

# [Data B] Crime/disaster prevention fields and RFID

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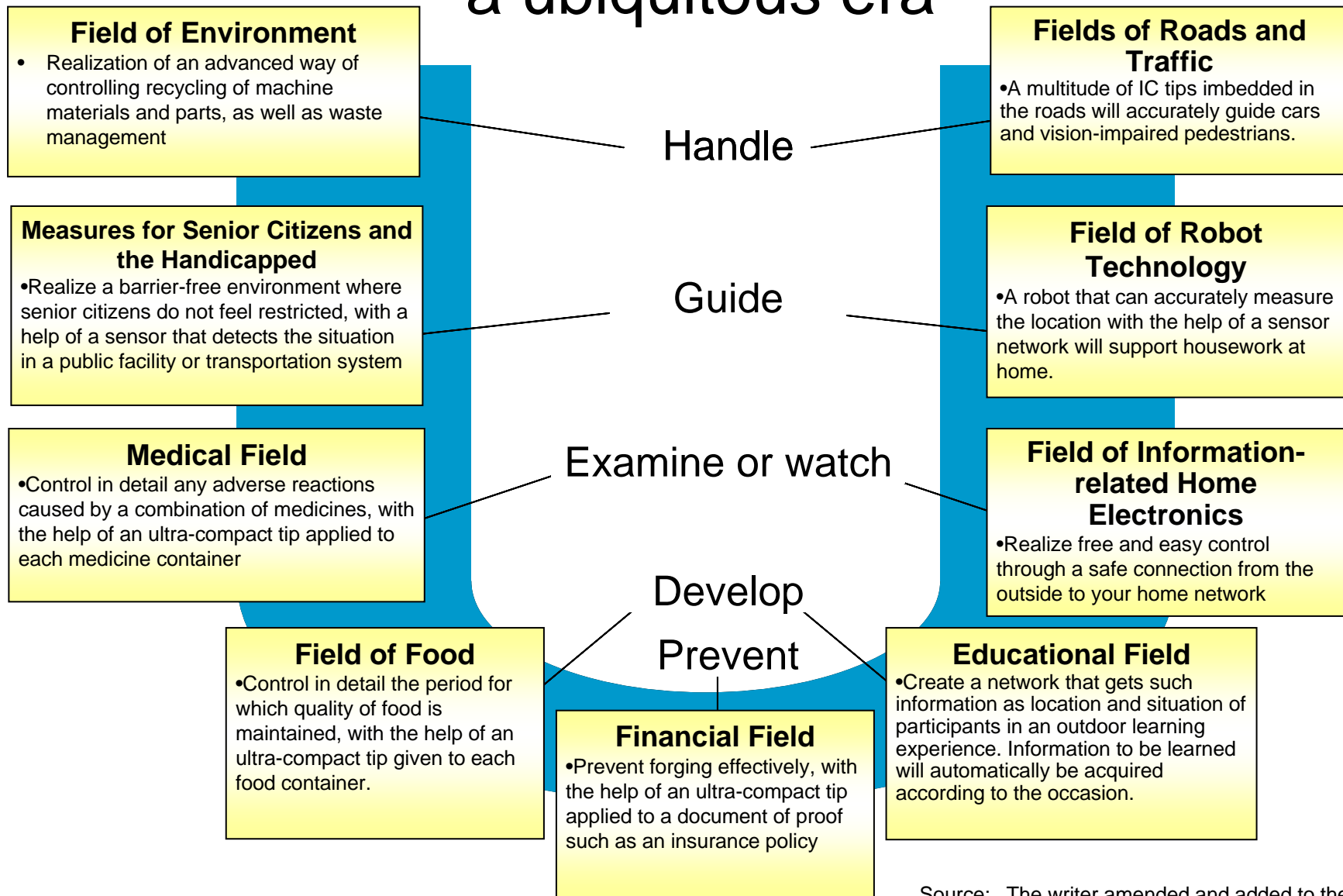
# Example of ICT\* utilization on safety and peace of mind security fields

- Countermeasures against car robbery = Container X-ray scanner
    - The Ministry of Finance Japan and National Customs Agency (U.S.A.) agreed to implement each other the prior export inspection of containers as a measure for counter terrorism.
    - By defining communication protocols for e-seals for marine containers, contents of cargoes are checked exactly in 2 seconds for presence of arms or parts, which could be used for terrorist attacks.
    - Applicable frequency bands, etc. are as follows: 4 types of 862M-928 MHz of frequency hopping method, 915 MHz of battery-less/narrow-wave band method, etc.
  - Short-distance high-resolution radar capable of scanning through external wall of container
    - Adaptation to customs clearance work for import/export = Search of objects placed in a building or buried underground
    - Device to scan the position of person who dropped in water
    - Obstruct penetrating radar in emergency: Monitoring of inside of building before assault by rescue team
    - Other fields of application
      - Constant monitoring/emergency reporting system at public area
      - Integrated as a part of local safety network such as information collection/transmission/direction system at big scale disaster, etc.
- \*: ICT = (Information Communication Technology)

# RFID application field and safety and peace of mind security field

- Auto ID project by Auto ID Center (Headquartered at MIT, U.S.A.)
  - Examples of RFID application indicated by Auto ID project
    - (1) Contents check/detail description interfaced with Internet
    - (2) Merchandise tracking with a combination of GPS and IC chip data
    - (3) History management for part replacement on a product assembled with many parts
    - (4) e-ticketing system
    - (5) Authenticity of securities, checks, etc.
- Auto ID Center (continued)
  - Examples of RFID application (continued)
    - (6) Location detection service for the aged
    - (7) Automatic information collection system for vending machines
    - (8) Maintenance management system for all kinds of weapon marked with e-tags

# Fields to which RFID (IC tags) are applied in a ubiquitous era



Source: The writer amended and added to the materials of Ministry of Internal Affairs and Communications.

# Features of Frequency Band

|                                    |                                  |                               |   |   |
|------------------------------------|----------------------------------|-------------------------------|---|---|
| <b>Frequency band</b>              | <b>Macrowave band (2.45 GHz)</b> | <b>UHF band (952-954 MHz)</b> | <b>Short wave band (13.56 MHz)</b>          | <b>Long wave band (135 KHz and shorter)</b> |
| <b>Transmission method</b>         | <b>Electronic wave method</b>    |                               | <b>Electro magnetic wave guiding method</b> |   |
| <b>Communication distance</b>      | <b>- 2.0m</b>                    | <b>- several meters</b>       | <b>- 1m</b>                                 | <b>- 0.3m</b>                               |
| <b>Tag size</b>                    |                                  |                               |   | <b>Large</b>                                |
| <b>Resistance to water or dust</b> |                                  |                               |   | <b>Strong</b>                               |
| <b>Cost</b>                        |                                  |                               |   | <b>High</b>                                 |

# Object location search other than air baggage and related matters [I]

- Use of ICT other than RFID
  - Locations of personnel or vehicles can be detected to some extent by means of satellite photographs or air photography, surveillance from aircraft, etc. (Own or enemy camp)
  - Monitoring with GPS terminal of locations of the personnel, vehicles, arms, other materials that constitute the army of own country or camp, police, etc. (Own camp)
  - Demerits of GPS
    - Accuracy deteriorates where 3 or more satellites cannot be scanned simultaneously,
    - It cannot measure any object placed in a vehicle, etc.
- Use of ICT other than RFID (continued)
  - Demerits of GPS (continued)
    - It is impracticable to install GPS terminals on many small arms or materials in terms of cost.

# Object location search other than air baggage and related matters [II]

- Use of RFID
  - Communication distance is several meters to 10 plus several meters.
  - Specifications vary depending on types.
    - Electric wave band
    - Active (Power supply is provided on the device) or passive (Without its own power supply, it generates power when electric waves are received and produces and transmits signals using the power)
  - Communication distance
    - It varies depending on active or passive.
    - Maximum - Several meters to several scores of meter
- Use of RDID (continued)
  - It is possible with RFID to identify locations, etc. of personnel, vehicles or arms within own camp.
    - It is highly possible to check the outflow of resources from own camp.
    - It is possible theoretically to discover any object came from suspicious sources if results of detection of objects by a short-distance high-resolution radar can be collated exactly with those obtained by RFID.

# Object location search of air baggage and related matters [I]

- Present condition and prospect in future
  - Verification experiment with air baggage marked with RFID: In progress
  - Air baggage could be integrated in future in a part of intensive inspection, which could be developed as a security management linked with the passport management data.
- Background
  - Earlier than 1990s: Information of baggage was recorded manually on a tag, which is classified by colors depending on the destinations. Air baggage is identified and controlled with the tag.
  - After 1990s: Auto sorting started using tags on which the baggage No. was indicated with the bar code. The tag tells the name of airline, flight No., port(s) of call and destination.
- Background (continued)
  - After 1990s (continued):  
Recognition ratio = About 70% on the world average.  
Optical scanning from a distance of about 1 m with a bar code reader mounted on a conveyor line.
    - It is not uniform the conditions how the tag is attached and where it is located.
    - It is remote from the bar code reader.
    - Level of printing technology varies country by country.
  - Of more than 1 billion pieces of baggage being handled every year, one out of 200 pieces of baggage is lost temporarily. It is hoped much from RFID.



# Object location search of air baggage and related matters [II]

- Trial at overseas
  - 1995. Lufthansa Airline employed “Member tag” based on a long wave band (125 kHz). It was discovered later, however, that the long wave bands are not practicable because of noises and durability of antenna.
  - From end of 1998. British Airline experimented at London Heathrow using 125 kHz band, 13.56 MHz (short wave) band, 868 MHz (UHF) band and 2.45 GHz band. It turned out that 13.56 MHz fits best. Recognition ratio was 98% with experiments using 75,000 tags.
  - From around 1998 in U.S.A.: Pieces of baggage of specific persons were checked in detail using 2.45 GHz wave band. Tag was rectangular and recyclable.
- Trials at overseas (continued)
  - U.S.A. (continued): Other than the above, the National Bureau of Aviation experimented using tags in the same shape as the bar code tag at Singapore Airport.
- Trial in Japan
  - Autumn of 2001. Experimented with 13.56 MHz and 1,500 samples. With this as a cue, the Radio Law was amended and the output restriction of antenna was made loose significantly.
  - Empty-hand travel service was tested from March 2004 through the end of March 2005. Baggage was collected at one’s own home by a home delivery service vendor and returned at the airport. Sample size: About 10,000 cases in total.

# Object location search of air baggage and related matters [III]

- Trials in Japan
  - Autumn of 2001. Experimented with 13.56 MHz and 1,500 samples. With this as a cue, the Radio Law was amended and the output restriction of antenna was made loose significantly.
  - Empty-hand travel service was tested from March 2004 through the end of March 2005. Baggage was collected at one's own home by a home delivery service vendor and returned at the airport. Sample size: About 10,000 cases in total.
- Trials in Japan (continued)
  - e-tag. Feasibility of auto-sorting was tested using the transfer lines at an airport. Period was from the end of April through December 10, 2004. Wave band was 13.56 MHz. About 200,000 tags were printed. Recognition ratio was about 98.8%.
  - Experiment with UHF band jointly with the National Inland Transportation Safety Agency.
  - Experiments at a plant of maker: From February 19 through the end of March 2004. No error was recorded during scanning of 300,000 cases (Read-only tags were used).
  - Experiments at an airport: Arrival line from Honolulu at Narita Airport. Recognition ratio was 98%.

# Object location search of air baggage and related matters [IV]

- From viewpoint of counter terrorism
  - After the terrorist attacks of 9.11 in U.S.A., the weight of viewpoint on the passenger security increased, in addition to quality improvement and energy conservation, in the operation, in the field related to air baggage.
  - Along with the increased weight in the viewpoint of counter terrorism, the recording function of RFID has been reevaluated.
- From viewpoint of counter terrorism (continued)
  - Even if the result of security check by EDS (Explosive Trace Detection System) or X-ray inspection device is saved in the data base together with the baggage No. written in the bar code, it does not necessary mean that the data base is accessible with a reasonable speed from any airports around the world.
  - Once the inspection is written in an RFID tag, it can be read at any place where provided with a reading device.

# Safety security for children and RFID in Japan [I]

- Project of NAJ
  - NAJ (Osaka) is a system integrator in a broad sense, which implements various projects related to information and communications.
  - Upon approval of Tezukayama Gakuin Primary School, Sumiyoshi-ku, Osaka, PTA, local self-governing meetings, etc., NAJ started an experiment in June 2005 to check children's attendance at and return from the school, among others, with RFID tags carried by the pupils and to watch their passage with crime prevention cameras installed on some automatic coin machines placed along the roads to school.
  - A pair of crime prevention cameras was installed outside the school in mid-June 2005.
  - Pupils put their RFID tag card over the reader placed at the entrance when they enter and leave school. E-mails are sent to guardian's mail addresses (a maximum of three addresses).
- NC Project
  - Proposing a way to describe location with coordinate codes with which latitudes and longitudes converted by a specific method of calculation will help specify a 5 square meter block in a daily living zone with eight-digit decimals
  - The zone from the southern limit of the Arctic Circle and the northern limit of the Antarctic Zone is divided into eighteen 5,000 square meter areas. → Specify a 50 square kilometer block in one of the areas with four-digit decimals. → Designate a point with six or eight digits.
  - A substantive experiment has been completed by Sakai City, Osaka Pref. using mobile phones with GPS.
  - They are now used by private elementary schools of the city.

# Safety security for children and RFID in Japan [II]

- Project by Takachiho Koheki, etc.
  - Takachiho Koheki, NTT Communications, etc.: Distribute Active's RFID tags to secondary schools and send e-mails to guardians once data are detected when students travel to and from schools. An antenna will also detect if there is any student in a school premise. An alarm will be sent to teachers and staff if there is not any. A substantiative experiment has been carried out at Furuedai Secondary School, Suita City from February 2006, and the secondary experiment is now underway.
  - Create a system with which the school, PTA, local community, police, etc. can act jointly at any time regardless of whether at an ordinary time or in an emergency.
- Projects by Fuji Electric Systems and others
  - Substantiative experiment by Fuji Electric Systems, Ritsumeikan University, etc. at Chuo Primary School, Chuo-ku, Osaka City. Distribute Active's RFID tags to pupils and place alarm detection devices and wireless LAN devices on vending machines along the streets on their way to and from school and at private homes.
  - If a pupil presses the emergency alarm button on a RFID tag, the device that detected it will send a request mail to a nearby registered volunteer's home for refuge. The detecting device will also turn on sirens and emergency lights.
  - Among the devices placed on an automatic coin machine, those with a camera will shoot the image of children about two seconds before and after they pass in front.

# RFID system and standardizing for solving problems of counter terrorism and safety security

- In RFID systems for counter terrorism or safety security, it is meaningful, needless to say, to some extent to consolidate standards in order to reduce cost or improve functions of various related devices or software.
- In case of the air travel industry, take for example, it will be difficult to enhance functions as the whole industry if specifications vary widely country by country or at respective airlines.
- On the other hand, if any unified specification products assembled with general purpose items are used over the world, it will raise a concern of risk in terms of counter terrorism or security of safety. If any method to outwit existing systems is devised based on any information available to the public or information obtained by analyzing devices, it could circulate over the world.

# RFID systems for solving problems of counter terrorism and safety security, and profit of enterprises after introduction

- It is difficult to provide powerful incentives when persuading to introduce any RFID system for counter terrorism or security of safety. However, once any terrorist attack or disaster should occur, nobody can predict how severe the aftermath could be.
- As it is learned from the disputes concerning the development of ATS after the accident at JR Takarazuka line in the end of April 2005, it is very difficult to assess how much will be appropriate the investment for countermeasures.
- It is everyone's guess that the managements are hard hit at airline companies, railways, bus companies, etc. as a result of privatization, deregulation, etc. In such circumstances, it is very likely that investments to introduce systems for counter terrorism or security of safety are put aside.
- However, the accident at JR Takarazuka line teaches us a delayed introduction of safety system could result in unimaginable calamity.

# RFID systems for solving problems of counter terrorism and safety security, and alleviation of concerns by providing necessary laws [I]

- We consider what is necessary here is to review and amend related laws in order to promote the introduction of RFID systems for counter terrorism and security of safety at the level of country.
- It could be able to say that a society where citizens can live safely and perform corporate activities safely is more competitive than other societies being left at lower levels of security.
- If it is possible to execute operations such as production, distribution, or others at lower costs, the products or services produced there will become more competitive in terms of price.
- The Government or local governments should not in any event to jeopardize introductions of information communication systems for counter terrorism and security of safety and should hurry to establish laws or ordinances to make compulsory the introduction in future.



# RFID systems for solving problems of counter terrorism and safety security, and alleviation of concerns by providing necessary laws [II]

- One of essentials is the standards for installation of crime prevention camera and RFID reader/writer, especially those for the installation of crime prevention camera.
- It is judged that there is no problem legally to take photographs with crime prevention cameras within premises of one's own company so far as the cameras are used without contradicting practices admitted by common sense.
- If any crime or the like occurs there, however, when premises of company or private school are opened to the public, the company or school could be accused for the breach of obligation of management. On the other hand, other problems could also arise because the premises could be judged equivalent to a public road or park in the circumstance.

# RFID systems for solving problems of counter terrorism and safety security, and alleviation of concerns by providing necessary laws [III]

- More particularly, someone may oppose to the installation of crime prevention cameras.
- If they are deemed to have a characteristic equivalent to a public road, if you say to someone “You should not step into a place where you could be taken your photograph if you don’t like it”, you could be accused in a charge of violating people’s right moving around freely.
- If it is a public road perfectly, the possibility becomes more higher to be accused of a violation of privacy or right to move around freely by the residents concerning the installation of crime prevention cameras. On the other hand, once any crime should occur, residents will demand strongly a local government, etc. to be more diligent to reduce crimes.
- If there are some guidelines concerning the installation of crime prevention camera, chances will become higher that the installer is not accused of unlawful infringement though it still remains a possibility to be accused in charge of violation of privacy.

# RFID systems for solving problems of counter terrorism and safety security, and alleviation of concerns by providing necessary laws [IV]

- Although there are not so many at least at present who own RFID tags or cards, the same problem as the crime prevention camera could arise related to the RFID readers/writers when the number of people who have the tags or cards increases.
- It is supposed that possibilities will increase the RFID reader/writer could scan also the RFIDs owned by persons who are not subject to the installation as the number of RFID readers/writers increases.
- It could constitute a violation of privacy.
- It will become an effective measure to same kind of problem if some standards are provided concerning the installation of RFID readers/writers.

# Individual authentication method

| Key Word          | Explanation                       | Example   | Advantage  | Disadvantage (Risk)  |
|-------------------|-----------------------------------|---|--|--|
| <b>KNOW</b>       | What they know                    | PIN No., password, countersign, and question                                  | No clue if made well. Easy to change. No special hardware required   | Forget what it was, loss of memo, furtive glance, leak by fishing and not recognizing a furtive glance   |
| <b>HAVE</b>       | What they have                    | Document of proof, ID card, RFID, passport and seal                           | Being able to discover loss. Invalidate the lost card and make another   | Possibility of loss and forging, leak by skimming and disguise   |
| <b>BE (BE-DO)</b> | Features of action                | Handwriting, vocal codes and characteristics of the way of walking            | Many have long history. Unable to easily copy  | Being able to break the through system, if defenseless, with duplicates. Unable to change even though forged.  |
| <b>BE (BE)</b>    | Features of condition. Biometrics | Fingerprints, palm prints, venous pattern, iris, retina pattern and body odor | Never being lost. Difficult to glance furtively except fingerprints and palm prints. Being able to easily combine various ways, making it powerful | May be slightly changed by physical conditions. Unable to change even though forged. Usually expensive devices required. Tell health records. Many have long history. Unable to easily copy. |

# Security of safety and 4 quadrants [I]

- Relationship between security of safety and RFID = 4 quadrants
  - Dividing further artificial matter/human being
  - Dividing further environment/organisms
  - Dividing further situation/information
  - The further dividing produces a total 12 categories but they contain some very practically unthinkable cases like II-B, etc.
- Position, situation/information, etc.
  - Location = Location detection of matters marked with RFID
  - Situation/information
    - Situation = Measurement of environment where matters marked with RFID are present
    - Information = Recording on RFID attached to matters of information on them

|                         |             | Environment / Organisms |           | Artificial matter / Human being |             |
|-------------------------|-------------|-------------------------|-----------|---------------------------------|-------------|
|                         |             | Environment             | Organisms | Artificial matter               | Human being |
| Position                |             | [II-B]                  | [II-A]    | [I-B]                           | [I-A]       |
| Situation / Information | Situation   | [III-B-a]               | [III-A-a] | [IV-B-a]                        | [IV-A-a]    |
|                         | Information | [III-B-b]               | [III-A-b] | [IV-B-b]                        | [IV-A-b]    |

# Security of safety and 4 quadrants [II]

- Typical examples of them
- Quadrant I:
  - Restriction of admittance to specific areas to only those who carry non-contact IC cards which are authenticated and approved ([I-A])
  - Location tracking of air baggage, etc. marked with RFID tag with which any unidentified baggage is checked as suspicious object ([I-B])
- Typical example of Quadrant II:
  - Location tracking of wild beast, etc. marked with RFID ([II-A])
- Typical example of Quadrant III:
  - Detection of gas, etc. with environmental sensor installed on wall, air-conditioning device, etc. and marked with RFID ([III-B-a])
  - Information that it is a sunken ground where there is risk of accumulated sulfide gas is recorded on RFID attached to cornerstone. ([III-B-b])
- Typical example of Quadrant IV:
  - RFID is used to report extent of wear on a part attached with a sensor, for example. ([IV-B-a])
  - Attachment of RFID, which records various kind of information concerning risk, etc. inherent to machines or parts. ([IV-B-b])

|                         |             | Environment / Organisms |           | Artificial matter / Human being |             |
|-------------------------|-------------|-------------------------|-----------|---------------------------------|-------------|
|                         |             | Environment             | Organisms | Artificial matter               | Human being |
| Position                |             | [II-B]                  | [II-A]    | [I-B]                           | [I-A]       |
| Situation / Information | Situation   | [III-B-a]               | [III-A-a] | [IV-B-a]                        | [IV-A-a]    |
|                         | Information | [III-B-b]               | [III-A-b] | [IV-B-b]                        | [IV-A-b]    |

# Summary

- X-ray scanner, short-distance high-resolution radar, GPS-related systems, etc. may be used to check the location or situation of object in order to secure safety.
- Use of such ICT (Information Communication Technology) tools is effective to some extent. However, RFID tag is also sufficiently effective in terms of low cost, etc.
- Regarding the destination control of air baggage, it has evolved from hand-written tag to bar-code printed tag. RFID is now being watched with keen interest for its adaptability to auto-sorting and recording of inspection or traveling history.
- Long wave bands do not fit to this kind of applications. Short wave band of 13.56 MHz, UHF bands, etc. are considered to be preferable. These bands could achieve a recognition ratio of 98% or higher.
- An idea to track movements of children has emerged.
- In these fields, if installation standards or the likes for crime prevention cameras or RFID reader/writers are officially established to control practices or behaviors of installing vendors, it could help solve problems such as the infringement of privacy or others.