• Focus has been on Safety
• The rising threat of terrorism and sabotage is now recognized and transport has been recognized as a vulnerable part of the nuclear and radioactive material supply chain.
• Transport is potentially the most vulnerable function in the handling of radioactive material
  • Radioactive material is removed from a protected facility and taken through public areas
  • Conveyances may be overpowered by adversaries
  • Sabotage and stand-off attacks can result in immediate releases (also in high populated areas)
Transport security is one of the most complex aspects of radioactive material control, involving many national authorities:

- Customs, modal safety and security, transport safety and security, licensing/authorization

Transport security may involve multiple operators:

- Shipping facility (consignor)

- One or more carriers, modes of transport, and in-transit storage facilities

- Receiving facility (consignee)

Security interfaces must perform seamlessly if security is to be continuous during a shipment.

This presents a challenging situation.
Dangerous Goods Transport Security

- Radioactive material is one of nine classes of dangerous goods regulated in transport (both safety and security)
- Radioactive material security must be compatible with the security approaches of the consignor, carrier, port authority, consignee, etc.
- Many other dangerous goods pose equally serious potential consequences
  - Toxic and Infectious substances
  - Bulk quantities of poisonous materials
  - Explosives
- Dangerous goods transport security is now being implemented worldwide
All Nine Classes of Dangerous Goods Require Appropriate Security During Transport

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>Explosives</td>
</tr>
<tr>
<td>Class 2</td>
<td>Gases</td>
</tr>
<tr>
<td>Class 3</td>
<td>Flammable liquids</td>
</tr>
<tr>
<td>Class 4</td>
<td>Flammable solids</td>
</tr>
<tr>
<td>Class 5</td>
<td>Oxidizing substances and organic peroxides</td>
</tr>
<tr>
<td>Class 6</td>
<td>Toxic and infectious substances</td>
</tr>
<tr>
<td>Class 7</td>
<td>Radioactive material</td>
</tr>
<tr>
<td>Class 8</td>
<td>Corrosives</td>
</tr>
<tr>
<td>Class 9</td>
<td>Miscellaneous dangerous goods</td>
</tr>
</tbody>
</table>
Dangerous Goods Transport Security
International Roles and Responsibilities

• International Atomic Energy Agency – radioactive material guidance

• UN Committee of Experts on the Transport of Dangerous Goods – recommendations for all classes (relies on the IAEA for class 7 recommendations)

• Modal organizations regulations
  – International Civil Aviation Organization
  – International Maritime Organization

• Universal Postal Union regulations

• Regional organizations – model regulations
The International Regulation of the Transport of all Dangerous Goods

UN Economic and Social Council

IAEA (Vienna)
ICAO
IMO
UN Committee of Experts (Geneva)
UPU
ECE

Regulations for the Safe Transport of Radioactive Material (Class 7)

Recommendations for the Transport of Dangerous Goods (All classes)

Regional/European Road, Rail and Inland Waterway Transport Agreements

South American MERCOSUR/MERCOSUL

National Regulations
Current Status of Transport Security

- UN Recommendations on the Transport of Dangerous Goods – Model Regulations
  - 13th Revised Edition includes security
- Two security levels
  - Basic (for most shipments)
  - Enhanced (for high consequence goods)
High Consequence Dangerous Goods as Defined by the UN Model Regulations

Class 1, explosives (certain divisions, in any quantity)
Class 2, gases, flammable gases in bulk and toxic gases (excluding aerosols)
Class 3, flammable liquids in bulk (certain packing groups)
Class 4, flammable solids and reactive substances (certain divisions and packing groups in bulk)
Class 5, oxidizing substances and organic peroxides (certain bulk materials)
Class 6, toxic and infectious substances (certain packing groups and substances, in any quantity)

Class 7, radioactive material in quantities greater than \(3000 \text{ A}_1\) (special form) or \(3000 \text{ A}_2\) (non-special form), as applicable, in Type B or Type C packages

Class 8, corrosive substances (packing group I in bulk)

Note 1: “bulk” means transported in quantities greater than 3000 kg or 3000 l

Note 2: For purposes of non-proliferation of nuclear material, the Convention on Physical Protection of Nuclear Material applies to international transport supported by IAEA INFCIRC/225(Rev.4).
Safety and Security of Radioactive Material
In Use, Storage & Transport

Radioactive Material

NUCLEAR MATERIAL

OTHER RADIOACTIVE MATERIALS

(Sabotage)

Unauthorized Removal

Unauthorized Removal Categories I,II,III CPPNM

Sub national Proliferation

Radiological Hazard

NSS No 9 “Security in the transport of radioactive material”
Transport Security Requirements for Radioactive Material

• **International basis**
  - No convention like nuclear material
    • While security is traditionally a State responsibility there is an aversion to additional obligations
  - Code of Conduct on the Safety and Security of Radioactive Sources is voluntary
  - **#9: Security in the Transport of Radioactive Material** provides detailed guidance
Provides States with guidance in implementing, maintaining or enhancing a nuclear security regime to protect radioactive material (including nuclear material) while in transport against theft, sabotage or other malicious acts that could, if successful, have unacceptable radiological consequences.
Purpose and Scope

• A uniform and consistent approach
• Guidelines apply to all radioactive material
• Should provide States with guidance in implementing or enhancing a state security system to protect radioactive material
The Transport Security Guide Considers

• Reference doses and other parameters
• Potential Radiological consequences to determine thresholds
• Categorization methodology
• Identification of security groups
Security Levels

- Some materials only need Prudent Management Practices
- The threshold can be used to define materials requiring “basic” and “enhanced” security measures

* Unless activity content is above the limit for non-special form
Security levels

- **Prudent management practices**
  - For small quantities of radioactive material transported as excepted packages with content not above the limit for non-special form, LSA-1 material or SCO-1
  - No specific security measures are proposed beyond the safety regulations which are already implemented by consignors and carriers

- **Basic security level**
  - For any package with contents exceeding the excepted package quantity and material other than LSA-1 and SCO-1, (but with quantities lower than 10D or 3000 A₂)

- **Enhanced Security Level**
  - For radioactive material packaged in significant quantities, such that it is deemed to be ‘high consequence’ dangerous goods (above 10D or 3000A₂)

- **Additional Security Measures**
  - Based on circumstances in view of the threat environment and nature of the material
### Enhanced Security Thresholds

3,000 A$_2$ in a single package except for the radionuclides in the following table:

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Transport Security Threshold (TBq)</th>
<th>Radionuclide</th>
<th>Transport Security Threshold (TBq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Am-241</td>
<td>0.6</td>
<td>Pd-103</td>
<td>900</td>
</tr>
<tr>
<td>Au-198</td>
<td>2</td>
<td>Pm-147</td>
<td>400</td>
</tr>
<tr>
<td>Cd-109</td>
<td>200</td>
<td>Po-210</td>
<td>0.6</td>
</tr>
<tr>
<td>Cf-252</td>
<td>0.2</td>
<td>Pu-238</td>
<td>0.6</td>
</tr>
<tr>
<td>Cm-244</td>
<td>0.5</td>
<td>Pu-239</td>
<td>0.6</td>
</tr>
<tr>
<td>Co-57</td>
<td>7</td>
<td>Ra-226</td>
<td>0.4</td>
</tr>
<tr>
<td>Co-60</td>
<td>0.3</td>
<td>Ru-106</td>
<td>3</td>
</tr>
<tr>
<td>Cs-137</td>
<td>1</td>
<td>Se-75</td>
<td>2</td>
</tr>
<tr>
<td>Fe-55</td>
<td>8000</td>
<td>Sr-90</td>
<td>10</td>
</tr>
<tr>
<td>Ge-68</td>
<td>7</td>
<td>TI-204</td>
<td>200</td>
</tr>
<tr>
<td>Gd-153</td>
<td>10</td>
<td>Tm-170</td>
<td>200</td>
</tr>
<tr>
<td>Ir-192</td>
<td>0.8</td>
<td>Yb-169</td>
<td>3</td>
</tr>
<tr>
<td>Ni-63</td>
<td>600</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Basic Security Measures (Below Enhanced Security Threshold)

- General security provisions
  - Competent Authority, at its discretion, should provide Threat information to operators
  - Operators should consider Security Requirements commensurate with their responsibilities
  - Transfers limited to appropriately identified carriers/consignees
  - Use of appropriate security measures at in-transit storage sites
  - Procedures to initiate inquiry for overdue shipments and, if lost or stolen, to initiate efforts to locate and recover
Basic Security Measures (continued)

- **Security locks**
  - Secure and closed conveyances or sealed packages >500 kg secured to the vehicle
  - State should consider need for additional measures for open vehicles

- **Security awareness**

- **Security awareness training of personnel**
  - Content of security awareness training
  - Verification of training
  - Record retention

- **Personnel identity verification**
  - Carrier personnel should carry positive identification

- **Security verification of conveyances**

- **Security inspections of conveyances**
Basic Security Measures (continued)

- Written instructions with required security measures
- Security related information exchange by operators
- Trustworthiness verification (“...may be subject to...commensurate with their responsibilities”)
Enhanced Security Measures

(Above Enhanced Security Threshold)

- Competent Authority should identify carriers and consignors
- All operators should develop, implement and periodically review a security plan
  - Allocation of responsibilities
  - Records of packages/materials transported
  - Review of operations and assessment of vulnerability
  - Identification of measures used to reduce security risks
  - Procedures for reporting and dealing with threats, breaches, and incidents
  - Evaluating, testing and review/update of security plan
  - Measures to ensure information security
  - Measures to limit distribution of sensitive information
  - Measures to monitor the shipment
Enhanced Security Measures (continued)

- State should assign responsibility for security plans
- Security plan may be incorporated into other plans
- Operators should ensure appropriate response plans
- Advance notification
  - Consignor should notify consignee of planned shipment, mode, and expected delivery time
  - Consignee should confirm receipt/non-receipt
  - Consignor should notify receiving/transit States (if required)
Enhanced Security Measures (continued)

- **Tracking devises**
  - When appropriate, transport telemetry or other tracking methods or devices should be used
    - Ranging from bar code to more sophisticated near real-time tracking systems

- **Carrier should provide ability to communicate from conveyance**

- **Additional provisions for road, rail, and inland waterway**
  - Carriers should ensure operational readiness of devices, equipment, etc.
  - Continuous attendance or secure parking of road conveyance
Additional Security Measures

States should consider enhancing measures based on prevailing threat or nature of the material, inter alia:

- Additional training
- Carrier licensing, approval of their security plans, and auditing
- Use of automated real-time tracking
- Use of guards
- Evaluation of potential for sabotage
- Transfer of security responsibilities during shipment
- Review of security plans, holding exercises, etc
Minimizing the Impact of Radioactive Transport Security Compliance

- **Consistency with other dangerous goods security requirements**

- **Consistent application**
  - National regulations and interpretations that set up unique requirements have caused some carriers to opt out of carrying radioactive material
  - “Context sensitive” (i.e., flexible) application of requirements, for example to air transport

- **As requirements are put into place, Competent Authorities and carriers should share experience**
  - Consistent interpretation of requirements
  - Application experience and ideas for improvement
Transport Security Summary

- Identify and coordinate with all interfacing agencies (regulatory, response, etc.)

- Ensure transport security arrangements for every shipment, particularly high consequence materials
  - Ensure adequacy of security plans
  - Ensure testing and implementation of the security plans
Thank you!

Questions?