

**While SSR-6 covers what must be done to ensure the safety of nuclear material during transport, it does not explain how compliance can be demonstrated.**

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## **Abstract**

INS belief that there is value to be gained in the sharing of experience and lessons learned in the demonstration of compliance of SSR-6, and the management of challenges relating to transportation within countries and across country borders.

It will highlight all the Stakeholders, both national and international, that need to be considered when planning a shipment.

It will clearly define the Transport of Nuclear Cargoes process that INS follows, highlighting the key aspects including:

- Transport Request Form
- Transport Document File
- Carrier Obligations

The paper describe the INS Nuclear Transport Safety Committee (NTSC) and its primary function to consider transport related 'Nuclear and Radiological Safety' aspects to support the needs of the INS business.

This includes the pre-shipment peer review, and its role in identifying any concerns of nuclear and radiological safety within the transport process.

The INS Learning from Experience (LFE) process will be discussed and any relevant experience gained from actual shipments.

The importance of the 'Rules of the Game' will present the requirement for Communications Agreements that need to be in place, as all transports of nuclear materials take place in the public domain and require the Stakeholder engagement and acceptance.

## **Introduction**

The IAEA Specific Safety Requirement No. SSR-6 [1] – "Regulations for the Safe Transport of Radioactive Material" details the safety aspects of radioactive material transportation. These Regulations establish standards of safety which provide an acceptable level of control of the radiation, criticality and thermal hazards to persons, property and the environment that are associated with the transport of radioactive material.

Whilst SSR-6 covers what must be done to ensure the safety of radioactive material during transport, it does not explain how compliance can be achieved. As experience of radioactive material transport may be varied across Member States, there is value to be gained in the sharing of experience and

lessons learned in the demonstration of compliance of SSR-6, and the management of challenges relating to transportation within countries and across country borders.

The purpose of this paper is to share information pertaining to the transport of radioactive material between both experienced nuclear material transporters and potentially to those who will be preparing to transport nuclear material for the first time.

## INS – who are we?

International Nuclear Services Limited (INS) is a wholly-owned subsidiary of the Nuclear Decommissioning Authority (NDA) in the United Kingdom. We have extensive and proven expertise in irradiated fuel management and transporting nuclear materials.

International Nuclear Services is based in the UK and has offices and facilities in France and Japan. INS' head office is based in Warrington, Cheshire, where the majority of our staff are based. Our office in Cumbria is located in the Nuclear Decommissioning Authority's headquarters, close to the Sellafield Site.

International Nuclear Services also operates a dedicated marine terminal at Ramsden Dock, Barrow in Furness, Cumbria with direct rail links to the Sellafield site.

## Key Stakeholders

To plan and execute international transports of nuclear materials, INS rely on the support of a number of key organisations. This section serves to provide additional information of those organisations who are involved in the transport of nuclear materials.

The ONR are the UK's Competent Authority and independently regulates nuclear safety and security at 36 nuclear licensed sites in the UK. They also regulate transport and ensure safeguards obligations for the UK are met. Their mission is 'To provide efficient and effecting regulation to the nuclear industry, holding it to account on behalf of the public'.

INS is the world's leading transporter of specialist nuclear materials. Together with the wider NDA group, including Sellafield Ltd (Road) and Direct Rail Services (Rail), it offers a true multi-modal nuclear transport and logistics capability with over 40 years of experience and expertise.

Other key stakeholders both within the UK and overseas, include Department for Business, Energy & Industrial Strategy (BEIS), Ministry of Defence (MoD), the Maritime & Coastguard Agency (MCA), the Foreign & Commonwealth Office (FCO), the Civil Nuclear Constabulary (CNC), International Maritime Organisation (IMO), Coastal & Shipping States and the Competent Authorities and Customs of the relevant countries.

## Transport of Nuclear Cargo

Within the INS Management System [2], the process for Transport of Nuclear Cargo is split into 3 main phases; Plan, Prepare and Deliver, as highlighted in the Fig.1 below.

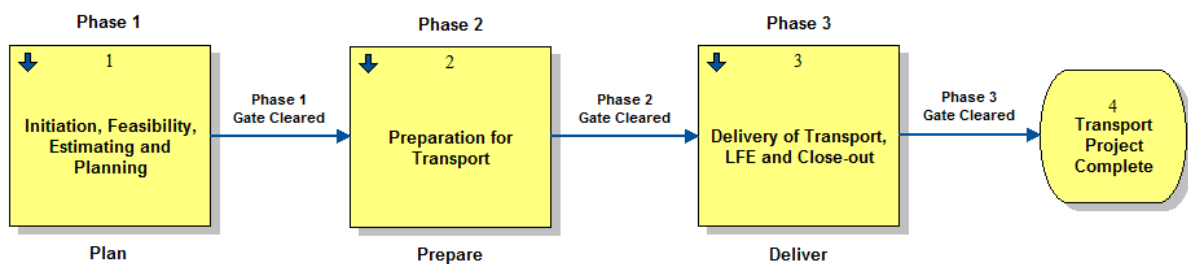


Fig.1 - Transport of Nuclear Cargo

## Phase 1 – Plan

This is the first stage of the process which obviously includes the Project Initiation. In addition, it also includes the Transport feasibility, Transport Estimate and Transport Planning Process. It is the final aspect, Planning that is divided then further into 3 main areas;

- Transport Request Form (TRF)
- Scope of Work (SoW)
- Operational Resource Estimate

### Transport Request Form (TRF)

This form has been developed to be the key interface document outlining what information INS requires from a prospective customer and also key areas of responsibilities thus enabling the project to commence. Further detail regarding the required information can be found in Table 1 below.

Table 1 - Transport Request Form

Key Aspect	Detail
Transport	Consigning Site, Transshipment Point(s), Destination Site
Classification	UN Number, Proper Shipping Name, Radionuclides, Activity, TI, CSI, Emergency Arrangements
Licences / Approvals/ Permits	Design/Validation Licence, Shipment Approval, Transfrontier Shipment Approval, Export/Import Licence, Transport Permit(s), Heavy Load Permit(s)
Notifications	7 Day Competent Authority Notification – Safety, Euratom Notification(s), Health & Safety Executive consent (UK road transport only), Transport Security Plan – Multi Modal
Transport Assets & Infrastructure	Package Type, No of packages, Serial Numbers, Ship Type (INF I, II or III), Package Maintenance Validity, Ship INF Certification & Validity
Labelling & Placarding	Marking & Labelling of Package(s), Placarding of Cargo Transport Units, Display of UN Numbers
Stakeholders / Agencies	Consignor/ Carrier/Consignee Name and Address, Custom's Agent/Cargo Shipping Agent/Ship's Agent - Port of loading/unloading,
Insurance	Certificate of Financial Security, P & I Insurance, Loss & Damage, Other (e.g. top up liability, public liability etc.)
Consignment Details	Mass of package & Conveyance, Vehicle Reg Number / Railwagon ID No, ISO ID No
ER & Radiological Protection	Emergency Arrangements – Road/Rail/Sea Radiation Protection Programme - Road/Rail/Sea, Dose Rate Assessment
Documentation	Multi Modal Dangerous Goods Note, Compliance letter – ADR/RID/IMDG, Transport Documentation File
Operations	Package Instructions, Tie-down

The Transport Request Form is used as a governance tool and consists of a series of documents used internally within INS to ensure all the regulatory preparation activities are in place prior to ‘Approval for Transport’ being issued.

## Phase 2 – Prepare

The second stage of the process is the Preparation for Transport and two key INS documents that are populated to demonstrate compliance with the regulations are;

- Transport Documentation File (TDF)
- Carriers Obligations

### Transport Documentation File

The TDF consists of a series of documents that travel with the transport as required by regulation. In addition to the regulatory requirements, the file often consists of a series of functional documents as agreed by all parties involved in the transport. Examples of these functional documents are re-assurance Health Physics surveys, trans-shipment package and operational inspections, as seen in Table 2 below.

A key section is the transfer of physical responsibility sheet which documents where and when the handover from one entity to another occurs. The TDF is usually laid out in chronological order starting with the Consignment site and finishing with the Consignee site.

For International Transports, it is important to consider the need for multi-lingual documentation to avoid any confusion in the document completion during transits through foreign territories.

Table 2 - Transport Documentation File

Section	Detail
Summary	Multimodal Dangerous Goods Note, Consignment Note and Consignor’s Declaration, Document File Check before Consignment, Flask Maintenance Record Sheet, Loading Plan, Certificate of Loading, Turnround Inspection and Maintenance of Flask
Radiological Survey of Flask	Maximum Radiation Measured on Flask, Non Fixed Contamination Measured on Flask, Maximum Radiation on Flask, Railwagon & Vehicle (Trans-shipment Points), Hold Position - Empty Ship
Marine Checklist	Thermal Survey, Radiological Survey of Marine Transport Frame
Radiological Survey	Empty & Loaded Rail Wagon, Empty & Loaded Vehicle
Certificate of Acceptance of Flask	Rail wagon (s) & Vehicle (s), Security Seal, Labels, Placards, Transport Documents, Malicious Acts
Transfer of Physical Responsibility	Consignor, Transporter (s), Consignee

### Carrier Obligation

To ensure INS meets its regulatory obligations, an in-depth review of the applicable regulations relevant to the transport under review is completed. These obligations are collated in a single document titled the 'The Carriers Obligations Paper' (Fig.2). Templates for each security category of transport (I, II & III) and mode (road, rail and sea) are available to use as part of the obligations review.

CARRIER OBLIGATIONS				
Cat I transport from xxxx to xxxx Issue x dated xxxx				
Table extracted from xxxxx – Issue x dated xxxx				
Subject	Obligations / Requirements	IMDG Regulation	Verification by	Evidence
	International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974)			
General Provisions				
Definitions				

Fig.2 - 'The Carriers Obligations Paper'

As part of this review, the obligations of the carrier are captured in a number of subject areas, these areas are detailed below in Table 3.

Table 3 – Key aspects of Carriers Obligations

General Provisions	Special Packaging Provisions for Class 7
Definitions	Consignment Procedures
Training	Marking & Labelling of Packages & Vehicles
Radiation Protection Programme	Transport Documentation
Management System	Cargo Securing Arrangements
Non Compliance	Construction of Packages & Vehicles
Security Provisions	Notifications in the event of Incident
Classification General Provisions	

### The Carriers Obligation Paper Review

During the process, the reviewer compiles a file of evidence to support the obligations laid out in the Carriers Obligation Paper from all parties associated with the transport. Examples of evidence can range from Vessel Inspection Certificates, Approved Shipboard Marine Emergency Plans through to Multimodal Dangerous Goods Notes and individuals training records.

As part of this review, each piece of evidence is verified to ensure its meets its obligation rather than merely ensuring it's availability. The output of the review is recorded on the Carriers Obligation Paper.

### Nuclear Transport Safety Committee

The primary function of the INS NTSC is to consider transport related 'Nuclear and Radiological Safety' aspects to support the needs of the INS business. Fig.3 below highlights all the relevant sections of INS that are included in the committee.

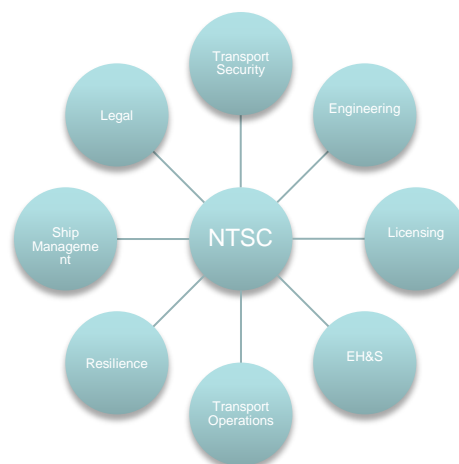


Fig.3 - Nuclear Transport Safety Committee

**Key Elements of the NTSC**

The key elements can be divided into 3 distinct aspects;



Fig.4 - Key Elements of the NTSC

**Assurance**

- Focus on nuclear and radiological safety
- Review of new legislation
- Competence
- Management Systems

**Improvement**

- Effective Learning from Experience (LFE)
- Eliminate and reduce the risk of errors
- Continuous review and assess effectiveness and optimise processes

**Peer review**

- Pre-shipment peer review
- Consignment Safety Report
- Assessing the impact of external event
- Contribution to INS’ INSAFE Readiness Reviews (Internal Safety Committee)
- Transport Risk Assessments
- Right First Time Safety Case Review

**Pre-shipment peer review**

The predominant assessment strategy is through pre-shipment peer review with the intent of identifying any gaps of nuclear and radiological safety within the transport process. A graded approach to this process is applied dependent on the nature of the shipment.

The Peer review may focus on various aspects including: transport interfaces; transport conveyance; package design; radiation; contamination; criticality; the effects of heat generation contents; emergency preparedness; and training. It endeavours to work towards the elimination/reduction in errors and the risk of errors through continuous improvement and effective Learning from Experience.

Other verification information is collected and reviewed concerning the package and modes of transport which include the following aspects in Table 4 & 5.

Table 4 – NTSC Review Package Safety Aspects

Package Safety	Accountability/ Responsibility	NTSC Comments
Package Manufacture		
Package Contents		
Criticality		
Package Operation/compliance		

Containment of package contents		
Shielding		
Heat Generation		
Package Maintenance		

For each Transport Mode (including multi-modal transfer points where a particular criteria or restriction is applicable) of the journey:

Table 5 – NTSC Review - Modal Safety Aspects

MODE: Road/Sea or Rail	Accountability/ Responsibility	NTSC Comments
Criticality Safety		
Shielding of crew (& public)		
Heatload / Temperature		
Package contamination		
Tie-down in ISO container (if applicable)		
Tie-down to vehicle		
Other restrictions or operational controls		
Emergency Support		

Each review is undertaken by suitably qualified employees whom have undergone training in the application of transport regulation of radioactive material and have many years of experience in the planning, preparation and delivery of radioactive transports across all modes and security classifications.

## Phase 2 – Delivery

### Learning from Experience (LfE)

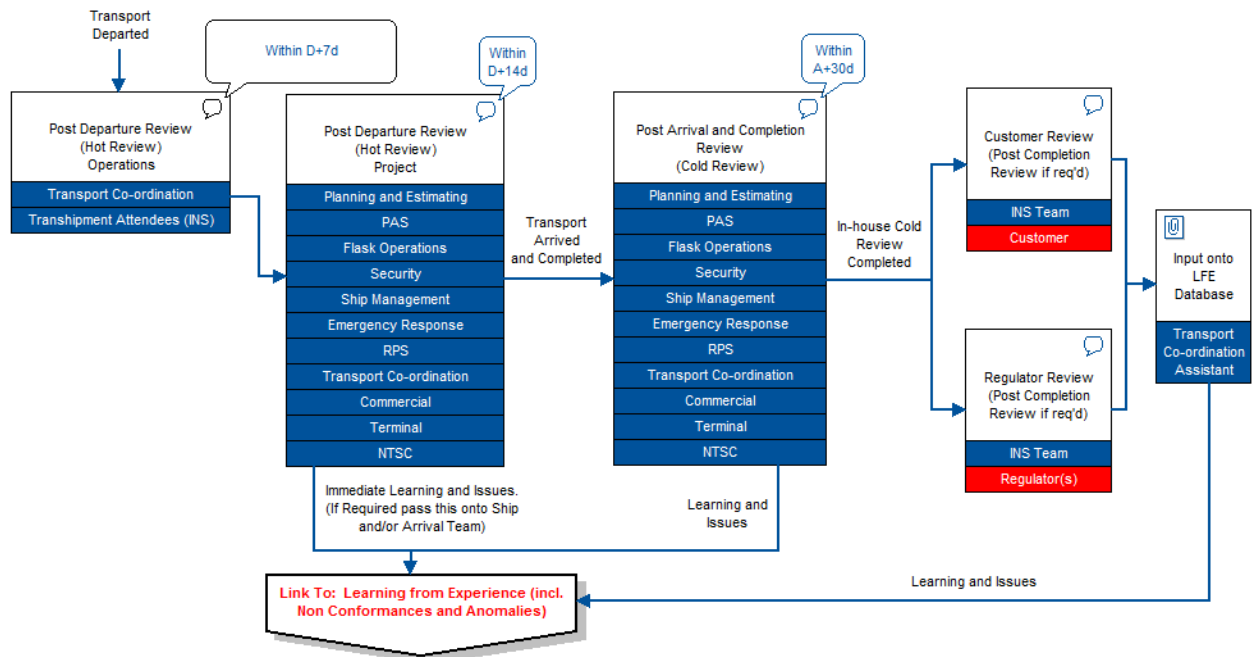


Fig.5 – INS Process Map - Learning from Experience

Through every stage of the INS Management System, there is requirement to continuously learn and develop our processes to become more effective and more efficient. An important point to note is that this should include not only what aspects could be done better, but also what aspects were successful and should be continued, where feasible.

A key part of the Transport LfE process to hold a review between those physically involved in the Transport as soon as practical after the shipment has begun. This is to ensure that all elements, however trivial they may appear, are captured for consideration at a later stage. Following this a review is completed that involves all Project members ensuring experience is captured from all disciplines. The duration of a significant percentage of INS transports are considerable. Therefore an additional review is held post arrival to ensure all learning is captured through the entire shipment.

Feedback is also compiled from Extremal Stakeholders, e.g. Customer, Regulator, thus ensuring holistic LfE is achieved.

A key step once all information is available is to input the issues into the LfE database. This ensures that all relevant experience is available to all future projects.

## **Rules of the Game – ROG**

When making arrangements for transport a key aspect to be cognisant of is that these shipments of nuclear materials take place in the public domain and require the acceptance, and often the support, of local communities, agencies and councils. This socio-economic element is therefore a key enabler to the success of any transport. It is important therefore that effective communication arrangements are in place to inform and give confidence to the public without undermining any safety or security arrangements prior to, during and after transports. This is of particular relevance when two or more States are involved in a transport of significant hazard material, the complexity of communications increases.

The Rules of the Game (ROG) is a phrase used to describe a communications agreement for a particular transport that is agreed between all States involved. This agreement will include the following elements;

- Agree proactive lines to take prior to, during and after the transport
- Agree the wording of all communications (verbatim)
- Agree exact date and time of each communication, how they will be communicated and by whom and what method (e.g. internet, media release etc.)

## **Conclusions**

The current Transport Regulations, SSR-6 cover the safety aspects of radioactive material transportation. This paper outlines the processes that INS has implemented to demonstrate how compliance with the requirements are assured.

A key document to ensure that the correct information is understood at the project initiation is the Transport Request Form. The Transport Document File is utilised to compile all functional documents are re-assurance Health Physics surveys, transshipment package and operational inspections. Also included is the transfer of physical responsibility sheet which documents where and when the handover from one entity to another occurs.

INS has developed ‘The Carriers Obligations Process’, which is in-depth review of the applicable regulations relevant to the transport to ensure INS meets its regulatory obligations

The INS Nuclear Transport Safety Committee (NTSC) has a primary function of considering transport related ‘Nuclear and Radiological Safety’ aspects to support the needs of the INS business. A graded



approach is applied to the pre-shipment peer review process, used to identify any potential gaps of nuclear and radiological safety within the transport process.

The INS Learning from Experience (LFE) process will be discussed and any relevant experience gained from actual shipments.

The importance of the 'Rules of the Game' ensure the requirement for Communications Agreements is understood and that they need to be in place, as all transports of nuclear materials take place in the public domain and require the Stakeholder acceptance.

## **References**

- [1] "IAEA Safety Standards Regulations for the Safe Transport of Radioactive Material 2012 Edition Specific Safety Requirements SSR-6".
- [2] International Nuclear Services and Pacific Nuclear Transport Limited Management Systems Manual, PROM 000 – M01 Issue 7