system assessment and improvement, environmental issues, and safety.</p>					
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## EXECUTIVE SUMMARY

The ARGUS Explosives Detection System (EDS) is intended to be a design that trades throughput capacity for lower unit cost which will enable a uniform level of security to be maintained throughout the United States civil aviation system in a cost-effective manner. This document establishes the Test and Evaluation Master Plan (TEMP) for the ARGUS development program.

The plan identifies 40 verification requirements, their method of verification, and assignments. While the Grantees are responsible for certifying compliance, this program formally verifies compliance. That is, regardless of the approach to verification identified in this TEMP for any particular requirement, the vendor is to certify that it has been satisfied prior to any evaluation by the FAA. The FAA will provide further verification of many requirements and, as required by statute, formal certification of specific effectiveness requirements.

Of the 40 requirements, eight are to be verified by formal testing and 13 by demonstration. Seven are to be verified by analysis and six by inspection. One will be verified by certification by an independent agency and four by vendor certification. Only one requirement, to minimize installation and integration costs, is not verifiable.

The plan identifies seven test and evaluation activities to take the EDS from development testing through system testing and technology transition to a procurement ready status. Each test and/or evaluation activity addresses some or all of the user/owner-oriented requirements and is described with a

- Descriptive title,
- Location (Grantee, FAATC, Airport, or other location),
- Lead organization (Grantee or FAA),
- Paragraphs in the specification document of particular interest, and
- List of requirements against which the ARGUS EDS prototype is to be evaluated.

FAA Certification Testing is an important part of the testing needed because no system can be fielded that has not passed that testing. However, it is only one of the seven events. Most of the requirements for the ARGUS EDS are not related to FAA Certification. Most of them apply to the suitability of the system for use in its intended operational environment by its intended users in accordance with its established procedures. These suitability requirements address such issues as initial and recurring cost, ease of operation, availability of quality documentation, and system reliability and availability, data collection for system assessment and improvement, environmental issues, and safety.

Test plans are not included with this TEMP, but will be required prior to each event assessing any requirement marked as requiring a test. The organizational structure is presented in the final section and an assignment table, identifying FAA personnel with each requirement, is included as an appendix. The applicable test plan due date is shown in Appendix A for each requirement segment.



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## 1. INTRODUCTION

The ARGUS Explosives Detection System (EDS) is intended to be a design that trades throughput capacity for lower unit cost which will enable a uniform level of security to be maintained throughout the United States civil aviation system in a cost-effective manner. The ARGUS program was initiated with a solicitation to industry, which included a specification document as an appendix [1]. Alternate prototype systems are being developed in parallel by cost-sharing Grantees under Cooperative Award Agreements (Grants) to assure a successful development.

The purpose of this document is to establish the Test and Evaluation Master Plan (TEMP) for the ARGUS development program. It describes the ARGUS system requirements, seven test and evaluation activities, and the ARGUS Systems Program Office that will take the ARGUS EDS from development testing through system qualification and technology transition to procurement ready status. This TEMP applies to all ARGUS development efforts. It differs from the Contractor's Master Test Plan described in the Acquisition Management System Test and Evaluation Guidelines [18] in that it specifically addresses the responsibilities of FAA personnel.

## 2. DOCUMENTS REFERENCED HEREIN

1. ARGUS Explosive Detection System (EDS), Solicitation No. 99.1, with Rev 8.8 of Appendix A "Revised ARGUS Explosives Detection System Specification"
2. Cooperative Agreement Number 2000-G-002, ARGUS Explosive Detection System (EDS) for Small Airports (PerkinElmer Instruments)
3. Cooperative Agreement Number 2000-G-003, ARGUS Explosive Detection System (EDS) for Small Airports (L-3 Communications Security Systems Division)
4. Cooperative Agreement Number 2000-G-004, ARGUS Explosive Detection System (EDS) for Small Airports (InVision Technologies)
5. Federal Register Vol. 57, No. 214, Notice # 92-16, Docket 27026, Nov 4, 1992: "Criteria for Certification of Explosive Detection Systems as Defined Under 14 CFR 108.20" (C)
6. ARGUS-EDS Operator Performance Criteria (C), 14 July 99 FAA- AAR-520
7. FAR 108.31
8. FAR Part 108.17
9. American Society for Testing and Materials Standard F792-82
10. Underwriter's Lab (UL) Standard 60950, commercial standards for fire and shock hazards
11. International Electrotechnical Commission (IEC) 950, commercial standards for fire and shock hazards
12. MIL-STD-973 Configuration Management
13. 47 CFR 15 FCC: Radio Frequency Devices

14. 21 CFR 1020.40 FDA: Performance Standards for Ionizing Radiation Emitting Products
15. 29 CFR 1910 OSHA: Ionizing Radiation
16. DOT/FAA/AR-97-67: "Functional Requirements for Threat Image Projection Systems on X-ray Machines"
17. DOT/FAA/AR-00/XX: "Airport Security Integration Technology (ASTI) Five-Year Plan" (Draft)
18. "Acquisition Management System Test and Evaluation Process Guidelines", December 1999.
19. DOT/FAA/CT-93/54: "Management Plan for Explosive Detection System Certification Testing", October 1993.

### **3. SYSTEM DESCRIPTIONS**

Three Grantees remain after the initial phase of the development program:

- PerkinElmer Instruments (PerkinElmer), Cooperative Agreement Number 2000-G-002, ARGUS Explosive Detection System (EDS) for Small Airports [2]
- L-3 Communications Security Systems Division (L-3), Cooperative Agreement Number 2000-G-003, ARGUS Explosive Detection System (EDS) for Small Airports [3]
- InVision Technologies (InVision), Cooperative Agreement Number 2000-G-004, ARGUS Explosive Detection System (EDS) for Small Airports [4]

Although each Grantee's proposed ARGUS EDS is unique with respect to details, all proposed systems incorporate the major subsystems/components listed below:

- Computed Tomography – use of a rotating assembly of X-ray sources and sensors to create three dimensional images using reconstruction software
- Algorithms implemented in software to discern suspect objects within baggage
- Internal conveyors to accept individual pieces of baggage, present the baggage to the X-ray equipment, and discharge the baggage from the system
- Shielding to protect the operator and others from the X-ray radiation
- A human-machine interface to enable operation of the system and facilitate operator resolution of alarms
- Other mechanical and electrical components, subsystems, and features as required to complete each system

Because competition furthers the low acquisition and maintenance cost objective of the ARGUS development program, potential vendors who have not participated successfully in the Grant may still bid on any procurement contracts that follow. Such procurement contracts will not be restricted to either the manufacturers or technologies listed above.

#### 4. SYSTEM REQUIREMENTS AND VERIFICATION APPROACH

The Federal Aviation Administration (FAA) Security Equipment Product Team (SEIPT) and air carrier representatives have actively participated in multiple design reviews during the first two phases and beginning of the third phase of the development program. As a result, some of the requirements anticipated for the planned procurement contracts to follow are at variance with requirements specified in the Grant. This TEMP reflects the latest, but not necessarily the final, requirements anticipated for procurement with one exception. Requirements addressing the cost of acquiring and maintaining a specified number of units with a particular set of features have been retained as a goal because low cost is a key objective of the ARGUS development program. The quantity specified has always been hypothetical and intended only as a design point, not as an acquisition objective.

Table 1 is organized using the structure of the specification document and displays a summary of the ARGUS EDS requirements relevant to the Cooperative Agreements. The requirements text shows editing to trace back to the original Grant requirements, version 8.8 [1]. Each requirement is traced to a specific paragraph in that specification document. The specification included additional requirements identified as not applicable to the grant but forward looking to the procurement. Typically, those requirements either did not involve research to be funded by a grant or involved issues to be resolved by the FAA. None of these requirements is addressed in the TEMP. Also shown in the table is the approach to be used to verify each requirement. The codes used to identify the verification approaches are listed below:

- A Analysis 7 cases
- C Certification<sup>1</sup>
  - C-I by an independent evaluation agency<sup>2</sup> 1 case
  - C-V by the Grantee 4 cases
- I Visual inspection 6 cases
- D Demonstration or informal testing with a small sample size; or Visual Inspection plus physical operation of the machine or operator interviews; or observation of random events during formal testing or other machine operations. 13 cases
- T Formal testing. A test plan is required. 8 cases
- NV Not Verifiable. 1 case

Appendix A contains the project specification verification matrix, which identifies the verifying needed to ensure the developed system satisfies the functional and performance requirements. To facilitate the verifying, all requirements have been divided into test and evaluation segments

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<sup>1</sup> Here, verification by certification does not refer to the FAA Certification of EDS.

<sup>2</sup> For example, Underwriters Laboratories

and leaders have been assigned to each segment, as identified in the appendix. The applicable test plan document number and due date are shown in the appendix for each segment.

It is emphasized that the philosophy of quality assurance in the ARGUS EDS program is to place the responsibility for quality in every respect on the vendor (Grantee) with further assurance provided by the FAA in selected areas. That is, regardless of the approach to verification identified in table 1 for any particular requirement, the vendor is to certify that it has been satisfied prior to any evaluation by the FAA.

**TABLE 1. REQUIREMENTS SUMMARY**

ARGUS Spec.	Specification Item	Issue	Requirement	Req. No.	Verify by
3.0	ARGUS-EDS CORE CAPABILITIES		<i>Header only</i>		
3.1	AUTOMATED INSPECTION		<i>Header only</i>		
3.1.1	AUTOMATED OPERATION		<i>Header only</i>		
3.1.1.a	AUTOMATED OPERATION	FAA Certification of Effectiveness	ARGUS shall meet all FAA EDS Certification Criteria for automated bag inspection except throughput. [5], [6]	1	T
3.1.1.b	AUTOMATED OPERATION	Reduced- Mass Effectiveness	ARGUS shall meet all certification level detection rates for 75% threat masses. (The false alarm rate for 75% threat mass should meet the EDS Certification Criteria as a goal.)	2	T
3.1.2	BAD-SCAN LIMIT	Bad-Scan Limit	Corrupted, split, or missed bag image events shall be $\leq 1$ per 1000.	3	T
3.2	OPERABILITY		<i>Header only</i>		
3.2.1	OPERATORS / HUMAN FACTOR CRITERION	Operator Skill Level	ARGUS shall be operable by screeners whose personnel requirements are specified in FAR Part 108.31 in terms of auditory and visual acuity, dexterity, English proficiency, and educational level. [7]	4	T
3.2.2	ALARM RESOLUTION		<i>Header only</i>		
3.2.2.1	STATE CONTROLS and DISPLAYS		<i>Header only</i>		
3.2.2.1.a	STATE CONTROLS and DISPLAYS	System Status Displays	ARGUS shall provide informative and actionable displays on system status, calibration and automated diagnostic results, bag jam and bad or incomplete scan events.	5	D
3.2.2.1.b	STATE CONTROLS and DISPLAYS	Start-Up and Power-Down	ARGUS shall permit simple start-up and power-down at one workstation.	6	D
3.2.2.1.c	STATE CONTROLS and DISPLAYS	Image Quality	ARGUS shall satisfy FAR Part 108.17 (a)(5) and shall permit a typical operator to distinguish 24-gauge wire under the fifth step using a Test Step Wedge specified in American Society for Testing and Materials (ASTM) Standard F792-82. [8]	7	D

TABLE 1. REQUIREMENTS SUMMARY (CONTINUED)

ARGUS Spec.	Specification Item	Issue	Requirement	Req. No.	Verify by
3.2.2.1.d	STATE CONTROLS and DISPLAYS	HMI	ARGUS shall permit operation with a graphic user interface emphasizing 'hard' keys or physical, dedicated switches for critical tasks involving state and alarm resolution functions.	8	D
3.2.2.2	ALARM RESOLUTION CONTROLS AND DISPLAYS		<i>Header only</i>		
3.2.2.2.a	ALARM RESOLUTION CONTROLS AND DISPLAYS	Effective Throughput	ARGUS shall be designed to permit an operator to resolve alarms accurately and achieve an average effective throughput of at least 50 bags per hour <sup>3</sup> (irrespective of hand search) [1].	9	T
3.2.2.2.b	ALARM RESOLUTION CONTROLS and DISPLAYS	Prompts	ARGUS shall include a provision for alarm resolution prompts to reinforce basic operator alarm resolution steps	10	D
3.2.3	DOCUMENTATION		<i>Header only</i>		
3.2.3.1	OPERATOR'S MANUAL	Operator's Manual	ARGUS shall contain an operator's manual for all tasks to be performed by the screener including state management, alarm resolution, training and limited diagnostics and maintenance.	11	I
3.2.3.2	HUMAN FACTORS ISSUES LOG	Human Factors Issues Log	Throughout its design, development, fabrication and testing, ARGUS shall include a physical log or manual record that identifies and tracks to resolution human factors issues including manpower, personnel, training, human factors engineering, and health & safety.	12	I
3.3	BAG CONTROL		<i>Header only</i>		
3.3.1	CLEARING JAMMED BAGS	Bag Jam Clearing	ARGUS shall permit direct personnel access to the main inspection enclosure to manually clear a bag jam in less than 30 seconds from time of discovery to resumption of inspection.	13	D
3.3.2	OPERATOR "SUSPECTED" BAG CONTROL	Suspicious Bag Control	ARGUS shall permit the operator and/or bag handler(s) to identify and control 100% of the bags the operator deems suspicious.	14	T
3.4	COST		<i>Header only</i>		
3.4.1	UNIT COST	Initial Cost	The ARGUS design, in a stand alone configuration and with features limited to the original Grant requirements, shall be producible <del>have</del> at a unit cost of \$-300,000 or less in production quantities of 100 units over 3 years as a goal.	15	A

<sup>3</sup> The published specification, reference 1, includes detail on means for determining satisfaction of this requirement.

TABLE 1. REQUIREMENTS SUMMARY (CONTINUED)

ARGUS Spec.	Specification Item	Issue	Requirement	Req. No.	Verify by
3.4.2	ANNUAL MAINTENANCE COST	Recurring Cost	ARGUS shall have an annual maintenance cost, including both preventive/scheduled and repair actions, of 10% of the Unit Cost or less, or security industry custom.	16	A
3.5	TRAINING PACKAGE	Training	ARGUS shall contain a training package <sup>4</sup> , completed by the end of Phase III, to create qualified operators.	17	T
3.6	INTERFACE DESIGN:	Power Tolerance	ARGUS shall accommodate airport lobby power and transients.	18	D
3.6	INTERFACE DESIGN	Installation Effort	ARGUS shall be designed to minimize installation and integration costs along with time.	19	NV
3.7	UL LISTING or EQUIVALENT	Listings by Safety Related Entities	ARGUS shall comply with appropriate standards (i.e., UL187 and UL 60950-1-1 or IEC 9506-10-1) listed by safety related organizations prior to the FAA's EDS Certification Readiness Test.	20	C-I
3.8	CONFIGURATION MANAGEMENT	Configuration Management	The ARGUS configuration should be controlled in accordance with an applicable standard (e.g., MIL-STD-973 Configuration Management or an equivalent ANSI/ISO/ASQC 9001) to assure performance verification repeatability and facilitate functional & physical configuration audits leading to production.	21	I
3.9	OPERATIONAL AVAILABILITY	Operational Availability	ARGUS reliability (Mean-Time-Between-Failure) and maintainability (Mean-Time-To-Repair) as designed should yield a 99% operational availability rate whereas the cumulative down-time per unit during inspection duty hours for all maintenance should not exceed 36.573 hours annually assuming a ten hour duty day for 365 days each year as a goal.	22	D
3.10	SINGLE SIDED ACCESS	Floor Space	ARGUS shall contain a provision for a configuration which offers single-sided access to minimize total floor space use.	23	D
3.11	PERFORMANCE GROWTH GOALS	Growth Goals	<i>Header only</i>		
3.11.1	PERFORMANCE GROWTH GOALS	Threat Mass	ARGUS should contain capacity for growth to achieve certifiable detection of smaller threat masses (below certification criteria) without compromise in false alarm or throughput as a first priority.	24	A

<sup>4</sup> As described in reference 1, the Grantee will use this training package to train and qualify five representative operators to verify satisfaction of operability requirements 4-14.



TABLE 1. REQUIREMENTS SUMMARY (CONTINUED)

ARGUS Spec.	Specification Item	Issue	Requirement	Req. No.	Verify by
3.11.2	PERFORMANCE GROWTH GOALS	Costs Reduction	ARGUS should contain capacity for growth to achieve lower unit or annual maintenance costs as a second priority.	25	A
3.11.3	PERFORMANCE GROWTH GOALS	Effective Throughput Growth	ARGUS should contain capacity for growth to achieve increased effective throughput as a third priority.	26	A
3.11.4	PERFORMANCE GROWTH GOALS	Installability	ARGUS should contain capacity for growth to achieve smaller footprint & lower weight and power needs as a fourth priority.	27	A
3.11.5	PERFORMANCE GROWTH GOALS	Trace Detection	<del>ARGUS should contain capacity for growth to achieve ICAO Vapor Taggant Detection with an integrated provision for an adjacent sensor as a fifth priority. Requirement Deleted</del>	28	A
3.12	PHYSICAL PARAMETERS		<i>Header only</i>		
3.12.1	PHYSICAL PARAMETERS	Bag Size	ARGUS should be able to accommodate oversized and extra-large checked bags with lengths up to 92 cm, widths up to 75 cm, and heights of 51 cm.	29	D
3.12.2	PHYSICAL PARAMETERS	Floor Loading	ARGUS floor loading should not exceed 500 kg per square meter.	30	A
3.12.3	PHYSICAL PARAMETERS	Footprint	ARGUS footprint should not exceed <del>165cm x 300335</del> cm.	31	I
3.12.4	PHYSICAL PARAMETERS	Height	ARGUS height should not exceed <del>200215</del> cm.	32	I
3.12.5	PHYSICAL PARAMETERS	Power	ARGUS power requirements should not exceed 20 kW.	33	C-V
4.0	LAB IMAGE ARCHIVER / PRINTER	Image Archiving and Printing	ARGUS shall possess an Image Archiver / <del>Printer</del> capability to support development. It shall record <del>and</del> redisplay, <del>and print</del> bag image files for near-real-time play-back to support data collection and testing.	34	D
5.0	ELECTROMAGNETIC COMPATIBILITY		<i>Header only</i>		
5.1	ELECTROMAGNETIC COMPATIBILITY	Personal Electronic Devices	ARGUS shall not alter or damage unpowered personal electronic devices in checked baggage.	35	C-V
5.2	ELECTROMAGNETIC COMPATIBILITY	Emission Control	All ARGUS radio frequency emissions shall be constrained to non-restricted bands in accordance with 47 CFR 15.	36	C-V
5.3	ELECTROMAGNETIC COMPATIBILITY	Power Transients	ARGUS shall not introduce transients into the airport power supply generation system.	37	D

TABLE 1. REQUIREMENTS SUMMARY (CONTINUED)

ARGUS Spec.	Specification Item	Issue	Requirement	Req. No.	Verify by
6.0	SECURITY CONTROLS	Unmanned Unit Security	ARGUS shall provide the means (via a mechanical console and panel locks, password protection and encrypted configuration files as well as a means to alert the operator of any unauthorized critical configuration change) to physically and electronically protect its sensitive components and collected data from theft and sabotage while in standby (powered without the operator present) and stored.	38	I
7.0	DATE CHANGE ANOMALY-FREE	Date Change Anomaly	ARGUS shall not contain any date change anomalies or fail to operate all functions from the date of the FAA EDS Certification Test through January 1st, 2028. ARGUS shall be Y2K Compliant as defined in the FAA Year 2000 Repair Process and Standards Handbook.	39	T
8.0	SAFETY	Regulatory Compliance	ARGUS shall comply with applicable safety standards and regulations (21 CFR 1020.40 FDA: Performance Standards for Ionizing Radiation Emitting Products; 29 CFR 1910 OSHA: Ionizing Radiation) during all modes of operation including non-operating states, operating, clearing a bag, jam and performing operator-level maintenance actions.	40	C-V
8.0	SAFETY	Lock-Down Mode	ARGUS shall possess a lock-down mode when an operator is not present so that: a. No portion of the system shall move under power; b. If ionizing radiation is employed, no radiation shall be produced; and c. No body part can be inserted, intentionally or unintentionally, into any portion of the system.	41	D

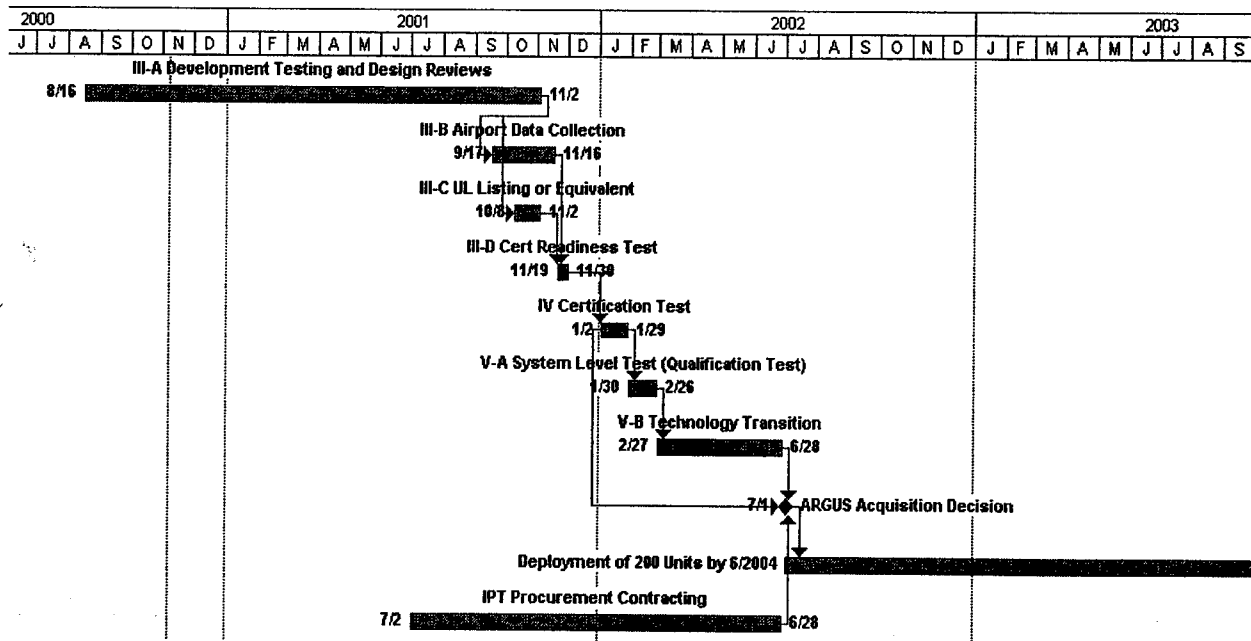
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## 5. TEST AND EVALUATION EVENTS

Table 2 lists the evaluation events along with the location, lead, focus, and requirements for each event. Figure 1 shows the general sequencing of the events. Task V-B is truly a transition phase with additional requirements from the SIR becoming applicable. The SEIPT will conduct an Operational Utility Evaluation (OUE) during that phase, somewhat overlapping in time with the last portion of the System Qualification Test. Performance on the OUE will be considered as a factor for award in procurement contracts, which may follow. Tasks below V-B Technology Transition are shown in figure 1 for context.

**TABLE 2. EVALUATION EVENTS SUMMARY**

Phase	Title	Location	Lead	Focus	Requirements
III-A	Development Testing and Design Reviews	Factory	Grantee	all required spec areas	1 – 40
III-B	Airport Data Collection	Airport	Grantee	False Alarm and Reliability, HF	
III-C	UL Listing or Equiv	TBD	Grantee	Para 3.7, 8.0	20, 40
III-D	Cert Readiness Verification	FAA Technical Center in NJ	Joint	Para 3.1 and 3.2	1 – 12
IV	Certification Test	FAA Technical Center	FAA	Para 3.1.1 and Para 3.1.2	1 – 3
V-A	System Level Test (Qualification Test)	Airport	FAA	Para(s) 3.1.1 (b), 3.2, 3.3, 3.4, 3.5... 5.0, 6.0, 7.0, 8.0	4 – 40
V-B	Technology Transition (4 month period)	Airport	FAA	all	1 – 40 plus additional



**FIGURE 1. SEQUENCE OF TEST AND EVALUATION EVENTS**

It is reiterated that the philosophy of quality assurance in the ARGUS EDS program is to place the responsibility for quality in every respect on the vendor (Grantee). That is, the Grantee is responsible for certifying that all requirements are satisfied regardless of the verification approach identified in table 1 for any particular requirement. The FAA will provide further verification of many requirements and, as required by statute, formal certification of specific effectiveness requirements.

Each of the test and evaluation event phases identified in table 2 is described in the following paragraphs. At the conclusion of each evaluation event, individuals responsible for the requirements addressed will draft a Report of Item Discrepancies for review and action decision by the Program Manager and others using the established processes.

### 5.1 III-A Development Testing

Development testing comprises any testing event at the Grantee's factory led by the Grantee. The Grantee is responsible for writing and executing test plans and procedures for design evaluation and design acceptance. Design evaluation tests are conducted with the purpose of investigating means to improve the design. Grantee design acceptance tests have the purpose of determining whether the developed prototype satisfies requirements.

The FAA may observe any test event on an informal basis and must witness Grantee design acceptance tests to validate them. The Grantee will provide to the FAA a copy of its corresponding test plan prior to any design acceptance test. A Certificate of Conformance (CoC) is the end product of this phase, which includes test, analysis, inspection, and/or demonstration activities. It shall contain sufficient configuration item identification to ensure performance verification repeatability in the FAA's verification activities.

### 5.2 III-B Airport Data Collection

Airport testing comprises the investigative studies conducted at an airport arranged for by the Grantee with FAA assistance. Each Grantee might conduct this effort at a different airport. The grantee is responsible for writing and executing data collection plans and procedures. The FAA may observe any data collection activity informally.

The system operation and data collection is to be done by Grantee personnel. Bag images are to be collected and archived for the purposes of both tuning the algorithms and satisfying the vendor qualification data package requirements. The data package is required prior to FAA Certification testing [19]. A total of 4,000 bag images is needed for that data package, including 2,000 summer destination bags and 2,000 winter destination bags. In addition, false alarm data is to be collected for the data package as a separate activity using the tuned algorithms and the archived images, but not necessarily at the airport. At the airport the Grantee personnel need not resolve alarms because the system is not yet certified<sup>5</sup>. It is assumed that there are no threats in the bags.

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<sup>5</sup> Of course, Grantee personnel are expected to resolve any suspicion they have of the presence of a threat.

Other data is collected at an airport for the purpose of assessing and improving operational suitability. For example, recording the mean time between failures and the time to effect repairs would enable substantiating availability estimates. However, no requirements will be verified during Airport Data Collection effort.

The Grantee shall provide at least a vendor-verified Certificate of Compliance (CoC) for requirements 20, 40, and 41 prior to any airport data collection event.

### 5.3 III-C UL Listing or Equivalent

UL Listing or Equivalent is a certification performed by Underwriter's Laboratories or equivalent independent agency. Test protocols and criteria have been established, for example [10] or [11].

### 5.4 III-D Certification Readiness Test

Phase III-D is a joint verification activity to assess certification readiness and will be conducted at the Aviation Security Laboratory according to a test plan written by the Grantee and the FAA. The purpose of the Certification Readiness Test is to substantiate the Grantee's CoC for effectiveness requirements, proving that the system is ready for the Certification Test. The Grantee shall provide an independent or vendor-verified CoC for requirement 20 and a vendor-verified CoC for all remaining functionality requirements prior to the Certification Readiness Test.

### 5.5 IV Certification Test

Phase IV is the FAA certification test. The FAA will conduct the Certification Test at the William J. Hughes Technical Center according to established protocols and criteria [5].

### 5.6 V-A System Level Test (Qualification Test)

Phase V-A is a System Level or Full Qualification Test in the lab and field as indicated to verify vendor CoC for all ARGUS specifications. The FAA is responsible for writing and executing the test plan and procedures for the System Level (Qualification) Test. This test will be conducted at an airport in conjunction with the Airport data Collection effort and the same, or possibly different, airport after the FAA Certification testing.

### 5.7 V-B Technology Transition

The Technology Transition phase involves complex activities by several FAA organizations. These activities will be planned and executed in accordance with a well-coordinated schedule. The FAA SEIPT will develop and publish a Screening Information Request (SIR) including a procurement specification and appropriate plans for accomplishment of Technology Transition activities. Solicitations, test and evaluation, vendor qualification, source selection, establishment of quality assurance and configuration management, and contracting will, at a minimum, be addressed. In addition, some development work will be conducted during this phase to incorporate additional functionality. Some activities may need to begin before the end of Phase V-A to enable a production award early in July of 2002.

## 6. ORGANIZATION

Figure 2 displays the overall program structure for the ARGUS R&D Program. The hierarchy portrayed applies to the coordination of the ARGUS development team effort only, and not to any formal reporting relationship.

### 6.1 Project Manager (Development)

The Project Manager is responsible for the technical, schedule, and budget success of the ARGUS development program.

### 6.2 Deployment and Operations Perspective (SEIPT)

All ARGUS development is driven by the system requirements, which were articulated in the specification document [1]. The requirements were derived from the standpoint of the user/owner community. The SEIPT and representatives of the airlines are shown on the program organization chart to emphasize their role as the source of the system requirements and the need for the technology development. The Checked Baggage Lead serves as the technical focal point for the needs of the user community.

### 6.3 Grants

The Grants Officer is responsible for the Cooperative Research and Development Agreement between the FAA and the Grantees. No changes to the commitments of the agreements will be made without her approval.

### 6.4 Test & Evaluation

The Test Director is responsible for testing the ARGUS prototypes.

#### 6.4.1 Certification

The Test Director will lead the Certification Testing phase of testing.. He is responsible for certifying that the developed ARGUS systems satisfy specific certification requirements [5].

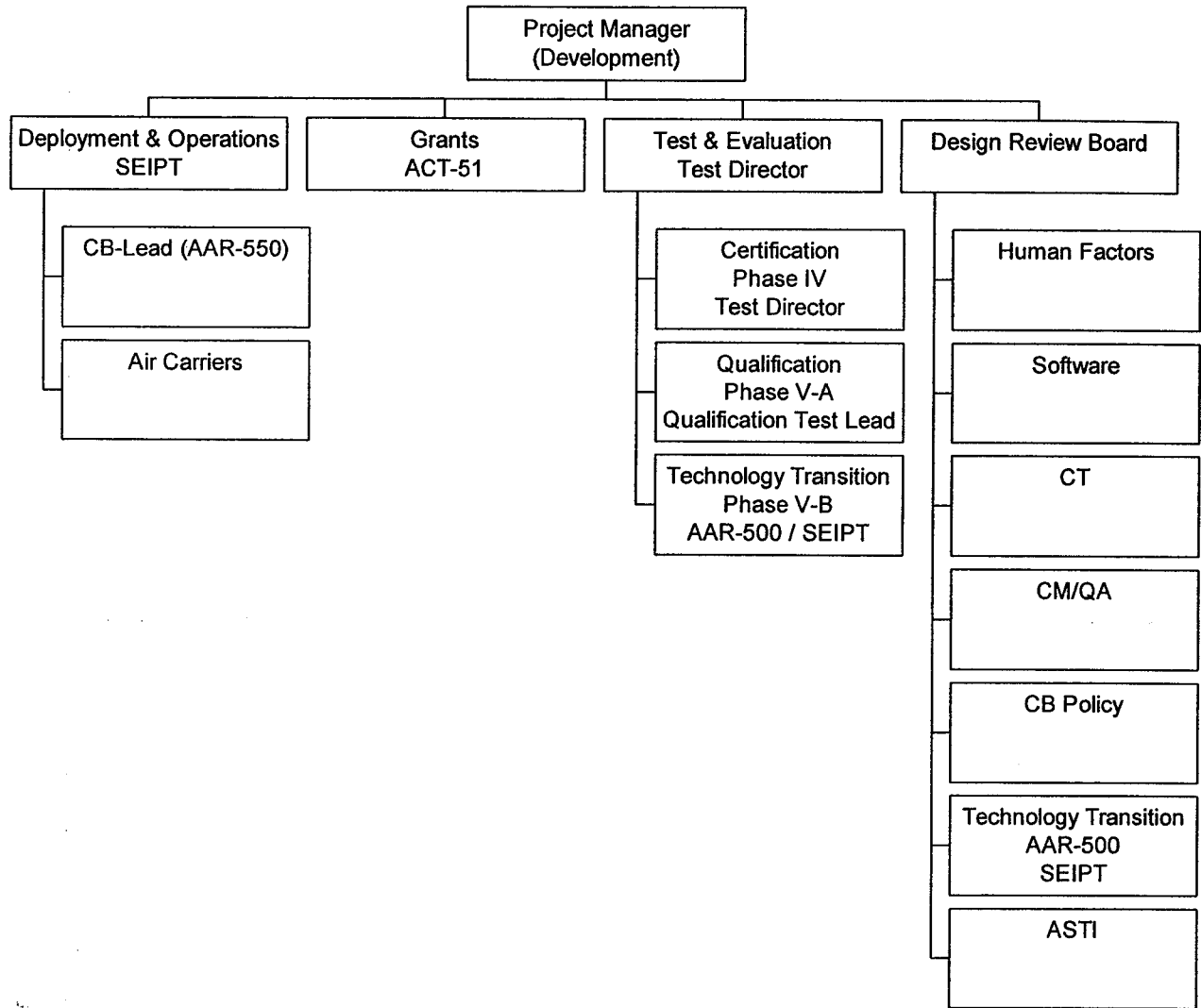
#### 6.4.2 Qualification

The Qualification Test Lead will lead the Qualification Testing phase of testing. He is responsible for verifying that the developed ARGUS systems satisfy all specification requirements [1] except the certification requirements.

#### 6.4.3 Technology Transition

AAR-500 will lead the Technology Transition phase of testing, in collaboration with the SEIPT. They are responsible for verifying that the developed ARGUS systems are ready for procurement. Activities during Technology Transition will be designed to assess if the ARGUS systems meet effectiveness and suitability requirements, if their designs are mature enough to be

produced, and that they are producible at the rates needed. In addition, the SEIPT will accomplish the necessary pre-solicitation and pre-contracting activities.



**FIGURE 2. ARGUS SYSTEM PROGRAM OFFICE**

### 6.5 DRB

The Design Review Board (DRB) supports the Project Manager at design review events and comprises individuals that provide expertise and knowledge useful for evaluating design and program progress. The DRB has been active in proposal evaluation and other events since the beginning of the program and will continue in that role.



Expertise and viewpoints represented on the DRB include Human Factors, Software design and testing, Computer Tomography, Configuration Management/Quality Assurance, Checked Baggage Vector Policy, Technology Transition, and Airport Security Systems and Technology Integration (ASTI).

The ASTI program provides additional support to the Project Manager at the interface between major program phases. At the conclusion of each phase (for example, III, IV, and V) ASTI will prepare a Milestone Evaluation Report for review and action decision by the Milestone Decision Authority (MDA). For an example of a Milestone Evaluation Report, see Appendix C of reference 18.

**APPENDIX A**  
**PROJECT SPECIFICATION**  
**VERIFICATION REQUIREMENTS TRACEABILITY MATRIX**

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**APPENDIX A**  
**PROJECT SPECIFICATION**  
**VERIFICATION REQUIREMENTS TRACEABILITY MATRIX**

ARGUS specification requirements are divided into test and evaluation segments in this appendix to facilitate the planning and conducting of test and evaluation activities. Table A-1 identifies the test and evaluation segments and the corresponding segment leaders, test plan document numbers, and document due dates. Segment leaders are responsible for producing the test plans by the dates shown and leading the corresponding tests.

Table A-2 comprises the project specification verification requirements traceability matrix, which identifies the testing needed to ensure the developed ARGUS system satisfies the functional and performance requirements in the FAA project specification [1]. The table is sorted by segment number and, for completeness, includes a segment '0' containing a requirement that cannot be verified. The requirements assigned to each segment are sorted by requirement number. Shown for each requirement are the project specification paragraph number and Critical Operational Issue (COI), the requirement text, general verification method, specific test plan document number, and the range of evaluation events during which the compliance to the requirement will be assessed.

**TABLE A-1. TEST SEGMENTS**

Segment	Seg. No.	Leader	Document	Due Date
FAA Certification Testing	1	Koo	DOT/FAA/CT-93/54 <sup>6</sup>	Done
Cost Analysis	2	SEIPT	DOT/FAA/AR-01/XX <sup>7</sup>	5/31/01
Human Factors Evaluations and Tests	3	DIXON	DOT/FAA/AR-01/XX <sup>8</sup>	""
Environmental, Task, & Operational Compatibility	4	Leone	DOT/FAA/AR-01/XX <sup>8</sup>	""
Growth Potential and Development Configuration	5	Fabry	DOT/FAA/AR-01/XX <sup>8</sup>	""
Technology Transition Testing	6 <sup>8</sup>			

<sup>6</sup> Management Plan for Explosive Detection System Certification Testing, October 1993

<sup>7</sup> ARGUS EDS System Qualification Test Plan, draft in progress. Input is required from multiple authors. Multiple numbered reports might result.

<sup>8</sup> Segment 6 evaluates requirements not relevant to the awarded cooperative agreements but is included for completeness.

TABLE A-2. PROJECT SPECIFICATION VERIFICATION REQUIREMENTS TRACEABILITY MATRIX

Seg. No.	Specification <sup>9</sup> COI	Req. No.	Requirement	Verify By <sup>10</sup>	Test Plan Doc. Number	Evaluation Event(s) <sup>11</sup>
0	3.6 Installation Effort	19	ARGUS shall be designed to minimize installation and integration costs along with time.	NV	N/A	--
1	3.1.1.a FAA Certification of Effectiveness	1	ARGUS shall meet all FAA EDS Certification Criteria for automated bag inspection except throughput. [5], [6]	T	DOT/FAA/CT-93/54	IV (III-D)
1	3.1.1.b Reduced-Mass Effectiveness	2	ARGUS shall meet all certification level detection rates for 75% threat masses. (The false alarm rate for 75% threat mass should meet the EDS Certification Criteria as a goal.)	T	DOT/FAA/CT-93/54	IV (III-D)
1	3.1.2 Bad-Scan Limit	3	Corrupted, split, or missed bag image events shall be ≤ 1 per 1000.	T	DOT/FAA/CT-93/54	IV (III-D)
2	3.4.1 Initial Cost	15	The ARGUS design in a stand alone configuration and with features limited to the original Grant requirements, shall be producible at have a unit cost of \$-300,000 or less in production quantities of 100 units over 3 years as a goal.	A	DOT/FAA/AR-00/XX	V-B (III-D)
2	3.4.2 Recurring Cost	16	ARGUS shall have an annual maintenance cost, including both preventive/scheduled and repair actions, of 10% of the Unit Cost or less, or security industry custom.	A	DOT/FAA/AR-00/XX	V-B (III-D)
3	3.2.1 Operator Skill Level	4	ARGUS shall be operable by screeners whose personnel requirements are specified in FAR Part 108.31 in terms of auditory and visual acuity, dexterity, English proficiency, and educational level.	T	DOT/FAA/AR-00/XX	V-A
3	3.2.1.a System Status Displays	5	ARGUS shall provide informative and actionable displays on system status, calibration and automated diagnostic results, bag jam and bad or incomplete scan events.	D	DOT/FAA/AR-00/XX	V-A (III-D)

<sup>9</sup> Each number shown references a paragraph in the project specification. [1] The Critical Operational Issue (COI) addressed is shown below the number.

<sup>10</sup> Verify by A = Analysis, I = Inspection, D = Demonstration, T = Test, C-I = Certification by Independent agency, C-V = Certification by Vendor

<sup>11</sup> In addition, verification is to be repeated at a subsequent event if the configuration of the system changes in any way potentially affecting the measure. Note: events shown in () indicate preliminary evaluations or follow-up evaluations.

**TABLE A-2. PROJECT SPECIFICATION VERIFICATION REQUIREMENTS TRACEABILITY MATRIX  
(CONTINUED)**

Seg. No.	Specification COI	Req. No.	Requirement	Verify By	Test Plan Doc. Number	Evaluation Event(s)
3	3.2.2.1.b Start-Up and Power-Down	6	ARGUS shall permit simple start-up and power-down at one workstation.	D	DOT/FAA/AR-00/XX	V-A (III-D)
3	3.2.2.1.c Image Quality	7	ARGUS shall satisfy FAR Part 108.17 (a)(5) and shall permit a typical operator to distinguish 24-gauge wire under the fifth step using a Test Step Wedge specified in American Society for Testing and Materials (ASTM) Standard F792-82.	D	DOT/FAA/AR-00/XX	V-A (III-D)
3	3.2.2.1.d HMI	8	ARGUS shall permit operation with a graphic user interface emphasizing 'hard' keys or physical, dedicated switches for critical tasks involving state and alarm resolution functions.	D	DOT/FAA/AR-00/XX	V-A (III-D)
3	3.2.2.2.a Effective Throughput	9	ARGUS shall be designed to permit an operator to resolve alarms accurately and achieve an average effective throughput of at least 50 bags per hour (irrespective of hand search).	T	DOT/FAA/AR-00/XX	V-A
3	3.2.2.2.b Prompts	10	ARGUS shall include a provision for alarm resolution prompts to reinforce basic operator alarm resolution steps	D	DOT/FAA/AR-00/XX	V-A (III-D)
3	3.2.3.1 Operator's Manual	11	ARGUS shall contain an operator's manual for all tasks to be performed by the screener including state management, alarm resolution, training and limited diagnostics and maintenance.	I	DOT/FAA/AR-00/XX	V-A (III-D)
3	3.2.3.2 Human Factors Issues Log	12	Throughout its design, development, fabrication and testing, ARGUS shall include a physical log or manual record that identifies and tracks to resolution human factors issues including manpower, personnel, training, human factors engineering, and health & safety.	I	DOT/FAA/AR-00/XX	III-A through V-B
3	3.3.2 Suspicious Bag Control	14	ARGUS shall permit the operator and/or bag handler(s) to identify and control 100% of the bags the operator deems suspicious.	T	DOT/FAA/AR-00/XX	V-A (III-D)
3	3.5 Training	17	ARGUS shall contain a training package, completed by the end of Phase III, to create qualified operators.	T	DOT/FAA/AR-00/XX	V-A
4	3.3.1 Bag Jam Clearing	13	ARGUS shall permit direct personnel access to the main inspection enclosure to manually clear a bag jam in less than 30 seconds from time of discovery to resumption of inspection.	D	DOT/FAA/AR-00/XX	V-A (III-D)
4	3.6 Power Tolerance	18	ARGUS shall accommodate airport lobby power and transients.	D	DOT/FAA/AR-00/XX	V-B (III-B)
4	3.7 Listings by Safety Related Entities	20	ARGUS shall comply with appropriate standards (i.e., UL147 UL60950 and UL 3101-1 or IEC 61010-1:2010) listed by safety related organizations prior to the FAA's EDS Certification Readiness Test.	C-I	DOT/FAA/AR-00/XX	III-C

TABLE A-2. PROJECT SPECIFICATION VERIFICATION REQUIREMENTS TRACEABILITY MATRIX  
(CONTINUED)

Seg. No.	Specification COI	Req. No.	Requirement	Verify By	Test Plan Doc. Number	Evaluation Event(s)
4	3.8 Configuration Management	21	The ARGUS configuration should be controlled in accordance with an applicable standard (e.g., MIL-STD-973 Configuration Management or an equivalent ANSI/ISO/ASQC 9001) to assure performance verification repeatability and facilitate functional & physical configuration audits leading to production.	I	DOT/FAA/AR-00/XX	III-A through V-B
4	3.9 Operational Availability	22	<del>ARGUS reliability (Mean-Time-Between-Failure) and maintainability (Mean-Time-To-Repair) as designed should yield a 99% operational availability rate whereas the Cumulative down-time per unit during inspection duty hours for all maintenance should not exceed 36.573 hours annually assuming a ten hour duty day for 365 days each year as a goal.</del>	D	DOT/FAA/AR-00/XX	V-B (V-A)
4	3.10 Floor Space	23	ARGUS shall contain a provision for a configuration which offers single-sided access to minimize total floor space use.	D	DOT/FAA/AR-00/XX	V-A (III-D)
4	3.12.1 Bag Size	29	ARGUS should be able to accommodate oversized and extra-large checked bags with lengths up to 92 cm, widths up to 75 cm, and heights of 51 cm.	D	DOT/FAA/AR-00/XX	V-A (III-D)
4	3.12.2 Floor Loading	30	ARGUS floor loading should not exceed 500 kg per square meter.	A	DOT/FAA/AR-00/XX	V-A (III-D)
4	3.12.3 Footprint	31	ARGUS footprint should not exceed <del>165cm</del> 210cm x 300335 cm.	I	DOT/FAA/AR-00/XX	V-A (III-D)
4	3.12.4 Maximum Height	32	ARGUS height should not exceed 190215cm.	I	DOT/FAA/AR-00/XX	V-A (III-D)
4	3.12.5 Power	33	ARGUS power requirements should not exceed 20 kW.	C-V	DOT/FAA/AR-00/XX	V-A (III-D)
4	5.1 Personal Electronic Devices	35	ARGUS shall not alter or damage unpowered personal electronic devices in checked baggage.	C-V	DOT/FAA/AR-00/XX	V-A (III-D)
4	5.2 Emission Control	36	All ARGUS radio frequency emissions shall be constrained to non-restricted bands in accordance with 47 CFR 15.	C-V	DOT/FAA/AR-00/XX	V-A (III-D)
4	5.3 Power Transients	37	ARGUS shall not introduce transients into the airport power supply generation system.	D	DOT/FAA/AR-00/XX	V-B (III-B)

**TABLE A-2. PROJECT SPECIFICATION VERIFICATION REQUIREMENTS TRACEABILITY MATRIX  
(CONTINUED)**

Seg. No.	Specification COI	Req. No.	Requirement	Verify By	Test Plan Doc. Number	Evaluation Event(s)
4	6.0 Unmanned Unit Security	38	ARGUS shall provide the means (via a mechanical console and panel locks, password protection and encrypted configuration files as well as a means to alert the operator of any unauthorized critical configuration change) to physically and electronically protect its sensitive components and collected data from theft and sabotage while in standby (powered without the operator present) and stored.	I	DOT/FAA/AR-00/XX	V-A (III-D)
4	7.0 Date Change Anomaly	39	ARGUS shall not contain any date change anomalies or fail to operate all functions from the date of the FAA EDS Certification Test through January 1st, 2028. ARGUS shall be Y2K Compliant as defined in the FAA Year 2000 Repair Process and Standards Handbook.	T	DOT/FAA/AR-00/XX	V-A (III-D)
4	8.0 Regulatory Compliance	40	ARGUS shall comply with applicable safety standards and regulations (21 CFR 1020.40 FDA: Performance Standards for Ionizing Radiation Emitting Products; 29 CFR 1910 OSHA: Ionizing Radiation) during all modes of operation including non-operating states, operating, clearing a bag, jam and performing operator-level maintenance actions.	C-V	DOT/FAA/AR-00/XX	V-A (III-D)
4	8.0 Lock-Down Mode	41	ARGUS shall possess a lock-down mode when an operator is not present so that: a. No portion of the system shall move under power; b. If ionizing radiation is employed, no radiation shall be produced; and c. No body part can be inserted, intentionally or unintentionally, into any portion of the system.	D	DOT/FAA/AR-00/XX	V-A (III-D)
5	3.11.1 Reduced Threat Mass	24	ARGUS should contain capacity for growth to achieve certifiable detection of smaller threat masses (below certification criteria) without compromise in false alarm or throughput as a first priority.	A	DOT/FAA/AR-00/XX	V-A
5	3.11.2 Costs Reduction	25	ARGUS should contain capacity for growth to achieve lower unit or annual maintenance costs as a second priority.	A	DOT/FAA/AR-00/XX	V-A
5	3.11.3 Effective Throughput Growth	26	ARGUS should contain capacity for growth to achieve increased effective throughput as a third priority.	A	DOT/FAA/AR-00/XX	V-A



**TABLE A-2. PROJECT SPECIFICATION VERIFICATION REQUIREMENTS TRACEABILITY MATRIX**  
**(CONTINUED)**

Seg. No.	Specification COI	Req. No.	Requirement	Verify By	Test Plan Doc. Number	Evaluation Event(s)
5	3.11.4 Installability	27	ARGUS should contain capacity for growth to achieve smaller footprint & lower weight and power needs as a fourth priority. <del>ARGUS should contain capacity for growth to achieve ICAO Vapor Taggant Detection with an integrated provision for an adjunct sensor as a fifth priority. Requirement Deleted</del>	A	DOT/FAA/AR-00/XX	V-A
5	3.11.5 Trace Detection	28	ARGUS shall possess an Image Archiver /Printer capability to support development. It shall record and, redisplay, and print bag image files for near-real-time play-back to support data collection and testing.	A	DOT/FAA/AR-00/XX	V-A
5	4.0 Image Archiving and Printing	34	ARGUS shall provide field image printing / archiving functionality. TBD	D	DOT/FAA/AR-00/XX	III-A
6	10.0 - 15.0	TBD		TBD	TBD-Qual Add12/TBD	V-B

12 TBD-Qual Add = To Be Determined. Input to Qualification Test Plan Addendum

