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MILITARY COMMITTEE LAND STANDARDIZATION BOARD (MC LSB)

7 February 2005

NSA(ARMY)0101-AST/2233

MC LSB Distribution List N° 1

**STANAG 2233 NSA AST (EDITION 1) (RATIFICATION DRAFT 1) – NATO
CONSIGNMENT AND ASSET TRACKING BY RADIO-FREQUENCY
IDENTIFICATION**
Reference:

NSA(ARMY)1182-AST/2233 dated 04 October 2000

1. The enclosed STANAG's ratification draft has been prepared by the US and staffed by the MC LSB NSA for circulation to obtain national ratification.

ACTION BY NATIONAL STAFFS – RATIFICATION

2. Ratifying Reference. Nations prepared to ratify the STANAG are requested to include in their reply, a single co-ordinated national ratifying reference number, which will be recorded at NSA and made available on the NSA websites.
3. Date of Implementation. Nations that ratify the STANAG are requested to specify an date of implementation, which may be stated as a number of months following promulgation of the STANAG for the services to which it applies (e.g. DOP or DOP + 3m).
4. Reservations. Nations prepared to ratify the STANAG but with reservations, are requested to state these in detail, so that they can be recorded at NSA and made available on the NSA websites. Nations should describe any portion of the STANAG which cannot be implemented and/or any portion which can only be implemented with limitations. (As this is implicit, Nations need not state, "This STANAG is applicable only to future procurement").
5. Non-Participation. Nations may elect to be registered as 'Not Participating' and may indicate (or revoke) such status at any stage of the validation process. A nation's non-participation will be taken into account by the Tasking Authorities (TA) when setting/reviewing promulgation criteria for the STANAG and 'non-participating' nations will be expected to make a fresh declaration at the issue of each new ratification draft.

NATO Standardization Agency – Agence OTAN de Normalisation
 B-1110 Brussels, Belgium Internet site: <http://nsa.nato.int>
 E-mail: nsa.army@hq.nato.int – Tel 32.2.707.55.39. – Fax 32.2.707.57.18

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6. **Non Ratifying.** Nations not wishing to ratify the STANAG are requested to indicate their intention and if possible give their reasons for not ratifying, or their suggested changes, which would make it acceptable. Non-ratification by a nation is not to be construed as a bar to the promulgation of the STANAG. In such a case a reply is requested.

ACTION BY NATIONAL STAFFS – IMPLEMENTATION

7. After the STANAG has been implemented, nations are to complete Annex N of AAP-3(I) and forward this to the relevant TA. The TA will also monitor the intended dates of implementation provided by nations and may seek confirmation of the date of implementation if responses have not been provided by nations.

ACTION BY THE STRATEGIC COMMANDS (SCs)

8. SCs are requested to review the agreement and forward their comments.

FORWARDING REPLIES

9. National staffs are to complete Annex M of AAP-3(I) for replies and forward it through their (Tasking Authority) national delegation as appropriate. SCs are to forward their replies in accordance with Command Operating instructions.

10. Replies should reach the MC LSB, NSA, by **6 April 2005**.

(Original Signed)
G. MARTINA
Colonel, ITA(A)
Chairman

Enclosure:

STANAG 2233 (Edition 1) (Ratification Draft 1)

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STANAG 2233
(Edition 1)
(Ratification Draft 1)

NAVY/ARMY/AIR

NATO STANDARDIZATION AGREEMENT
(STANAG)

NATO CONSIGNMENT AND ASSET TRACKING BY RADIO-FREQUENCY
IDENTIFICATION

- Annexes: A. RFID System Requirements
 B. Miscellaneous Considerations

Related Documents:

AAP-23	NATO Glossary of Packaging Terms and Definitions
AAP-35	NATO Glossary of Asset Tracking Terms and Definitions
STANAG 2185	NATO Asset Tracking Electronic Data Interchange (EDI)
STANAG 2494	NATO Asset Tracking Shipping Label and Associated Symbolologies
STANAG 2495	Data Formats for Asset Tracking Technology
STANAG 4281	NATO Standard Marking for Shipment and Storage
STANAG 4329	NATO Standard Barcode Symbolology
STANAG 4553	Electronic Commerce
STANAG 2345	Evaluation and Control of Personnel Exposure to Radio Frequency Fields – 3kHz to 300GHz
STANAG 4234	Electromagnetic Radiation (Radio Frequency) – 200kHz to 40 GHz Environment – Affecting the Design of Material for Use by NATO Forces
ISO 9735	Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules
ISO/IEC 15418	Information technology - EAN/UCC Application Identifiers and ANS MH10 Data Identifiers
ISO/IEC 15424	Information technology - Automatic identification and data capture techniques – Data carrier/Symbolology identifiers
ISO/IEC 15434	Information technology - Automatic identification and data capture techniques - Common syntax for high capacity ADC media
ISO/IEC 15961	RFID for Item Management – Data protocol: Application interface
ISO/IEC 15962	RFID for Item Management – Protocol: Data encoding rules and logical memory functions
ISO/IEC 15963	RFID for Item Management – Unique Identification of RF tag
ISO/IEC 19762	Information technology - AIDC techniques - Harmonized vocabulary

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ISO/IEC 18000-3	Information Technology — Radio Frequency Identification (RFID) for Item Management — Part 3: Parameters for air interface communications at 13,56 MHz
ISO/IEC 18000-6B	Information Technology — Radio Frequency Identification (RFID) for Item Management — Part 6: Parameters for Air Interface Communications at 860-930 MHz – Type B – Binary Tree
ISO/IEC 18000-7	Information technology - AIDC techniques - RFID for item management - Air interface, Part 7 – Parameters for an active RFID air interface communications at 433 MHz
ERC Rec. 70-03	Relating to the Use of Short Range Devices (SRD)
ETSI EN 300 330-2 V1.1.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive
ETSI EN 300 220	Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Radio Equipment to be used in the 25MHz to 1000 MHz frequency range with power levels ranging up to 500mW; Part 1: Technical characteristics and test methods
EC 94/9 23 March 1994	Intrinsically Safe - ATEX

AIM

1. The purpose of this agreement is to achieve Radio-Frequency Identification (RFID) interoperability to support consignment and asset tracking within NATO.

SCOPE

2. The scope of this STANAG is limited to the use of RFID capabilities to support consignment and asset tracking and applies to NATO Operations. Nations (including NATO Agencies) are encouraged to utilize the provisions of this STANAG internally. This STANAG excludes radio frequency data communications and the application of RF tracking using satellite tracking capabilities and Real Time Locating Systems (RTLS). This STANAG is in addition to the requirements of STANAGs 2494 and 4281.

AGREEMENT

3. If participating nations implement an RFID consignment and asset tracking system solution they agree to implement as described in this STANAG.

DEFINITIONS

4. Terms and definitions used for the purpose of this agreement are defined in AAP-35, AAP-23 and ISO/IEC 19762, Part 3 for RFID terminology. Asset tracking and bar code terminology can be found in ISO/IEC 19762 Parts 1 and 2 and STANAG 4329 respectively.

NATO/PfP UNCLASSIFIED**GENERAL PRINCIPLES**

5. The principles followed in this STANAG and which will apply to subsequent amendments and supplements are as follows:

- a. Subject to overriding operational considerations, the RFID media should be the same in peacetime as in time of conflict.
- b. The RFID media should comply, insofar as practicable, with commercial requirements when it meets military needs.
- c. This STANAG deals with the unique identification of a consignment or asset using RFID.
- d. Each RFID tag shall have a Unique tag ID. This tag ID shall conform to ISO/IEC 15963. For active RFID Tags it shall be possible to identify the tag ownership from the Unique Tag ID.
- e. Each active high capacity RFID tag shall contain the SSCC of the consignment when available.
- f. Other transmission of data of distinct national interest is permitted insofar as they do not detract from the clarity of this minimum data.
- g. The transmission protocols between the RFID tag and RFID reader shall conform to the appropriate part of ISO/IEC 18000.
- h. Data message protocols for exchange of information between nations shall conform to STANAG 2185.
- i. All data shall be identified and structured in accordance with ISO/IEC 15418 (ANS MH10.8.2 and General EAN.UCC Specifications) and ISO/IEC 15434 (ANS MH10.8.3).
- j. The air interface protocols between the interrogators and tags shall be in accordance with ISO/IEC 18000 series for the specified operating frequency as shown in Table 1.
- k. RF transmission, power levels, duty cycles, and channel width and separation (if applicable) will have to be approved by the host nation in which the equipment is to be used.
- l. In peacetime and whenever practical in times of conflict, users of active RFID devices shall ensure compliance with National and International air safety regulations controlling or limiting radio transmission whenever air carriage is involved.

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DETAILS OF THE AGREEMENT

6. Details of the agreement are described in the Annexes as follows:
 - a. Annex A (RFID REQUIREMENTS) describes the system attributes that NATO requires to satisfy the requirements of this STANAG.
 - b. Annex B (MISCELLANEOUS REQUIREMENTS) describes those requirements and cautions not included in Annex A.

PROTECTION OF PROPRIETARY RIGHTS

7. None. Any intellectual property that is identified as germane to this STANAG shall be made available to other vendors on a fair, reasonable, and non-discriminatory basis.

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ANNEX A TO
STANAG 2233
(Edition 1)

RFID SYSTEM REQUIREMENTS

GENERAL

1. This agreement is designed to be used in conjunction with STANAG 2495 (Data Formats for Asset Tracking Technology).
2. The mandatory qualifier standards and associated formats are as follows:
 - a. ASC MH10 Data Identifiers (DIs) and EAN.UCC Application Identifiers (AIs) in accordance with STANAG 2495 and ISO/IEC 15418 shall be used in conjunction with data formats in the RFID tags. The authoritative reference for Data Identifiers is ANS MH10.8.2. The authoritative reference for Applications Identifiers is the General EAN.UCC Specifications.
 - b. The message syntax in accordance with STANAG 2495 and ISO/IEC 15434 shall be used in conjunction with data formats and syntax in the high capacity (active) RFID tags. Message syntax for passive tags shall be in accordance with ISO/IEC 15962. ISO/IEC 15961 can be used to convert/translate the bit oriented data to and from traditional STANAG 2495 and ISO/IEC 15434 data format structures.
 - c. Air interface standards shall be in accordance with ISO/IEC 18000, Part 3 Mode 1 (Passive), ISO/IEC 18000, Part 6b (Passive) and ISO/IEC 18000, Part 7 (Active). Air interfaces for consignment tracking shall be in accordance with ISO/IEC 18000, Part 6b and/or ISO/IEC 18000, Part 7.
 - d. Frequency and RF power requirements shall be agreed upon between the user and the host nation(s) before installations are initiated. The attributes of those RF requirements are recommended as found in Table 1.
 - e. Electronic Data Interchange (EDI) shall be in accordance with STANAG 2185 and ISO 9735.
 - f. Communications shall be established in accordance with STANAG 4553.
 - g. RFID systems (tags and interrogators) shall conform to all safety and regulatory requirements of the host and operating nations. These include but are not limited to:
 - (1) The limits of human exposure as defined in NATO STANAG 2345.

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- (2) The limits of electromagnetic radiation for fuels and ordnance as defined in NATO STANAG 4234. The level of RF radiation emitted must not reduce the safety of any nearby explosives or fuels. Governing (national, regional or mutually agreed upon) policies and procedures for ensuring this and areas where RFID tags may be installed and used shall be followed. Use in explosive storage/handling/processing areas and on explosive item containers shall be subject to this provision.
- (3) RFID Tags and interrogators shall comply with ERC Rec. 70-03, ETSI EN 300 330-2 V1.1.1, EC 94/9 and ETSI EN 300 220 as appropriate.

3. Those implementing this agreement are encouraged to become familiar with the Asset Tracking Working Group; Technical Report 2233, "Radio Frequency Identification".

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Table 1 — Requirements for Radio Frequency Identification Systems

Properties	Passive Requirement	Passive Requirements	Active Requirements
Subject Band (MHz)	13,56	860 – 960	433.92
Transmission	Passive - Inductive	Passive - Propagative	Active
Authoritative Source for table data	ISO/IEC 18000 -3	ISO/IEC 18000 – 6B	ISO/IEC 18000-7
Minimum Bandwidth	13, 56 MHz \pm 7KHz (for Interrogator to Tag)	200 kHz/Channel minimum 10 channels for a min 2 MHz	500 kHz
Recommended Band	$13,553 \leq f < 13,567$ (IMS)	Close to 900 MHz. This band should be in 860 – 960 MHz as defined in ISO/IEC 18000 Part 6.	433-435 MHz
Minimum Power Level (E.U.)	42 dB μ A/m at 10m ETSI Compliant with ETSI, ARIB STD-T60 and FCC maximum out of Band allowed field strength.	500 mW ERP 10% Duty Cycle (measured over 1 hour) <i>Proposed: (865-868 MHz): 2W ERP 10% - 30% (measured over 1 hour)</i>	10 mW ERP (< 10 % Duty cycle) /1 mW ERP (-13 dBm/10 kHz) (Up to 100% Duty Cycle)
Minimum Power Level (N.A.)	Compliant with ETSI, ARIB STD-T60 and FCC maximum out of Band allowed field strength.	902-928 MHz 4W EIRP 100% Duty Cycle	11 μ V average power @ 3 metres, 5 second on cycle for each transmitter
Recommended Power Level	Compliant with ETSI, ARIB STD-T60 and FCC maximum out of Band allowed field strength.	2W ERP 10% - 30% (measured over 1 hour)	11 μ V average power @ 3 metres, 5 second on cycle for each transmitter
Spectrum Mask	CEPT/ETSI or FCC	CEPT/ETSI or FCC	CEPT/ETSI or FCC
Narrowband or Spread Spectrum	N/A	Spread Spectrum preferred	Narrowband
If Spread Spectrum			
DSSS or FHSS	N/A	FHSS	
Min. # of Channels	N/A	10 (recommend 25 to 50)	
Min. Channel width	N/A	200 kHz	
Min. Channel separation	N/A	200 kHz	
Recommended Modulation	PJM (Mode 2) or AM (Mode 1)	AM	FSK
Recommended Bit Rate	1.65, 26.48 kbps (Mode 1) or 423.75 kbps (Mode 2)	40 kbps	27.7 kbps
Recommended Minimum Duty Cycle	N/A	30% (measurement period of one hour)	50% (0.1 Watt) /100% (0.01 Watt)
Maximum Frequency Deviation	Compliant with ETSI, ARIB STD-T60 and FCC maximum out of Band allowed field strength.		+/-50 KHz
Recommended Operating Frequency Accuracy	\pm 100 ppm Japan: \pm 50 ppm		<50 ppm
Readers	Handheld	Fixed or handheld	Fixed or handheld

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4. It is the intent that RFID should be used in harmony with other Automatic Identification Technology (AIT), specifically linear bar code and 2D symbols.
5. Considering the key NATO Asset Tracking applications, the ISO references are:
 - a. In-transit container tracking – ISO/IEC 18000, Part 7
 - b. Shipping and receiving applications – ISO/IEC 18000, Part 6b for packages and boxes of product; ISO/IEC 18000, Part 7 for freight containers. Either technology is applicable for returnable transport items
 - c. Container park management – ISO/IEC 18000, Part 7
 - d. Individual high value asset tracking – ISO/IEC 18000, Part 6b
 - e. Individual asset tracking – ISO/IEC 18000, Part 3 Mode 1 or ISO/IEC 18000, Part 6b

Uses and applications of RFID technology are listed below:

Table 2
Matching Application Requirements to Technology (Capability)

Application	Parameter	Value	RFID Technology
In-transit container tracking	Distance / Speed	≥ 10 meters / ≤ 20 kph	18000, Part 7
Shipping and receiving (Packages, Parcels)	Distance / Tags in Field of View (FoV)	≤ 5 meters/ 100 tags	18000, Part 6B
Shipping and receiving (Freight containers)	Distance / Tags in FoV	≤ 5 meters/ 100 tags	18000, Part 7
Shipping and receiving (Returnable transport item)	Distance / Tags in FoV	≤ 5 meters/ 100 tags	18000, Part 6B / 18000, Part 7
Container park management	Distance / Tags in FoV	≤ 100 meters / 100 tags	18000, Part 7
Asset Management – product tagging	Distance / Tags in FoV	≤ 0.5 meters / 500 tags	18000, Part 3 Mode 1
		≤ 5 meters / 500 tags	18000, Part 6B

"Requirements for each system may or may not be identical and the values are for guidance only. The distances and number of tags in the field of view may vary by application."

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ANNEX B TO
STANAG 2233
(Edition 1)

MISCELLANEOUS CONSIDERATIONS

1. **RF SITE SURVEYS.** Site surveys for RF coverage by fixed interrogators may be required:

a. When the area to be covered is large

LARGE AREAS. Large areas are those areas that cannot be effectively covered by one omni-directional antenna. Large areas may not be able to be covered by a single interrogator. This may be due to the size or shape of the area. Examples of areas that may cause a problem because of shape would include "L"-shaped areas and long narrow piers.

b. When directional coverage is necessary

DIRECTIONAL COVERAGE. This type of coverage is often desired in a choke point scenario where coverage is desired in only one direction and RF signals might be minimized in directions where containers may be stored or RF interference may occur. In some cases the RF power level of the interrogator is reduced so that only nearby containers will respond. In other cases, devices, such as proximity detectors, may be used to trigger the interrogators, thereby transmitting only when a container is in the field of view.

c. When materiel, terrain, or other obstacles interfere with the RF field

BLOCKED FIELD OF VIEW. A site survey should be accomplished if there is any possibility that buildings, equipment, or containers may affect tag readability in the field of view. It should also be noted that the human body may affect readability if a person is standing in the immediate vicinity of the tag. Another scenario within this category is when tags of interest are inside a totally enclosed metal trailer. In such cases the tags may be unreadable from interrogators located alongside or over the roadway.

d. Where other radio frequency devices may be present

OTHER RADIO FREQUENCY GENERATION DEVICES. Mobile radios, wireless local area networks, alarm systems, radio microphones, wireless audio, amateur broadcasting, radio location devices, sealing machines, and other machinery may emit RF signals that may unintentionally interfere with RFID devices. A site survey will enable potential users to identify the amount, type, and source of potentially interfering emissions.

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- e. Where explosive ordnance and or fuels may be present

EFFECTS OF ELECTROMAGNETIC RADIATION AND INTRINSICALLY SAFE. Installation of RFID equipment where fuel and or ordnance may be present must be subject to a site survey to ensure that all relevant safety regulations are adhered to.

2. **ACTIVE TAG MAINTENANCE AND RETURN POLICY.** The owner of active RFID-tag is responsible for the inventory, maintenance and battery replacement of the tag. Active tags will be returned to the owner of the tags at the owner's expense as soon as possible following the completion of the shipment. To avoid unintended interrogations and extend battery life and the batteries of these tags shall be reversed or disabled in accordance with the manufacturer's instruction. Nations are encouraged to use external labels and or logos to assist in identifying ownership and return of tags.