DOD AUTOMATIC IDENTIFICATION TECHNOLOGY CONCEPT OF OPERATIONS FOR SUPPLY AND DISTRIBUTION OPERATIONS

11 JUNE 2007

UNITED STATES TRANSPORTATION COMMAND
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11 June 2007

MEMORANDUM FOR (SEE DISTRIBUTION LIST)

FROM: TCCC

SUBJECT: DOD Automatic Identification Technology (AIT) Concept of Operations (CONOPS) for Supply and Distribution Operations

1. The DOD Automatic Identification Technology (AIT) Concept of Operations (CONOPS) for Supply and Distribution Operations was developed by the DOD community to improve overall support to the war fighter. In our role as the Distribution Process Owner (DPO) and the lead functional proponent for radio frequency identification (RFID) and related AIT implementation for the DOD supply chain, our goal is to ensure AIT is synchronized to enhance asset visibility and maximize deployment and distribution operational efficiencies. The CONOPS provides DOD's future vision for AIT use across the supply chain and has an intended horizon of FY2010-2015.

2. This is a "living document" that can be updated in the future to keep pace with technology advancements and DOD logistics process improvements. We are developing a companion DOD Implementation Plan to serve as a roadmap for transitioning from the current AIT environment to the one envisioned in this CONOPS.

NORTON A. SCHWARTZ
General, USAF
Commander

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Executive Summary

The Department of Defense (DoD) has used automatic identification technology (AIT) as a data entry tool for more than 30 years. AIT use started with the adaptation of the linear bar code and has progressed to encompass a variety of more advanced technologies. The DoD has explored a wide variety of AIT through prototyping and implementations throughout the Services and agencies. Within the past 5 years, the warfighting Combatant Commands (COCOMs) and Services, and Combat Support Agencies have leveraged technological advances in AIT and wireless communications to partially fill asset visibility gaps that have remained a challenge for the warfighter. In order to advance command and control decisions, the value coming from AIT into the strategic, operational, and tactical platforms allows the warfighter to respond effectively while meeting the inherent challenges of a dynamic, global environment.

The speed at which AIT and accompanying technologies have progressed has allowed for some significant improvements in the management and flow of both materiel and personnel. That same speed, however, has increased the possibility of divergent paths in technology use, with different organizations independently researching, selecting, and implementing differing AIT media for similar purposes. From an end-to-end supply chain perspective, if a standard baseline suite of AIT was applied uniformly across standard data collection business processes and could be counted upon from the initial acquisition of materiel until that materiel was consumed or disposed of, various DoD business processes could leverage AIT more effectively and efficiently. To maximize the potential for AIT use and the benefits of such use, it is in the best collective interest of all DoD supply chain partners to agree upon a baseline standard of AIT use throughout the supply chain and a set of guidelines under which additional AIT may be applied for unique needs of specific DoD supply chain partners.

To better focus the Department's logistical support on the warfighter's needs, the DoD named the U.S. Transportation Command (USTRANSCOM) as the distribution process owner (DPO) responsible for the overall distribution of materiel worldwide in 2003. Then in 2006 the Office of the Secretary of Defense for

Acquisition, Technology and Logistics (OSD[ATL]) designated USTRANSCOM, in its role as the DPO, as the lead functional proponent for radio frequency identification (RFID) and related AIT implementation within the DoD supply chain. A key goal of USTRANSCOM in this functional proponent role is to ensure AIT use throughout the supply chain is coordinated to maximize the effectiveness of the deployment and distribution decisions across the supply chain. USTRANSCOM will continue to assess technology, examine future trends and update policies to provide the warfighter with the best possible integrated, end-to-end solution. As a primary conduit to the broader deployment and distribution enterprise, AIT plays a key role in providing decision makers with the ability to shape and respond to ever-changing force requirements and closure profiles.

To improve the overall support to the warfighter, this joint concept of operations (CONOPS) identifies appropriate AIT for assets wherever they may exist in the DoD supply chain. AIT is identified by consolidation layer—from the very item itself through its individual packing, cartons, consolidated shipments in pallets or intermodal containers, to the conveyance moving the material through various supply chain nodes. This CONOPS identifies the following for each consolidation layer:

- A baseline set of AIT media to be applied in all situations. A primary AIT is identified, coupled with a backup AIT which is to be included for downstream supply chain participants to use as an alternative in those isolated situations where the primary AIT is non-responsive or is unable to be used due to business process nuances, available technology infrastructure, or safety considerations.

- Sets of premium AIT media that may be applied if compelling reasons for their use exist. The CONOPS defines several premium reasons, including limited communications channel, perishable items, critical end item considerations, and safety and security requirements.

- Who should apply the media, and when and how the media will be used in the DoD supply chain.

This CONOPS has been compared to existing DoD initiatives, and it aligns with current efforts with three key exceptions:

- It migrates away from the linear bar code to the two-dimensional (2D) bar code format for applications where either bar code symbol could be used. Unlike the linear bar code, the 2D symbol format is more robust and less likely to become unreadable. However, it is clear that commercial industry and the international community will continue to use the linear bar code and this CONOPS retains the ability for the DoD supply chain to receive linear bar coded items and use those bar codes within DoD processes, as makes sense. One exception is for the item level marking where the 2D Data Matrix is the required symbol.

- It does not designate the optical memory card (OMC) or mini-compact disc (CD) as baseline AIT for any consolidation layer. The OMC and mini-CD are considered electronic packing lists that are convenient for some service retail supply systems to receive with the material, but they are not efficient for identifying the consolidation and its contents quickly. At the request of the ordering Service, OMC/CD technology can continue to co-exist as an electronic shipment packing list and be used by those activities that currently use it.

- It uses a license plate type of active RFID tag for the majority of 463L pallets and intermodal containers moving worldwide. With connectivity to backend databases, in the box visibility is available using the license plate tag. The current data-rich tags are still available and can be used whenever a COCOM or the Service component of the COCOM determines that they will be operating in an environment where a stable communications channel to backend databases and systems *is absent or expected to be unreliable.*

The backbone of this CONOPS consists of a blend of passive and active license tag AIT and 2D symbols. The intent is to focus on facilitating mainstream logistics applications by identifying a minimum set of AIT that can be relied upon from one segment of the supply chain to the next. As this foundation is implemented, stakeholders performing continuous process improvement reengineering initiatives can rely on a baseline from which to anchor their data capture solutions. Although not covered in the CONOPS, the DoD AIT Implementation Plan will address specific automated information systems (AISs) that receive data captured by the AIT, data architectures of the many different supply chain business processes, and the special situations that may require the application of premium AIT.

This CONOPS has an intended horizon of FY2010–2015 and provides a vision for consistent, coordinated use of AIT media throughout the supply and distribution process in DoD supply chain and should be used as a blueprint to achieve seamless AIT use and enable improved asset visibility. This CONOPS is a "**living document**," intended to be adjusted in the future as to keep pace with technology advancements and DoD logistics processes reengineering projects. During the development of follow-on documents such as the DoD AIT Implementation Plan, it may be necessary to re-evaluate the technologies selected for item identification through conveyance. This will allow the business processes, industry use and standards to ensure the right technology is selected for each supply chain layer. A joint AIT governance structure will be established to approve future adjustments to the CONOPS as necessary.

There are types of AIT applications that are not addressed in this CONOPS, mostly due to the complexity and time needed to develop a workable position on which AIT is appropriate. These exclusions are not meant to be permanent and will be addressed and released in later versions of this CONOPS as approved by the Distribution Transformation Task Force (DTTF). These exclusions are

- Personnel;

- Items within a maintenance process;
- Items in use; and
- Items in storage or transit solely within the proprietary business process and controls of DoD suppliers' and vendors' supply chains, such as those found in planned direct vendor delivery items, prime vendor items, performance based logistics, contractor logistics support, and items acquired with credit card purchases. However, the CONOPS does address which AIT is to be affixed at the item and individual packaging level when the materiel is ultimately turned over to any DoD activity, regardless of whether the point of turn-over is a depot, transportation node, or ordering customer.

As a logical follow-on to this document, a companion DoD AIT Implementation Plan will also be developed before the end of fiscal year 2007. The implementation plan will serve as a roadmap for transitioning from the current AIT environment to the envisioned FY2015 environment outlined herein.

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Chapter 1
Introduction and Background

Automatic Identification Technology (AIT)[1] is an important tool that the Department of Defense (DoD) has used in various forms for more than 30 years. AIT, known commercially as Automatic Identification Data Capture (AIDC), is a suite of technologies enabling the automatic capture of data, thereby enhancing the ability to identify, track, document, and control assets, e.g., materiel, deploying and redeploying forces, equipment, personnel, and sustainment cargo. Efficient data capture, enabled by AIT, normally improves the accuracy and speed of data processed and stored by DoD's automated information systems (AISs). With a few exceptions in the sensor technology arena, AIT data without the AIS to interpret that data is meaningless. AIT encompasses a variety of data storage and/or carrier technologies, such as bar codes, magnetic strips, integrated circuit cards, optical laser discs (optical memory cards and/or compact discs), satellite tracking, and radio frequency identification (RFID) tags used for marking or "tagging" individual items, equipment, air pallets, or containers. AIT integration with logistic information systems is a key enabler in the DoD's Asset Visibility (AV) efforts. AIT use started with the adaptation of the 3-of-9 linear bar code and has progressed to encompass a variety of more advanced technologies. The DoD has a significant investment in AIT research, testing, prototyping, and implementation throughout the Services and Agencies.

The speed at which AIT and accompanying technologies have progressed has allowed for significant improvements in the support provided to the warfighter through the management and flow of both materiel and personnel. That same speed, however, has increased the possibility of divergent paths in technology use, with different organizations independently researching, selecting, and implementing differing AIT media for similar purposes. Today, one participant in the supply chain may not be able to leverage the advantages of any particular AIT on a global basis because there is so little standardization or AIS connectivity among the many AIS's across DoD's many supply chain business processes. Without connectivity and data sharing among these data repositories, AIT will be of little value. To maximize the potential for AIT use and the benefits of such use, it is in the best collective interest of all DoD supply chain partners to agree upon a baseline standard of AIT use throughout the supply chain and a set of guidelines under which additional AIT may be applied for unique needs of specific DoD supply chain partners. A key to leveraging AIT will lay in standardizing electronic data interchange (EDI) transactions so that the AIT and business process information systems can link across Service and supply-chain vendors.

[1] A more detailed explanation of AIT, to include types of AIT in use within DoD today, is provided in Chapter 4 of this Concept of Operations document.

In 2003, the DoD named the U.S. Transportation Command (USTRANSCOM) as the distribution process owner (DPO) responsible for the overall distribution of materiel worldwide. Then in 2006, the Office of the Secretary of Defense for Acquisition, Technology and Logistics (OSD[ATL]) designated USTRANSCOM, in its role as the DPO, as the lead functional proponent for RFID and related AIT implementation within the DoD supply chain. A key goal of USTRANSCOM in this functional proponent role is to ensure that AIT use throughout the supply chain is coordinated to maximize effective AIT media use across the supply chain, with minimal AIT redundancies or conflicting technologies in use.

To coordinate and agree on a common AIT vision, this concept of operations (CONOPS) has been created. This CONOPS identifies the various reasons for AIT use, the types of AIT media, and their key attributes. The CONOPS progresses through a logical evaluation of each medium based on how the DoD supply chain operates and designates a baseline set of AIT media. Finally, the CONOPS designates sets of "premium" media that may be required based on a defined set of conditions that may require AIT capabilities beyond the designated baseline. The CONOPS horizon for achieving this end-state is the year 2015, allowing for funding within the FY2010 to FY2015 budget cycles.

It is intended that this document will be followed by an AIT Implementation Plan to explore and identify the business process, AISs, special situations, specific constraints and other nuances that must be identified and worked to fill in the details of "how" and "how much," and then address costs based on the implementation plan. As various tasks within the implementation plan are being worked, it is anticipated that situations will be identified which will require adjustments to be made to this CONOPS. Therefore, this document is considered a "living document" subject to change throughout the seven year implementation plan horizon.

The CONOPS is organized as follows:

- Chapter 2, *Method and Scope*: The method used to approach the CONOPS development and identification of any topics deferred for follow-on analysis.
- Chapter 3, *End-to-End DoD Supply Chain*: A look at the DoD supply chain and identification of the high level distribution processes that occur.
- Chapter 4, *AIT Media*: Identification of key types of AIT and their basic characteristics, and investigation into the various reasons why AIT media is used by the DoD today.
- Chapter 5, *AIT Use Assessment*: Based upon the supply chain processes, the characteristics of the media, and the reasons for using AIT, the evaluation of each AIT medium and a determination of its applicability for use at various stages within the supply chain. Resulting from these assessments, a basic level of AIT media is identified for use in the DoD supply chain, along with sets of "premium" media for certain conditions.

- Chapter 6, *Current DoD AIT Efforts*: A comparison of the AIT identified in Chapter 5 against the various policies, regulations, initiatives, and prototypes active in the DoD today, identifying how closely current initiatives compare to the identified AIT direction.

- Chapter 7, *AIT Use Conceptual Walk-Through*: Using the AIT identified in Chapter 5, a narration of the business processes and identification of where AIT will be applied and used.

- Chapter 8, *The Way Forward:* This chapter highlights the next steps and planned methodology to migrate from the current AIT use environment to the CONOPS vision.

- The appendixes contain a brief discussion on item unique identification (IUID), details concerning the AIT media evaluations, a list of current DoD efforts and how they compare with the AIT designations, and a list of abbreviations.

Chapter 2
Method and Scope

Because of the many years of AIT development and use within the DoD as well as the rapid pace of AIT development, it is important to clearly outline the underlying method used throughout the development of the CONOPS. This chapter outlines that method and any assumptions used, including a list of specialized distribution areas that will be addressed in later, focused follow-on efforts to this overall CONOPS.

METHOD

This CONOPS strives to balance three key objectives:

- Improve logistical support to the warfighter.
- Account for all of the efforts and initiatives underway in the DoD today.
- Create a future concept of standard AIT use that was not restricted by prior efforts or bias–targeted towards the year 2015.

Adoption and institutionalization of AIT within the DoD has been slower than desired because of conflicting priorities and limited available resources. This CONOPS is a good opportunity to take a fresh look at how AIT should fit into the DoD supply chain processes without regard to prior guidance or AIT currently in use. The AIT recommended in this CONOPS is based on requirements and AIT attributes. To this end, the CONOPS' method first involved a "green-field"[1] approach, which addresses where AIT media should be used. This approach allows identification of the minimum AIT media for the supply chain based on the suite of media available now, as opposed to being limited by the decisions and investments made throughout the years as AIT evolved.

In the green-field approach, current AIT technologies were identified and evaluated in two phases. The first evaluation phase (referred to as the "first pass") compared the AIT media attributes against the environments in which they must operate, eliminating those that did not meet the operating conditions. The second evaluation phase (second pass) compared the AIT media (that passed the first evaluation phase) against the reasons for using AIT within the business process. Each medium received an applicability grade for each evaluation phase.

[1] "Green-field" is a common design and construction term referring to construction on an undeveloped site, with the most efficient design, without any design restrictions based on existing building, utilities, and other infrastructure.

The second step of the method was to compare the green-field map of AIT use against the current DoD AIT infrastructure and efforts. Policies, regulations, prototypes, and information from other initiatives were gathered to create a comprehensive view of current AIT use. These uses were compared against the green-field analysis to identify

- good AIT uses not addressed within the green-field results,
- potentially non-ideal AIT uses that should be phased out in favor of the green-field results, and
- special use cases that may affect the minimum AIT "green-field" analysis.

SCOPE

The DoD supply chain is one of the largest and most complex in existence. Some refer to the "8 Supply chains"—a reference to the current Defense Logistics Agency (DLA) organization, while others will point out that there are many more than eight supply chains. The challenge of this CONOPS is to identify a baseline set of AIT that can be agreed to among all participants in each supply chain—however many there are, but provide enough flexibility to handle the differences that may exists among them. It should be noted, for example, that if the baseline CONOPS manages to work well in at least 75-80 percent of the business processes within DoD, adjustments to the CONOPS and follow-on AIT Implementation Plan will be made over the next seven years to address the specific situations where the baseline AIT does not suit the intended purpose. The DoD supply chain complexity stems from a variety of factors:

- DoD manufacturers, vendors, supply depots, and consignees are worldwide.
- DoD deploys units and their equipment to all parts of the globe. Applying AIT to this aspect of DoD's logistics presents special challenges that most *Fortune 500* companies have not experienced. DoD consignee locations can change frequently and include locations without stable, mature infrastructure or communications.
- DoD materiel covers an extremely broad range of items, from bulk items (fuel) to foodstuffs, clothing, munitions, and office supplies. Often, these materials require special packaging, handling, safety, security, and environmental considerations.
- DoD manufacturers and vendors are, by design, a wide range of sizes and technological maturity, from extremely large billion dollar companies with state-of-the-art supply chain designs and collaboration technologies, to small businesses with limited technological capabilities.

- DoD business processes and technologies must interface with various national partners, such as the General Services Administration (GSA), the Defense Commissary Agency (DeCA), and the Army Air Force Exchange System (AAFES), as well as international coalition partners.

- DoD acquisition policies allow for flexible delivery arrangements with vendors, some of which keep the distribution of materiel completely within the vendor's responsibility until final receipt at the consignee.

- From end-to-end, DoD's logistics systems and processes do not represent a single, standard, or closed loop system, rather a mosaic of service and agency systems and processes that pass-off materiel and documentation along multiple functional seams.

- In most companies where logistics efforts approach the size and complexity of DoD, there is a single supply chain manager from end-to-end. DoD has numerous supply chain managers, further complicating the task of coordinating, funding, and providing management oversight, and executing a seamless solution to the customer (warfighter).

These factors lead to several special circumstances that may not be covered *completely* within this CONOPS. Items deferred from this initial CONOPS include the following:

- *Personnel*. There are many uses of AIT for managing and tracking the movement of personnel and their processes. However, while the "stuff is stuff" philosophy is true in many cases, people cannot be considered in the same context as inanimate material. A separately focused effort will be needed to address AIT for personnel. Since this business area should not influence the direction and content of the CONOPS for materiel, the uses of AIT for personnel will be handled separately.

- *Items in use*. This concept is not intended to address the numerous ways materiel owners may further leverage AIT capabilities once an item has been issued and is in use in the field. Any "in use AIT" is out of the scope of this CONOPS. If an issued item is returned or requires re-issue, reconsignment, or storage the AIT used to affect this lateral or reverse logistics effort is considered to be within the scope of this CONOPS.

- *Resale Items*. Resale Items refers to items purchased, carried in inventory, or sold by AAFES, Navy Exchange Service Command (NEXCOM) and DeCA. It is unlikely that this CONOPS will ever need to address AIT for resale at the individual item or manufacturers' package levels. That topic will be left up to the vendors and buyers of those organizations. However, when these items are consolidated into an air pallet or sea container load for overseas movement within the Defense Transportation System (DTS) the consolidation AIT may need to comply with the baseline AIT as long as they are being managed under DTS processes. Therefore, this CONOPS

only applies to that level of consolidation when it is moving within the DTS. Consideration of any other level of AIT application will be deferred until a valid reason for consideration is identified.

- *Items in maintenance*. An item in maintenance may use AIT specific to maintenance processes, but those processes and AIT are out of scope for this CONOPS. The transport of an item to and from a maintenance location and the AIT associated with its successful delivery and receipt are within the boundaries of this CONOPS.

- *Automated information systems (AIS) communications and architecture*. This CONOPS focuses on the AIT media appropriate for the business process and consolidation layer involved. AIT will clearly rely on effective communication with an AIS and the transfer of information from one AIS to another (including electronic communications from the vendor). While this CONOPS points out the high-level responsibilities of the AIS component, it does not define any architecture or technical data flows. There are other efforts underway within the DoD logistics community to address business data flows and technical architectures. This CONOPS has been constructed in such a manner as to be flexible and complementary to the outcomes of these various efforts.

- *Reengineering business processes*. Good AIT used in a bad business process will result in subpar performance when compared to a business process reviewed and reengineered in tandem with an appropriate AIT. However, the purpose of a CONOPS is not to reengineer each of the many business processes. This CONOPS complements the reengineering efforts that are underway within the DoD components and formulates a high-level set of guidelines for the application of a minimum acceptable AIT for each major supply chain step. The analysis culminates in Chapter 7, *AIT Use Conceptual Walk-Through*, where narratives describe how the various AIT will be applied in specific examples. Any detailed business process review and reengineering is subject to consideration of the commodity in question, the aims of the many DoD business process managers, and many other specific variables. Some of the unique commodity and business process considerations will undoubtedly have to be part of the collective considerations in conjunction with an implementation plan that will follow this CONOPS. During the development of the follow-on implementation plan, the stakeholders that have a vested interest in this CONOPS may identify adjustments needed to facilitate or accommodate implementation goals, available resources, and strategies. In such situations, adjustments will be vetted, and, if necessary, this CONOPS will be further adjusted. This document, together with the follow-on implementation plan, is intended to be a road map that will lead the DoD Logistics community forward, not rigidly preclude necessary adjustments.

- *RFID Security Vulnerabilities.* While the use of RFID technology has the potential to significantly enhance overall asset visibility, it also introduces potential security vulnerabilities into our networks. The specific details on these vulnerabilities, including methods that can be used to minimize or mitigate known vulnerabilities, are beyond the scope of this overarching CONOPS document. However, it is imperative that these issues are studied and understood. These issues will be addressed in greater detail in the AIT Implementation Plan.

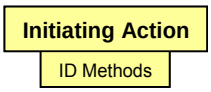
Chapter 3
End-to-End DoD Supply Chain

Before addressing appropriate AIT media for the supply chain, it is important to understand, at a high level, the basic processes used within the chain. This chapter highlights the main processes, discusses a "building block" approach to understanding the processes, and formulates a process-based view for evaluating and applying AIT. Processes that occur within the "last tactical mile" are shown generically because there are so many variations of them, depending on the COCOM's area of operation, specific Service organizations, commodities, and in some cases force protection posture.

THE BUILDING BLOCKS OF SUPPLY

While there are many variations within the DoD supply chain, the basic principles and actions of the supply chain may be defined in terms of generic, reusable building blocks. The distribution process has many common elements, regardless of commodity, destination, and mode.

Initiating Action



An initiating action is a trigger that starts the need for something to be shipped to another location. The DoD has many such triggers:

- *Requisition*. An item is requested for use. The item is sourced from a storage location (either DLA depot or other DoD installation) or through a contract order to a vendor directly. Each requisition or order has a unique identity (document) number to identify it throughout the process until receipt by the requisitioner or ultimate consignee.

- *Unit move*. Unit Line Numbers (ULNs) in Joint Operation Planning and Execution System (JOPES) identify force requirements. When units are identified to deploy, in support of those force requirements, they identify specific equipment and personnel for movement. Transportation Control Numbers (TCNs) are then assigned to the unit cargo and accompanying sustainment.

- *Turn-in for repair*. If an item requires maintenance or repair that cannot occur at its current location, the item is shipped to a maintenance depot or vendor for maintenance. Each item is provided a unique turn-in (for maintenance) document number for reference tracking and accountability purposes.

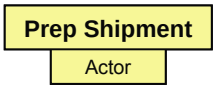
- *Turn-in for re-issue or disposal*. When an item is no longer needed by the current owner, or is not serviceable or repairable, it is either disposed of

locally, sent back to a supply inventory account (supply support activity [SSA] or DLA Distribution Center) for restock and issue, or turned in to the Defense Reutilization and Marketing Office (DRMO) for disposal or redistribution to another location. Each request for turn-in (for disposal) has a unique reference number for record keeping and accountability purposes.

- *Acquisition*. The item is acquired either by Service, DLA or through GSA. Each acquisition has a unique identification number of identify it through the process. The process also identifies how the item will enter into the DoD distribution process.

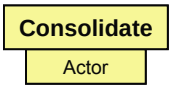
In all cases, each initiating action contains an IUID (if one exists) and a national stock number (NSN) (if one exists), or a commercial item number; a quantity and a unit of issue; and a unique reference number for the initiating action (such as requisition number or TCN).

Prepare Shipment



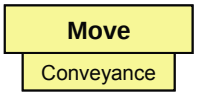
Once the need to ship is identified, the items need to be prepared for shipment. The supply chain "actor," such as a distribution center or another inventory/ storage location, removes the item from storage and updates storage inventory levels in the appropriate AIS. The items are appropriately packaged and marked for the commodity, mode of transport, and destination. Each shipment unit is assigned a TCN. Paperwork (electronic preferred) is provided for the shipment unit and electronic shipment notice information should be passed along to the original ordering activity, next interim node, carrier, and any other interested parties.

Consolidate



Depending upon the size of the single shipment unit and the destination location, the shipment unit may be consolidated with other shipments into one or more levels of consolidation, such as a tri-wall container, a 463L pallet, or an inter-modal container. Each consolidation level is assigned a TCN. Multiple materiel release orders (MROs) may be consolidated into a multi-line shipment unit or a single MRO may be divided into two or more shipment units, which, if consolidated, are then associated with a consolidated TCN. Further consolidations can occur as items are put together and higher level consolidated TCNs are assigned to the third level of consolidation. Paperwork (electronic preferred) is provided for the shipment unit and electronic shipment notice information should be passed along to the original ordering activity, next interim node, carrier, and any other interested parties. Consolidation may occur at the same location where the single shipment unit is prepared if enough single shipments occur to warrant consolidation. Otherwise, consolidation can happen at a containerization and consolidation point (CCP), or other supply chain nodes, such as a theater consolidation and shipping point or an aerial port (pallets created at the aerial ports are typically for flight purposes only and are not officially "consolidated"—they are "aggregated").

Move



Shipments can be moved from one location to another using a variety of transport methods.

MOVE BY TRUCK, RAIL, BARGE

Most shipments will have one or more surface movement segments between the shipment origin and final consignee location that are made by truck, rail, barge or a combination of these modes. The predominant mode is truck for sustainment items of supply and rail for unit movements. For simplicity of explanation, the term truck is used in this CONOPS. The truck movement may be within the continental United States (CONUS) or outside the continental United States (OCONUS), and the shipment may be transferred from one truck to another during its in-transit movement. Most truck movements have a carrier identifier (ID), conveyance ID, and bill of lading (or similar document) that should identify all shipment pieces listed on the bill-of-lading, by TCN, within the conveyance.

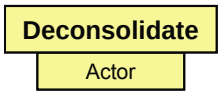
MOVE BY AIR

Shipments may move by air if the shipment is time-critical. Most air shipments are consolidated or aggregated shipments. As with truck shipment, a shipment may change aircraft multiple times between the origin and destination ports, similar to commercial air travelers who need to make connecting flights if no direct flight exists to the desired destination. Each aircraft movement has an aircraft ID, and a manifest (or similar document) that identifies all consolidated shipments by TCN, within the conveyance. Content detail for each consolidated or aggregated pallet is not contained within the manifest.

MOVE BY VESSEL

Shipments may move by vessel if the destination is across a large body of water and the required delivery time will allow this slower mode of transportation. Most sustainment shipments by sea are consolidated shipments. As with truck shipments, a consolidated shipment may change vessels multiple times between the origin and destination ports, similar to commercial air travelers who need to make connecting flights if no direct flight exists to the desired destination. Each vessel movement is assigned a carrier ID, vessel ID, and a manifest (or similar document) that identifies all consolidated shipments within the conveyance by TCN.

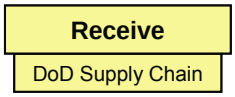
Deconsolidate



If a single shipment unit was consolidated with other shipments for transport, the shipment is deconsolidated for delivery to the consignee. Deconsolidation may happen at a port of debarkation (pallets created at the aerial port for flight purposes only are not officially “deconsolidated” at the port of debarkation—they are “broken down”), at a theater distribution center (TDC), at a supply support activity,

or even at the final consignee activity location (if multiple shipments were sent to different organizations at the same location). Once deconsolidated, the consolidation TCN has served its purpose and is no longer used.

Receive



After the single shipment unit arrives at the final consignee location, the item is received by the supply activity. The item is noted in the supporting software system for that service or agency's activity. The item may be put into storage for later issue or routed directly to a consuming customer and placed in use.

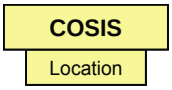
Initial Receipt from Vendor

The DoD orders items from vendors through a variety of contracting methods. Embedded in the purchase terms are directions concerning where and how to ship the items and what type of advanced notification the vendor should provide to the DoD concerning the shipment and item details. Upon initial receipt from the vendor, the items are initiated into the defense supply chain.

Store

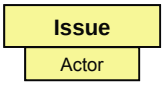
When an item is not immediately needed and does not require repair, it is placed in storage. Items may be stored in units of issue or larger groupings, such as pallets or cartons. Condition, shelf-life, and security requirements should be considered for items in storage. Special monitoring requirements may also exist for sensitive, hazardous, or other special materials. Inventory/accountable records are updated to reflect the additional quantity and storage location.

Care of Supplies in Storage (COSIS)



While an item is in storage, standard care for these items is performed. The type of care required depends upon the type of materiel. All materiel undergoes periodic inventory auditing to confirm quanties, locations, and shelf life. Items that required specific environmental conditions may be monitored to ensure conditions are maintained, such as the temperature for items requiring refrigeration. Other items may require periodic testing to ensure they are still serviceable.

Issue



When an item in storage is needed for use, an order is placed and the item is issued. The item may have a minimum issue quantity based on quantity packaging. The inventory records are updated once the item is issued.

PUTTING THE PIECES TOGETHER

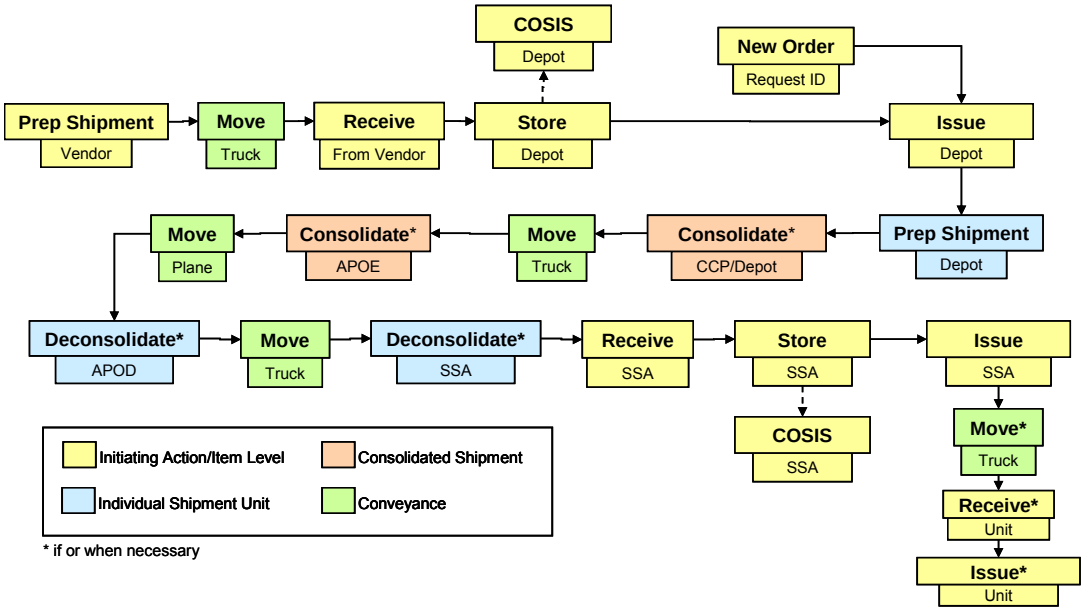
Using these defined building blocks, typical materiel distribution flows throughout the DoD supply chain can be represented. Five possible distribution flows are presented to illustrate the concept. These examples *are not* intended to be representative of all potential materiel flows. Portraying all material flows and different variations of the same flows would take an inordinate amount of space in this document and add little additional value. The examples chosen for this discussion are sufficient to illustrate the points being made. Each building block is color-coded to identify when steps are dealing with individual items, single shipment units, consolidated shipments, or conveyances.

Example 1: OCONUS Aerial Delivery of New Item

Figure 3-1 illustrates a new item request for OCONUS delivery via air. In this specific example, the item requested is a stocked item. The item request did not trigger a back-order to the vendor, however, in the illustration; the flow from the vendor is included for the purpose of showing that items sent to the depot will be required to meet specified AIT application requirements. These AIT applications may enable the depot to receive materiel already marked with AIT compatible with the depot receipt, storage and issue processes. Upon arrival at the depot, the items that arrive to replenish depot stock are received and placed into storage. While in storage, the item may receive special care if required. At some point, this stocked item is ordered by a consuming field activity and the item manager at the Inventory Control Point (ICP) issues a Materiel Release Order (MRO) to the distribution center that will source the requirement. This MRO triggers the item to be issued by the depot and prepared for shipment. If multiple items have been requested by the same consignee they may be combined into the same shipment. Further, if multiple shipments are destined to be handled via the same SSA[2], multiple shipments can be consolidated onto a 463L air pallet. The shipment, either loose or consolidated onto a pallet, is moved by truck to the aerial port of embarkation (APOE). At the APOE, loose shipments are aggregated onto 463L pallets for the flight. All pallets are loaded onto the plane and flown to the aerial port of debarkation (APOD). At the APOD, the loose shipment pallets are often broken down, whereas the others remain full pallet shipments. Whether palletized or loose, the shipments are forwarded to the TDC or SSA by truck. At the SSA all remaining pallets are deconsolidated, and the SSA receives the items. If the SSA ordered the item for inventory, it will be stored until issued for use by a unit. Otherwise it will be immediately issued.

[2] It should be noted that the acronym SSA is used in a generic context. It is understood that SSA is an Army specific term but it is also a useful descriptor to mean any supply support activity that receives inbound supplies that its warfighting customers have ordered and affects distribution over the "last tactical mile." If this example were for distribution to a Navy warship, it would be the shore based naval activity that receives supplies from the wholesale system and arranges and delivers the supplies to the ship.

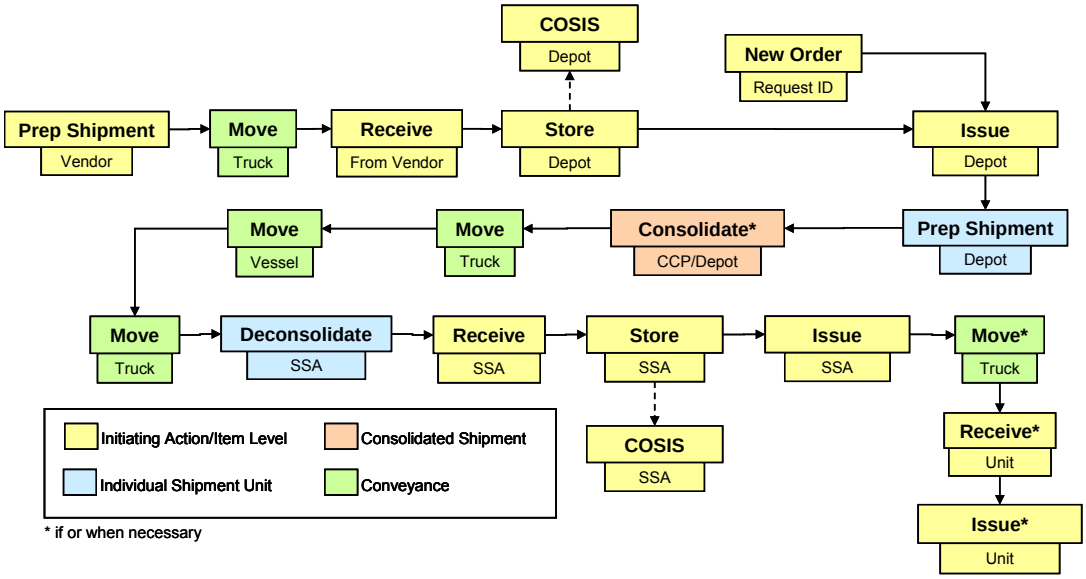
Figure 3-1. OCONUS Aerial Delivery of New Item



Example 2: OCONUS Surface Delivery of New Item

Figure 3-2 shows a new item request for OCONUS delivery via surface methods. This particular example is similar to the aerial flow (in Figure 3-1). The item requested is stocked at a depot. The item request did not trigger a back-order to the vendor, however, in the illustration; the flow from the vendor is included for the purpose of showing that items sent to the depot will be required to meet specified AIT application requirements. These AIT applications will enable the depot to receive materiel already marked with AIT compatible with the depot receipt, storage and issue processes. Upon arrival at the depot, the items that arrive to replenish depot stock are received and then placed into storage, where the item may receive special care if required. At some point the item is ordered by a consuming field activity and an (MRO) is placed by the item manager. This MRO triggers the item to be issued by the depot and prepared for shipment. If multiple items have been requested by the same consignee they may be combined into the same shipment. Further, all shipments headed to the same SSA or other consignee that can be serviced by the same container conveyance are consolidated into an inter-modal container. This consolidation may occur at a service installation shipping point, a distribution center, or at a CCP. The consolidated inter-modal container is moved by truck to the sea port of embarkation (SPOE). All inter-modal containers are loaded onto the vessel and delivered to the sea port of debarkation (SPOD), either directly or via one or more transshipments. At the SPOD the containers are offloaded and cleared through customs before they are forwarded to the SSA by truck. The SSA receives the item. If the SSA ordered the item for inventory, it is stored until issued for use by a unit. Otherwise it will be immediately issued.

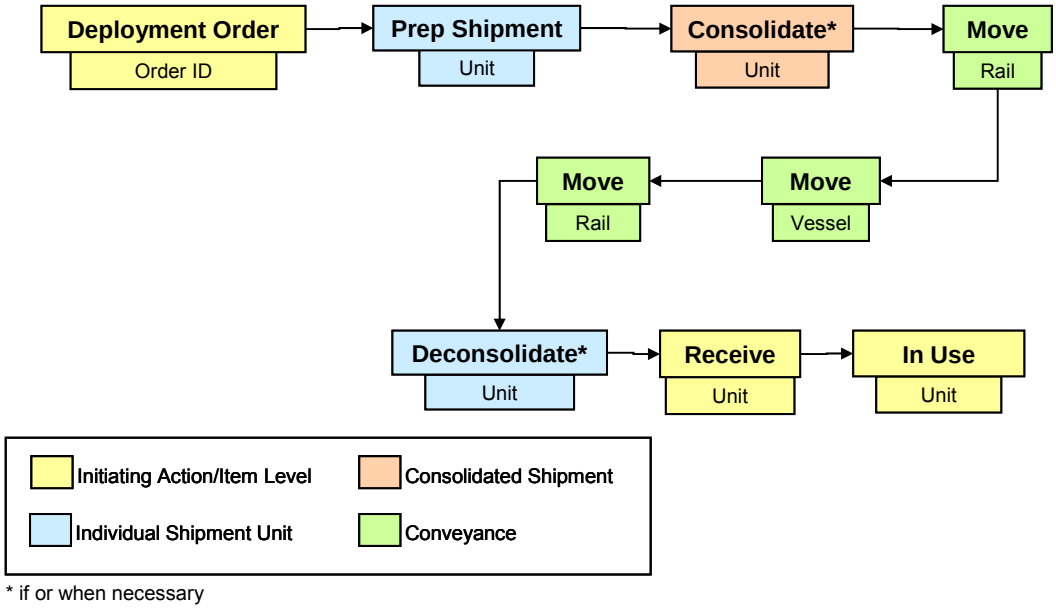
Figure 3-2. OCONUS Surface Delivery of New Item



Example 3: Unit Move by Surface—Materiel and Unit Equipment

Figure 3-3 shows an example of materiel and unit equipment for a unit move deploying to its new destination by surface transportation. A deployment order triggers the unit to prepare materiel and equipment for movement to their deployed location. Materiel will be consolidated into inter-modal containers or perhaps within trucks or other vehicles associated with the unit. Usually, but not always, the materiel and unit equipment is moved by rail to an SPOE, where it is then moved by vessel to the SPOD. Upon arrival at the SPOD, the materiel and unit equipment is offloaded received, staged, and moved (by rail or other mode) to the unit's new location, where it is deconsolidated from the conveyance it arrived on and placed into use (employed).

Figure 3-3. Unit Move of Materiel via Surface

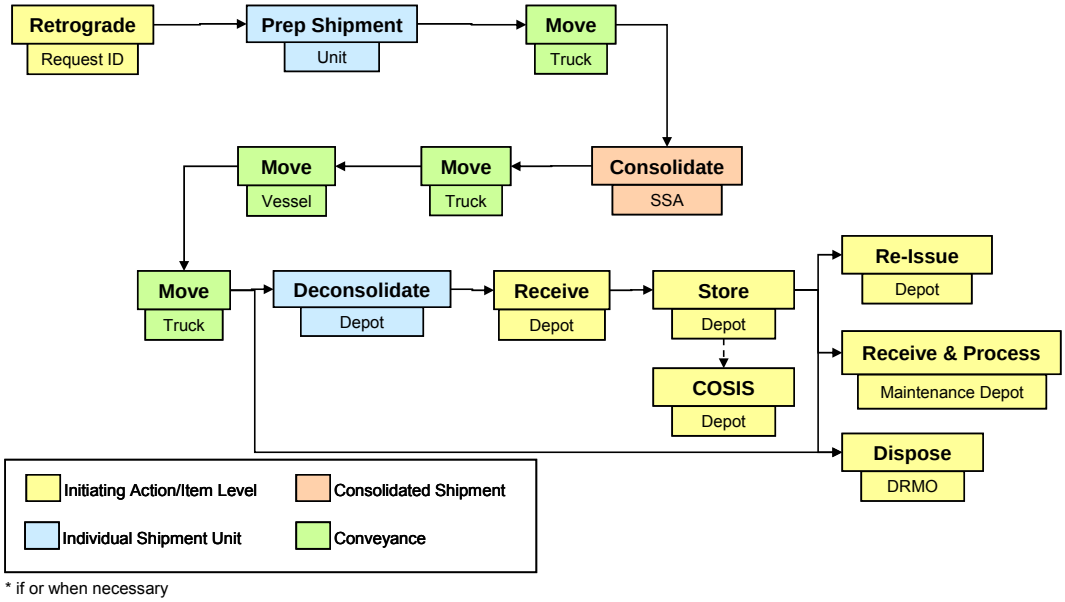


Example 4: Surface Retrograde Movements

There are many types of retrograde movements. While some items are disposed of in theater and not sent back to CONUS, this example illustrates the situation where the item does go back and is either re-issued, stored or disposed of in the United States.

Figure 3-4 illustrates a typical example of a retrograde surface movement of materiel from a theater of operations to a DLA disposal activity. A retrograde decision by the inventory manager triggers disposition instructions and the item to be prepared for shipment. If the item can be containerized with other items moving to and from the same origin and destination points, the item is moved to the SSA, where it will be consolidated with other retrograde materiel. The consolidated container is moved by truck to the SPOE, where it is loaded on a vessel and moved to the SPOD. The disposition instructions may also direct disposal in theater at which point it will move directly to a DLA DRMO site. At the SPOD, the container is offloaded and moved by truck to the depot, or it is sent directly to a DRMO site (if all items are headed for disposal rather than maintenance). If sent to the depot, the depot receives the shipments and stores the items until the item is re-issued, sent to DRMO for disposal, or sent to the maintenance unit for maintenance.

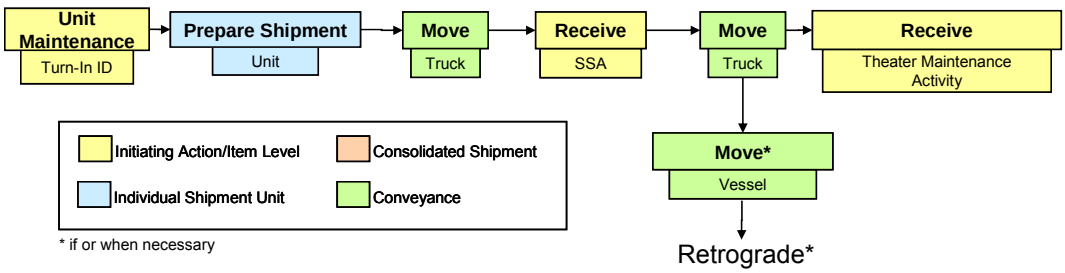
Figure 3-4. Surface Retrograde Movements



Example 5: Maintenance Turn-In

The final example is a depot-level reparable (DLR) item that is being turned in for repair via surface movement. The owner of the item prepares the reparable component or end item for shipment. Typically, item documentation will reference a serial number (and the IUID when available) for accountability. The item is documented with a unique turn-in identification number for reference and accountability purposes, including the IUID when available, and moved by truck to the SSA, a specialized contractor who manages the reverse logistics for a service or agency, or other designated DLR materiel holding and shipping facility. From this level, the item may or may not be consolidated with other items moving to the same repair facility and then is moved by truck to a theater maintenance facility or is moved to an SPOE to be sent back to the United States (becoming a retrograde movement, as illustrated in Figure 3-5).

Figure 3-5. Maintenance Turn-In

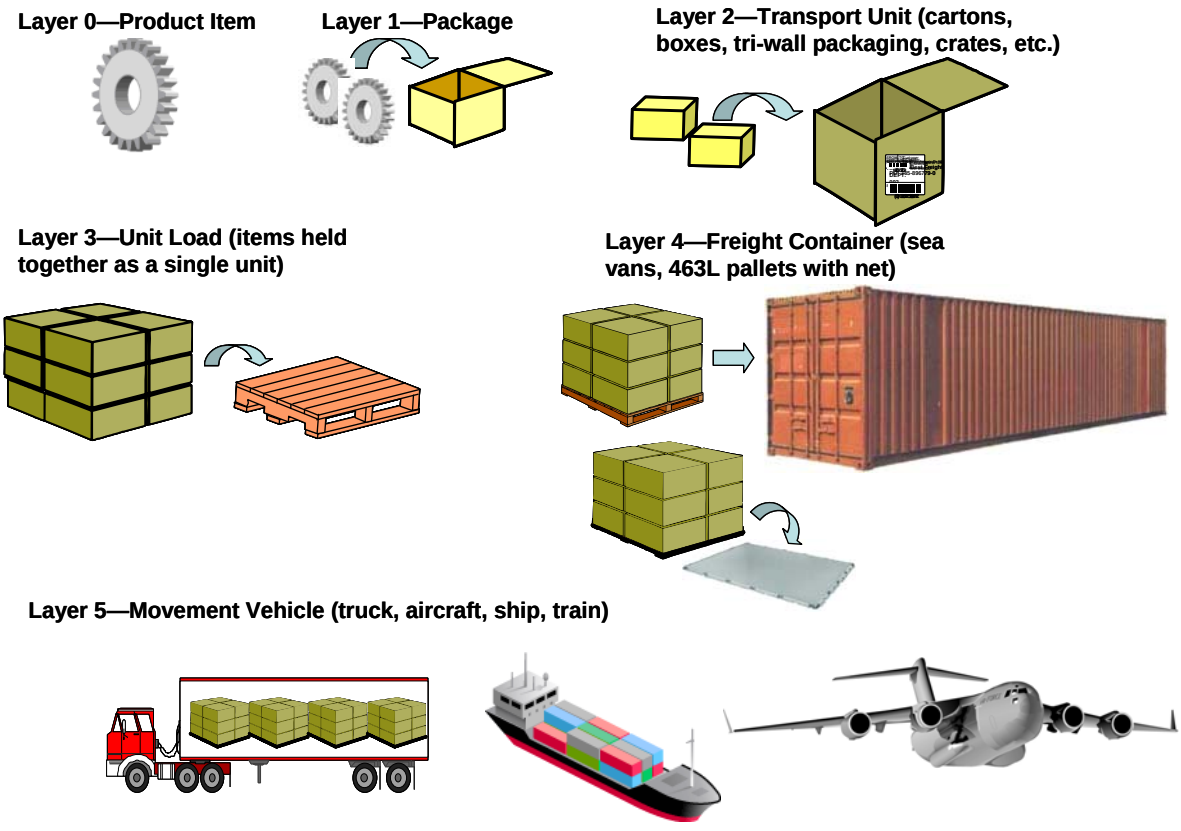


CONSOLIDATION LAYERS

While there are many other variations of materiel flow, what becomes clear from the examples illustrated is the fact that there are several different layers of consolidation of an item–from the item itself, to the shipment created to move the item, to a consolidation of multiple shipments, to the conveyance moving the item. Each layer of consolidation adds another identifiable and manageable "wrapper" around the item, requiring identifying markings, including AIT.

Figure 3-6 illustrates each layer of consolidation, used in this CONOPS. This definition set closely matches the layers as identified in the Office of the Secretary of Defense (OSD) RFID Memorandum of 2003 and can be used to evaluate all AIT. Also included is a mapping to the Military Standard (MILSTD) 129 designation, where applicable.

Figure 3-6. Layers of Consolidation



- *Layer 0—Product item* (individual item): An item or assembly that is in end-user configuration. This layer is the lowest level, unconsolidated, unpackaged item for purposes of applying AIT. These items can be a secondary item (such as a part), consumable item (such as cleaning fluid), a component of an end item (such as starter assembly), or the end item itself (such as a vehicle). When the item has a unique identification number and

a DoD business process requires tracking by that Unique Item Identifier (UII), the DoD IUID will apply to this specific layer of consolidation. An IUID provides a globally unique and permanent identifier for an item throughout the entire item's life cycle. IUID requires a specific AIT that contains the identifier. See Appendix A for details on the IUID initiative and the UID Guide to Implementation available at www.acq.OSD/DPAP/PDI(UID Office).mil/dpap/uid for details on the IUID initiative.

- *Layer 1—Package* (first level packaging–the "bubble pack"); aka MILSTD 129 Unit Pack. The first tie, wrap or container of a single item or quantity thereof that constitutes a complete identifiable pack. A product package may be an item packaged singularly, multiple quantities of the same item packaged together, or a group of parts packaged together.

- *Layer 2—Transport Unit* (second level packaging–cartons, boxes, tri-wall packaging, crates, etc.); aka Case or MILSTD 129 Exterior Container or Shipping Container: Packaging contains one or more articles or packages or bulk materiel for the purposes of transport, storage, handling and/or distribution.

- *Layer 3—Unit Load* (one or more transport units (Layer 2) or other items held together by means such as a pallet, slip sheet, strapping, interlocking, glue, shrink wrap, or net wrap, making them suitable for transport, stacking, storage, or distribution as a single unit); aka Pallet or MILSTD 129 Palletized Unit Load.

- *Layer 4—Container or 463L Pallet*; aka MISTD 129 Freight Container: An article of transport equipment that

  - is designed for extreme durability and repeated use,

  - is fitted with devices to facilitate its transfer from one mode of transport to another,

  - is designed to be easy to fill and empty, and

  - has an internal volume of 1 m3 or more.

  Layer 4 excludes vehicles.

- *Layer 5—Movement Vehicle* (truck, aircraft, ship, train)

Chapter 4
AIT Media

With the concept of layers defined in Chapter 3 as the chosen approach for this AIT CONOPS assessment, this chapter now looks at the AIT currently in use or being adopted commercially and within the DoD. There is no attempt to explain the entire universe of existing and emerging AIT or to cover all the various combinations of AIT that are known to have been integrated to provide a specific business process solution. To cover such a wide array of media would create a lengthy and largely irrelevant chapter of information—at least for the purpose of this document. This chapter focuses on the more mainstream media that are considered mature and produced in sufficient quantities to be considered for inclusion in a DoD-wide CONOPS. This chapter briefly defines each of the evaluated media, identifies key attributes that differentiate the various media, and explores the basic and advanced reasons why supply chains use AIT.

MEDIA DEFINED

The following is a definition of AIT provided by the DoD Logistics AIT Office that will be included in the next revision of the Joint publication dictionary:

> Automatic Identification Technology (AIT), known commercially as Automatic Identification Data Capture (AIDC), is a suite of technologies enabling the automatic capture of data, thereby enhancing the ability to identify, track, document, and control assets, e.g., materiel, deploying and redeploying forces, equipment, personnel, and sustainment cargo. AIT encompasses a variety of data storage and/or carrier technologies, such as bar codes, magnetic strips, integrated circuit cards, optical laser discs (optical memory cards and/or compact discs), satellite tracking, and radio frequency identification tags used for marking or "tagging" individual items, equipment, air pallets, or containers. AIT integration with logistic information systems is a key enabler in the Department of Defense's Asset Visibility (AV) efforts.

Bar Codes

Bar codes are one of the most mature forms of AIT in the DoD supply chain. They are required by DoD, the DFARS, Service policies, and military standards for use on supply and transportation documentation. Bar code policy was first issued in 1981 when DoD adopted the use of Code 39 linear bar codes. 2D symbols are normally used on military shipping labels, and for recording pallet content for ammunition storage.

Bar codes require direct line-of-sight to be read by a scanner. Reader equipment scans the bar code, decodes it, and transfers the data to supporting AIS. Bar codes are very inexpensive, costing pennies to create on paper labels and only about $2 for metal-etched bar codes. The price of basic bar code readers can range from approximately $100 to $1,000. However, AIT devices are coming down in cost and size over time.

Linear bar codes are one-dimensional bar codes because they carry information in only one direction—horizontally. The height of the bars offers the reader vertical redundancy of data that makes scanning easier, especially when the bar code symbol may be damaged. Linear barcodes normally carry a maximum of 15 to 20 characters.

DoD uses two types of machine-readable 2D symbols—the PDF417 and the Data Matrix ECC 200—both of which are defined by international specifications. PDF417 symbols are used by DoD for package identification and address identification in shipment and storage applications. Data Matrix symbols are used for item identification. The 2D Data Matrix is the mandatory part marking media for the UID program and is the minimum acceptable machine-readable marking for any item that qualifies for IUID.

See Figure 4-1 for examples of the three different bar code types.

Figure 4-1. Linear and 2D Symbol and 2D Data Matrix Symbol

Radio Frequency Identification Tags

PASSIVE RFID

A passive RFID tag is an electronic identification device consisting of a chip and an antenna, usually embedded within a “smart” packaging label. Passive RFID tags have no battery; they draw power from the reader, which sends out electromagnetic waves that induce a current in the tag’s antenna. Passive RFID readers transmit significant power to activate the passive tags and are not currently approved for use on ammunition, missiles, or other potentially explosive hazard.

Passive RFID is currently being used in the DoD supply chain as vendors respond to the requirement to deliver cases and pallets with electronic product code (EPC)-compliant passive RFID tags attached and provide corresponding advanced shipping notices (ASNs) identifying the materiel. ASNs come to the DoD systems from vendors using the Wide Area Workflow (WAWF), Electronic Data Interchange

(EDI), and other agreed upon formats. The reception of the ASN is critical to the DPO pipeline gaining the original visibility of an item entering their system. The ASN must include the passive RFID and IUID data, if applied as specified in the applicable DFARS clause. Using this information, vendors can be paid upon receipt of materiel. Passive RFID holds significant potential for internal DoD supply chain process improvements if applied to materiel at the requisition, MRO, or item level.

A direct line of sight is not required to read a passive tag. Their read range is shorter than active tags—10 to 20 feet (one DoD operation has reported reliable read ranges at less than 10 feet). However, read range can vary with type of product, packaging material, RF interference, and nearby physical obstructions. There are several different kinds of passive RFID tags. Frequency, air protocol, power, and data constructs affect performance. Some passive RFID tags cannot be read beyond and inch or two while others can be read at many yards. At smaller or more forward DoD locations, a handheld is required to read a passive RFID tag since the fixed infrastructure may not exist. Simple passive tags cost from 20 cents to several dollars, depending on the amount of memory on the tag, packaging, and other features. The cost of passive RFID readers is $1,000 to $2,000, but some of the handheld readers can read linear bar codes and 2D symbols as well. Fixed passive RFID portals are typically more expensive, around $3,600 to $3,800, but their exact cost will depend on the specific requirements at the implementation location. However, AIT devices are coming down in cost and size over time.

Passive RFID tags (see Figure 4-2) have a unique identification number, but they are not designed to carry large amounts of data. Passive RFID tag ID numbers are normally used in reference to a network database. Therefore, connectivity to a database is required for the effective use of passive RFID.

Figure 4-2. Passive RFID Tags

ACTIVE RFID

An active RFID tag is a reusable electronic identification device consisting of a chip and an antenna, usually embedded contained within a plastic housing. An active RFID tag uses a lithium battery to power the microchip's circuitry and transmit a signal to an interrogator. The DoD currently uses an active RFID tag that can be read from 300 feet away by fixed or mobile interrogators for in-transit

visibility (ITV) applications. The tags have unique serial numbers and can store up to 128 KB of data. Active RFID tags can be "data-rich" and carry shipment content data without the need for connectivity to a database, or the tags can be simply "license plate" tags that contain only a unique identifier to associate the attributes of the shipment with data in a database. Active tags require some maintenance—the battery must be changed after a year or more of use. However, active tags can be reused.

Active RFID tags are being used primarily to provide location information when shipments pass the interrogators at each RF-ITV (radio frequency ITV) network node. Most interrogators are stationary or permanently installed. Portable deployment kits used in field operations to read tags with hand held active RFID interrogators attached to bar code scanners. Active RFID tags have the potential to provide additional value when fully integrated with functional AISs, such as BCS3, and processes such as the Marine Corps' Last Tactical Mile. For example, full content detail may be available to a user at any location if that information has been stored in an AIS and is associated with a tag ID.

An active RFID tag (see Figure 4-3) typically costs $70, but it can cost closer to $100 if it is integrated with sensor technology. Active RFID tag interrogators cost approximately $1,500, and can either be fixed interrogators attached to permanent infrastructure or handheld interrogators. The fixed interrogators only handle active RFID media, but the handheld interrogators often can read linear and 2D symbols as well. However, AIT devices are coming down in cost and size over time.

Figure 4-3. Active RFID Tag

The nature of active RFID has led to the emergence of different applications that leverage the technology for different purposes.

- Active RFID is used in a real time location system (RTLS) that integrates location tracking capabilities with existing wireless networks to allow real time location of assets where wireless network coverage is provided.

- Mesh networking is also an emerging technology that leverages RFID. Mesh networks are known as "self-forming" and "self-healing" networks that route data between nodes. All nodes are connected to each other, thus providing a continuous and redundant network. A mesh network can continue to operate even when a node or a connection breaks, which leads to a very reliable network. The Army is currently investigating mesh networking.

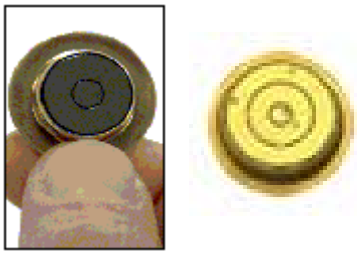
Contact Memory Buttons

The contact memory button (CMB) is a battery-free, read and write electronic data storage technology designed to perform in extreme operating environments, such as those associated with military, aerospace, utility, transportation, and industrial applications. Advantages of CMBs are their relatively large data capacity (up to 32 MB), read/write capabilities, durability, and data availability at the point of use and do not require connectivity to a database. CMB technology enhances configuration management, asset tracking, inspection, and maintenance functions throughout the service life of the asset to which it is attached.

In addition to exceptional durability, CMBs offer the potential to improve productivity by eliminating or reducing the time and inconvenience associated with accessing a central database. Data stored on a CMB is retrieved by momentary contact using a probe and can be viewed and updated. Each button has a unique serial number. CMBs, which have been tested to rugged military specifications, are used by the Aviation Maintenance Automated Tracking System as a field-to-depot data carrier with major end-item flight history and configuration data. They also have potential application when logbooks or other large files of paperwork need to kept with materiel.

CMBs (see Figure 4-4) can cost as little as $2, depending on quantity ordered. CMB probes, costing approximately $50 can be attached to many scanners or fixed workstations or a CMB/scanner combination can be purchased for $1,000–$1,500. However, AIT devices are coming down in cost and size over time.

Figure 4-4. Contact Memory Buttons



Optical Memory Cards and Mini-CDs

An Optical Memory Card (OMC) is a one-time use data storage device that uses compact disk technology. OMC technology was developed in the early 1980s. An OMC is a high-capacity, low-cost medium that can withstand harsh environments. Data is written to an OMC in sequential order. As changes occur, all the shipment data is rewritten on the card (data on the card cannot be over-written). The card can be reused until all available memory space is filled.

The OMC has a relatively large data capacity (2.8 MB), and DoD accepts the Drexler European License Association (DELA) standard format. OMCs are relatively

inexpensive, reusable, and unaffected by climatic changes. They are best used to carry large amounts of shipment data to facilitate receipt processing at final destination.

DLA has implemented the use of optical memory cards to document consolidation and manifests of deliveries from its warehouses. Connectivity to a database is not required to access the data. This information was important for distribution operations with limited communications and network connectivity.

The Army and DLA have tested supporting the shipment manifest documentation with mini-compact discs, or CDs. This change would replace unique, expensive OMC readers with CD drives that are standard in most current desktop computers. An OMC costs around $6 and a CD costs less than $1. OMC reader/writers cost around $6,500, while a CD-R costs approximately $150–500. See Figure 4-5 for examples of an OMC and mini-CDs.

Figure 4-5. OMCs and Mini-CDs

Optical memory card Mini CDs

Environmental and Condition Monitoring Sensor Technology

Environmental and condition monitoring (ECM) sensors are an emerging AIT capability for monitoring environmental conditions, keeping historical logs, or reporting dynamically when leveraged with communications such as RFID or satellite communications. Condition-monitoring sensors have the ability to monitor and report condition and health indicators of operating systems to warn of such conditions as equipment failures, needed maintenance, or breaches to security.

Currently, only a few classes of supply—such as Class VIII medical supplies—are using ECM sensors. Medical materiel shipped via cold chain methods include temperature-sensing devices that notify the user who opens the shipment if the temperature was kept within acceptable thresholds during shipment. These devices provide after-the-fact warnings; it cannot provide condition visibility during transit when used as stand-alone devices. These devices are available for one time use ($30 each) or reuse ($175 each) (see Figure 4-6).

Figure 4-6. Environmental and Condition Monitoring Sensor

Additionally, demonstrations have been conducted on Class I materiel (perishables) to monitor temperature and security as well as Class II materiel, Individual Protective Equipment (IPE) to monitor temperature and shelf-life. The demonstrations have helped to further develop the technology and establish its applicability to DoD logistics processes.

ECM sensors that are integrated with RFID (e.g., micro-electrical mechanical systems [MEMS]) or satellite terminal communications could add to distribution security and safety by detecting and reporting the fault over a network as an alarm to initiate corrective action by a user or item manager. This solution can provide condition information while in transit. A sensor-enabled active RFID tag costs around $100, while the infrastructure required to support in-transit visibility costs hundreds of thousands of dollars. However, the majority of this infrastructure cost has already been incurred while building the existing nodal ITV network. Although some alert information may be available at the point of use, for some sensor solutions, connectivity to a database or a software application that can access and display stored sensor log information is required to access the complete environmental history.

Satellite or Cellular

Satellite and cellular technology are an emerging set of AIT that can offer asset visibility applications where connectivity and existing infrastructure does not currently exist (see Figure 4-7). Combined with Global Positioning System (GPS) capabilities and provided there is adequate satellite coverage and authority to operate the transponders in the area of operations and a clear view of the sky, this technology can provide exact location information any place on the globe.

The use of sensors for intrusion detection or presence of dangerous chemicals with satellite or cellular technology offers expanded asset visibility information not available in some remote areas.

Much like an active RFID tag, some satellite transceivers are large, but, the hardware is getting smaller and smaller as the technology progresses. Since data is sent over the air, information security is a significant concern when using this technology.

Satellite technology also is expensive. A satellite terminal can cost anywhere from the hundreds of dollars to the thousands, depending on the requirements for coverage, latency, etc. Satellite service providers offer different plans for transmission costs, so typical transmission costs can range from $0.03 to $0.20 per report, depending on the use. The infrastructure cost for a satellite system is in the hundreds of thousands of dollars for the satellites, ground stations, software, servers, etc. Because of the high cost, most users purchase subscriber services from a provider company rather than purchase and own this expensive infrastructure themselves, so long as the system is not maintained outside the dot.mil network. Additionally, DoD requires a specific chip set that facilitates non-government denial of satellite access in times of national emergency, which substantively adds to the cost of the RF device used for satellite communication.

Figure 4-7. Satellite Transceiver with GPS

MEDIA ATTRIBUTES

The following media attributes can affect how an AIT medium performs, therefore establishing the applicability of the medium to a business process. These attributes are applied in Chapter 5 in the AIT media attribute assessment.

Form Factor

The form factor includes the linear dimensions, configuration, and durability of a device. For the AIT use assessment that follows in Chapter 5, the dimensions of the AIT device as compared to the dimensions of the layer packaging are considered when determining the appropriate use of an AIT medium. Another form factor consideration is whether or not the AIT media can be easily attached to a packaging layer, such as cardboard, plastic, or metal. The durability of an AIT medium in harsh conditions is also a consideration within the form factor.

Data Capacity

Data capacity is the amount of data that an AIT device can hold. For example, a linear bar code can store up to 20 characters of information, while a CMB can store as much as 32 MB of data. This attribute is a key differentiator when large amounts of data are required from the AIT device for a particular business process.

Media Cost

The cost of AIT varies significantly by media. For example, bar codes cost pennies to create, while satellite modems can cost thousands of dollars.

Infrastructure Cost

Infrastructure cost also varies by AIT media. All AIT requires some type of infrastructure to operate from handheld devices to satellites in orbit. The cost of the device to write to a CMB is as low as $50, but the infrastructure required to transmit data from a satellite terminal could costs hundreds of thousands of dollars, depending on how many items are tracked, how often reports are sent, integration of other devices with the GPS, and many other factors. However, an AIT solution is not just hardware or media. Software costs/licenses can be substantial.

Read Method

The read method includes the range at which an AIT medium can be read by a scanner, accuracy of the read, and how much automation is offered. For example, a linear bar code requires line-of-sight visibility by the reader and must be read within a very close range for an accurate reading. In contrast an active RFID can be automatically read at a long read range (300 feet) and does not require human intervention. Another consideration is whether or not the AIT media must be removed from the layer packaging in order to be read.

Information Security

Information security protects data from unauthorized access, use, disclosure, destruction, modification, or disruption.[1] Some AIT media only contain license plate data and pose little information security risk. AIT that is hands free or wireless has a higher level of security to be considered in order for the AIT to function. Other AIT media can include large amounts of data, both encrypted and unencrypted. If an AIT medium containing unencrypted data can be easily separated from the layer packaging, the medium generally increases the risks to information security. Certain AIT that portrays location, position, and identification information, such as satellite tracking terminals (anything with GPS) require certain information assurance mitigation technologies that can add significantly to their cost.

Standards

Standards were not considered in the ensuing AIT Use Assessment in Chapter 5, but are included here as an AIT media attribute for completeness. This CONOPS assumes that standards are complete and in place for the technologies recommended by this CONOPS. The DoD application of the various AIT technologies

[1] United States Code Collection 3542(b)(1) Definitions, 2006.

shall be based to the maximum extent practicable on consensus based commercial standards as described in Public Law 104-113 and Office of Management & Budget (OMB) Circular 119A. Use of these consensus standards provides lower cost alternatives to unique military solutions and facilitates interoperability with technologies used by the commercial sector. The specific DoD approved consensus based commercial standards for each application shall be listed in the appropriate DoD implementation plan.

MEDIA SELECTION

The DoD logistics community's interest in AIT is for the purpose of improving the efficiency of its logistics business process and reducing process costs, thereby enhancing support to DoD's war-fighting capability. Several different types of AIT technologies may be suitable for the intended data capture purpose. However, depending on the application to which it is applied, there may be specific reasons why an organization might want to utilize the attributes offered by a specific type of AIT. To understand which is the most suitable technology for a given application, it is useful to understand the root cause, or reason, for wanting to apply any AIT to a given business process. Within the DoD logistics community, the most basic answers to the question "Why AIT?" are discussed below.

Basic Use of AIT—Facilitate Data Management

The primary use of AIT is to facilitate data management. There are several tasks within the function of data management where AIT offers enhancement opportunities. The first of these is in the area of cost and processing time needed for data capture. The second is improving data accuracy, the third is improving data timeliness, and the fourth is enhancing the ability for DoD to measure its actual metrics against desired performance standards.

- *Improve data accuracy.* Once data is uploaded to an AIT medium and verified, the AIT can then faithfully replicate that same data without error as an item passes through multiple processes. This reduces keystroke errors and transaction and database error correction efforts.

- *Reduce data capture cost and processing time.* When an AIT is properly matched to a business process task, it can reduce the resource costs and process time needed to collect operational data. In some cases, human intervention may still be required, but not to the extent of totally manual data capture processes. In other cases the data capture process can be completely automated, thereby eliminating human intervention altogether.

- *Reduce data latency.* AIT can assist with the uptake of data to AISs, enhancing the ability of an AIS user to "see" in near-real-time where assets are in the work flow and who currently has responsibility for them. This improves the overall quality and usefulness of the data by reducing data

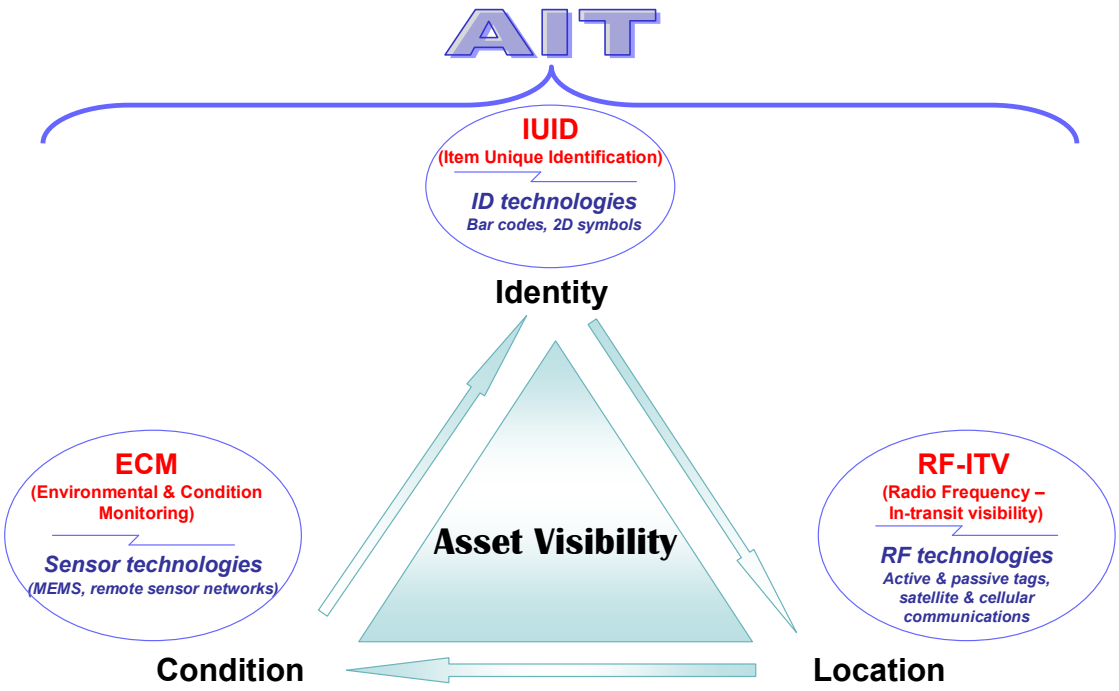
latency between the time an asset is involved in a reportable event to the time that information is accessible in a database for action by decision makers. The resulting information provides operators and decision makers with the ability to make decisions based on what the current state of an asset is rather than on data that could be hours, if not days old.

- *Enhance supply chain performance monitoring.* Using a variety of AIT as well as distribution and asset flow data derived from throughout the supply chain, the AIT media can help monitor how responsive the supply chain is against a desired standard metric. This can be done by comparing data from AIT located on an asset or consolidation layer, the location of where that data was captured, and system clock data against defined standard planning metrics.

Advanced Uses of AIT

Figure 4-8 depicts the three dimensions of asset visibility: identity, location, and condition. AIT can provide uses beyond data management facilitation that support these three dimensions.

Figure 4-8. Three Dimensions of AIT Enhanced Asset Visibility



Note: Sample AIT media considered most germane to the respective dimension is noted in blue (ID technologies, sensor technologies, and RF technologies). The red lettering then refers to a well-known program or system that is currently being implemented via a DoD initiative (IUID, ECM and RFID-ITV).

IMPROVED ASSET IDENTIFICATION

DoD has millions of assets. Consisting of everything from secondary items (e.g., individual repair parts), consumable items (e.g., fasteners), and oils and liquids, to major end items (e.g., tanks and wheeled vehicles), these assets can move through the distribution process as a single item or as part of consolidated shipments. Asset identification becomes increasingly more difficult when contained in one or more layers of consolidation.

DoD has been criticized over the years for wasteful business processes and for losing accountability of the things it owns. Many times, it is a matter of an item not being physically lost, but being hidden within consolidation data. The use of the proper type of AIT can assist in tracking these parent-child consolidation relationships. AIT can enable asset identification in two ways. The first is to use an AIT device identifier that is related to asset identification in a database that contains all the underlying information concerning the assets. This can be done for individual items (one AIT device to one asset) or on consolidated packs (one AIT device to many assets contained in a consolidated shipment). The second method of asset identification is an AIT device that contains all the detailed identification data (including content details within a consolidation) and can be read and interpreted without the need to access a separate database for the underlying information. The DoD IUID policy, *Policy for Unique Identification of Tangible Items: New Equipment, Major Modifications, and Reprocurements of Equipment and Spares* (see Appendix A) lays the foundation to enable asset visibility at varying levels throughout the DoD supply chain.

REMOTELY MONITOR ENVIRONMENTAL CONDITIONS

Certain assets that are received, stored, and shipped must be monitored while in the supply chain to detect a specific condition that would be adverse to the serviceability, functionality, safety, or security of the item. AIT media can be used to monitor and report the occurrence/existence of one or more conditions at the item level all the way through the item, package, cargo, and equipment condition even during distribution or in-storage operations. These sensing AIT devices are used to detect a predefined condition, and if combined with other AIT, such as RFID or satellite terminals, report the existence of the condition to an interrogator or an AIS. Sensors are developed to detect certain environmental conditions such as measuring humidity, thermal, biological, chemical, optical, impact, and magnetic phenomena. The derived information can then be used to determine the serviceability of an asset or to ensure stricter control of the environment for some desired outcome or purpose. AIT can also be used to monitor performance of an asset while in operation, such as the amount of wear on an engine by remotely sensing metal particles in engine oil.

Environmental and condition monitoring is where AIT can provide premium capabilities beyond the basic need for accurate data collection. The advanced capabilities include the following:

- *Enhance safety*. AIT can be used to automatically inspect stored assets/ inventory, containers, pallets and loose cargo, and transport conveyances to determine safety threats to personnel, structures, and static and in-transit assets by *detecting unsafe conditions* or dangerous threats such as radiation emissions and dangerous contraband. The business process improvements sought are to detect such phenomena or validate a condition without having to interrupt the business process or apply an inordinate amount of labor resources to accomplish the same purpose. This use of AIT could increase the number of assets inspected in storage and while in transit and improve safety and security of materiel handling. Ordnance material is particularly sensitive to environmental factors (e.g., temperature, humidity, shock, and vibration) and the application of sensor-enhanced RFID is a priority objective.

- *Improve cargo security*. A variety of scanning and sensing AIT can be used to mark, track, and identify cargo and containers transiting DTS. The most basic reasons AIT solutions are sought for security purposes are to identify assets that have been lost or stolen, identify unauthorized intrusion, and initiate emergency response.

- *Monitor perishable considerations*. Sensor-enabled AIT can monitor an item or shipment's surrounding conditions and shelf-life to ensure the item remains in good working condition and is not compromised from adverse conditions. Items and shipments requiring environmental condition and shelf-life monitoring are designated by the item manger.

DETERMINE LOCATION

Location reporting provides insight into the last known location of the item. This aspect is particularly critical for items in transit.

- *Current location.* This information serves two useful purposes: It identifies where the item is and generally who should have control of it. This is useful for security purposes (to determine if it is off-route) as well as for safety reasons (to determine if it is entering a restricted area).

- *Supply chain criticality*. This is the need to monitor an item's or shipment's location to ensure special "rush" processing through the DoD supply chain in order to process and deliver critical items that are currently in short supply. Items and shipments that require special location monitoring due to critical shortage should be designated by Owner/User in coordination with shipper and the COCOM.

Chapter 5
AIT Use Assessment

With the AIT media defined, including major attributes, and the reasons for AIT identified, the CONOPS can assess the applicability of each medium. This chapter evaluates each medium for its reasonableness of use. While it is recognized that there are an infinite number of ways a particular AIT can be used, this chapter focuses on the mainstream reasons that AIT is used. Each medium is evaluated in terms of key attributes that affect its performance in the business process and operating conditions in the first pass evaluation and reasons why AIT use is desirable in the second pass evaluation. Based upon these evaluations, specific AIT are identified for each layer of consolidation. It is important to note, however, that based on the nature of the commodity, any layer may also constitute any or all layers above it. For example, a helicopter for delivery to a unit is an item, or Layer 0. That helicopter may be flown to a delivery point however, in which case the helicopter effectively constitutes all layers up to the transport layer, or Layer 5.

FIRST PASS EVALUATION—ATTRIBUTES

Each AIT medium has unique characteristics that make identification, reporting, and tracking more appropriate for use based upon the use environment and state of consolidation. The appropriateness of each medium was evaluated for each layer of consolidation based on the attributes previously defined. The summary results of the evaluation are as follows. The detailed media assessment and scores are provided in Appendix B. Each medium was rated as “Not Acceptable” if it didn’t meet minimum required performance characteristics, “Acceptable” if it met minimum required performance characteristics, and “Preferred” if it not only met but exceeded minimum required performance characteristics significantly. If a medium received any “Not Acceptable” ratings, it was removed from consideration as a finalist for the second pass evaluation.

Layer 0—Item

At the item layer, a tag or mark on the item itself is deemed most appropriate. When an item is a UID item, a specific AIT is required that contains the identifier. MIL-STD-130 (Department of Defense Standard practice Identification Marking of U.S. Military Property) contains detailed information for identification marking at the item layer (included IUID items). Specific contract requirement for item identification and

valuation for IUID purposes are contained in DFARS 252.211-7003 Item Identification and Valuation.

- The linear bar code, 2D symbol, contact memory button, and sensor technology tags were deemed applicable at the item layer.

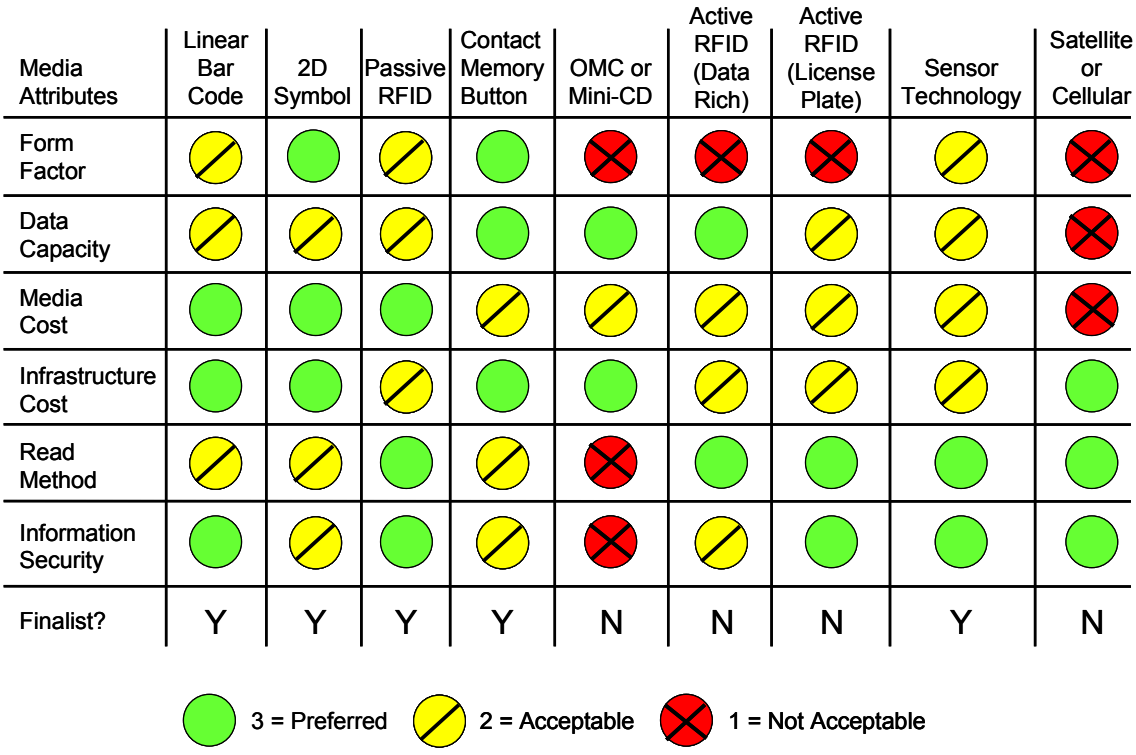
- The passive RFID tag was deemed inappropriate for item marking because it does not meet the permanent mark requirements of MIL-STD-130. Passive RFID is very susceptible to damage and should not be used to permanently identify an item, especially if it is packaged. Passive RFID should only be applied to the individual packaging for an item that will be stored or moved.

- The OMC or mini-CDs were deemed inappropriate because their size is too large relative to the likely size of items, the media must be physically removed from the item to be read, and separation of the media from the item may increase the risks to information security.

- Active RFID and satellite or cellular tags were deemed inappropriate because of their size in relation to the item and their expense in relation to the likely cost of the item. However, for larger items, specifically certain Class VII End-Items, such as a wheeled or track vehicle, and other similar equipment these media may be used, especially in unit movement scenarios. While still required to be marked with a IUID, for purposes of this CONOPS, these high profile or larger end items should not be considered as being a Layer 0 candidate. Layers 4 and 5 media evaluations and designated AIT are more applicable to those types of high profile and larger end items.

Figure 5-1 illustrates the results of the Layer 0 assessment.

Figure 5-1. Item Layer AIT Media Attribute Assessment



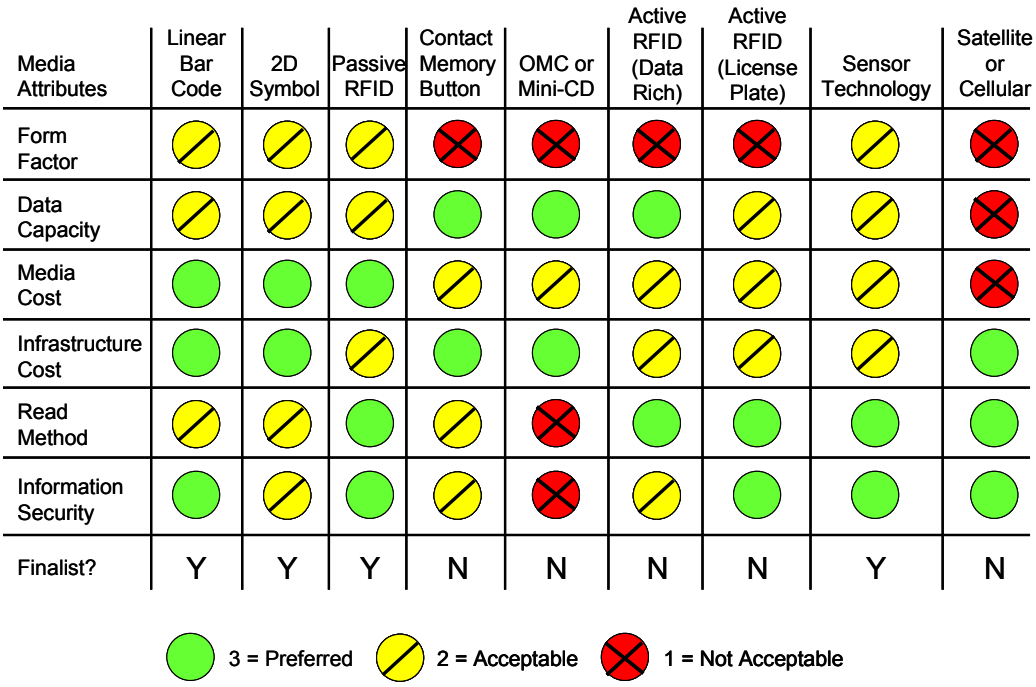
Layer 1—Individual Package

At the individual package layer, a tag or mark on the first level wrapping or box around the item is desired. This wrapping is most likely cardboard, plastic, or similar material.

- The linear bar code, 2D symbol, passive RFID tag, and sensor technology tags were deemed applicable at the package layer.
- The contact memory button was deemed inappropriate because it adheres best to metal surfaces. The button would not attach well to cardboard or flimsy plastic, making it inappropriate for this layer.
- The OMC or mini-CDs were deemed inappropriate because their size is too large relative to the likely size of items, the media must be physically removed from the item to be read, and separation of the media from the item may increase the risks to information security.
- Active RFID and satellite or cellular tags were deemed inappropriate because of their size in relation to the item and their expense in relation to the likely cost of the item.

Figure 5-2 illustrates the result of the Layer 1 assessment.

Figure 5-2. Individual Package Layer AIT Media Attribute Assessment



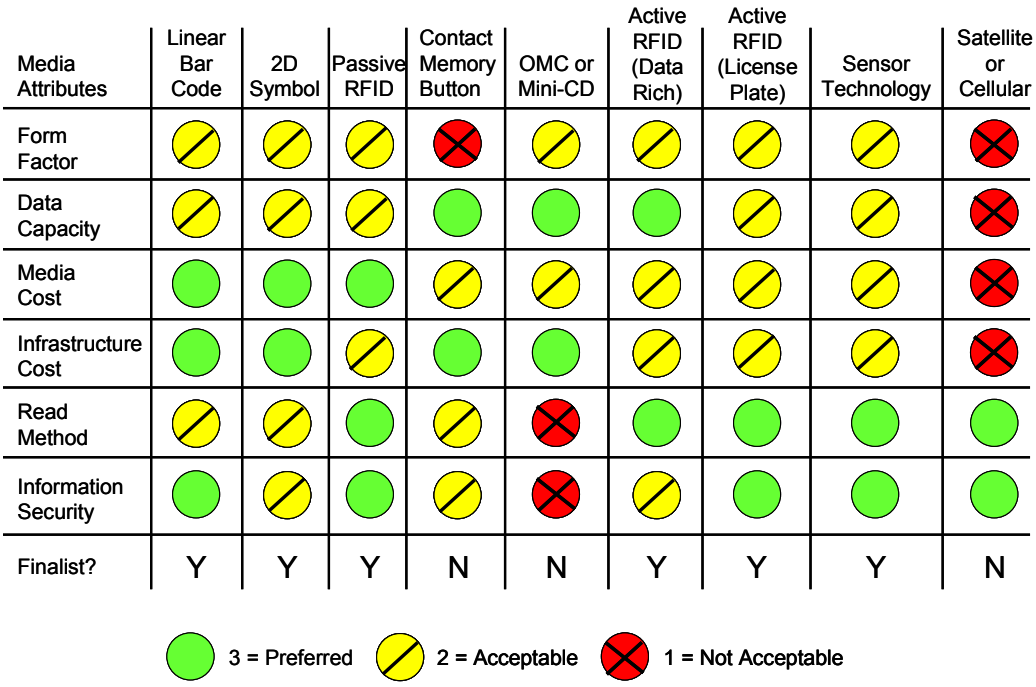
Layer 2—Transport Unit

At the transport unit layer, the tag or mark is being put on the single shipment unit. The shipment is most likely prepared in cardboard, plastic, or similar material.

- The linear bar code, 2D symbol, passive RFID tag, and sensor technology tags were deemed applicable at the transport unit layer.
- Active RFID tags were added to the list of applicable media for those shipments that are large enough and valuable enough to justify their use.
- The contact memory button was deemed inappropriate because it adheres best to metal surfaces. The button would not attach well to cardboard or flimsy plastic.
- The OMC or mini-CDs were deemed inappropriate because their size is too large relative to the likely size of items, the media must be physically removed from the item to be read, and separation of the media from the item may increase the risks to information security.
- Satellite or cellular tags were deemed inappropriate because of their size in relation to the shipment and their expense in relation to the likely cost of the items in the shipment.

Figure 5-3 illustrates the result of the Layer 2 assessment.

Figure 5-3. Transport Unit Layer AIT Media Attribute Assessment



Layer 3—Unit Load

At the unit load layer, the tag or mark is put on a consolidation of smaller shipments (Layers 0, 1, and 2) into a larger carton or tri-wall.

Additionally, a bare item could also constitute a unit load, in which case the unit load AIT would also be appropriate on the bare item.

- The linear bar code, 2D symbol, passive RFID tag, and sensor technology tags were deemed applicable at the transport unit layer.
- Active RFID tags were added to the list of applicable media for shipments that are large enough and valuable enough to justify their use.
- The contact memory button was deemed inappropriate because it adheres best to metal surfaces. The button would not attach well to cardboard.
- The OMC or mini-CDs were deemed inappropriate because their size is too large relative to the likely size of items, the media must be physically removed from the item to be read, and separation of the media from the item may increase the risks to information security. These technologies may co-exist with other AIT as an automated packing list but are insufficient to meet the minimum required AIT.

- Satellite or cellular tags were deemed inappropriate at this consolidation level because of their size in relation to the shipment and their expense in relation to the likely cost of the items in the shipment. In addition, because this layer is most often placed inside a container, interrogation of tags within the container would be obstructed. However, some unit loads will move OCONUS separate from containers and 463L pallets, and satellite or cellular tags may be appropriate.

Figure 5-4 illustrates the result of the Layer 3 assessment.

Figure 5-4. Unit Load Layer AIT Media Attribute Assessment

Media Attributes	Linear Bar Code	2D Symbol	Passive RFID	Contact Memory Button	OMC or Mini-CD	Active RFID (Data Rich)	Active RFID (License Plate)	Sensor Technology	Satellite or Cellular
Form Factor	2	2	2	1	2	2	2	2	1
Data Capacity	2	2	2	3	3	3	2	2	1
Media Cost	3	3	3	2	2	2	2	2	1
Infrastructure Cost	3	3	2	3	3	2	2	2	1
Read Method	2	2	3	2	1	3	3	3	3
Information Security	3	2	3	2	1	2	3	3	3
Finalist?	Y	Y	Y	N	N	Y	Y	Y	N

3 = Preferred 2 = Acceptable 1 = Not Acceptable

Layer 4—Container or 463L Pallet

Starting with this layer, there is a shift in the conditions that an AIT medium must endure. In addition, the items being marked may be moving at higher speeds and read from greater distances than in the previous layers. This affected the evaluation of the different media.

- The linear bar code was retained because it is required by ISO standards and United Nations Standardization Agreements (UN STANAGs) for the military shipping label. The 2D symbol was retained as applicable because of its error correction capabilities.

- Passive RFID and active RFID tags are both applicable at this layer, with active RFID preferred due to increased read range.

- This layer involves, in most cases, metal surfaces, allowing the contact memory button to apply. However, the read method of the button (contact) may restrict its use based on best business processes.
- The OMC or mini-CDs were deemed inappropriate because the media must be physically removed from the item to be read, and separation of the media from the item may increase the risks to information security.
- Satellite or cellular tags were deemed appropriate if the value of the contents in the container or 463L pallet justified the cost of the media and related infrastructure.

Figure 5-5 illustrates the result of the Layer 4 assessment.

Figure 5-5. Container or 463L Layer AIT Media Attribute Assessment

Media Attributes	Linear Bar Code	2D Symbol	Passive RFID	Contact Memory Button	OMC or Mini-CD	Active RFID (Data Rich)	Active RFID (License Plate)	Sensor Technology	Satellite or Cellular
Form Factor	2	2	2	3	2	2	2	2	3
Data Capacity	2	2	2	3	3	3	2	2	2
Media Cost	3	3	3	3	3	2	2	2	2
Infrastructure Cost	3	3	2	3	3	2	2	3	2
Read Method	2	2	3	2	1	3	3	3	3
Information Security	3	2	3	2	1	2	3	3	3
Finalist?	Y	Y	Y	Y	N	Y	Y	Y	Y

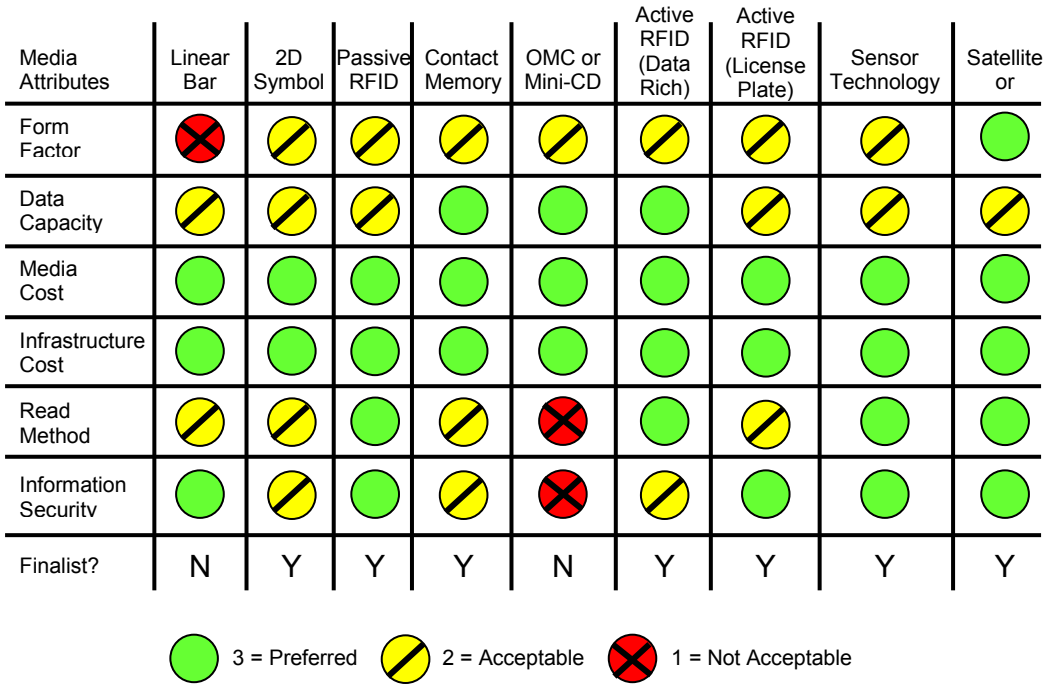
3 = Preferred 2 = Acceptable 1 = Not Acceptable

Layer 5—Conveyance

Because conditions are similar to Layer 4 for tracking an actual conveyance (tractor, rail engine, vessel, or airplane), and based strictly on the media attributes, the same media could potentially be applicable to many of the business processes associated with the management of these conveyances. The identification and tracking of commercial conveyances are most typically handled by specialized commercial asset tracking systems. If DoD imposed or demanded the use of specific AIT at this level, it would be based on the unique situation and specific internal business processes.

Figure 5-6 illustrates the result of the Layer 5 assessment.

Figure 5-6. Conveyance Layer AIT Media Attribute Assessment



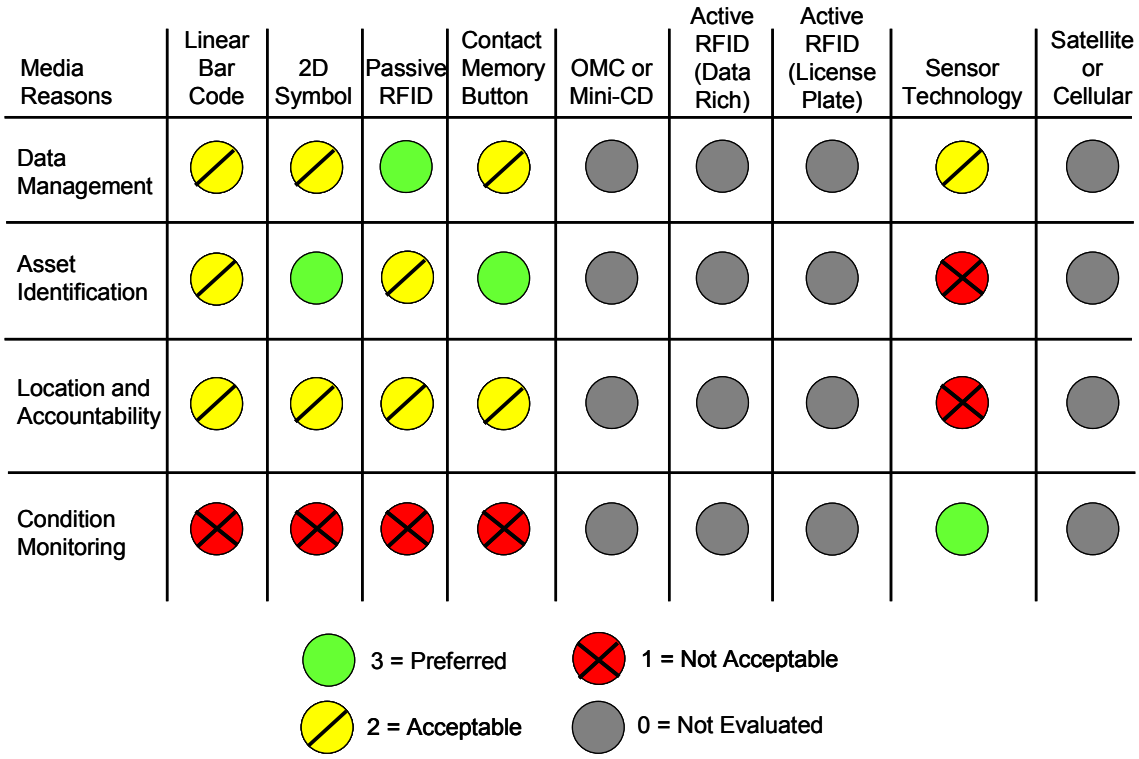
SECOND PASS EVALUATION—AIT REASONS

With the first pass evaluation complete, a list of applicable AIT that could work for each consolidation layer has been generated, based upon the ability of the media to work in the operating conditions. The CONOPS now evaluates this subset of AIT media for each layer based upon the potential uses of the AIT. While each medium *could* be used, one or more of these may not serve the purpose for which a user needs to apply the technology. The summary results of the evaluation, by layer, follow. The detailed media assessment and scores are provided in Appendix C. Each medium was rated as "Not Acceptable" if it didn't meet minimum required performance characteristics, "Acceptable" if it met minimum required performance characteristics, and "Preferred" if it not only met but exceeded minimum required performance characteristics significantly.

Layer 0—Item

Figure 5-7 shows that, for the item layer, the 2D symbol is the best mark for long term marking based on form, fit and function for in-use applications that should be as permanent as the normal life expectancy of the item (see MIL-STD-130). The contact memory button is best to handle information about the item, because CMBs hold more detailed information. At this layer, all media are used in conjunction with a physical business process; therefore, they rely on the business process AIS to translate the AIT read into a location and accountability notation for the item. Finally, only sensor technologies monitor conditions.

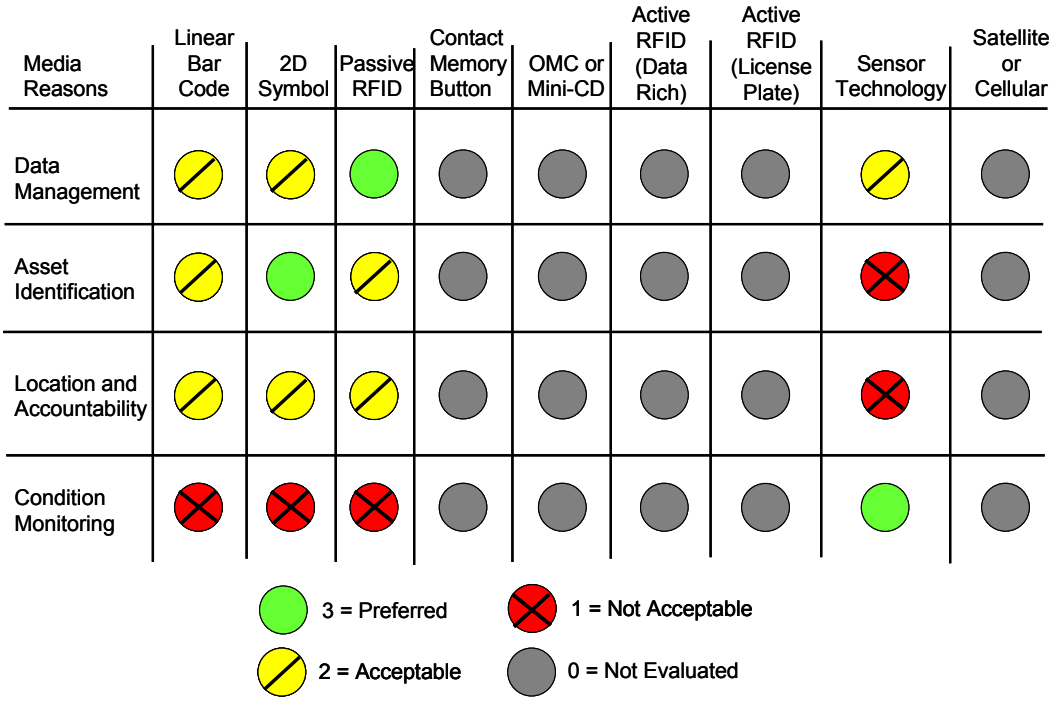
Figure 5-7. Item Layer AIT Media Reason Assessment



Layer 1—Individual Package

Figure 5-8 shows that, for the individual package layer, the passive RFID tag is the best AIT medium in terms of easy accessibility to the data because it does not require a direct line of sight and combined with a backend AIS, can provide detailed asset information. The 2D symbol is also ideal to handle information about the item. At this layer, all media are used in conjunction with a physical business process: therefore, they rely on the business process AIS to translate the AIT read into a location and accountability notation for the item. Finally, only sensor technologies monitor conditions.

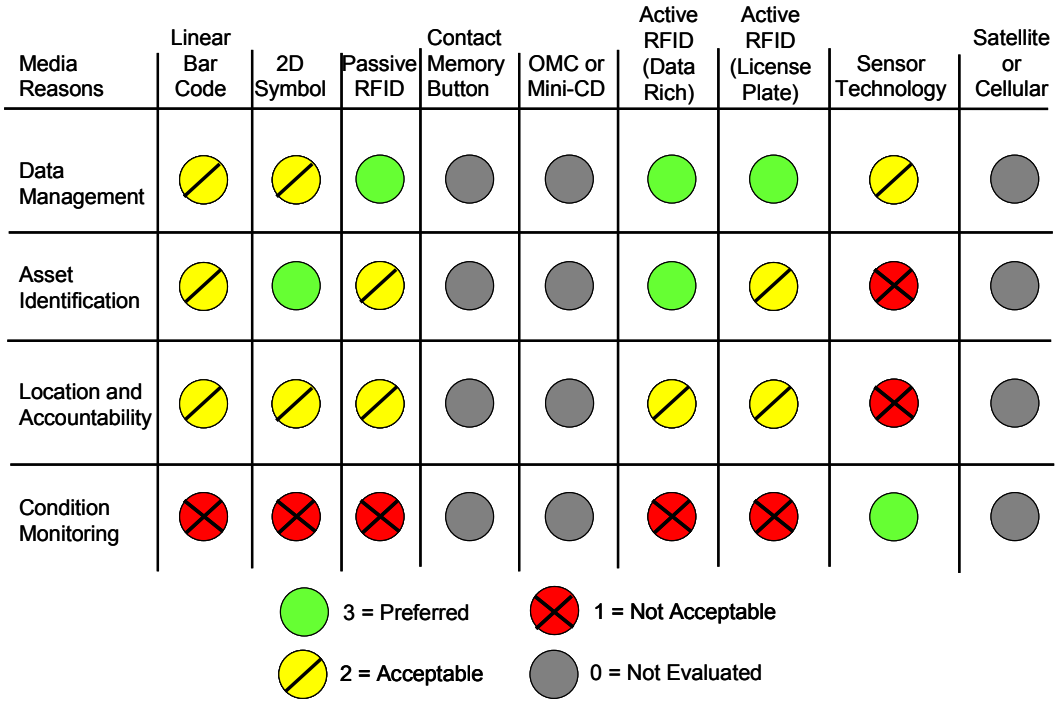
Figure 5-8. Individual Package Layer AIT Media Reason Assessment



Layer 2—Transport Unit

Figure 5-9 shows that, for the transport unit layer, the RFID tags (passive or active) are the best AIT media in terms of easy accessibility to the data because they do not require a direct line of sight to read and they can be read from a distance. The 2D symbol and active RFID data-rich tag are best at handling information about the item, because they can hold more detailed information about the layer and its contents. At this layer, all media are used in conjunction with a physical business process; therefore, they rely on the business process AIS to translate the AIT read into a location and accountability notation for the item. Finally, only sensor technologies monitor conditions.

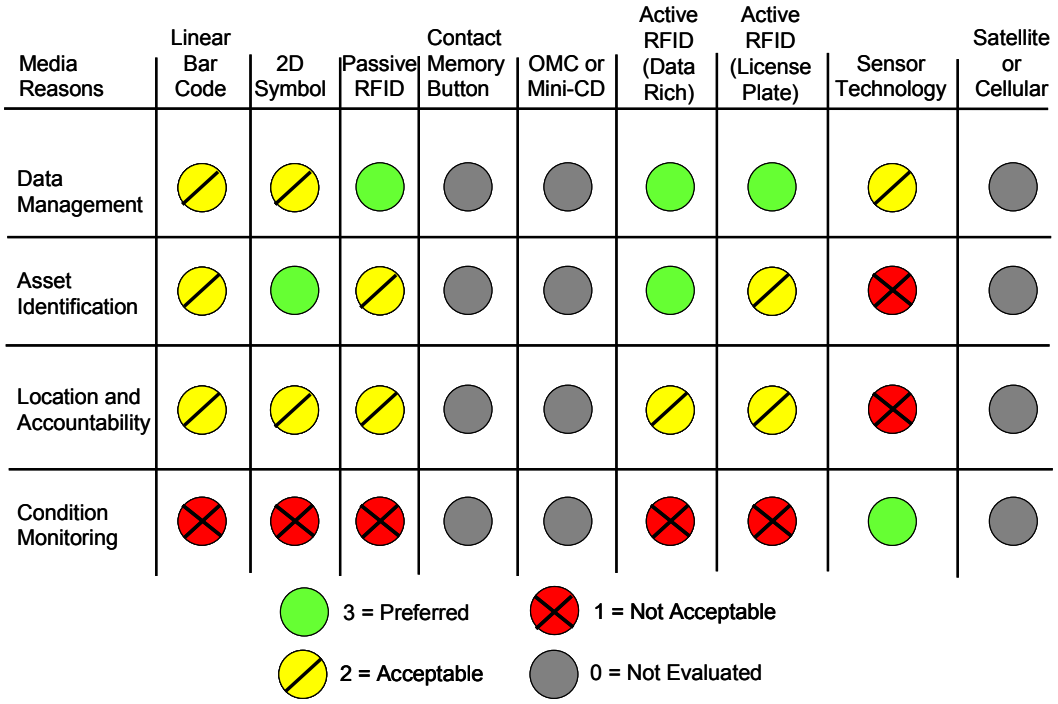
Figure 5-9. Transport Unit Layer AIT Media Reason Assessment



Layer 3—Unit Load

Figure 5-10 shows that, for the unit load layer, the RFID tags (passive or active) are the best AIT media in terms of easy accessibility to the data because they do not require line of sight to read and can be read from a distance. The 2D symbol and active RFID data-rich tag are best at handling item information because they hold more detailed information about the layer and its contents. At this layer, all media are used in conjunction with a physical business process; therefore, they rely on the business process AIS to translate the AIT read into a location and accountability notation for the item. Finally, only sensor technologies monitor conditions.

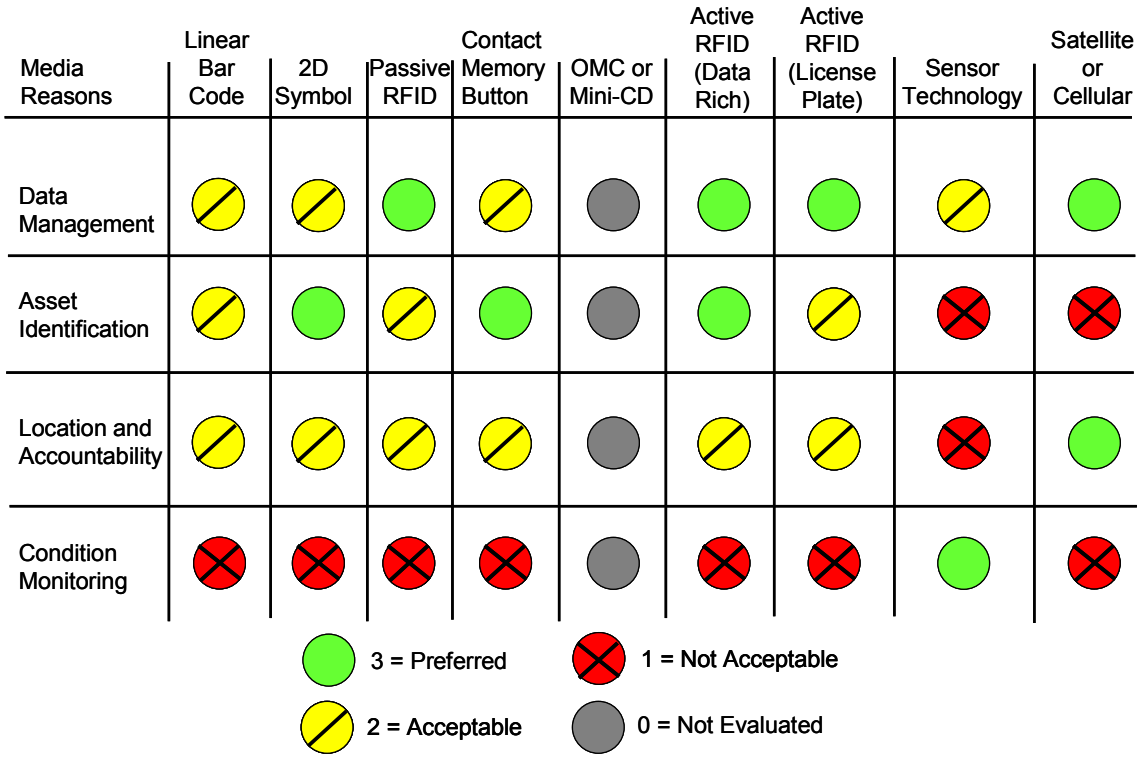
Figure 5-10. Unit Load Layer AIT Media Reason Assessment



Layer 4—Container or 463L Pallet

Figure 5-11 shows that, for intermodal containers, 463L pallets, or large individual items that undergo harsh conditions or are transitory, RFID tags (passive or active) and satellite tags are the best AIT media in terms of easy accessibility to the data because they do not require line of sight and they can be read from a distance. Passive RFID tags have a relatively short readability distance, however, and are less preferred than the active RFID tags or satellite transponders. The 2D symbol, passive RFID tag, contact memory button, and active RFID data-rich tags are best at handling information about the layer, because they hold more detailed information about the layer and its contents. At this layer, items may be in transit and outside a physical facility with a surrounding business process. In this situation, satellite or cellular technology provides the best hands-off method for tracking the location of an item as closely as possible. Although active RFID tags can also track location, they rely on an extensive fixed infrastructure *and* the container or 463L pallet must traverse the correct route within the distance of these interrogators—clearly, this is not an ideal set of requirements. Finally, only sensor technologies monitor conditions.

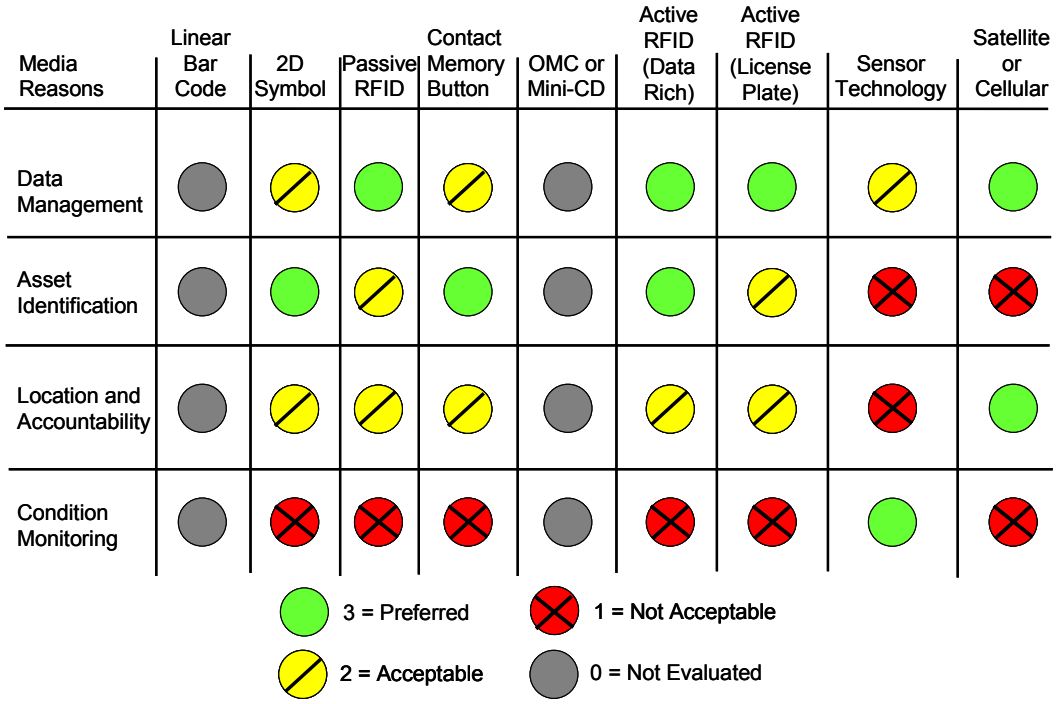
Figure 5-11. Container or 463L Layer AIT Media Reason Assessment



Layer 5—Conveyance

Figure 5-12 shows that, for conveyances, RFID tags (passive or active) or satellite tags are the best AIT in terms of easy accessibility to the data because they do not require a line of sight to read and they can be read from a distance. The 2D symbol, contact memory button, and active RFID data-rich tags are best at handling information because they hold more detailed information about the layer and its contents. At this layer, satellite or cellular technology provide the best hands-off method for tracking the location of an item as closely as possible. While active RFID tags can also track location, they rely on an extensive fixed infrastructure *and* the conveyance must first traverse the correct route within the distance of active RFID interrogators—clearly not an ideal set of requirements. Finally, the only media type that monitors conditions are sensor technologies.

Figure 5-12. Conveyance Layer AIT Media Reason Assessment



AIT DESIGNATIONS PER LAYER

With the above assessments completed, a set of AIT and an identification of which are appropriate for what reasons has been generated. This set of AIT represents the finalists to consider in the concept of operations. Not all finalists will be used on each layer, so the CONOPS identifies a set of AIT using these finalists.

Baseline versus Premium AIT Levels

Not all items or shipments require high-end AIT media. Chapter 4 discussed some very special requirements for monitoring and tracking:

- *Safety*. The need to monitor an item's or shipment's location and surrounding conditions to ensure it will not pose a threat to the surrounding people and infrastructure. Items and shipments requiring special safety considerations are normally designated by the item manager. Arms, ammunition, and explosives, for example, require added safety precautions.

- *Security*. The need to monitor an item's or shipment's location and surroundings to ensure it is not tampered with or stolen. Items and shipments requiring special security considerations are designated by the shipper or the DPO based on known threat levels.

- *Location*. The need to monitor an item's or shipment's location and provide stand-alone content detail to ensure access to content information when the destination location cannot reliably connect to back-end AIS via a stable communications channel. Items and shipments that require special location monitoring and content-level detail should be designated by the involved Service owner/customer in conjunction with the COCOM and USTRANSCOM.

- *Perishable considerations*. The need to monitor an item's or shipment's surrounding conditions to ensure the item remains in good working condition and it is not compromised from adverse conditions. Items and shipments requiring environmental condition monitoring are designated by the item manager.

- *Supply chain criticality*. The need to monitor an item's or shipment's location to ensure special "rush" processing through the DoD supply chain in order to process and deliver critical items that are in short supply. Items and shipments that require special location monitoring due to critical shortage should be designated by the Service owner/customer in conjunction with the shipper, USTRANSCOM and COCOM involved.

All items or shipments that do not fall into any of the above conditions are considered to be in this CONOPS' minimum "baseline" AIT. The baseline AIT designations will focus on the ability to identify the asset with access to AIS via a communications channel and provide the most flexibility to read the AIT as easily and efficiently as possible. *All* items and shipments will require this baseline set of AIT. Items and shipments that require additional monitoring or content data will require additional *premium* AIT to address those needs. These premium items and shipments will still have the baseline AIT. In most instances, the premium AIT media will be *in addition to* the baseline AIT; it will not replace the baseline AIT. However, in the case of data-rich versus license-plate active RFID tags, the premium will replace the baseline.

Baseline and Premium Designations

Using this concept of baseline and premium AIT, this CONOPS identifies the AIT media for each layer as shown in Figure 5-13. Two AIT media are designated for each layer as a baseline. The primary baseline AIT should be used if possible, but a secondary (i.e., backup) AIT can be used if the primary AIT does not function, or while migrating the current business processes and infrastructure to the primary AIT. Two AIT media are recommended per layer so that the business process owner uses the primary AIT if at all possible, but the backup AIT in the isolated situations where primary AIT use is precluded due to

- Business process,
- Readability,
- Technology infrastructure available, and
- Spot failures of the primary media.

Figure 5-13. AIT Designations per Consolidation Layer

	Linear Bar Code	2D Symbol	Passive RFID***	Contact Memory Button	OMC or Mini-CD	Active RFID (Data Rich)	Active RFID (License Plate)	Sensor Technology	Satellite or Cellular
Layer 0* (Item)	IUID**	IUID Data Matrix	Inv Data	Mntnce Data			Unit Move Equip	Safety Security Perishable	Location Safety Security
Layer 1 (Package)		PDF 417						Safety Security Perishable	
Layer 2 (Trnsprt Unit)		PDF 417						Safety Security Perishable	
Layer 3 (Unit Load)		PDF 417				Content Data	Location	Safety Security Perishable	
Layer 4 (463L/Cont)		PDF 417				Content Data		Safety Security Perishable	Location Safety Security
Layer 5 (Vehicle)						Content Data	Location	Safety Security Perishable	Location Safety Security

Primary Baseline AIT
Backup Baseline AIT
Premium Service AIT
Not Recommended

*Note: For Layer 0 non-IUID items, no AIT is required.
**Note: For Layer 0, linear bar codes are backup baseline AIT for only selected data elements of IUID items.
***Note: Passive RFID is the primary AIT at the MRO/requisition level.

Layer 0—Item

Three distinct sets of baseline AIT designations are addressed, each with different item markings requirements for this layer.

- *IUID markings*. For items that cost more than $5,000 and/or fall within the requirements of the IUID (i.e. items which are serially managed, mission essential, or part of controlled inventory), the primary baseline AIT is the 2D Data Matrix. The backup baseline AIT for IUID is a linear bar code. IUID data encoding generally exceeds the capacity of linear bar codes. In most cases, the only practical use of the linear bar code is limited to backup of select data elements. The linear bar code may not replace the 2D symbol, but it can be put on the item in addition to the 2D symbol.

- *Non-IUID items*. For items below the threshold for an IUID, no AIT is required. If some type of machine readable information (MRI) is preferred, a 2D Data Matrix should be used (in accordance with MIL-STD-130) in order to provide consistency with IUID marked items. However, items may be marked with other MRI as makes sense, such as a passive RFID tag or a linear bar code. The type of MRI used should comply with associated

commercial and international standards in order to ensure its usability within the DoD supply chain.

- *Large individual items*. For large items or principal end items (PEI) that are used in harsh conditions and may be transitory in nature (truck, container, etc.), a license plate active RFID tag should be used as the primary baseline AIT. A 2D symbol or linear bar code on a durable surface should be the backup baseline AIT. If this is an IUID item, a 2D Data Matrix is required.

In addition to these baseline AIT media, the following premium AIT may be used, but only *if there is a compelling reason for their use.*

- Passive RFID may be used for inventory management by an owning entity.
- Contact memory buttons may be used on individual items when detailed use and maintenance history is desired.
- Sensors may be used to monitor individual items to note temperature, humidity, light, or other environmental conditions that may imperil the item or may indicate an imminent safety or security concern.
- Satellite or cellular technology may be used on large individual items that require detailed location tracking to ensure priority processing or to note potential safety risks or security breaches because of the item's location.

Layer 1—Individual Package

For this layer, the baseline AIT designations are as follows:

- Passive RFID tags should be used as the primary baseline AIT.
- A 2D symbol or linear bar code should be used as the backup baseline AIT if the passive RFID tag is non-responsive or until passive RFID is incorporated into the business processes.

In addition to these baseline AIT media, sensor technology may be used as a premium AIT, but only *if there is a compelling reason for their use.* Sensors may be used to monitor individual items in their packaging to note temperature, humidity, light or other environmental conditions that may imperil the item or may indicate an imminent safety or security concern.

Layer 2—Transport Unit

For this layer, the baseline AIT designations are:

- Passive RFID tags should be used as the primary baseline AIT.
- The 2D symbol or linear bar code on the Military Shipping Label (MSL) should be used as the backup baseline AIT if the passive RFID tag is non-responsive or until passive RFID is incorporated into the business processes.

In addition to these baseline AIT media, sensor technology may be used as a premium AIT, but only *if there is a compelling reason for their use.* Sensors may be used to monitor individual items in their packaging to note temperature, humidity, light or other environmental conditions that may imperil the item or may indicate an imminent safety or security concern.

Layer 3—Unit Load

For this layer, the baseline AIT designations are:

- Passive RFID tags should be used as the primary baseline AIT.
- The 2D symbol or linear bar code on the Military Shipping Label (MSL) should be used as the backup baseline AIT if the passive RFID tag is non-responsive or until passive RFID is incorporated into the business processes.

In addition to these baseline AIT media, sensor technology may be used as a premium AIT, but only *if there is a compelling reason for their use.* Sensors may be used to monitor individual items in their packaging to note temperature, humidity, light, or other environmental conditions that may imperil the item or may indicate an imminent safety or security concern.

Layer 4—Container or 463L Pallet

For this layer, the baseline AIT designations are:

- Active RFID license plate tags as the primary baseline AIT for business process flow. The license plate active RFID tag can also provide some baseline in-transit visibility using a fixed interrogator infrastructure. *This assumes that there will be assured communications for all locations and that the assured communications will be steady and cannot be disrupted by enemy forces.*
- Linear bar codes or 2D symbols, applied onto a durable surface, should be used as the backup baseline AIT if the active RFID tag is non-responsive or until active RFID is incorporated into the business processes.

In addition to these baseline AIT media, the following premium AIT may be used, but only *if there is a compelling reason for their use*.

- Sensors may be used to monitor container or 463L conditions to note temperature, humidity, light, or other environmental conditions that may imperil one or more shipments or may indicate an imminent safety or security concern.
- Satellite or cellular technology may be used on containers with shipments that require detailed location tracking to ensure priority processing or to note potential safety risks or security breaches because of the container's location.
- A *data-rich* active RFID tag may be affixed to the container or 463L if the final destination of the container or 463L does not enjoy stable and reliable access to an AIS with the content data.

Layer 5—Conveyance

As noted earlier, the identification and tracking of commercial conveyances are most typically handled by specialized commercial asset tracking systems. Therefore, no baseline AIT is identified for this layer. However, the DoD can require additional AIT to convey special materiel based on the definitions outlined in Chapter 3. Whether the equipment is organic or contractor-provided, satellite tags with GPS and active RFID may be applied as needed. However, for contractor equipment, AIT is applied only if required within the contract specifications.

The following premium AIT may be used, but only *if there is a compelling reason for their use*.

- Sensors may be used to monitor conveyance to note temperature, humidity, light, or other environmental conditions that may imperil the conveyance; track the shipments it is carrying; or indicate an imminent safety or security concern.
- Satellite or cellular technology may be used on a conveyance that requires detailed location tracking to ensure priority processing or to note potential safety risks or security breaches based upon the conveyance's location.
- Combinations of sensor technologies, integrated with active RFID or satellite and cellular technologies can be used where it is imperative to read environmental conditions remotely while an item is in-storage or in-transit.

OTHER AIT CONSIDERATIONS

When reviewing the overall AIT uses prescribed in this CONOPS, some overarching topics need to be addressed. Rather than address each repeatedly within each layer, they are addressed here.

Linear Bar Codes

Over time, the DoD may gradually phase out the current linear bar code technology for normal day-to-day use. However, until standards and business practices change, linear bar codes will remain as a recommended backup baseline AIT.

Contact Memory Buttons

Contact memory buttons are a specific technology that is envisioned to be applicable mostly to DoD's maintenance business processes. They are durable and effective when permanently affixed to certain parts, components and end items and can provide a vast amount of information about the item, its history, and specific rebuild specs and tolerances. While it is conceivable to use CMB technology for many purposes, it was designed to be rugged and permanent and does require physical contact to access the data content. For the foreseeable future CMB is not considered as a general purpose, minimal AIT solution.

OMC/Mini-CD

OMC and the follow-on mini-CD replacement have proven to be invaluable, especially to the Army, as an electronic form of a packing list. As such, this CONOPS does not consider it as part of the minimum AIT solution, but as an electronic packing list that can easily co-exist with all the technologies designated as the minimum AIT solution sets, where desired by the ordering Service. However, in the future, OMC/mini-CD may become obsolete by AIT technology that links shipment data to Service systems through Defense Logistics Management System (DLMS) transactions.

Direct Vendor Deliveries

The term direct vendor deliveries (DVD) is used to describe shipments from a vendor to a destination other than a wholesale depot for storage. As used here, "direct vendor deliveries" is meant to imply

- planned DVD supply chains (when directed from a DoD source of supply to a vendor, these shipments include AIT media as directed by the various military standards and regulations and include standard logistical data shared among DoD partners via AISs),
- contracted logistics support (CLS) and performance-based logistics (PBL) supply chains,
- prime vendor supply chains, and
- deliveries made via government purchase card purchases.

The DoD should strive towards a single set of business processes that facilitate processing of both DVD and non-DVD shipments. As such, the AIT baselines designated by this CONOPS are expected for DoD processing and should be enforced for all vendor deliveries where contract specifications may be written and enforced, such as with PBL contracts or DLA DVD contracts. The subsequent AIT Implementation Plan will address the specific data required on the AIT and the data to be sent electronically to DoD systems. Updates to the military standards, regulations, and the DFARS may be needed to require and enforce AIT use for DVDs.

However, not all direct deliveries use contracts. Government purchase card purchases are an excellent example of items where AIT application cannot be guaranteed. This CONOPS does *not* address how to approach the handling of these non-contract vendor deliveries. Much more work is needed in this area, and the department cannot wait for all the issues to be resolved before adopting a basic AIT CONOPS with which to move forward.

Pre-positioned Materiel

The CONOPS' analysis indicates the AIT for pre-positioned materiel is no different than the AIT that will be identified for the main supply chain concept, including special requirements for munitions.

Munitions

The safe use of AIT with munitions deserves special consideration. As of the date this CONOPS was completed, Hazards of Electromagnetic Radiation to Ordnance (HERO) testing for compatibility of passive RFID and all the complete inventory of munitions/ordnance has not been completed. For that reason, this CONOPS recognizes that no passive RFID be used around munitions and other explosive ordnance. The 2D symbol should be the primary baseline AIT for munitions for Layers 0-3 rather than a passive RFID tag. If requirements identification and supporting DoD policy modifications determine safe passive RFID technologies and methods, this CONOPS can be adjusted.

The Importance of AIS Communication

The austere environments that U.S. ground forces find themselves operating in have demonstrated that assured logistics system communications have not yet been achieved. It is recognized that the Army and Marine Corps will need premium AIT at the beginning of a conflict in an austere environment for several years into the future. As an operation matures, connectivity should improve and premium AIT may not be needed. Additionally, during the 6th year of implementation of this CONOPS (FY2013) the Army is scheduled to have a new battlefield communications system in place that should help alleviate many of the Army's logistic system connectivity issues. This CONOPS acknowledges this connectivity issue by retaining the data-rich active RFID use when it is necessary but also moves

toward a less expensive and easier to secure active license plate RFID in those environments where connectivity with an AIS is not an issue. Content level data will continue to be created for the license plate data and will continue to be sent to the RFID database, or other joint repository if one evolves over the next seven years.

This CONOPS provides a baseline of minimally acceptable technologies to be applied at the different states as the item passes through the various logistics processes. The minimum baseline AIT is built on the premise that the Army and Marine Corp can resolve their lack of connectivity by at least 2015. By then, the AIT will be read into one or more AIS used throughout the DoD supply chain. Once the AIT has been read by the first AIS, any transmission of data and asset visibility benefits must be driven by AIS to AIS communication. Key to any data architecture and business process improvement efforts should be the transmittal of the AIT data and *the logical references to each layer of consolidation currently in effect*. In other words, if, for example, a container is stuffed at a CCP, the CCP AIS should provide to the DoD supply chain the appropriate active RFID tag ID for that container, any premium AIT ID numbers (e.g., satellite) and the nested passive RFID tags and 2D symbol identifiers for the shipments within the container. A complete "consolidation tree" of information should be continually updated and made available as material flows through the supply chain.

Data-Rich versus License Plate Active RFID Tags

By 2015, if the AIS and business processes of DoD are designed and operating properly, there should rarely be a reason to apply data-rich active RFID to any asset or shipment. An active RFID license plate tag would be more practical, more secure, and less expensive and would simply point to the data in a database where more information about the item could be accessed, including content level detail. In the interim, a premium technology data-rich tag will be placed on the item or shipment to fill the gap left by inadequate communications and AIS connectivity, or when reach back communication adequacy cannot confidently be ascertained beforehand.

Chapter 6
Current DoD AIT Efforts

Since AIT is not a new topic for most DoD organizations, it is useful to review and assess significant DoD AIT efforts from the past. This chapter briefly summarizes this review. There are many policies, regulations, and other documents that address AIT use or formulate potential AIT use scenarios. This chapter identifies the more current DoD documents and efforts pertaining to AIT use. In consideration of previous guidance and initiatives that have preceded this CONOPS, this chapter compares each effort against the AIT guidance contained in Chapter 5.

EXISTING DOCUMENTATION

As stated in Chapter 2, the approach to this CONOPS encompassed a review of existing AIT efforts within DoD and a comparison to the "green-field" evaluation provided in Chapter 5.

The first step in reviewing existing AIT efforts was to collect a list of DoD documents that discussed the use of AIT. The following were among the documents reviewed:

- DoD regulations, standards, and specifications
- DoD memoranda
- Concepts of operations
- Implementation and integration plans
- Requirements and gaps
- Studies and tests of AIT
- Government Accountability Office (GAO) reports
- Overarching policy, plans, and requirements
- Charters for Offices, task forces, and working groups.

Refer to Appendix D for a complete list of the documents gathered. A draft version of this list was presented to a DoD AIT stakeholders meeting in January 2007, and the group provided input to complete the list.

ORGANIZATIONS INVOLVED IN CONOPS FORMULATION AND REVIEW

Organizations that were involved in stakeholders meetings and in subsequent CONOPS coordination that supported the development of the CONOPS include the following:

- Air Force (AF) AIT Program Management Office, Air Force Materiel Command (AFMC) LSO/LOA
- Air Force Staff, A4
- AMC (Blue)/A4TI
- Aviation and Missile Command (AMCOM)
- Army Staff, G-4
- DLA
- Defense Logistics Management Standards Office (DLMSO)
- DoD Logistics AIT Office
- GSA
- Joint Staff/J4
- Navy AIT Program Office
- Product Manager, Joint - Automatic Identification Technology (PM J-AIT)
- PM J-AIT from Army DCS, G-46, Contract Support
- PM J-AIT, Team Chief, RF-ITV Operations
- Under Secretary of Defense (USD), Acquisition Technology and Logistics (AT&L), Logistics and Materiel Readiness (L&MR), Supply Chain Integration (SCI)
- United States Marine Corps (USMC)
- USTRANSCOM TCJ3
- USTRANSCOM TCJ5/4 Liaison to DPfM
- USTRANSCOM TCJ5/4-PI

- USTRANSCOM TCJ6
- Warfighting COCOMs.

EFFORTS UNDERWAY

As evidenced by the volume of information referenced in Appendix D, significant AIT activity is underway throughout the DoD. Below are a few examples of initiatives that have influenced the current direction of AIT use within DoD.

RFID Policy Memo of 30 July 2004

This policy memo established the vision of implementing and integrating the use of passive RFID and active RFID for improved asset visibility throughout the DoD supply chain. It requires vendors to affix passive RFID tags at the package, transport unit, and unit load consolidation levels and for vendors and DoD to affix active RFID tags at the freight container layer. It also requires an ASN identifying the passive tag with the shipment. These requirements complement the AIT use guidance provided in this CONOPS; however, more work is needed to fully implement the vision, such as requiring the use of passive RFID tags within the DoD, fully integrating the passive tag data with active tags, and ensuring compliance with the ASN requirement.

RFID/MEMS Demonstration, Sierra Army Depot, CA, 26 July 2006

Army's Logistics Innovation Agency (LIA) conducted a year-long demonstration at the Sierra Army Depot to validate the use of sensor-enabled active RFID tags for monitoring the environmental conditions (specifically temperature and humidity) of medical assets while in long-term storage. This demonstration confirmed the use of AIT in the form of active RFID combined with MEMS sensors was superior to the previously used—and very subjective—visual humidity indicator. AIT provided accurate and timely alert information when humidity thresholds were breached. At one point during the demonstration, after several high humidity alerts were received for one container, the asset owner, the U.S. Army Medical Materiel Agency (USAMMA), opened the container, found a breached door gasket and water in the container. The visual humidity indicator did not indicate the high humidity condition that the AIT media successfully identified.

The results of this demonstration also align with the AIT use guidance provided in this CONOPS. For special case needs, such as requirements to monitor environmental conditions for storage items that have sensitivity to heat or humidity, and whenever the business case justifies its use, sensor technology should be used as a premium AIT in addition to the designated baseline AIT.

RFID/MEMS Demonstration, U.S. Army Medical Materiel Center—Europe, 2005–2006

LIA also demonstrated the RFID/MEMS capability for in-transit condition monitoring and automated nodal reporting. The demo encompassed medical materiel shipments from U.S. Army Medical Materiel Center-Europe to downrange destinations using the DoD standard active RFID tag, and the existing RF-ITV infrastructure. The demonstrations and supporting analysis have shown that sensor technologies are well-suited for in-transit visibility condition monitoring.

The results of this demonstration also align with the AIT use guidance provided in this CONOPS. For special case needs, such as requirements to monitor environmental conditions for in-transit items that have sensitivity to heat or humidity, and whenever the business case justifies its use, sensor technology should be used as a premium AIT in addition to the designated baseline AIT.

EVALUATION OF CURRENT EFFORTS

An analysis of the current efforts listed in Appendix D was conducted to determine which AIT was discussed at which consolidation layer in the document. See Appendix E for the detailed results of this analysis. In this appendix, some items are highlighted in red, identifying where the suggested AIT use in the document does not align with the AIT use designated in Chapter 5 of this CONOPS. In general, most of the current DoD AIT efforts align with the direction of this CONOPS. This section identifies some of the variances identified in the analysis.

Layer 0—Item

As stated in Chapter 5, the baseline AIT for the Layer 0 includes 2D symbols and supplemental linear bar codes for IUID items. An evaluation of current efforts indicated current AIT use tracks with the guidance in this CONOPS. Sensors may be used as a premium AIT at this layer for environmental condition monitoring where applicable.

One document of note is the *Department of the Navy AIT Implementation Manual,* dated June 2006. This manual recommends the use of CMBs. Depending on the intended use of the CMB, this may be appropriate if they are used on individual items when detailed use and maintenance history is desired. In this CONOPS, CMBs are considered a premium AIT that can be applied when detailed data, such as maintenance and item use history, that is affixed to the item itself is desired.

Layers 1–3—Individual Package to Unit Load Layers

The baseline AIT for consolidation Layers 1 through 3 is passive RFID as the primary AIT and 2D symbols and linear bar codes as the backup AIT. Sensors

may be used as a premium AIT at these layers for environmental condition monitoring where applicable.

Current DoD efforts are consistent with the CONOPS with the following exceptions:

- *Linear bar codes*. Current regulations, standards, and procedures dictate the creation and use of the linear bar code and/or 2D symbol based on the application. The more robust format of the 2D symbol allows even the simplest of data (a license plate ID number) to be stored redundantly in the mark and remain readable even if the symbol is damaged. Over time, linear bar codes should be phased out in favor of 2D symbols for those applications where the symbol print quality can be assured.

- *OMC*. A few of the documents in Appendix E (such as the *Department of the Navy AIT Implementation Manual*, dated June 2006, and previously published AIT CONOPS and AIT implementation plans) refer to the use of OMCs at Layers 1–3. The OMC is not identified as a baseline or premium AIT because it must be removed from the layer to be read and really serves more as an electronic packing list than a layer identifier. However, this CONOPS does not preclude their use as an additional AIT should organizations involved within the specific business process agree to use them *in addition to the baseline AIT*.

Layer 4—Container or 463L Pallet

The baseline AIT for Layer 4 is license plate active RFID tags as the primary AIT and linear bar codes/2D symbols as the backup AIT. Premium AIT for this layer includes sensors, satellite or cellular technology, and data-rich active RFID tags.

Current DoD efforts are consistent with the CONOPS with the following exceptions:

- *Linear bar codes.* Current regulations and procedures dictate the creation and use of the linear bar code. However, the linear bar code can be easily damaged and rendered unusable. This CONOPS migrates to the 2D symbol where either bar code symbol could be used. This migration is in line with DoD's 2000 mandate to have the 2D bar code become the primary bar code device by March 2002. The more robust format of the 2D symbol will allow even the simplest of data (a license plate ID number) to be stored redundantly on the tag and remain readable even if the bar code is damaged. Over time, linear bar codes should be phased out in favor of 2D symbols. However, it is clear that commercial industry and the international community will continue to use the bar code and this CONOPS retains the ability for the DoD supply chain to receive linear bar coded items and use those bar codes within DoD processes, as makes sense

- *OMC*. A few of the documents in Appendix E refer to the use of OMCs at this layer. The OMC is not identified as a baseline or premium AIT because it must be removed from the layer to be read and really serves more as an electronic packing list than an identifier of the layer. However, the CONOPS does not preclude their use as an additional AIT should organizations involved within the specific business process agree to use them *in addition to the baseline AIT*.

- *Active RFID*. As noted in Chapter 4, the baseline AIT is a license plate tag rather than the data-rich tag. This CONOPS does *not* eliminate the use of the data-rich tag, rather focusing on its use at *locations where stable communications to access AIS databases are unavailable*. When moving a 463L pallet or intermodal container to an established location with stable communications, the baseline AIT is the license plate tag. If deliveries are required to an austere location with limited communications, the COCOM and Service component of that COCOM may request the premium use of a data-rich tag.

- *Passive RFID*. The use of passive RFID is suggested at this layer by a few documents, such as the Surface Deployment and Distribution Command (SDDC) *Radio Frequency Identification Support Concept of Operations* (Draft), dated January 2004, the *Distribution Process Owner Asset Visibility Concept of Operations* (Draft), and the *DPO USTC-DLA E2E Analysis*, dated January 2006. Although passive RFID could conceivably be used at this layer (including such purposes as an asset identification marking for government-owned containers), it is not used in this CONOPS for this layer because of the short, rather static read distance required for the passive RFID tags. When looking at this layer of consolidation, intermodal containers and 463L pallets are moving at relatively high rates of speed (pulled by road power or on drayage equipment) in outdoor environments. The active RFID media provides the capability to read tags over long distances, sometimes up to 300 feet, whereas passive RFID tags have a maximum read range of less than 15 feet. Although a passive RFID tag may be used in specific business process situations, where manual, up-close handling of the container or pallet is necessary, it should not be the norm. When close human intervention is required, the 2D symbols can be used just as easily.

Layer 5—Conveyance

This CONOPS does not provide a baseline AIT for Layer 5, but it does allow for the use of active RFID, sensors, and satellite or cellular technology as premium AIT. Various satellite tracking demonstrations indicate that current DoD efforts are in alignment with this CONOPS' assessment of satellite and cellular use at this level.

Chapter 7
AIT Use Conceptual Walk-Through

Using the AIT designations from Chapter 5 and the high-level business process building blocks defined in Chapter 3, this chapter presents a narrative walk-through of how the various AIT will be applied and used at each layer of consolidation. To do this, two illustrative examples of the DoD logistics chain have been chosen. Several orientation points should be noted. For purposes of brevity, all variations of events and activities that could possibly occur or be involved in a given supply chain segment are not intended to be shown. The scenarios chosen for illustration demonstrates how the CONOPS pertains to a new, high priority order that was picked from depot inventory stocks and sent to the customer via air delivery. The scenarios shown below were selected to illustrate many of the supply chain segments, layer changes, and related AIT that would be applied under this CONOPS in filing the warfighter's order for sustainment supplies.

BASELINE AIT EXAMPLE

The air shipment scenario first introduced in Chapter 3 (Figure 3-1) will be used to illustrate the AIT designations for the majority of shipments. It is presented again here as Figure 7-1.

Figure 7-1. OCONUS Aerial Delivery of New Item

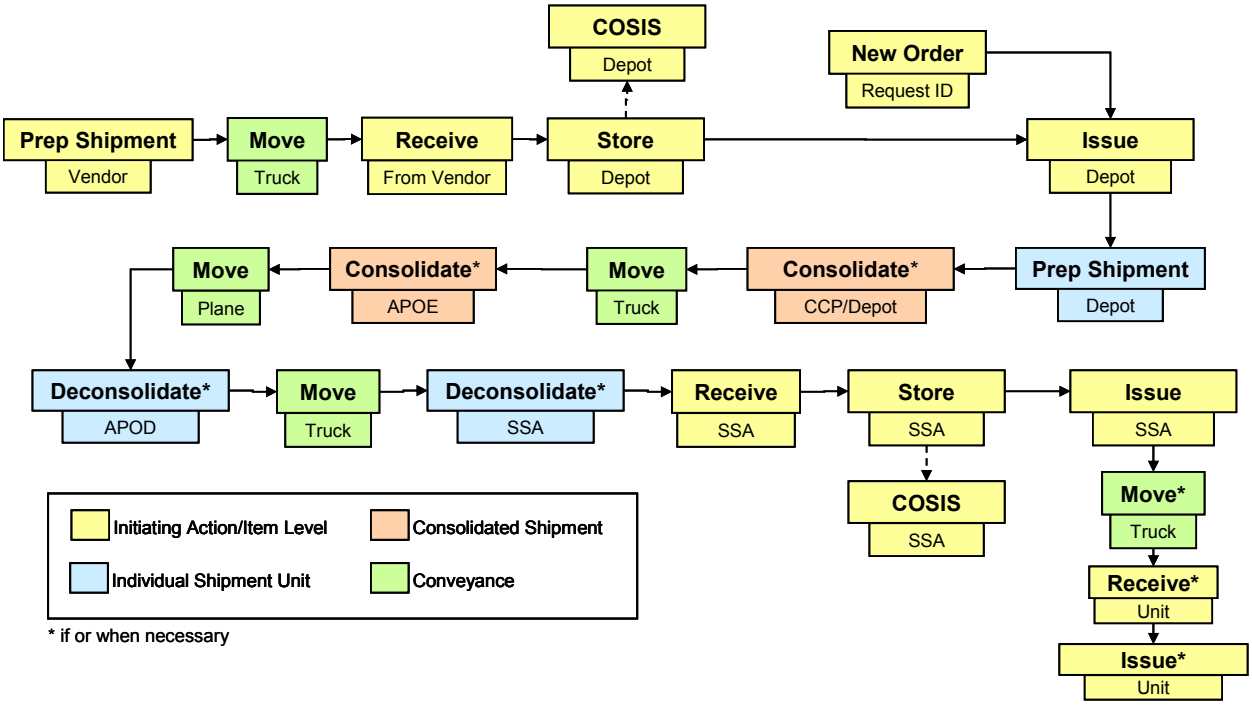


Figure 7-1 shows the flow of materiel from a vendor through initial DoD receipt at a depot to issue from the depot and final delivery to a unit for use. Now the process is broken down by building block, identifying where AIT is applied. A basic mechanical part, such as a large gear, is used in this example. The gear has an IUID requirement and thus is marked with a 2D Data Matrix as the baseline AIT.

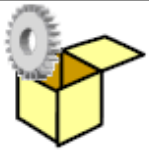
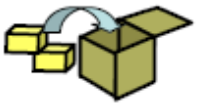
Throughout this entire flow from the vendor to the final unit consignee, one layer of identification remain constant: the item level marking. All other layers are temporary for the purpose of identifying a specific order, a one-time movement, or placing the item in a specific storage location.

Prepare Shipment [Vendor]

The vendor has manufactured the gear and has affixes a passive RFID tag and linear bar code or 2D symbol to both the individual pack and the case (exterior container/shipment unit), if required in the contract.

Table 7-1 shows, by layer, the AIT associated with the gear as it is prepared. Please note that for Table 7-1, and all tables in this chapter, shows the AIT and uses human readable numbers to convey the unique number either physically on the media ***or*** the unique number the AIT points to in the business process AIS, such as a passive RFID tag pointing to a TCN for a transport unit

Table 7-1. AIT Associated with the Gear at the End of Prepare Shipment

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 56789	 56789	

Move [to Depot] by Truck

Depending upon the terms of the contract, either the vendor or DoD arranges for the movement of the gear shipment by truck to the depot. When the shipment is ready and departing the vendor (and if the contract requires AIT), the vendor should provide the DoD an advanced ship notice of the shipment information and all relevant AIT associations—the passive RFID tag and linear bar code/2D symbol numbers for Layers 0–2. Because the conveyance is a privately operated fleet, no AIT is specifically required. The fleet operator may employ a variety of media for his own management purposes.

Table 7-2 shows, by layer, the AIT associated with the gear as it is moved by truck to the depot.

Table 7-2. AIT Associated with the Gear during Truck Movement

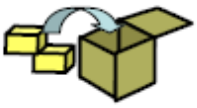
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 56789	 56789	
5—Truck				

Receive from Vendor

Using the ASN and required AIT associations from the vendor, the depot receives the shipment by reading the passive RFID tag on the shipment. In a large facility with high throughput, the tag is read as it moves through fixed portals. For smaller facilities and/or more forward locations, or wherever a 100 percent read rate cannot be achieved on a fast moving mechanized receiving line or fixed infrastructure (portals) may not exist, a handheld passive RFID tag reader can be used. If the passive RFID tag is not readable, a handheld reader can be used to read the backup linear bar code/2D symbol. This reader should be capable of reading both passive RFID and linear bar codes/2D symbols. This read should confirm receipt and trigger payment to the vendor.

Table 7-3 shows, by layer, the AIT associated with the gear as it is received from the vendor.

Table 7-3. AIT Associated with the Gear during Receipt from Vendor

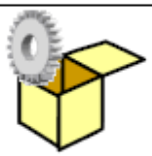
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 56789	 56789	

Store and COSIS [Depot]

When the received gear is put into storage, the inventory/accountable records are updated. For ease of storage, if the transport unit contains multiple gears of the same part number, the gears may be stored in the unit shipment. If the gear is removed from the unit shipment, it is stored in its individual pack level. In either case, the warehousemen use the passive RFID tag on the appropriate layer (unit shipment or individual pack) to update storage information to reflect the gear is put away and the put-away location. If the warehouse is an advanced facility, portals by each storage location may note the put-away and location automatically. Otherwise, for smaller locations and/or more forward facilities where passive RFID infrastructure does not exist, the warehousemen use handheld scanners to scan the passive RFID tag on the gear and the relevant storage location. If the passive RFID tag does not respond, the warehousemen scan the linear bar code/2D symbol.

Table 7-4 shows, by layer, the AIT associated with the gear as it is put away into storage.

Table 7-4. AIT Associated with the Gear during Store and COSIS

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 56789	 56789	

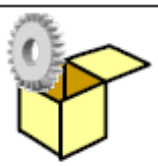
Note: Layer 2 applies only if stored in unit shipment carton.

Issue [from Depot Storage]

Upon receipt of an MRO, the gear is issued from the depot storage. The gear may be issued as a single gear or as a quantity of gears. When the gear is issued, any reference to the vendor transport unit is no longer valid. Any old AIT tags or symbols are for a completed shipment that no longer exists—a new shipment is starting and new labels and accompanying tags and symbols are generated.

Table 7-5 shows, by layer, the AIT associated with the gear as it is issued from storage.

Table 7-5. AIT Associated with Issuing from Storage

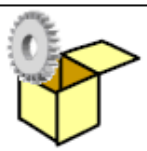
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	

Prepare Shipment [Depot]

With the gear issued and pulled from inventory, the depot prepares the gear for shipment. If the existing packaging will not suffice for shipment, an appropriate shipping carton is found, and the gear (and any other items headed to the same consignee) is packed in the carton. Shipping documents are generated and a paper label is printed and affixed to the carton. A passive RFID is affixed to the shipment along with the shipment TCN identifier. A linear bar code/2D symbol and human-readable text should be printed on the label as well. The gear now has a Layer 2 transport unit pack again, but with a different passive RFID and linear bar code/2D symbol than what was on the carton originally received from the vendor.

Table 7-6 shows, by layer, the AIT associated with the gear as it is prepared for shipment.

Table 7-6. Associated with Preparing the Gear for Shipment

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	

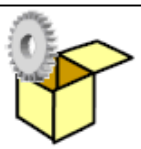
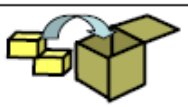
Consolidate [Depot]

If enough single transport units are going to the same final consignee, the depot consolidates these shipments onto a 463L pallet. During this consolidation, the warehousemen read each Layer 2 passive RFID tag (or linear bar code/2D symbol), and the depot AIS creates the logical consolidation references to accurately note which unit shipments are on the 463L pallet. The pallet is netted, and an active RFID license plate tag is affixed to the pallet. Documentation is printed and affixed to the pallet in accordance with MIL-STD-129.

The depot AIS must correctly associate the pallet level active RFID tag and linear bar code/2D symbol with the consolidated unit shipments. This information must also update the active RFID tag that has accompanied the shipment from the depot. The depot AIS provides, either directly via electronic messages or via a central database or message repository, this consolidation relationship tree (advance shipment information) to the rest of the supply chain, including the next destination and the final consignee. In addition, this new set of information must be uploaded into the RF-ITV Server.

Table 7-7 shows, by layer, the AIT associated with the gear as the depot consolidates it with other items.

Table 7-7. AIT Associated with the Gear at Consolidation

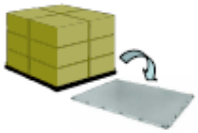
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet		 ABCDEF	 SW312371763A001XXX	

Move [to APOE] by Truck

The 463L pallet is moved by truck to the APOE. The APOE should receive advanced shipment information about the pallet, including the consolidation information, prior to the pallet's arrival. This advance information provides the critical cross-reference between the active RFID number and the shipment TCN.

Table 7-8 shows, by layer, the AIT associated with the gear as it is moved to the APOE by truck.

Table 7-8. AIT Associated with the Gear During Truck Movement

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet		 ABCDEF	 SW312371763A001XXX	
5—Truck				

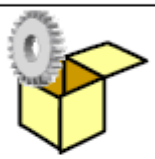
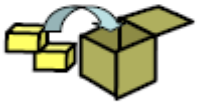
Consolidate [APOE]

When the truck arrives at the APOE, the pallets (or loose unit shipments if not consolidated at the depot) are unloaded and placed in short-term storage to await outbound flight. The APOE uses the passive RFID or linear bar code/2D symbol to record the put-away and pick of loose unit shipments to and from storage. The active RFID tag or the linear bar code/2D symbol for the pallet is used to track pallet storage location.

Loose shipments are aggregated at the APOE in preparation for the flight. As described for the depot processes, the APOE reads the passive RFID tag or linear bar code/2D symbol on each loose shipment during the aggregation process, and the APOE AIS records and preserves the aggregation information. An active RFID license plate tag is created, affixed to the pallet, and associated with the aggregated shipment in the AIS.

Table 7-9 shows, by layer, the AIT associated with the gear as it is processed at the APOE.

Table 7-9. AIT during Consolidation and APOE Processing

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet		 ABCDEF	 SW312371763A001XXX	

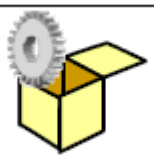
Move by Plane

When an aircraft is ready for loading, the pallets are moved to the tarmac using material handling equipment. Active RFID interrogators set by each aircraft loading area should note the pallet movement. As each pallet is loaded onto the aircraft, the active RFID tag or the linear bar code/2D symbol is read and used within the business process as confirmation of loading.

When the plane departs, any advance shipment information, such as the electronic manifest and any new consolidations made at the APOE, should be provided, either directly via electronic messages or via a central database or message repository, to the rest of the supply chain, including the next destination and the final consignee. This advanced shipment information is the critical linkage between the active RFID license plate tag number and the shipment's associated data prelodged in the APOD AIS.

Table 7-10 shows, by layer, the AIT associated with the gear as it is moved by air.

Table 7-10. AIT Associated with the Gear during Plane Movement

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet		 ABCDEF	 SW312371763A001XXX	
5—Plane				

Deconsolidate [APOD]

When an aircraft arrives, the pallets will be moved from the tarmac using material handling equipment. As each pallet is unloaded from the aircraft, the active RFID tag or the linear bar code/2D symbol should be read and used within the business process as confirmation of receipt, based on the associated consolidation or aggregation information stored in the AIS. Active RFID interrogators set by each aircraft loading area should note the pallet movement.

Any pallets created at the APOE are typically broken down at the APOD. During the breaking down of the aggregated pallet, the airmen scan the passive RFID or linear bar code/2D symbol on each transport unit as it is removed from the pallet. Once the pallet is broken down, that layer no longer exists, and all AIS and supply chain references to it should be updated to remove the association.

Table 7-11 shows, by layer, the AIT associated with the gear as it is deconsolidated and processed by the APOD.

Table 7-11. AIT during Deconsolidation and APOD Processing

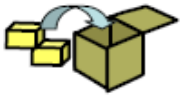
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1— Individual Pack		 34567	 34567	
2— Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	

Move [to Supply Activity] by Truck

The unit shipments (and the 463L pallets that were not deconsolidated at the APOD) are moved by truck to the supply activity with the same AIT that was on the shipment when it arrived at the APOD. The supply activity should receive advanced shipment information from the APOD, including the consolidation information, prior to the truck arrival.

Table 7-12 shows, by layer, the AIT associated with the gear as it is moved to the shipping activity.

Table 7-12. AIT Associated with the Gear during Truck Movement

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
5—Truck				

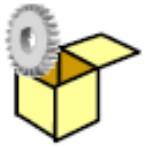
Deconsolidate and Receive [Supply Activity]

When the truck arrives, the unit shipments and pallets are unloaded, and warehousemen should read each active RFID (pallet), passive RFID (unit shipment), or linear bar code/2D symbol (pallet or unit shipment) as confirmation of receipt, based on the associated consolidation information stored in the AIS.

Any remaining pallets are deconsolidated. During the deconsolidation, the warehousemen scan the passive RFID or linear bar code/2D symbol on each transport unit as it is removed from the pallet. Once the pallet is deconsolidated, that layer of consolidation no longer exists, and all AIS and supply chain references to that consolidation should be updated to indicate completion of that consolidated movement and arrival of its contents at the deconsolidation activity. At this point, the consolidation that was broken down by the receiving activity ceases to be an active movement event and only exists, if needed, as a historical record.

Table 7-13 shows, by layer, the AIT associated with the gear as it is deconsolidated at the supply activity.

Table 7-13. AIT during Receipt and Deconsolidation

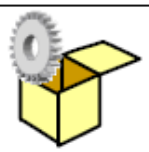
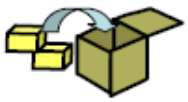
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	

Store and COSIS [Supply Activity]

When the received gear is put into storage, the inventory/accountable records are updated. For ease of storage, if the transport unit contains multiple gears of the same part number, the gears may be stored in the unit shipment. If the gear is removed from the unit shipment, it is stored in its individual pack level. In either case, the warehousemen use the passive RFID tag on the layer used (unit shipment or individual pack) to update storage to reflect the put-away and the put-away location. If the warehouse is an advanced facility, portals by each storage location may note the put-away and location automatically. Otherwise, for smaller or more forward locations where passive RFID infrastructure may not exist, the warehousemen use handheld scanners to scan the passive RFID tag of the gear and the relevant storage location. If the passive RFID tag does not respond, the warehousemen scan the linear bar code/2D symbol.

Table 7-14 shows, by layer, the AIT associated with the gear as it is stored at the supply activity.

Table 7-14. AIT Associated with the Gear During Store and COSIS

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	

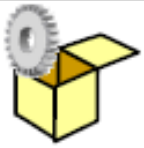
Note: Layer 2 applies only if stored in unit shipment carton.

Issue from SSA to Unit

The supply activity issues the gear from storage when it is needed by a unit. When the gear is issued, any reference to the previous transport unit will usually be no longer valid. In the majority of cases, when the item reaches the SSA it is either placed on the shelf as shelf stock or an ordering unit is notified to pick up their item. If the item is picked up by the unit, it is considered to be “in-use” by that unit and no further documentation or tagging is required. In a few situations an item is further shipped by an SSA to an ultimate user. In those instances, any old AIT tags or symbols for the completed inbound shipment to the SSA no longer apply to the new outbound SSA shipment. In these cases, a new shipment is starting and new documentation, labels and accompanying tags and symbols should be generated. The same tagging rules would apply for whatever layer may be involved in that final shipment and an ASN should be generated. Where time, distance and technical capability allow, the ASN should be sent to the ordering unit that will receive the item.

Table 7-15 shows, by layer, the AIT associated with the gear as it is issued to the unit.

Table 7-15. AIT Associated with the Gear during Issue to Unit

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 New shipment TCN (not needed if picked up)	 New shipment TCN (not needed if picked up)	

PREMIUM AIT EXAMPLE

Using the same air shipment scenario, the use of premium AIT is illustrated by changing some of the scenario parameters. For this example, the item is now a complex engine component that requires humidity monitoring to ensure moisture

does not damage the working component. This item is critical in nature and is headed to a forward theater location with limited communication.

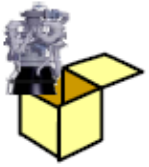
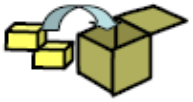
As with the baseline example, throughout this entire flow from the vendor to the final unit consignee, two layers of identification remain constant: the item-level marking and the individual pack markings. All other layers are temporary for the convenience of movement or storage.

Prepare Shipment [Vendor]

The vendor has manufactured the engine component and is required, by DoD acquisition specifications, to mark it with an IUID. The vendor also designed and provided custom packaging for the component with a humidity sensor. Depending on the design, the sensor may include radio frequency or global positioning transmission technology. The component is packaged into the custom pack, and a passive RFID tag and linear bar code/2D symbol is affixed, if required by DoD acquisition specification. The engine component is shipped in its custom individual pack as an individual item. The vendor prepares the appropriate shipping label.

Table 7-16 shows, by layer, the AIT associated with the engine component as it is prepared for shipment.

Table 7-16. AIT Associated with the Engine Component after Prepare Shipment

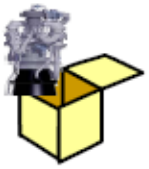
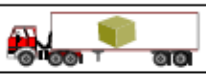
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 56789	 56789	

Move [to Depot] by Truck

Depending upon the acquisition terms, either the vendor or DoD arranges for the movement of the shipment by truck to the depot. When the shipment is ready and departing the vendor's facility, the vendor should provide the DoD with an advanced notice of the shipment date, carrier, and all relevant AIT associations—the passive RFID tag and linear bar code/2D symbol numbers for Layers 0–2. Because the conveyance is a privately operated fleet, no AIT is specifically required. The fleet operator may employ a variety of media for his own management purposes.

Table 7-17 shows, by layer, the AIT associated with the engine component as it is moved by truck.

Table 7-17. AIT Associated with the Engine Component during Truck Movement

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 56789	 56789	
5—Truck				

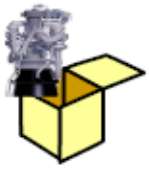
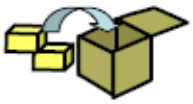
Receive from Vendor

Using the ASN and required AIT associations from the vendor, the depot receives the shipment by reading the passive RFID tag on the shipment. In a large facility with high throughput, the tag is read as it moves through fixed portals. For smaller or more forward locations where passive RFID infrastructure may not exist, a handheld passive RFID tag reader can be used. If the passive RFID tag is not readable, a handheld reader can be used to read the backup linear bar code/2D symbol. This reader should be capable of reading both passive RFID and linear bar codes/2D symbols. This receipt should trigger payment to the vendor.

Upon receipt the humidity sensor data concerning the component's condition may be downloaded to determine if any corrective action is required.

Table 7-18 shows, by layer, the AIT associated with the engine component as it is received from the vendor.

Table 7-18. AIT Associated with the Engine Component during Vendor Receipt

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 56789	 56789	

Store and COSIS [Depot]

When the received shipment is put into storage, the inventory/accountable records are updated. The warehousemen use the passive RFID tag on the appropriate layer (unit shipment or individual pack) to update storage information to reflect the engine is put away and the put-away location. If the warehouse is an advanced facility, portals by each storage location may note the put-away and location automatically; otherwise, for smaller or more forward locations where passive RFID may not exist, the warehousemen use handheld scanners to scan the passive RFID tag of the engine component and the relevant storage location (typically bar coded). If the passive RFID tag does not respond, the warehousemen scan the linear bar code/2D symbol.

While in storage, the depot AIS may prompt for periodic reading of the humidity sensor. Depending upon the transmission technology imbedded within the sensor, it may periodically report the current humidity levels to the depot AIS on its own.

Table 7-19 shows, by layer, the AIT associated with the engine component as it is put into storage.

Table 7-19. AIT Associated with the Engine Component during Store and COSIS

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 56789	 56789	

Note: Layer 2 applies only if stored in unit shipment carton.

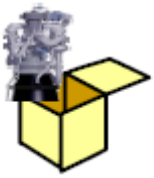
Issue [from Depot]

Upon receipt of an MRO, the component is issued from the depot storage. When the component is issued, any reference to the vendor transport unit is no longer valid. Any old AIT tags or symbols are for a completed shipment that no longer exists—a new shipment is starting and new labels and accompanying tags and symbols will be generated.

During issue, the humidity sensor should be checked to ensure a serviceable component is being sent forward.

Table 7-20 shows, by layer, the AIT associated with the engine component as it is issued from storage.

Table 7-20. AIT Associated with Issuing from Storage

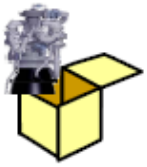
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	

Prepare Shipment [Depot]

Once the component is issued and pulled from inventory, the depot prepares it for shipment. The component is shipped directly in its custom individual pack. Shipping documents are generated, and a paper label is printed and affixed. A linear bar code/2D symbol and human readable text should also be on the label as well. The engine component again has a Layer 2 transport unit pack, but with a different passive RFID and linear bar code/2D symbol than what was received from the vendor originally.

Table 7-21 shows, by layer, the AIT associated with the engine component as it is prepared for shipment

Table 7-21. AIT Associated with Preparing the Engine Component for Shipment

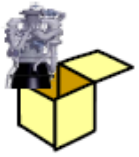
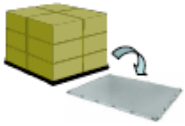
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	

Consolidate [Depot]

If several items are headed to the same consignee at a location with limited communications, the shipments (including the engine component) are consolidated onto a 463L pallet. During this consolidation, the warehousemen read each Layer 2 passive RFID tag (or linear bar code/2D symbol), and the depot AIS creates the logical consolidation references to accurately note which unit shipments are on the 463L pallet. The pallet is netted, and an active RFID tag is affixed to the pallet. Because the consignee is in a location with limited communications, the active RFID tag is a premium tag with all content data. Documentation, including a linear bar code/2D symbol, is printed and affixed to the pallet in accordance with MIL-STD-129. The depot AIS must correctly associate the pallet-level active RFID tag and linear bar code/2D symbol with the consolidated unit shipments. The depot AIS provides, either directly via electronic messages or via a central database or message repository, this consolidation relationship tree to the rest of the supply chain, including the next destination and the final consignee.

Table 7-22 shows, by layer, the AIT associated with the engine component as it is consolidated.

Table 7-22. AIT Associated with the Engine Component at Consolidation

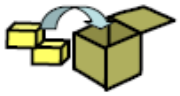
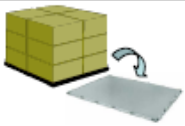
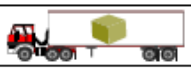
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet			 SW312371763A001XXX	 Premium tag content data

Move [to APOE] by Truck

The 463L pallet is moved by truck to the APOE. The APOE should receive advanced shipment information about the pallet, including the consolidation information, prior to the pallet arrival. If the humidity exceeds acceptable thresholds the sensor will note the humidity violation, and, depending on the sensor design, may transmit the violation via radio frequency or global positioning to an AIS.

Table 7-23 shows, by layer, the AIT associated with the engine component as it is moved by truck.

Table 7-23. AIT Associated with the Engine Component during Truck Movement

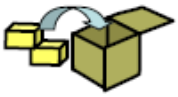
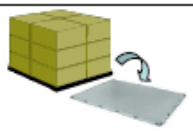
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet			 SW312371763A001XXX	 Premium tag content data
5—Truck				

Consolidate [APOE]

When the truck arrives at the APOE, the pallet is unloaded and placed in short-term storage to await outbound flight. The active RFID tag or the linear bar code/2D symbol for the pallet will be used to track pallet storage location.

Table 7-24 shows, by layer, the AIT associated with the engine component as it is processed at the APOE.

Table 7-24. AIT during APOE Processing

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet			 SW312371763A001XXX	 Premium tag content data

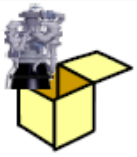
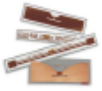
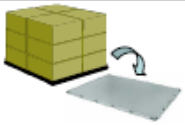
Move by Plane

When an aircraft is ready for loading, the pallet is moved to the tarmac using material handling equipment. Active RFID interrogators set by each aircraft loading area should note the pallet movement. As each pallet is loaded onto the aircraft, the active RFID tag or the linear bar code/2D symbol is read and used as confirmation of loading.

When the plane departs, the electronic manifest and any new consolidations made at the APOE should be provided, either directly via electronic messages or via a central database or message repository, to the rest of the supply chain, including the next destination and the final consignee.

Table 7-25 shows, by layer, the AIT associated with the engine component as it is moved via air.

Table 7-25. AIT Associated with the Engine Component during Plane Movement

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet			 SW312371763A001XXX	 Premium tag content data
5—Plane				

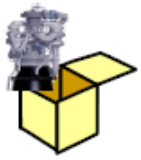
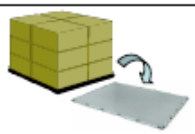
Deconsolidate [APOD]

When an aircraft arrives, the pallets are moved from the tarmac using material handling equipment. As each pallet is unloaded from the aircraft, the active RFID tag or the linear bar code/2D symbol should be read and used as confirmation of receipt. Active RFID interrogators set by each aircraft loading area should note the pallet movement.

Because this pallet has several shipments to the same consignee, it is not broken down at the APOD. Instead it is stored awaiting onward surface movement.

Table 7-26 shows, by layer, the AIT associated with the engine component as it is processed at the APOD.

Table 7-26. AIT during APOD Processing

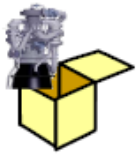
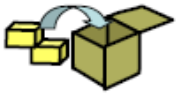
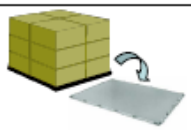
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet			 SW312371763A001XXX	 Premium tag content data

Move [to Supply Activity] by Truck

Ultimately, the 463L pallet is moved by truck to a supply activity. Because the items on this pallet are critical, the truck moving the pallet is equipped with a satellite tracking device and a GPS to monitor its location in near-real-time. The supply activity should receive advanced information from the APOD about the shipments, including the consolidation information, prior to the truck's arrival. If the humidity exceeds an acceptable threshold, the sensor notes the humidity violation, and, depending on the sensor design, may transmit the violation via radio frequency or a satellite system to an AIS.

Table 7-27 shows, by layer, the AIT associated with the engine component as it is moved by truck.

Table 7-27. AIT Associated with the Engine Component during Truck Movement

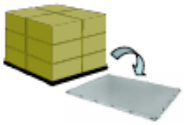
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet			 SW312371763A001XXX	 Premium tag content data
5—Truck				

Deconsolidate and Receive

When the truck arrives, the pallet is unloaded, and warehousemen read each active RFID or linear bar code/2D symbol (pallet or unit shipment) as confirmation of receipt within the business process. If there is no communications to central systems during receipt, the content from the active RFID tag should be read. The receiving facility downloads the sensor data history to determine if the environmental conditions were acceptable during transportation and if the engine component is serviceable.

Table 7-28 shows, by layer, the AIT associated with the engine component as it is received and deconsolidated.

Table 7-28. AIT during Receipt and Deconsolidation

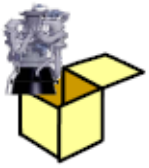
Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	
4—463L Pallet			 SW312371763A001XXX	 Premium tag content data

Store and COSIS

When the received engine component is put into storage, the inventory/accountable records are updated using either the passive RFID tag or the linear bar code/2D symbol. Any sensors (e.g., humidity, temperature, etc.) should be checked to ensure conditions have been and are acceptable. Depending upon the transmission technology embedded within the sensor, the sensor may communicate directly with the SSA AIS to report humidity conditions.

Table 7-29 shows, by layer, the AIT associated with the engine component as it is put into storage.

Table 7-29. AIT Associated with the Engine Component during Store and COSIS

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 HX7NNW7025S021TT2	 HX7NNW7025S021TT2	

Note: Layer 2 applies only if stored in unit shipment carton.

Issue from SSA to Unit

The supply activity issues the gear from storage when it is needed by a unit. When the gear is issued, any reference to the previous transport unit will usually be no longer valid. In the majority of cases, when the item reaches the SSA it is either placed on the shelf as shelf stock or an ordering unit is notified to pick up their item. If the item is picked up by the unit, it is considered to be “in-use” by that unit and no further documentation or tagging is required. In a few situations an item is further shipped by an SSA to an ultimate user. In those instances, any old AIT tags or symbols for the completed inbound shipment to the SSA no longer apply to the new outbound SSA shipment. In these cases, a new shipment is starting and new documentation, labels and accompanying tags and symbols should be generated. The same tagging rules would apply for whatever layer may be involved in that final shipment and an ASN should be generated. Where time, distance and technical capability allow, the ASN should be sent to the ordering unit that will receive the item.

Table 7-30 shows, by layer, the AIT associated with the engine component as it is issued to the unit.

Table 7-30. AIT Associated with the Engine Component during Issue to Unit

Layer		Primary Baseline AIT	Backup Baseline AIT	Premium AIT
0—Item		 12345	 12345	
1—Individual Pack		 34567	 34567	
2—Transport Unit		 New shipment TCN (not needed if picked up)	 New shipment TCN (not needed if picked up)	

Chapter 8
The Way Forward

This CONOPS has identified a high-level vision of AIT use. This concept, while in line with current DoD efforts and direction, cannot be attained today. Gaps in policy, business process, and data architecture exist that require attention and mitigation. This CONOPS will be used as an end-state "destination" to be attained in the future, with a target horizon of 2015. This chapter briefly highlights the next steps planned to migrate from the current AIT use environment to the CONOPS vision.

IMPLEMENTATION PLAN

Using the CONOPS as a target goal for AIT media application and use, an AIT Implementation Plan will be developed. This plan will

- Identify gaps in policies, regulations, business processes, data architecture and other areas that inhibit the implementation of the CONOPS vision;
- Document a list of initiatives required to close the identified gaps;
- Formulate a high-level implementation plan timeline that shows all initiatives and any interdependencies among the initiatives;
- For each initiative
  - Identify a lead proponent for the initiative that will spearhead initiative progress;
  - Identify key stakeholders with the DoD supply chain community that must participate for success;
  - Formulate an initial roadmap of actions for initiative completion;
  - Formulate a timeline for all actions within the initiative;
  - Identify potential security vulnerabilities and solutions concerning RFID or other AIT usage, and
  - Identify progress measures;

- Identify a recurring update methodology for all initiatives where
  - Each initiative status is briefed;
  - Lead proponents and key stakeholders meet to discuss initiative progress; and
  - Initiative actions and roadmap are adjusted as needed to account for changes in the implementation landscape due to funding, technology developments, etc.

As with this CONOPS, the AIT Implementation Plan will be a living document that changes to adapt as needed. The stakeholders and lead proponents will have the flexibility and ownership of the implementation initiatives to ensure success within an agile framework.

STAKEHOLDER PARTICIPATION

While USTRANSCOM is the lead functional proponent of RFID and other AIT in the DoD supply chain, the successful implementation of the CONOPS relies on the input, participation and ownership from many organizations within the DoD community, including:

- COCOM logisticians;
- Service and agency business process owners;
- Acquisition staffs;
- Policy makers;
- Information technology data architecture and systems;
- Standards organizations;
- Weapons program managers;
- Financial community; and
- Industry.

Appendix A
Item-Unique Identification Primer

Item-unique identification is a DoD effort to mark each of its high-value end items with a permanent, non-repeatable identifier that refers only to that item. There are three terms associated with the IUID effort:

- *Unique identification* (UID) is a system of marking items delivered to the DoD with unique item identifiers.
- *Item-unique identification* (IUID) refers to the application of a unique identifier to a particular end item. In some DoD documents, IUID shares the same definition as UID.[1]
- *Unique item identifier* (UII) is the actual data placed on the end item. It consists of a set of data elements in machine-readable format which marks that item as globally unique and unambiguous. Generically, it also can refer to the data element composition of a particular identifier. There are two data element constructs and several DoD-approved commercial constructs for the UII.

According to the current DoD policy,[2] DoD inventory items must have a UII associated with them when the unit's acquisition cost is $5,000 or more. Items less than $5,000 may require a UII when (1) they are serially managed, mission essential, or controlled items; (2) a program office has deemed that an item should have a permanent identifier, regardless of acquisition cost; or (3) the item is a DoD serially managed embedded item (or a parent item that contains an embedded item).

The mandatory information technology (IT) medium used in UII marking is a data matrix, a type of two-dimensional (2D) Data Matrix. The matrix may appear on a label or data plate, or it may be directly marked on the end item.[3] The UII marking also may contain a linear bar code if contract requirements dictate. For legacy items in inventory, operational use, or in the hands of a contractor, UIIs may be assigned to an item before it is physically marked.[4] DoD also allows specific

[1] For examples see *Department of Defense Guide to Uniquely Identifying Items: Assuring Valuation, Accountability and Control of Government Property*, Version 1.6, 1 June 2006, p. 10; and *The IUID Registry*, p. 1. Both are available at http://www.acq.osd.mil/dpap/UID.

[2] Undersecretary of Defense, Acquisition, Technology, and Logistics, *Policy for Unique Identification of Tangible Items: New Equipment, Major Modifications, and Reprocurements of Equipment and Spares*, 29 July 2003.

[3] *IUID Overview*, Version 2.2, (interactive slide presentation) available at www.acq.osd.mil/dpap/UID.

[4] Ibid.

IUID equivalent formats, such as the Electronic Serial Number of a cell phone[5], but IUID equivalents must be marked on the item using the 2D Data Matrix symbol.

When a manufacturer or DoD activity creates and applies a UII, it enters basic information about the item in the IUID Registry, a database managed by the Defense Logistics Information Service in Battle Creek, MI. This registry contains each item's "pedigree" (how and when it was acquired), acquisition cost (and any changes in that cost), current custody (government or contractor), and configuration (any embedded items, markings, or changes in part number). The database is web-accessible, and users may query it for item information.

The UII itself is, therefore, a means of identifying a particular end item. It is not a means of conveying information about a distribution activity, such as ordering, receiving, or in-transit visibility.

[5] Department of Defense, *Department of Defense Standard Practice: Identification Marking of U.S. Military Property* (MIL-STD-130M), 2 December 2005.

Appendix B
AIT Media Evaluations Against Attributes

This appendix contains the detailed scoring and rationale for each AIT medium and the attributes defined in Chapter 4.

Table B-1. Scoring Matrix

	Media Attribute	Linear Bar Code	2-D Symbol	Passive RFID	Contact Memory Button	OMC / Mini CD	Active RFID Data Rich	Active RFID License Plate	Sensor Technology	Satellite or Cellular
Layer 0 (Item Level)	Form Factor	2	3	2	3	1	1	1	2	1
	Data Capacity	2	2	2	3	3	3	2	2	1
	Cost - Media	3	3	3	2	2	2	2	2	1
	Cost - Infrastructure	3	3	3	3	3	2	2	2	1
	Read Method	2	2	3	2	1	3	3	3	3
	Information Security	3	2	3	2	1	2	3	3	3
	Finalist?	Y	Y	Y	Y	N	N	N	Y	N
Layer 1 (Package)	Form Factor	2	2	2	1	1	1	1	2	1
	Data Capacity	2	2	2	3	3	3	2	2	1
	Cost - Media	3	3	3	2	2	2	2	2	1
	Cost - Infrastructure	3	3	3	3	3	2	2	2	1
	Read Method	2	2	3	2	1	3	3	3	3
	Information Security	3	2	3	2	1	2	3	3	3
	Finalist?	Y	Y	Y	N	N	N	N	Y	N
Layer 2 (Transport Unit)	Form Factor	2	2	2	1	2	2	2	2	1
	Data Capacity	2	2	2	3	3	3	2	2	1
	Cost - Media	3	3	3	2	2	2	2	2	1
	Cost - Infrastructure	3	3	3	3	3	2	2	2	1
	Read Method	2	2	3	2	1	3	3	3	3
	Information Security	3	2	3	2	1	2	3	3	3
	Finalist?	Y	Y	Y	N	N	Y	Y	Y	N
Layer 3 (Unit Load)	Form Factor	2	2	2	1	2	2	2	2	1
	Data Capacity	2	2	2	3	3	3	2	2	1
	Cost - Media	3	3	3	2	2	2	2	2	1
	Cost - Infrastructure	3	3	3	3	3	2	2	2	1
	Read Method	2	2	3	2	1	3	3	3	3
	Information Security	3	2	3	2	1	2	3	3	3
	Finalist?	Y	Y	Y	N	N	Y	Y	Y	N
Layer 4 (Freight Container or 463L)	Form Factor	2	2	2	3	2	2	2	2	3
	Data Capacity	2	2	2	3	3	3	2	2	2
	Cost - Media	3	3	3	3	3	2	2	2	2
	Cost - Infrastructure	3	3	3	3	3	2	2	3	2
	Read Method	2	2	2	2	1	3	3	3	3
	Information Security	3	2	3	2	1	2	3	3	3
	Finalist?	Y	Y	Y	Y	N	Y	Y	Y	Y
Layer 5 (Movement Vehicle)	Form Factor	1	2	2	2	2	2	2	2	3
	Data Capacity	2	2	2	3	3	3	2	2	2
	Cost - Media	3	3	3	3	3	3	3	3	3
	Cost - Infrastructure	3	3	3	3	3	3	3	3	3
	Read Method	2	2	2	2	1	2	2	3	3
	Information Security	3	2	3	2	1	2	3	3	3
	Finalist?	N	Y	Y	Y	N	Y	Y	Y	Y

Table B-2. Layer 0–5 Evaluation Grade Definitions

Layer 0 - 5 Ratings			
	1	**2**	**3**
Form Factor (Dimensions & Durability)	The size of the AIT is not compatible at the item level.	The AIT is small with some durability.	The AIT is very small, very durable.
Data Capacity	The AIT does not have the capacity to store data.	The AIT has limited or small data capacity.	The AIT has a large data capacity.
Cost - Media	The AIT is very expensive at a cost of over $100 per unit.	The AIT is relatively inexpensive at a cost from $10 - $100 per unit.	The AIT is very inexpensive at a cost of less than $1 per unit.
Cost - Infrastructure	The cost is too high for this layer of consolidation.The relative cost is of over $100,00 per reader.	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation.The relative cost is in the $1,000s per reader.	The cost is reasonable for the number of items associated in this layer of consolidation.The relative cost is in the $100,s to low $1,000s per reader.
Read Method (Range/Automation)	The AIT has no read range and must be seperated from the item to be read.	The AIT may read at close range and requires human intervention.	The AIT is read at medium or long range and most likely does not require human intervention.
Information Security	The AIT contains content specific data and transmits that data.	The AIT contains limited data or requires contact to access data.	The AIT contains limited data that poses no inherent risk if compromised.

Table B-3. Layer 0 Scoring Rationale

Layer 0 - Item Level			
	Media	**Rating**	**Reason**
Form Factor (Dimensions & Durability)	Linear Bar Code	2	The AIT is small, reasonably durable, but contains no safety specific data.
	2D Symbol	3	The AIT is very small, durable, and can contain safety relevant data
	Passive RFID	2	The AIT is small and has some durability.
	CMB	3	The AIT is small, durable and can contain safety relevant data.
	OMC/Mini CD	1	The dimension of the AIT is not compatible at the item level.
	Active RFID - data rich	1	The dimension of the AIT is not compatible at the item level.
	Active RFID - License Plate	1	The dimension of the AIT is not compatible at the item level.
	Sensor Technology	2	Small, durable, can collect safety relevant data and monitor conditions
	Cellular/Satellite	1	The dimension of the AIT is not compatible at the item level.
Data Capacity	Linear Bar Code	2	The AIT has small data capacity.
	2D Symbol	2	The AIT has limited data capacity.
	Passive RFID	2	The AIT has small data capacity.
	CMB	3	The AIT has large data capacity.
	OMC/Mini CD	3	The AIT has large data capacity.
	Active RFID - data rich	3	The AIT has large data capacity.
	Active RFID - License Plate	2	The AIT has small data capacity.
	Sensor Technology	2	The AIT may have limited data capacity.
	Cellular/Satellite	1	The AIT does not have data capacity.
Cost - Media	Linear Bar Code	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	2D Symbol	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	Passive RFID	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	CMB	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	OMC/Mini CD	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - data rich	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - License Plate	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Sensor Technology	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Cellular/Satellite	1	The AIT is very expensive at a cost of over $100 per unit.
Cost - Infrastructure	Linear Bar Code	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	2D Symbol	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Passive RFID	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	CMB	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	OMC/Mini CD	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Active RFID - data rich	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Active RFID - License Plate	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Sensor Technology	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Cellular/Satellite	1	The cost is too high for this layer of consolidation. The relative cost is of over $100,00 per reader.
Read Method (Range/Automation)	Linear Bar Code	2	The AIT must be read at close range and requires human intervention to access data.
	2D Symbol	2	The AIT must be read at close range and requires human intervention to access data.
	Passive RFID	3	The AIT must be read at close range, most likely does not require human intervention to access data.
	CMB	2	The AIT has no read range and requires human intervention to access data.
	OMC/Mini CD	1	The AIT has no read range and requires human intervention to access data. The AIT must be separated from the item.
	Active RFID - data rich	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Active RFID - License Plate	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Sensor Technology	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Cellular/Satellite	3	The AIT can be read at long or medium range and does not require human intervention to access data.
Information Security	Linear Bar Code	3	The AIT only contains license plate data.
	2D Symbol	2	The AIT contains limited data.
	Passive RFID	3	The AIT only contains license plate data.
	CMB	2	The AIT may contain detailed data but requires physical contact with a special device
	OMC/Mini CD	1	The AIT contains content specific data and
	Active RFID - data rich	2	While the AIT contains significant data that may be compromised the data may not be useful with AIS access
	Active RFID - License Plate	3	The AIT only contains license plate data.
	Sensor Technology	3	Sensor Technology Data is not a security risk
	Cellular/Satellite	3	The AIT contains encrypted data.

Table B-4. Layer 1 Scoring Rationale

Layer 1 - Package			
	Media	**Rating**	**Reason**
Form Factor (Dimensions & Durability)	Linear Bar Code	2	The AIT is small, reasonably durable, but contains no safety specific data.
	2D Symbol	2	The AIT is very small, durable, and can contain safety relevant data
	Passive RFID	2	The AIT is small and has some durability.
	CMB	1	The AIT is very small and durable but is difficult to keep attached.
	OMC/Mini CD	1	Size is not compatible at the item level
	Active RFID - data rich	1	Size is not compatible at the item level
	Active RFID - License Plate	1	Size is not compatible at the item level
	Sensor Technology	2	Small, durable, can collect safety relevant data and monitor conditions
	Cellular/Satellite	1	Size is not compatible at the item level
Data Capacity	Linear Bar Code	2	The AIT has small data capacity.
	2D Symbol	2	The AIT has limited data capacity.
	Passive RFID	2	The AIT has small data capacity.
	CMB	3	The AIT has large data capacity.
	OMC/Mini CD	3	The AIT has large data capacity.
	Active RFID - data rich	3	The AIT has large data capacity.
	Active RFID - License Plate	2	The AIT has small data capacity.
	Sensor Technology	2	The AIT may have limited data capacity.
	Cellular/Satellite	1	The AIT does not have data capacity.
Cost - Media	Linear Bar Code	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	2D Symbol	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	Passive RFID	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	CMB	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	OMC/Mini CD	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - data rich	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - License Plate	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Sensor Technology	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Cellular/Satellite	1	The AIT is very expensive at a cost of over $100 per unit.
Cost - Infrastructure	Linear Bar Code	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	2D Symbol	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Passive RFID	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	CMB	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	OMC/Mini CD	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Active RFID - data rich	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Active RFID - License Plate	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Sensor Technology	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Cellular/Satellite	1	The cost is too high for this layer of consolidation. The relative cost is of over $100,00 per reader.
Read Method (Range/Automation)	Linear Bar Code	2	The AIT must be read at close range and requires human intervention to access data.
	2D Symbol	2	The AIT must be read at close range and requires human intervention to access data.
	Passive RFID	3	The AIT must be read at close range, most likely does not require human intervention to access data.
	CMB	2	The AIT has no read range and requires human intervention and physical contact to access data.
	OMC/Mini CD	1	The AIT has no read range and requires human intervention to access data. The AIT must be separated from the item.
	Active RFID - data rich	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Active RFID - License Plate	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Sensor Technology	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Cellular/Satellite	3	The AIT can be read at long or medium range and does not require human intervention to access data.
Information Security	Linear Bar Code	3	The AIT only contains license plate data.
	2D Symbol	2	The AIT contains limited data.
	Passive RFID	3	The AIT only contains license plate data.
	CMB	2	The AIT may contain detailed data but requires physical contact with a special device
	OMC/Mini CD	1	The AIT contains content specific data and transmits that data.
	Active RFID - data rich	2	While the AIT contains significant data that may be compromised the data may not be useful with AIS access
	Active RFID - License Plate	3	The AIT only contains license plate data.
	Sensor Technology	3	Sensor Technology Data is not a security risk
	Cellular/Satellite	3	The AIT contains encrypted data.

Table B-5. Layer 2 Scoring Rationale

Layer 2 - Transport Unit (cartons, boxes)			
	Media	**Rating**	**Reason**
Form Factor (Dimensions & Durability)	Linear Bar Code	2	The AIT is small, reasonably durable, but contains no safety specific data.
	2D Symbol	2	The AIT is very small, durable, and can contain safety relevant data
	Passive RFID	2	The AIT is small and has some durability.
	CMB	1	Very small, very durable, difficult to keep attached
	OMC/Mini CD	2	Form factor suitable for some boxes
	Active RFID - data rich	2	Form factor suitable for some boxes
	Active RFID - License Plate	2	Form factor suitable for some boxes
	Sensor Technology	2	Small, durable, can collect safety relevant data and monitor conditions
	Cellular/Satellite	1	Size is not compatible at the item level
Data Capacity	Linear Bar Code	2	The AIT has small data capacity.
	2D Symbol	2	The AIT has limited data capacity.
	Passive RFID	2	The AIT has small data capacity.
	CMB	3	The AIT has large data capacity.
	OMC/Mini CD	3	The AIT has large data capacity.
	Active RFID - data rich	3	The AIT has large data capacity.
	Active RFID - License Plate	2	The AIT has small data capacity.
	Sensor Technology	2	The AIT may have limited data capacity.
	Cellular/Satellite	1	The AIT does not have data capacity.
Cost - Media	Linear Bar Code	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	2D Symbol	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	Passive RFID	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	CMB	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	OMC/Mini CD	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - data rich	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - License Plate	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Sensor Technology	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Cellular/Satellite	1	The AIT is very expensive at a cost of over $100 per unit.
Cost - Infrastructure	Linear Bar Code	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	2D Symbol	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Passive RFID	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	CMB	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	OMC/Mini CD	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Active RFID - data rich	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Active RFID - License Plate	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Sensor Technology	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Cellular/Satellite	1	The cost is too high for this layer of consolidation. The relative cost is of over $100,00 per reader.
Read Method (Range/Automation)	Linear Bar Code	2	The AIT must be read at close range and requires human intervention to access data.
	2D Symbol	2	The AIT must be read at close range and requires human intervention to access data.
	Passive RFID	3	The AIT must be read at close range, most likely does not require human intervention to access data.
	CMB	2	The AIT has no read range and requires human intervention and physical contact to access data.
	OMC/Mini CD	1	The AIT has no read range and requires human intervention to access data. The AIT must be separated from the item.
	Active RFID - data rich	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Active RFID - License Plate	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Sensor Technology	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Cellular/Satellite	3	The AIT can be read at long or medium range and does not require human intervention to access data.
Information Security	Linear Bar Code	3	The AIT only contains license plate data.
	2D Symbol	2	The AIT contains limited data.
	Passive RFID	3	The AIT only contains license plate data.
	CMB	2	The AIT may contain detailed data but requires physical contact with a special device
	OMC/Mini CD	1	The AIT contains content specific data and transmits that data.
	Active RFID - data rich	2	While the AIT contains significant data that may be compromised the data may not be useful with AIS access
	Active RFID - License Plate	3	The AIT only contains license plate data.
	Sensor Technology	3	Sensor Technology Data is not a security risk
	Cellular/Satellite	3	The AIT contains encrypted data.

Table B-6. Layer 3 Scoring Rationale

Layer 3 - Unit Load (warehouse pallet, tri-wall)			
	Media	**Rating**	**Reason**
Form Factor (Dimensions & Durability)	Linear Bar Code	2	The AIT is small, reasonably durable, but contains no safety specific data.
	2D Symbol	2	The AIT is very small, durable, and can contain safety relevant data
	Passive RFID	2	The AIT is small and has some durability.
	CMB	1	Very small, very durable, difficult to keep attached
	OMC/Mini CD	2	The AIT is now being designed to fit some boxes. It is typically used in tri=walls.
	Active RFID - data rich	2	The AIT is now being designed to fit some boxes. It is typically used in tri=walls.
	Active RFID - License Plate	2	The AIT is now being designed to fit some boxes. It is typically used in tri=walls.
	Sensor Technology	2	Small, durable, can collect safety relevant data and monitor conditions
	Cellular/Satellite	1	Size is not compatible at the item level
Data Capacity	Linear Bar Code	2	The AIT has small data capacity.
	2D Symbol	2	The AIT has limited data capacity.
	Passive RFID	2	The AIT has small data capacity.
	CMB	3	The AIT has large data capacity.
	OMC/Mini CD	3	The AIT has large data capacity.
	Active RFID - data rich	3	The AIT has large data capacity.
	Active RFID - License Plate	2	The AIT has small data capacity.
	Sensor Technology	2	The AIT may have limited data capacity.
	Cellular/Satellite	1	The AIT does not have data capacity.
Cost - Media	Linear Bar Code	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	2D Symbol	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	Passive RFID	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	CMB	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	OMC/Mini CD	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - data rich	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - License Plate	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Sensor Technology	2	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Cellular/Satellite	1	The AIT is very expensive at a cost of over $100 per unit.
Cost - Infrastructure	Linear Bar Code	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	2D Symbol	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Passive RFID	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	CMB	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	OMC/Mini CD	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Active RFID - data rich	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Active RFID - License Plate	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Sensor Technology	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Cellular/Satellite	1	The cost is too high for this layer of consolidation. The relative cost is of over $100,00 per reader.
Read Method (Range/Automation)	Linear Bar Code	2	The AIT must be read at close range and requires human intervention to access data.
	2D Symbol	2	The AIT must be read at close range and requires human intervention to access data.
	Passive RFID	3	The AIT must be read at close range, most likely does not require human intervention to access data.
	CMB	2	The AIT has no read range and requires human intervention and physical contact to access data.
	OMC/Mini CD	1	The AIT has no read range and requires human intervention to access data. The AIT must be separated from the item.
	Active RFID - data rich	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Active RFID - License Plate	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Sensor Technology	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Cellular/Satellite	3	The AIT can be read at long or medium range and does not require human intervention to access data.
Information Security	Linear Bar Code	3	The AIT only contains license plate data.
	2D Symbol	2	The AIT contains limited data.
	Passive RFID	3	The AIT only contains license plate data.
	CMB	2	The AIT may contain detailed data but requires physical contact with a special device
	OMC/Mini CD	1	The AIT contains content specific data and transmits that data.
	Active RFID - data rich	2	While the AIT contains significant data that may be compromised the data may not be useful with AIS access
	Active RFID - License Plate	3	The AIT only contains license plate data.
	Sensor Technology	3	Sensor Technology Data is not a security risk
	Cellular/Satellite	3	The AIT contains encrypted data.

Table B-7. Layer 4 Scoring Rationale

Layer 4 - Freight Container (Seavan, 463L Pallet)			
	Media	**Rating**	**Reason**
Form Factor (Dimensions & Durability)	Linear Bar Code	2	The AIT is small and produced on appropriately durable surfaces should be readable if with some damage, due to data redundancy built into the format
	2D Symbol	2	The AIT is small and produced on appropriately durable surfaces should be readable if with some damage, due to data redundancy built into the format
	Passive RFID	2	The AIT is small and has some durability.
	CMB	3	The AIT is small is very durable.
	OMC/Mini CD	2	Must be inside container for durability purposes
	Active RFID - data rich	2	The AIT can be separated from container.
	Active RFID - License Plate	2	The AIT can be separated from container.
	Sensor Technology	2	The AIT is small and durable.
	Cellular/Satellite	3	Most transponder footprints are designed to fit inside most containers with the ability to place the antenna outside the actual container
Data Capacity	Linear Bar Code	2	The AIT has small data capacity.
	2D Symbol	2	The AIT has limited data capacity.
	Passive RFID	2	The AIT has small data capacity.
	CMB	3	The AIT has large data capacity.
	OMC/Mini CD	3	The AIT has large data capacity.
	Active RFID - data rich	3	The AIT has large data capacity.
	Active RFID - License Plate	2	The AIT has small data capacity.
	Sensor Technology	2	The AIT may have limited data capacity.
	Cellular/Satellite	2	The AIT does not have data capacity.
Cost - Media	Linear Bar Code	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	2D Symbol	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	Passive RFID	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	CMB	3	The AIT is somewhat inexpensive at a cost of $10-100 per unit. At this level of consolidation the cost is reasonable given the value of the cargo size.
	OMC/Mini CD	3	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - data rich	2	Although the cost is somewhat expensive at a cost from $10-100 per unit, the cost is reasonable given the value of the cargo at this level of consolidation.
	Active RFID - License Plate	2	Although the cost is somewhat expensive at a cost from $10-100 per unit, the cost is reasonable given the value of the cargo at this level of consolidation.
	Sensor Technology	2	Although the cost is somewhat expensive at a cost from $10-100 per unit, the cost is reasonable given the value of the cargo at this level of consolidation.
	Cellular/Satellite	2	Although the cost is somewhat expensive at over $100 per unit, the cost is reasonable given the value of the cargo at this level of consolidation.
Cost - Infrastructure	Linear Bar Code	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	2D Symbol	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Passive RFID	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	CMB	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	OMC/Mini CD	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Active RFID - data rich	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Active RFID - License Plate	2	The cost is somewhat high but acceptable given the number of items typically within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Sensor Technology	3	The cost is somewhat high but reasonable given the value of the cargo within this layer of consolidation. The relative cost is in the $10,000s per reader.
	Cellular/Satellite	2	The cost is high but acceptable given the number of items typically within this layer of consolidation. The relative cost is over $100,000 per reader.
Read Method (Range/Automation)	Linear Bar Code	2	The AIT must be read at close range and requires human intervention to access data.
	2D Symbol	2	The AIT must be read at close range and requires human intervention to access data.
	Passive RFID	2	The AIT must be read at close range, most likely does not require human intervention to access data.
	CMB	2	The AIT has no read range and requires human intervention and physical contact to access data.
	OMC/Mini CD	1	The AIT has no read range and requires human intervention to access data. The AIT must be separated from the item.
	Active RFID - data rich	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Active RFID - License Plate	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Sensor Technology	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Cellular/Satellite	3	The AIT can be read at long or medium range and does not require human intervention to access data.
Information Security	Linear Bar Code	3	The AIT only contains license plate data.
	2D Symbol	2	The AIT contains limited data.
	Passive RFID	3	The AIT only contains license plate data.
	CMB	2	The AIT may contain detailed data but requires physical contact with a special device
	OMC/Mini CD	1	The AIT contains content specific data and transmits that data.
	Active RFID - data rich	2	While the AIT contains significant data that may be compromised the data may not be useful with AIS access
	Active RFID - License Plate	3	The AIT only contains license plate data.
	Sensor Technology	3	Sensor Technology Data is not a security risk
	Cellular/Satellite	3	The AIT contains encrypted data.

Table B-8. Layer 5 Scoring Rationale

Layer 5 - Movement Vehicle			
	Media	**Rating**	**Reason**
Form Factor (Dimensions & Durability)	Linear Bar Code	1	Small, limited durability,
	2D Symbol	2	The AIT is small and produced on appropriately durable surfaces should be readable if with some damage, due to data redundancy built into the format
	Passive RFID	2	Small, some durability
	CMB	2	Very small, very durable
	OMC/Mini CD	2	Must be inside container for durability purposes
	Active RFID - data rich	2	Can be separated from vehicle
	Active RFID - License Plate	2	Can be separated from vehicle
	Sensor Technology	2	Small, durable,
	Cellular/Satellite	3	Most transponder footprints are designed to fit inside most containers with the ability to place the antenna outside the actual container
Data Capacity	Linear Bar Code	2	The AIT has small data capacity.
	2D Symbol	2	The AIT has limited data capacity.
	Passive RFID	2	The AIT has small data capacity.
	CMB	3	The AIT has large data capacity.
	OMC/Mini CD	3	The AIT has large data capacity.
	Active RFID - data rich	3	The AIT has large data capacity.
	Active RFID - License Plate	2	The AIT has small data capacity.
	Sensor Technology	2	The AIT may have limited data capacity.
	Cellular/Satellite	2	The AIT does not have data capacity.
Cost - Media	Linear Bar Code	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	2D Symbol	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	Passive RFID	3	The AIT is very inexpensive at a cost of less than $1 per unit.
	CMB	3	The AIT is somewhat inexpensive at a cost of $10-100 per unit. At this level of consolidation the cost is reasonable.
	OMC/Mini CD	3	The AIT is somewhat inexpensive at a cost of $10-100 per unit
	Active RFID - data rich	3	Although the cost is somewhat expensive at a cost from $10-100 per unit, the cost is very reasonable given the value of the cargo at this level of consolidation.
	Active RFID - License Plate	3	Although the cost is somewhat expensive at a cost from $10-100 per unit, the cost is very reasonable given the value of the cargo at this level of consolidation.
	Sensor Technology	3	Although the cost is somewhat expensive at a cost from $10-100 per unit, the cost is very reasonable given the value of the cargo at this level of consolidation.
	Cellular/Satellite	3	The AIT is somewhat expensive at a cost of over $100 per unit. At this layer of consolidation the cost is very reasonable.
Cost - Infrastructure	Linear Bar Code	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	2D Symbol	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Passive RFID	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	CMB	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	OMC/Mini CD	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Active RFID - data rich	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Active RFID - License Plate	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Sensor Technology	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
	Cellular/Satellite	3	The cost is reasonable for the number of items associated in this layer of consolidation. The relative cost is in the $1,000s per reader.
Read Method (Range/Automation)	Linear Bar Code	2	The AIT must be read at close range and requires human intervention to access data.
	2D Symbol	2	The AIT must be read at close range and requires human intervention to access data.
	Passive RFID	2	The AIT must be read at close range, most likely does not require human intervention to access data.
	CMB	2	The AIT has no read range and requires human intervention and physical contact to access data.
	OMC/Mini CD	1	The AIT has no read range and requires human intervention to access data. The AIT must be separated from the item.
	Active RFID - data rich	2	The AIT can be read at long or medium range and does not require human intervention to access data.
	Active RFID - License Plate	2	The AIT can be read at long or medium range and does not require human intervention to access data.
	Sensor Technology	3	The AIT can be read at long or medium range and does not require human intervention to access data.
	Cellular/Satellite	3	The AIT can be read at long or medium range and does not require human intervention to access data.
Information Security	Linear Bar Code	3	The AIT only contains license plate data.
	2D Symbol	2	The AIT contains limited data.
	Passive RFID	3	The AIT only contains license plate data.
	CMB	2	The AIT may contain detailed data but requires physical contact with a special device
	OMC/Mini CD	1	The AIT contains content specific data and transmits that data.
	Active RFID - data rich	2	While the AIT contains significant data that may be compromised the data may not be useful with AIS access
	Active RFID - License Plate	3	The AIT only contains license plate data.
	Sensor Technology	3	Sensor Technology Data is not a security risk
	Cellular/Satellite	3	The AIT contains encrypted data.

Appendix C
AIT Media Evaluations Against AIT Reasons

This appendix contains the detailed scoring and rationale for each AIT medium and the reasons for using AIT defined in Chapter 4.

Table C-1. AIT Evaluation Matrix

	Reason for AIT Use	Linear Bar Code	2D Symbol	Passive RFID	Contact Memory Button	OMC / Mini CD	Active RFID Data Rich	Active RFID License Plate	Sensor Technology	Satellite or Cellular
Layer 0 (Item Level)	Data Management	2	2	3	2	0	0	0	2	0
	Asset Identification	2	3	2	3	0	0	0	1	0
	Location and Accountability	2	2	2	2	0	0	0	1	0
	Condition Monitoring	1	1	1	1	0	0	0	3	0
Layer 1 (Package)	Data Management	2	2	3	0	0	0	0	2	0
	Asset Identification	2	3	2	0	0	0	0	1	0
	Location and Accountability	2	2	2	0	0	0	0	1	0
	Condition Monitoring	1	1	1	0	0	0	0	3	0
Layer 2 (Transport Unit)	Data Management	2	2	3	0	0	3	3	2	0
	Asset Identification	2	3	2	0	0	3	2	1	0
	Location and Accountability	2	2	2	0	0	2	2	1	0
	Condition Monitoring	1	1	1	0	0	1	1	3	0
Layer 3 (Unit Load)	Data Management	2	2	3	0	0	3	3	2	0
	Asset Identification	2	3	2	0	0	3	2	1	0
	Location and Accountability	2	2	2	0	0	2	2	1	0
	Condition Monitoring	1	1	1	0	0	1	1	3	0
Layer 4 (Freight Container or 463L Pallet)	Data Management	2	2	3	2	0	3	3	2	3
	Asset Identification	2	3	2	3	0	3	2	1	1
	Location and Accountability	2	2	2	2	0	2	2	1	3
	Condition Monitoring	1	1	1	1	0	1	1	3	1
Layer 5 (Movement Vehicle)	Data Management	0	2	3	2	0	3	3	2	3
	Asset Identification	0	3	2	3	0	3	2	1	1
	Location and Accountability	0	2	2	2	0	2	2	1	3
	Condition Monitoring	0	1	1	1	0	1	1	3	1

Table C-2. Layer 0 Evaluation of AIT

Layer 0 Item Level	Data Management	Reason	Asset Identification	Reason	Location/ Accountability	Reason	Condition Monitoring	Reason
Linear Bar Code	2	The AIT requires active human intervention to access data.	2	The AIT can only uniquely identify the asset if the bar code ID is unique within the supply chain or across the industry	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
2D Symbol	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the item, including serial number and manufacturer ID.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Passive RFID	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the asset if the tag ID is unique within the supply chain or across the industry	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Contact Memory Button	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the item, including serial number and manufacturer ID.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
OMC/Mini CD								
Active RFID (Data Rich)								
Active RFID (License Plate)								
Sensor Technology	2	The AIT has monotoring capability.	1	The AIT does not inherently contain asset identification information.	1	The AIT has no monotoring capability unless it is tied into the business process explicitly to provide location.	3	This is the only AIT that has monotoring capability.
Satellite or Cellular								

Table C-3. Layer 1 Evaluation of AIT

Layer 1 Package	Data Management	Reason	Asset Identification	Reason	Location/ Accountability	Reason	Condition Monitoring	Reason
Linear Bar Code	2	The AIT requires active human intervention to access data.	2	The AIT can only uniquely identify the asset if the bar code ID is unique within the supply chain or across the industry.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
2D Symbol	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the item, including serial number and manufacturer ID	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Passive RFID	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the asset if the tag ID is unique within the supply chain or across the industry	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Contact Memory Button								
OMC/Mini CD								
Active RFID (Data Rich)								
Active RFID (License Plate)								
Sensor Technology	2	The AIT has monotoring capability.	1	The AIT does not inherently contain asset identification information.	1	The AIT has no monotoring capability unless it is tied into the business process explicitly to provide location.	3	This is the only AIT that has monotoring capability.
Satellite or Cellular								

Table C-4. Layer 2 Evaluation of AIT

Layer 2 Transport Unit (boxes)								
	Data Management	**Reason**	**Asset Identification**	**Reason**	**Location/ Accountability**	**Reason**	**Condition Monitoring**	**Reason**
Linear Bar Code	2	The AIT requires active human intervention to access data.	2	Can only uniquely identify the transport unit if the bar code ID is unique within the supply chain or across the industry.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
2D Symbol	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the transport unit including some content information.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Passive RFID	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the asset if the tag ID is unique within the supply chain or across the industry	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Contact Memory Button								
OMC/Mini CD								
Active RFID (Data Rich)	3	The AIT can be read automatically as it passes a reader/portal.	3	The AIT can contain unique information about the transport unit including extensive content information.	2	While an active tag may be read at high speeds and from significant distances, location is dependent on a significant fixed network of readers and if the vehicle is not in the vicinity of a reader, location will not be known.	1	The AIT has no capability to monitor conditions.
Active RFID (License Plate)	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the asset if the tag ID is unique within the supply chain or across the industry.	2	While an active tag may be read at high speeds and from significant distances, location is dependent on a significant fixed network of readers and if the vehicle is not in the vicinity of a reader, location will not be known.	1	The AIT has no capability to monitor conditions.
Sensor Technology	2	The AIT has monotoring capability.	1	The AIT does not inherently contain asset identification information.	1	The AIT has no monotoring capability unless it is tied into the business process explicitly to provide location.	3	This is the only AIT that has monotoring capability.
Satellite or Cellular								

Table C-5. Layer 3 Evaluation of AIT

Layer 3 **Unit Load (tri-wall)**								
	Data Management	**Reason**	**Asset Identification**	**Reason**	**Location/ Accountability**	**Reason**	**Condition Monitoring**	**Reason**
Linear Bar Code	2	The AIT requires active human intervention to access data.	2	The AIT can only uniquely identify the unit load if the bar code ID is unique within the supply chain or across the industry.	2	Does not inherently provide location but location is identified in relation to the business process and AIS reading the tag	1	The AIT has no capability to monitor conditions.
2D Symbol	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the unit load including some content information.	2	Does not inherently provide location but location is identified in relation to the business process and AIS reading the tag	1	The AIT has no capability to monitor conditions.
Passive RFID	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the asset if the tag ID is unique within the supply chain or across the industry	2	Does not inherently provide location but location is identified in relation to the business process and AIS reading the tag	1	The AIT has no capability to monitor conditions.
Contact Memory Button								
OMC/Mini CD								
Active RFID (Data Rich)	3	The AIT can be read automatically as it passes a reader/portal.	3	The AIT can contain unique information about the unit load including some content information.	2	While an active tag may be read at high speeds and from significant distances, location is dependent on a significant fixed network of readers and if the vehicle is not in the vicinity of a reader, location will not be known.	1	The AIT has no capability to monitor conditions.
Active RFID (License Plate)	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the transport unit if the tag ID is unique within the supply chain or across the industry.	2	While an active tag may be read at high speeds and from significant distances, location is dependent on a significant fixed network of readers and if the vehicle is not in the vicinity of a reader, location will not be known.	1	The AIT has no capability to monitor conditions.
Sensor Technology	2	The AIT has monotoring capability.	1	The AIT does not inherently contain asset identification information.	1	The AIT has no monotoring capability unless it is tied into the business process explicitly to provide location.	3	This is the only AIT that has monotoring capability.

Table C-6. Layer 4 Evaluation of AIT

Layer 4 - Freight Container (Seavan, 463L Pallet)	Data Management	Reason	Asset Identification	Reason	Location/ Accountability	Reason	Condition Monitoring	Reason
Linear Bar Code	2	The AIT requires active human intervention to access data.	2	The AIT can only uniquely identify the unit load if the bar code ID is unique within the supply chain or across the industry.	2	Does not inherently provide location but location is identified in relation to the business process and AIS reading the tag	1	The AIT has no capability to monitor conditions.
2D Symbol	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the consolidation including some content information.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Passive RFID	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the asset if the tag ID is unique within the supply chain or across the industry	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Contact Memory Button	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the consolidation including some content information.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
OMC/Mini CD								
Active RFID (Data Rich)	3	The AIT can be read automatically as it passes a reader/portal.	3	The AIT can contain unique information about the consolidation including some content information.	2	While an active tag may be read at high speeds and from significant distances, location is dependent on a significant fixed network of readers and if the vehicle is not in the vicinity of a reader, location will not be known.	1	The AIT has no capability to monitor conditions.
Active RFID (License Plate)	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the consolidation if the tag ID is unique within the supply chain or across the industry.	2	While an active tag may be read at high speeds and from significant distances, location is dependent on a significant fixed network of readers and if the vehicle is not in the vicinity of a reader, location will not be known.	1	The AIT has no capability to monitor conditions.
Sensor Technology	2	The AIT has monotoring capability.	1	The AIT does not inherently contain asset identification information.	1	The AIT has no monotoring capability unless it is tied into the business process explicitly to provide location.	3	This is the only AIT that has monotoring capability.
Satellite or Cellular	3	Automatic reads to satellite or cellular tower	1	The AIT will have a unique identifier that can be tied to the consolidation logically in an AIS. The tag, however contains NO information about the consolidation.	3	The AIT provides geographical location (latitude and longitude) of consolidation.	1	The AIT can only monitor location and not environmental conditions.

Layer 5 Movement Vehicle								
	Data Management	Reason	Asset Identification	Reason	Location/ Accountability	Reason	Condition Monitoring	Reason
Linear Bar Code								
2D Symbol	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the vehicle including some content information.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Passive RFID	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can only uniquely identify the asset if the tag ID is unique within the supply chain or across the industry	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
Contact Memory Button	2	The AIT requires active human intervention to access data.	3	The AIT can contain unique information about the vehicle including some content information.	2	The AIT does not inherently provide location but location is identified in relation to the business process and AIS reading the tag.	1	The AIT has no capability to monitor conditions.
OMC/Mini CD								
Active RFID (Data Rich)	3	The AIT can be read automatically as it passes a reader/portal.	3	The AIT can contain unique information about the vehicle including detailed content information.	2	While an active tag may be read at high speeds and from significant distances, location is dependent on a significant fixed network of readers and if the vehicle is not in the vicinity of a reader, location will not be known.	1	The AIT has no capability to monitor conditions.
Active RFID (License Plate)	3	The AIT can be read automatically as it passes a reader/portal.	2	The AIT can contain unique information about the vehicle including detailed content information	2	While an active tag may be read at high speeds and from significant distances, location is dependent on a significant fixed network of readers and if the vehicle is not in the vicinity of a reader, location will not be known.	1	The AIT has no capability to monitor conditions.
Sensor Technology	2	The AIT has monotoring capability.	1	The AIT does not inherently contain asset identification information.	1	The AIT has no monotoring capability unless it is tied into the business process explicitly to provide location.	3	This is the only AIT that has monotoring capability.
Satellite or Cellular	3	The AIT automatically reads to a satellite or cellular tower.	1	The AIT will have a unique identifier that can be tied to the consolidation logically in an AIS. The tag, however contains NO information about the consolidation.	3	The AIT provides geographical location (latitude and longitude) of a vehicle.	1	The AIT can only monitor location and not environmental conditions.

Appendix D
DoD Documents Gathered

This appendix provides a complete list of documents gathered in the development of this CONOPS. Various DoD logistics community stakeholders provided input to this list. The fields listed in Table D-1 are included for each document.

Table D-1. List of Fields

Field	Comments
Title	Title
Author	Office, organization, or individual as appropriate
Date	Date published
Publisher	May be same as author (if author is not an individual)
Report No.	(if applicable)
Version No.	(if applicable)
Description	Brief description of document's contents and intent
Media Type	RFID, barcodes, satellite, contact memory button, optical memory card, etc.
Node	Distribution node(s) addressed (storage, port of embarkation/debarkation, in-transit, etc.)
Supply Class	DoD supply class (if applicable)
Rationale	Explain why this AIT medium/media was/were chosen for this situation
Status	Draft, final, current policy, etc. (if applicable)

DoD Regulations, Standards, and Specifications

DFARS 252.211 Solicitation provisions and contract clauses 7003 UID	
Author	None specified
Date	Jun-05
Publishing Org.	OSD AT&L DPAP
Report No.	DFARS 252.211-7003 Item Identification and Validation
Version No.	2
Description	Provides contract clauses and requirements for UID in DoD contracts
Media Type	2D Data matrix
Node	N/A
Supply Class	All
AIT Rationale	Asset identification
Status	Final
DFARS 252.211 Solicitation provisions and contract clauses 7006 RFID	
Author	None specified
Date	Feb-07
Publishing Org.	OSD AT&L DPAP
Report No.	DFARS 252.211-7006 RFID
Version No.	2
Description	Provides contract clauses and requirements for passive RFID on deliveries from contractors
Media Type	Passive RFID
Node	N/A
Supply Class	Class I (packaged operational rations), Class II, Class III, Class IV, Class VI, Class VII (medial materials, excluding pharma, biologicals and reagents), Class IX
AIT Rationale	Multiple rationales
Status	Final
Department of Defense Standard Practice: Military Marking for Shipment and Storage	
Author	None specified
Date	Oct-04
Publishing Org.	Chief, Logistics Support Activity, Packaging, Storage, and Containerization Center, Toby-hanna, PA
Report No.	MIL-STD-129P w/change 3
Version No.	Version P, Change 3
Description	Marking specifications for DoD packaging and labeling. Includes guidance for linear and 2D barcodes.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final

Department of Defense Standard Practice: Identification Marking of US Military Property	
Author	None specified
Date	Dec-04
Publishing Org.	DFSG/SBT, Wright - Patterson AFB
Report No.	MIL-STD-130M
Version No.	Version M
Description	Contains guidance for identification marking of high-end or serialized items.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset identification
Status	Final
Defense Transportation Regulation, Part II, Appendix O—Unit Move Documentation	
Author	None specified
Date	Jan-07
Publishing Org.	USTRANSCOM
Report No.	DoD 4500.9-R
Version No.	N/A
Description	For unit moves: "…all Layer 4 Freight Containers (e.g., 20/40 foot SEAVANs, large engine containers) and palletized (463L air pallets) unit move shipments, as well as all major organizational equipment, must have active data-rich RFID tags written with content level detail (e.g., nomenclature, stock number) and applied at the point of origin by all activities (including contractors) stuffing containers or building air pallets. Self-deploying aircraft and ships are exempted, but not the manifested, RFID Layer 4 shipments they may be carrying."
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset and Intransit Visibility
Status	Final
Defense Transportation Regulation, Part II, Appendix X—Background and Technical Details for Two Dimensional (2D) Symbology on the Military Shipping Label (MSL)	
Author	None specified
Date	Jan-07
Publishing Org.	USTRANSCOM
Report No.	DoD 4500.9-R
Version No.	N/A
Description	Contains 2D barcode specifications for MSL application.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset and Intransit Visibility
Status	Final

Defense Transportation Regulation, Part II, Chapter 208 - Packaging and Handling	
Author	None specified
Date	Jan-07
Publishing Org.	USTRANSCOM
Report No.	DoD 4500.9-R
Version No.	N/A
Description	Contains requirements for applying linear and 2D barcodes on MSLs.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset and Intransit Visibility
Status	Final
DLMS EDI 856a Ship Notice/Manifest - Consolidations	
Author	None specified
Date	
Publishing Org.	
Report No.	
Version No.	
Description	Describes how DoD trading partners will use the ANSI ASC X12 856a transaction to exchange data that describes Receipt/Shipment Consolidation/Due-In Notice information. It replaces the TAV/TAW. It can be used to exchange both Receipt Notice and Shipment-Consolidation Notice data.
Media Type	
Node	
Supply Class	Multiple
AIT Rationale	EDI pre positioned data—supply, shipment, contract deliveries, and consolidation info
Status	
DLMS EDI 856s Advance Shipping Notice/Manifest	
Author	None specified
Date	
Publishing Org.	
Report No.	
Version No.	
Description	Describes X.12 856s transaction—Advanced Ship Notice. Also provides UII and RFID information when applicable.
Media Type	
Node	
Supply Class	Multiple
AIT Rationale	EDI pre positioned data—supply, shipment, contract deliveries, and consolidation info
Status	DLMS EDI 856s Advance Shipping Notice/Manifest

DLMS XML Visibility Transaction	
Author	DLMSO
Date	7-Dec 2006
Publishing Org.	DLA-DLMSO
Report No.	ADC 219
Version No.	
Description	Describes how DoD trading partners will use the XML format to exchange data that describes the status of a passive RFID tag in the DTS pipeline.
Media Type	
Node	
Supply Class	
AIT Rationale	Data collection of a passive RFID tag in movement.
Status	
DLMS XML Passive Reader Transaction	
Author	DLMSO
Date	7-Dec 2006
Publishing Org.	DLA-DLMSO
Report No.	ADC 219
Version No.	
Description	Describes how DoD trading partners will use the XML format to exchange data that describes the passive RFID reader in use at the trans-shipment point.
Media Type	
Node	
Supply Class	
AIT Rationale	Data collection of a passive RFID tag in movement.
Status	
USTRANSCOM TT&P for In-Transit Visibility (ITV)	
Author	RADM AMES, USN,
Date	4-Mar
Publishing Org.	Strategy, Plans, Policy, and Programs, USTRANSCOM
Report No.	USTRANSCOM Instruction 20–2
Version No.	
Description	Describes how TRANSCOM and TCCs will support ITV. Includes specific taskings to TCCs with reporting metrics
Media Type	Various
Node	Intransit organic and commercial
Supply Class	Multiple
AIT Rationale	ITV reporting to GTN
Status	Final

Optical Memory Card Data Format	
Author	None specified
Date	9/20/01 (posted date)
Publishing Org.	None specified
Report No.	N/A
Version No.	N/A
Description	
Media Type	Optical Memory Card
Node	In-transit (consolidated shipment)
Supply Class	Multiple
AIT Rationale	
Status	Unknown

DOD MEMORANDA

Lead Proponent for Radio Frequency Identification (RFID) and Related Automatic Identification Technology (AIT) for the DoD Supply Chain	
Author	Kenneth Krieg
Date	Sep-06
Publishing Org.	USD AT&L
Report No.	N/A
Version No.	N/A
Description	Transfers responsibility for RFID and related AIT implementation to USTRANSCOM. Calls on USTRANSCOM to develop a CONOPS, incorporate AIT and RFID into the DPO architecture. AT&L retains policy and guidance responsibilities.
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final
Radio Frequency Identification (RFID) Policy	
Author	Michael Wynne, acting USD-AT&L
Date	Jul-04
Publishing Org.	USD-ATL
Report No.	N/A
Version No.	N/A
Description	Establishes DoD policy on using RFID policy. Attachments provide guidance on Active RFID used for container (level 4) consolidations; passive RFID for case, pallet, and high-value end items needing UIDs (levels 1-3), data formats, and implementation timeliness.
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Real time accountability
Status	Final

Procedures for the Reuse and Return of Active Radio Frequency Identification (RFID) Tags	
Author	Alan Estevez, ADUSD Supply Chain Integration
Date	May-06
Publishing Org.	OUSD - AT&L
Report No.	N/A
Version No.	N/A
Description	In response to GAO report GAO-06-366R, directs services, DLA, and USTRANSCOM to develop/modify procedures to increase the reuse or return of active tags.
Media Type	Active RFID (lic plate/asset)
Node	In-transit (consolidated shipment)
Supply Class	N/A
AIT Rationale	Asset identification
Status	Final

CONCEPTS OF OPERATION AND INSTRUCTIONAL GUIDES

Surface Deployment and Distribution Command Radio Frequency Identification Support Concept of Operations	
Author	SDDC
Date	Jan-04
Publishing Org.	SDDC
Report No.	N/A
Version No.	N/A
Description	Outlines SDDC objectives, guidelines and plans for supporting RFID in support of USD-ATL 10/2/03 policy for RFID.
Media Type	Various
Node	In-transit (consolidated shipment)
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Draft
Distribution Process Owner Asset Visibility Concept of Operations	
Author	USTRANSCOM
Date	Jan-05
Publishing Org.	USTRANSCOM
Report No.	N/A
Version No.	N/A
Description	Draft assessment of AV issues, challenges, and initiatives in the DPO framework. Discusses RFID (Army), AIT policy and planning in DoD. Appears to be an early draft; some information incomplete.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Draft

DLA Active RFID CONOPS 1 Jul 2004	
Author	DLA J-37
Date	Jul-04
Publishing Org.	DLA
Report No.	
Version No.	
Description	Implementation for sustainment active RFID only, prescribes tag data format for tags from contractors and assigns DSCP as item manager for active tags.
Media Type	Active RFID
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset and Intransit Visibility
Status	Current
DoD Internal Guide to Passive RFID v14 DRAFT	
Author	
Date	Undated draft
Publishing Org.	DUSD-LMR
Report No.	
Version No.	v 14
Description	Passive RFID operating guide for suppliers
Media Type	Passive RFID
Node	Multiple
Supply Class	Multiple
AIT Rationale	Data collection and management
Status	Current
DoD Suppliers Guide to Passive RFID v8.0	
Author	
Date	Undated
Publishing Org.	DUSD-LMR
Report No.	
Version No.	v 8
Description	Passive RFID operating guide for internal DoD use
Media Type	Passive RFID
Node	Multiple
Supply Class	Multiple
AIT Rationale	Data collection and management
Status	Draft

PM JAIT ITV Operations Pocket Guide	
Author	PM JAIT
Date	May-05
Publishing Org.	Product Manager Joint-Automatic Identification Technology
Report No.	N/A
Version No.	N/A
Description	Illustrated User information for Active RFID and MTS Satellite for Asset and Intransit Visibility
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset and Intransit Visibility
Status	Current operations
PM JAIT ITV Server Pocket Guide	
Author	PM JAIT
Date	May-05
Publishing Org.	Product Manager Joint-Automatic Identification Technology
Report No.	N/A
Version No.	N/A
Description	Illustrated User information for RF-ITV server use for Asset and Intransit Visibility
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Data collection and management
Status	Current operations
Logistics Automatic Identification Technology Concept of Operations	
Author	AIT Task Force
Date	Nov-97
Publishing Org.	DUSD (Logistics)
Report No.	N/A
Version No.	
Description	Initial Broad CONOPS for AIT in DoD
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	

IMPLEMENTATION AND INTEGRATION PLANS

Department of Defense: Implementation Plan for Logistics Automatic Identification Technology	
Author	DoD (LMI client report)
Date	Mar-00
Publishing Org.	USD-ATL (signed off)
Report No.	N/A
Version No.	N/A
Description	Describes types of AIT, present and ongoing prototypes and a summary of AIT implementation action items, lead organizations, and the status of the actions (some info is dated).
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final
Defense Logistics Agency Automatic Identification Technology Implementation Plan	
Author	LMI client report
Date	Mar-01
Publishing Org.	None specified
Report No.	N/A
Version No.	N/A
Description	DLA's overarching guidance and specific direction to implementing AIT across the agency. Includes descriptions of media, program management guidance, QA, vendor shipments, and appendixes.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	

United States Army Strategic Plan for Implementation of RFID Technology	
Author	Army G-4 CIO
Date	Nov-04
Publishing Org.	Army G-4 CIO
Report No.	N/A
Version No.	Version 2.2
Description	Draft Document—Army Implementation of DoD RFID Policy of 30 July 2004 and Logistics Decision Memorandum of 14 October 2005—includes budget numbers.
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Draft
Department of the Navy AIT Implementation Manual	
Author	Navy AIT Program Office Naval Supply Systems Command
Date	Jun-06
Publishing Org.	NKO
Report No.	N/A
Version No.	N/A
Description	Comprehensive implementation guidance including applicable policy, standards references, BCA approach and AIT media selection discussions. Designed to provide assistance selecting and implementing AIT for logistics processes Excellent information. In process for annual update scheduled for Jan 2007.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Current policy
United States Navy RFID Implementation Plan	
Author	None specified
Date	Dec-05
Publishing Org.	Naval Supply Systems Command
Report No.	N/A
Version No.	N/A
Description	Navy RFID Implementation Plan—includes budget numbers and deployment build out plans
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Current policy

USAF RFID Implementation Plan	
Author	AF AIT PMO
Date	Nov-05
Publishing Org.	HQ USAF/IL
Report No.	
Version No.	Version 4
Description	USAF RFID Implementation Plan
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Current policy
USMC RFID Implementation Plan	
Author	HQ USMC LPD
Date	Nov-05
Publishing Org.	HQ USMC I&L LP
Report No.	N/A
Version No.	
Description	USMC RFID Implementation Plan. Includes organizational responsibilities and identification of budget requirements.
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Current policy
DLA Strategic Management Approach for the Successful Implementation of RFID	
Author	HQ DLA J-37
Date	Nov-05
Publishing Org.	HQ DLA J-37
Report No.	N/A
Version No.	
Description	Provides DLA's long term goals and objectives, rollout by location (COMPLETE) and funding requirements.
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Current policy

U.S. Transportation Command: Automatic Identification Technology Integration Plan	
Author	USTRANSCOM (LMI client report)
Date	Sep-01
Publishing Org.	None specified
Report No.	N/A
Version No.	N/A
Description	Broad overview of AIT and plans for a two-phased implementation across port operations. An update of 1999 version; includes integration program status for "phase I" activities.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Draft
DoD UID Guide	
Author	DoD AT&L
Date	Jun-06
Publishing Org.	ODUSD (AT&L)
Report No.	N/A
Version No.	Version 1.6
Description	Consolidated UID requirements, acceptable data constructs, marking requirements and contract language.
Media Type	2D barcode
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset identification
Status	Current policy
The Future of Radio Frequency Identification in Army Distribution Management	
Author	LMI (individuals not specified)
Date	Dec-04
Publishing Org.	Product Manager Joint-Automatic Identification Technology
Report No.	N/A
Version No.	N/A
Description	An RFID integration "vision" for the Army's distribution processes, focusing on order fulfillment. Includes vision parameters, challenges, and an economic feasibility assessment.
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Facilitate data management
Status	Final

EUCOM Policy for Theater Asset Visibility	
Author	EUCOM
Date	Mar-05
Publishing Org.	EUCOM
Report No.	Directive 66-2
Version No.	N/A
Description	Complete AIT/ITV including tasks to supporting COCOMS, Components, AIT media use by node/process.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset and Intransit Visibility
Status	Current policy
CENTCOM REG 700-4 Logistics AIT and ITV	
Author	None specified
Date	Jan-07
Publishing Org.	CENTCOM
Report No.	REG 700-4
Version No.	N/A
Description	Requires use of AIT in all logistics processes. First to require an RFID for all OCONUS consolidated shipments.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset and Intransit Visibility
Status	Current policy
CFLCC RFID ITV Policy for the CFLCC AOR	
Author	CFLICC
Date	Jan-07
Publishing Org.	CFLCC
Report No.	
Version No.	
Description	Implements DoD RFID Policy and use of GPS.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset and Intransit Visibility
Status	Current policy

Air Mobility Command AIT Integration Plan for Air Transportation	
Author	
Date	Jun-00
Publishing Org.	Air Mobility Command
Report No.	N/A
Version No.	N/A
Description	An AIT integration plan that calls for linear and 2D barcodes, RFDC, and support for Army RFID and TRANSCOM tasked active RFID.
Media Type	various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Internal GATES business processes and RFID ITV to support others
Status	Final, dated

REQUIREMENTS AND GAPS

Asset Tracking/Management Tag 11 Jan 2007 Meeting	
Author	N/A
Date	Jan-06
Publishing Org.	USTRANSCOM Meeting
Report No.	N/A
Version No.	N/A
Description	Documents License-Plate Active RFID tag potential uses and requirements
Media Type	
Node	Multiple
Supply Class	Multiple
AIT Rationale	
Status	
COCOM 129 as of 22 December 2005	
Author	JCS J-4
Date	Dec-05
Publishing Org.	JCS J-4
Report No.	N/A
Version No.	N/A
Description	DJ-4 prioritized COCOM 129 - ITV and AV high priority
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Current gap
DPO USTC-DLA E2E Analysis January 2006	
Author	DPO
Date	Jan-07
Publishing Org.	DPO DLA&USTRANSCOM
Report No.	
Version No.	
Description	Describes DPO interest problems; many center on ITV AV and data collection and availability to support problem processes.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Current gap

STUDIES AND TESTS OF AIT

An Analysis of the Use of Passive RFID at an Army Supply Support Activities (SSA)	
Author	None specified
Date	Sep-06
Publishing Org.	US Army Logistics Innovation Agency
Report No.	N/A
Version No.	N/A
Description	Presents the results of a modeling and simulation exercise for using passive RFID at an Army SSA using the G2 Rethink tool. The model indicated that passive RFID can improve receipt and inventory activities at SSAs.
Media Type	Passive RFID
Node	Receipt
Supply Class	Multiple
AIT Rationale	Asset identification
Status	Final
DoD Initial Implementation Analysis of Passive RFID	
Author	Various
Date	Feb-06
Publishing Org.	OSD, SCI
Report No.	N/A
Version No.	N/A
Description	Reports on DoD sponsored passive RFID initiatives
Media Type	Passive RFID
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final
Final Report of the Passive RFID Project FISC Norfolk Ocean Terminal 20 Oct 2004	
Author	
Date	Oct-04
Publishing Org.	FISC Norfolk
Report No.	N/A
Version No.	N/A
Description	Goal was to increase manifest accuracy and inventory accountability in the Ocean Terminal operations.
Media Type	Passive RFID
Node	Ocean Terminal Ops
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final

RFID/MEMS Demonstration Sierra Army Depot, CA July 26, 2006	
Author	
Date	Jul-06
Publishing Org.	U.S. Army Logistics Innovation Agency
Report No.	
Version No.	
Description	Examines use of MEMS to monitor medical supplies in storage
Media Type	Sensors, active RFID
Node	Storage
Supply Class	VIII
AIT Rationale	Monitor environmental conditions
Status	Draft
Business Case Analysis for Passive RFID Tag Use within Aerial Port Operations	
Author	N Ryan, D Guilliams, M Ledington
Date	Jul-06
Publishing Org.	LMI
Report No.	TR601T1
Version No.	N/A
Description	Examined ROI for implementing passive RFID at aerial ports. Found minimal ROI and recommended using non-financial reasons to justify such an implementation.
Media Type	Passive RFID
Node	Multiple
Supply Class	Multiple
AIT Rationale	Real time accountability
Status	Final
US Transportation Command: Radio Frequency Identification (RFID) Business Process Plan	
Author	TRANSCOM J5
Date	Apr-04
Publishing Org.	TCJ5
Report No.	N/A
Version No.	N/A
Description	Business process guidance and direction for the transportation component commands in using active and passive RFID.
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Unknown

US Army Logistics Innovation Agency: Micro Electrical Mechanical Systems—Individual Protective Equipment Implementation Strategy for Integrating MEMS Technology into Army IPE Management	
Author	LMI client report
Date	Oct-06
Publishing Org.	US Army LIA
Report No.	N/A
Version No.	N/A
Description	Presents an implementation strategy for using MEMS to manage the storage and monitoring of IPE (individual protective equipment) stocks.
Media Type	Micro electrical mechanical systems sensors
Node	Storage
Supply Class	Class II-Clothing/Textile
AIT Rationale	Monitor Conditions
Status	Final
Alaska RFID Implementation Stakeholder Conference 24 Oct 2006	
Author	N/A
Date	N/A
Publishing Org.	N/A
Report No.	N/A
Version No.	N/A
Description	DLA TRANSCOM the TCC's and the Services are conducting an integration effort for active and passive RFID. Integrating distribution from DLA through transportation to AF/Army activities in Alaska.
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Unknown

GAO REPORTS

Defense Logistics: More Efficient Use of Active RFID Tags Could Potentially Avoid Millions in Unnecessary Purchases	
Author	Government Accountability Office
Date	Mar-06
Publishing Org.	GAO
Report No.	GAO-06-366R
Version No.	N/A
Description	Encourages DoD to adopt a stricter policy for returning and reusing active tags. Most are used only once.
Media Type	Active RFID (lic plate/asset)
Node	In-transit (consolidated shipment)
Supply Class	Multiple
AIT Rationale	
Status	Final
Information Security: Radio Frequency Identification Technology in the Federal Government	
Author	GAO
Date	May-05
Publishing Org.	GAO
Report No.	GAO-05-551
Version No.	N/A
Description	Discusses legal, security, and privacy issue with RFID. DoD mentioned under usages (logistics and shipment tracking).
Media Type	RFID both
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final
GAO Better Strategic Planning Can Help Ensure DoD's Successful Implementation of Passive RFID Sep 05	
Author	GAO
Date	Sep-05
Publishing Org.	GAO
Report No.	GAO 05-345
Version No.	N/A
Description	Addresses DoD management of RFID implementation
Media Type	Passive RFID
Node	
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final

Electronic Government: Challenges to the Adoption of Smart Card Technology	
Author	Joel Willenssen, managing director, IT services, GAO
Date	Sep-03
Publishing Org.	GAO
Report No.	GAO-03-1108T
Version No.	N/A
Description	Testimony on implementation challenges of smart cards. DoD called out as one of largest government implementers; notes implementation costs for DoD nearly tripled; mostly used for system/network access, not for physical/facility access.
Media Type	Smart card
Node	N/A
Supply Class	N/A
AIT Rationale	Security
Status	Final

OVERARCHING POLICY, PLANS, AND REQUIREMENTS

USTC Strategic Plan December 2006	
Author	
Date	Dec-06
Publishing Org.	USTRANSCOM
Report No.	N/A
Version No.	N/A
Description	Improve- Global Deployment, Distribution for Warfighter - RFID/related AIT CONOPS
Media Type	Various
Node	Various
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final
DLA Asset Visibility Guide Aug 2005	
Author	
Date	Aug-05
Publishing Org.	DLA
Report No.	N/A
Version No.	N/A
Description	Guide to AV AIS Application
Media Type	
Node	
Supply Class	
AIT Rationale	
Status	
DLB Decision Passive RFID and DPO October 2005	
Author	Kenneth Krieg
Date	Oct-05
Publishing Org.	ODSD
Report No.	N/A
Version No.	N/A
Description	Direction to Proceed with Passive RFID Implementation
Media Type	
Node	
Supply Class	
AIT Rationale	
Status	

DoD Business Transformation 2006	
Author	
Date	Mar-06
Publishing Org.	OSD
Report No.	N/A
Version No.	N/A
Description	Annual Report to Congress—Transformation
Media Type	RFID both
Node	
Supply Class	
AIT Rationale	Multiple rationales
Status	Final
Quadrennial Defense Review	
Author	
Date	Feb-06
Publishing Org.	
Report No.	N/A
Version No.	N/A
Description	Mentions RFID as enabler to knowledge-based logistics
Media Type	RFID both
Node	
Supply Class	
AIT Rationale	Multiple rationales
Status	Final
GEN Schwartz Senate Armed Services Testimony April 4, 2006	
Author	Gen Schwartz
Date	Apr-06
Publishing Org.	
Report No.	N/A
Version No.	N/A
Description	Improve - adaptive and agile - Global Deployment, Distribution for Warfighter - use passive and active RFID
Media Type	RFID both
Node	
Supply Class	
AIT Rationale	Multiple rationales
Status	Final

2007 USTRANSCOM Commanders Guidance	
Author	
Date	Jan-07
Publishing Org.	USTRANSCOM Commander
Report No.	N/A
Version No.	N/A
Description	Improve Global Deployment, Distribution for Warfighters
Media Type	
Node	
Supply Class	
AIT Rationale	Multiple rationales
Status	Final
DoD Supply Chain Materiel Management Regulation	
Author	DUSD-LMR
Date	May-03
Publishing Org.	DUSD-LMR
Report No.	DoD 4140.1-R
Version No.	N/A
Description	Section C7.2.1 calls on DoD components to consider AIT as a preferred input/data collection method, ensure compatibility with both commercial and military AIT devices, and lists the minimal technical compliance requirements. Being updated for RFID specific requirements.
Media Type	Various
Node	
Supply Class	
AIT Rationale	Multiple rationales
Status	Final
Update to Policy on Unique Identification (UID) of Tangible Items	
Author	Michael Wynne, acting USD_AT&L
Date	Sep-04
Publishing Org.	USD-ATL
Report No.	N/A
Version No.	N/A
Description	Allows suppliers to use electronic product codes in lieu of DoD's UID numbering system.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Asset identification
Status	Final

Common Access Card (CAC)	
Author	Bernard Rosker and Arthur Money
Date	Jan-01
Publishing Org.	OSD
Report No.	N/A
Version No.	N/A
Description	States that CAC is DoD's smart card implementation. CAC will become the DoD standard ID card.
Media Type	Smart card
Node	N/A
Supply Class	N/A
AIT Rationale	Security
Status	Final
Common Access Card & US Army Logistics: A Vision and a Plan	
Author	US Army Logistics Integration Agency (LMI client report)
Date	Jul-02
Publishing Org.	US Army Logistics Integration Agency
Report No.	N/A
Version No.	N/A
Description	A high level vision and implementation plan for CACs within the Army logistics community. Billed as a living document, updated as required. Contains discussions of current (as of publication) DoD smart card initiatives and how Army CAC implementation might integrate with them, other smart card initiatives.
Media Type	Smart card
Node	N/A
Supply Class	N/A
AIT Rationale	Security
Status	Final

MISCELLANEOUS REPORTS

Final Regulatory Analysis of Passive RFID August 2005	
Author	ODSD (LMR)
Date	Aug-05
Publishing Org.	OUSD (AT&L)
Report No.	N/A
Version No.	N/A
Description	Rational/Justification for passive RFID DFAR
Media Type	Passive RFID
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final
Future of the Global Positioning System Def Sci Board October 2005	
Author	DSB
Date	Aug-05
Publishing Org.	DSB
Report No.	
Version No.	
Description	Analysis of need for GPS
Media Type	GPS
Node	N/A
Supply Class	N/A
AIT Rationale	Multiple rationales
Status	Final

CHARTERS FOR OFFICES, TASK FORCES, AND WORKING GROUPS

Department of Defense Logistics Automatic Identification Technology (AIT) Office Charter (contained in App. B of DoD Logistics Implementation Plan)	
Author	None specified
Date	Dec-98
Publishing Org.	DLA
Report No.	N/A
Version No.	N/A
Description	Charter containing the purpose, scope, roles and responsibilities for DoD Logistics AIT Office.
Media Type	Various
Node	Multiple
Supply Class	Multiple
AIT Rationale	Multiple rationales
Status	Final

Appendix E
DoD Document AIT Use Assessments

The following matrix identifies which AIT is recommended by each document from Appendix D at each consolidation layer. Documents that had no specific AIT recommended, required, or used for a given layer were colored gray. AIT recommended, required, or used for a given layer that vary from the designations in this CONOPS are noted in red. See Chapter 6 for a discussion of the variances.

Table E-1. Current DoD Efforts Comparison Against Proposed AIT Use

Document title	Layer				
	0	1	2 and 3	4	5
DFARS 252.211 Solicitation provisions and contract clauses 7003 UID	◆ 2D data matrix				
DFARS 252.211 Solicitation provisions and contract clauses 7006 RFID		◆ PRFID	◆ PRFID		
Department of Defense Standard Practice: Military Marking for Shipment and Storage MIL STD 129		◆ Linear bar code ◆ 2D bar code ◆ PRFID	◆ Linear bar code ◆ 2D bar code ◆ PRFID	◆ Linear bar code ◆ 2D bar code ◆ ARFID	
Department of Defense Standard Practice: Identification Marking of U.S. Military Property MIL STD 130	◆ Linear bar code ◆ 2D data matrix	◆ Linear bar code ◆ 2D bar code			
Defense Transportation Regulation, Part II, Appendix O—Unit Move Documentation				◆ ARFID	
Defense Transportation Regulation, Part II, Appendix X—Background and Technical Details for Two Dimensional (2D) Symbology on the Military Shipping Label (MSL)			◆ Linear bar code ◆ 2D bar code ◆ ARFID	◆ Linear bar code ◆ 2D bar code ◆ ARFID	
Defense Transportation Regulation, Part II, Chapter 208—Packaging and Handling			◆ Linear bar code ◆ 2D bar code		
DLMS EDI 856a Receipt Shipment Consolidation					
DLMS EDI 856s Advance Shipping Notice/Manifest					
DLMS XML Visibility Transaction		◆ PRFID	◆ PRFID		
DLMS XML Passive Reader Transaction		◆ PRFID	◆ PRFID		
USTRANSCOM TT&P for In-Transit Visibility (ITV)			◆ Linear bar code ◆ 2D bar code	◆ ARFID ◆ Linear bar code ◆ 2D bar code	
Optical Memory Card Data Format			◆ OMC	◆ OMC	

Table E-1. Current DoD Efforts Comparison Against Proposed AIT Use

Document title	Layer				
	0	1	2 and 3	4	5
Lead Proponent for Radio Frequency Identification (RFID) and Related Automatic Identification Technology (AIT) for the DoD Supply Chain Memo of Sep 2006					
Radio Frequency Identification (RFID) Policy Memo of 30 July 2004		◆ PRFID	◆ PRFID	◆ ARFID	
Procedures for the Reuse and Return of Active Radio Frequency Identification (RFID) Tags				◆ ARFID	
New DPO Designation Memo 8 May 2006					
Surface Deployment and Distribution Command Radio Frequency Identification Support Concept of Operations DRAFT Jan 2004		◆ Linear bar code ◆ 2D bar code ◆ PRFID	◆ Linear bar code ◆ 2D bar code ◆ PRFID	◆ Linear bar code ◆ 2D bar code ◆ ARFID ◆ PRFID	
Distribution Process Owner Asset Visibility Concept of Operations DRAFT		◆ Linear bar code ◆ 2D bar code ◆ PRFID	◆ Linear bar code ◆ 2D bar code ◆ PRFID ◆ OMC	◆ Linear bar code ◆ 2D bar code ◆ ARFID ◆ PRFID ◆ OMC	◆ Satellite
DLA Active RFID CONOPS 1 Jul 2004				◆ ARFID	
DOD Internal Guide to Passive RFID v14 DRAFT		◆ PRFID	◆ PRFID		
DOD Suppliers Guide to Passive RFID v8.0		◆ PRFID	◆ PRFID		
PM JAIT ITV Operations Pocket Guide May 2005				◆ ARFID	
PM JAIT ITV Server Pocket Guide May 2005				◆ ARFID	
Logistics Automatic Identification Technology Concept of Operations Nov 1997	◆ Linear bar code	◆ Linear bar code ◆ 2D bar code ◆ OMC	◆ Linear bar code ◆ 2D bar code ◆ OMC	◆ ARFID ◆ Satellite	◆ Satellite
Department of Defense: Implementation Plan for Logistics Automatic Identification Technology March 2000	◆ Linear bar code	◆ Linear bar code ◆ 2D bar code ◆ OMC	◆ Linear bar code ◆ 2D bar code ◆ OMC	◆ ARFID ◆ Satellite	◆ Satellite
Defense Logistics Agency Automatic Identification Technology Implementation Plan March 2001	◆ Linear Bar code	◆ Linear bar code ◆ 2D bar code ◆ OMC	◆ Linear bar code ◆ 2D bar code ◆ OMC	◆ Linear bar code ◆ 2D bar code ◆ OMC ◆ ARFID	
United States Army Strategic Plan for Implementation of RFID Technology DRAFT v2.2 of 18 Nov 2005		◆ PRFID	◆ PRFID	◆ ARFID	

Table E-1. Current DoD Efforts Comparison Against Proposed AIT Use

Document title	Layer				
	0	1	2 and 3	4	5
Department of the Navy AIT Implementation Manual June 2006	◆ Linear bar code ◆ 2D Data Matrix, ◆ CMB	◆ Linear bar code ◆ 2D bar code ◆ OMC ◆ PRFID	◆ Linear bar code ◆ 2D bar code ◆ OMC ◆ PRFID	◆ ARFID	
United States Navy RFID Implementation Plan 8 Dec 2005	◆ PRFID	◆ PRFID	◆ PRFID		
USAF RFID Implementation Plan 17 Nov 2005	◆ PRFID	◆ PRFID	◆ PRFID	◆ ARFID	
USMC RFID Implementation Plan of 10 November 2005	◆ PRFID	◆ PRFID	◆ PRFID	◆ ARFID	
DLA Strategic Management Approach for the Successful Implementation of RFID of 18 Nov 2005	◆ PRFID	◆ PRFID	◆ PRFID	◆ ARFID	
U.S. Transportation Command: Automatic Identification Technology Integration Plan Sep 01		◆ Linear bar code ◆ 2D bar code	◆ Linear bar code ◆ 2D bar code	◆ Linear bar code ◆ 2D bar code ◆ ARFID	
DOD UID Guide of 1 June 2006	◆ Linear bar code ◆ 2D Data Matrix				
The Future of Radio Frequency Identification in Army Distribution Management Dec 2004 PM JAIT		◆ PRFID	◆ PRFID	◆ ARFID	
EUCOM Policy for Theater Asset Visibility March 2005		◆ Linear bar code ◆ 2D bar code	◆ Linear bar code ◆ 2D bar code ◆ OMC	◆ Linear bar code ◆ 2D bar code ◆ OMC ◆ Active RFID	◆ Satellite
CENTCOM REG 700-4 23 Jan 2006 Logistics AIT and ITV		◆ Linear bar code ◆ 2D bar code	◆ Linear bar code ◆ 2D bar code	◆ ARFID	◆ Satellite
CFLCC ITV policy 29 Jan 2005			◆ OMC	◆ ARFID ◆ Satellite	◆ Satellite
Air Mobility Command AIT Integration Plan for Air Transportation		◆ Linear bar code ◆ 2D bar code	◆ Linear bar code ◆ 2D bar code	◆ Linear bar code ◆ 2D bar code ◆ ARFID	
Asset Tracking/Management Tag 11 Jan 2007 Meeting				◆ ARFID	
COCOM 129 as of 22 December 2005				◆ ARFID—non-data-rich	
DPO USTC-DLA E2E Analysis January		◆ Linear bar	◆ Linear bar	◆ Linear bar	

Table E-1. Current DoD Efforts Comparison Against Proposed AIT Use

Document title	Layer				
	0	1	2 and 3	4	5
2006 (non specific requirements)		code ◆ 2D bar code ◆ PRFID	code ◆ 2D bar code ◆ PRFID	code ◆ 2D bar code ◆ ARFID ◆ PRFID ◆ Satellite	
An Analysis of the Use of Passive RFID at an Army Supply Support Activities (SSA) Aug 4, 2006	◆ PRFID	◆ PRFID	◆ PRFID		
Army LIA MEMS IPE Demonstration DRAFT July 21, 2006		◆ Temp and humidity sensors, with RF transmis-sion capability	◆ Temp and humidity sensors, with RF transmis-sion capability		
DOD Initial Implementation Analysis of Passive RFID 14 Feb 2006 Final		◆ PRFID	◆ PRFID		
Final Report of the Passive RFID Project FISC Norfolk Ocean Terminal 20 Oct 2004		◆ PRFID	◆ PRFID		
RFID/MEMS Demonstration Sierra Army Depot, CA July 26, 2006		◆ Temp and humidity sensors, with RF transmis-sion capability		◆ Temp and humidity sensors, with RF transmis-sion capability	
RFID/MEMS Demonstration United States Army Medical Materiel Center, Europe (USAMMCE), Concept Design Document, Draft June 21, 2005		◆ Temp and humidity sensors, with RF transmis-sion capability	◆ Temp and humidity sensors, with RF transmis-sion capability		
Business Case Analysis for Passive RFID Tag Use within Aerial Port Operations			◆ Linear bar code ◆ 2D bar code ◆ PRFID	◆ Linear bar code ◆ 2D bar code ◆ PRFID	
US Transportation Command: Radio Frequency Identification (RFID) Busi-ness Process Plan April 2004		◆ PRFID	◆ PRFID	◆ ARFID	
Alaska RFID Implementation Stake-holder Conference 24 Oct 2006	◆ PRFID	◆ PRFID	◆ PRFID	◆ ARFID	
GAO Defense Logistics: More Efficient Use of Active RFID Tags Could Poten-tially Avoid Millions in Unnecessary Purchases: May 2005				◆ ARFID	
GAO Radio Frequency Identification Technology in the Federal Government Information May 2005 (Security and Privacy					
GAO Better Strategic Planning Can Help Ensure DoD's Successful Implementa-tion of Passive RFID Sep 05	◆ PRFID	◆ PRFID	◆ PRFID		

Table E-1. Current DoD Efforts Comparison Against Proposed AIT Use

Document title	Layer				
	0	1	2 and 3	4	5
Electronic Government: Challenges to the Adoption of Smart Card Technology Sep 2003					
USTC Strategic Plan December 2006					
DLA Asset Visibility Guide Aug 2005					
DLB Decision Passive RFID and DPO October 2005					
DOD Business Transformation 2006					
QDR Feb 2006					
Comments on QDR 06 on RFID					
2007 USTRANSCOM Commanders Guidance					
Common Access Card (CAC)					
GEN Schwartz Senate Armed Services Testimony April 4, 2006					
Final Regulatory Analysis of Passive RFID August 2005	◆ PRFID	◆ PRFID	◆ PRFID		
Future of the Global Positioning System Def Sci Board October 2005					
Department of Defense (DoD) Logistics Automatic Identification Technology (AIT) Office Charter (contained in App. B of DoD Logistics Implementation Plan)					

Appendix F
Abbreviations

AAFES	Army Air Force Exchange System
AF	Air Force
AFMC	Air Force Materiel Command
AIDC	Automatic Identification Data Capture
AIS	automated information system
AIT	automatic identification technology
AMC	Air Mobility Command
AMCOM	Aviation and Missile Command
APOD	aerial port of debarkation
APOE	aerial port of embarkation
ARFID	active radio frequency identification
ASN	advance shipment notice
AT&L	Acquisition, Technology, and Logistics
BCA	business case analysis
CCP	consolidation and containerization point
CD	compact disk
CFLCC	Coalition Forces Land Component Command
CLS	contracted logistics support
CMB	contact memory button
COCOM	combatant commander
COSIS	care of supplies in storage
CONOPS	concept of operations
CONUS	continental United States
DDSP	Defense Distribution Center Susquehanna
DeCA	Defense Commissary Agency
DELA	Drexler European License Association
DFARS	Defense Federal Acquisition Regulation Supplement
DLA	Defense Logistics Agency
DLMS	Defense Logistics Management System

DLMSO	Defense Logistics Management Standards Office
DoD	Department of Defense
DPO	Distribution Process Owner
DRMO	Defense Reutilization and Marketing Office
DTS	Defense Transportation System
DTTF	Distribution Transformation Task Force
DVD	direct vendor delivery
ECM	environmental and condition monitoring
EDI	electronic data interchange
EUCOM	European Command
GAO	Government Accountability Office
GPS	Global Positioning System
GSA	General Services Administration
GTN	Global Transportation Network
HERO	Hazards of Electromagnetic Radiation to Ordnance
ICP	Inventory Control Point
ID	Identifier; identification
IPE	individual protective equipment
ITV	in-transit visibility
IUID	item unique identification
JOPES	Joint Operation Planning and Execution System
L&MR	Logistics and Materiel Readiness
LIA	Logistics Innovation Agency
LOGCAP	Logistics Civil Augmentation Program
MEMS	micro-electrical mechanical systems
MILSTD	Military Standard
MRI	Machine readable information
MRO	material release order
MSL	Military Shipping Label
NEXCOM	Navy Exchange Service Command
NOT	Norfolk Ocean Terminal
NSN	national stock number
OCONUS	outside the continental United States

OMB	Office of Management & Budget
OMC	optical memory card
OSD	Office of the Secretary of Defense
PBL	performance based logistics
PEI	principal end item
PM J-AIT	Product Manager, Joint-Automatic Identification Technology
PMO	program management office
PPP&M	preservation, packaging, packing and marking
PRFID	passive radio frequency identification
RFDC	Radio Frequency Data Collection
RFID	radio frequency identification
RFMSL	Radio Frequency Military Shipping Label
ROI	return on investment
RTLS	real time location system
SCI	Supply Chain Integration
SMU	Supply Management Unit
SPOD	sea port of debarkation
SPOE	sea port of embarkation
SSA	supply support activity
TAV	total asset visibility
TCN	transportation control number
TDC	Theater Distribution Center
UID	unique identification
UII	unique item identification; unique item identifier
ULN	unit line number
UN STANAG	United Nations Standardization Agreement
USAMMA	United States Army Medical Materiel Agency
USD	Under Secretary of Defense
USTRANSCOM	United States Transportation Command
UTC	Unit Type Code
WAWF	Wide Area Work Flow