SECURITY CATEGORY I - MARINE TRANSPORT OF MOX FUEL BETWEEN GERMANY AND THE UNITED KINGDOM

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SUMMARY

Till about 4 years ago, transports of Security Category I from or towards the United Kingdom (U.K.) were usually carried out as the standard combination of road/air/road transports. This possibility to carry out transports of Security Category I from or towards Germany per air was practically temporarily abolished about 4 years ago, due to decisions made by the competent German licensing authorities. The German licensing authorities decided that the IAEA requirements must be fulfilled to obtain the license. This means that either the transported material must be proved to be Low Dispersable Material (LDM), or that type C transport packages must be used.
In 1993, neither the required LDM verifications nor type C transport packages were available, so that an alternative had to be found to the road/air/road transport route.
In this paper, the required steps will be presented, from the choice of a concept up to the actual carrying out of the transport. The following points will be examined for this purpose:

- working out the security concept and selection of a ship,
- consultation with German and British authorities to agree on the security concept,
- fulfilment of the regulations according to the INF code,
- experience obtained from maritime transports carried out between Germany and the United Kingdom between October 1996 and April 1997.

INTRODUCTION

Due to the shut-down of the MOX-processing plant, an increased number of transports of fresh MOX fuel assemblies must be carried out between Germany and other countries. Furthermore, residual quantities which remained in the shut-down MOX fabrication plant must be transported abroad.
For over 16 years, NUCLEAR CARGO + SERVICE (NCS) has carried out transports of fresh MOX fuel assemblies and of fabrication residues, as well as of plutonium and of high enriched uranium, over the European Continent, without any particular incidents having occurred so far. For this, NCS uses its own High Security Truck and its own specially trained and armed drivers and escort personnel.

Further special tasks performed by NCS are the world-wide transports of all kinds of radioactive materials, e. g. from uranium ore concentrates up to fresh fuel assemblies, irradiated fuel assemblies from experimental reactors and, beginning on 1 January 1998, also from power reactors. Furthermore, NCS manages the design, the manufacturing, the obtaining of approvals and the operation of transport packages as well as of security vehicles and systems, and also the storage of radioactive materials.
Due to the above mentioned change in the conditions for the granting of authorisations for road/air/road transports, and to the lack of possibilities to fulfil these conditions, which continues prevailing, an alternative route had to be found for transports between Germany and the United Kingdom. The direct and combined road and railway transport via France, as well as the combined road/sea/road transport between Germany and the United Kingdom were examined. As a result of this examination, and due to the much higher probability of realisation, the combined road/sea/road transport was finally chosen.

WORKING OUT OF THE SECURITY CONCEPT AND SELECTION OF THE SHIP

The following regulations had to be taken into account to work out the security concept and to select the ship:

- Catalogue of Security Measures for the Transport of Radioactive Materials, Germany 1977 (German short term: SMK 77) - Restricted -,
- Guidelines for the Protection of Radioactive Material Transports against Disturbances and other Influences by third Parties during Transports, Germany 1991 (German short term: SEWD Guideline or SiRiLi) - Restricted -
- INFCIRC 225, Rev. 3,
- Code for the Carriage of Irradiated Nuclear Fuel, Plutonium and High Level Radioactive Wastes in Flasks on Board of Ships, IMO 1993 (INF code),
- Regulations of the United Kingdom Atomic Energy Authority - Directorate of Civil Nuclear Security (UKAEA-DCNSy), 1995 - Restricted -

The following main points were also taken into account when making a decision concerning the concept:

- the time the ship had to remain at the dock for loading and unloading was to be as short as possible,
- the security barriers surrounding the nuclear material were not to be opened during transports, and especially not during the transfer from one means of transport to the other,
- the number of instances which were to be informed about the transport and which were not security relevant, was to be reduced as far as possible,
- the ship was to be loaded and unloaded at the port of departure and of arrival without using either dock cranes or ship's own cranes,
- it had to be possible to check the reliability of the shipping company and of the ship's crew according to German nuclear act,
- installation of required supplementary security equipment on the ship, without touching or modifying the ship's structure,
- fulfilment of the INF conditions,
- compact size of the ship, to make sure it could run at small ports in case of an emergency, and
- sufficient accommodation on board the ship for supplementary armed NCS security guards, and if required, of further escort personnel.

Based on the above mentioned conditions, specifications were worked out for the selection of the ship, and a Ro-Ro ship sailing under German flag was chosen. This Ro-Ro ship is exclusively loaded over a stern ramp, by self powerd vehicles which are driven on board. The overall ship's length is 89 m, its maximum width is 14.5 m and the draught is about 5.1 m.
This Ro-Ro ship allows to fulfil the main security requirements, namely:

- fast loading and unloading of the ship, and
- no need to open or modify the security barriers/safety devices around the nuclear material,

because the NCS High-Security-Truck can be driven directly into the hold at the port of departure and out again when the port of destination is reached to carry on the transport up to the receiver's nuclear facility, without having to remain parked on the dock. If an exchange of the towing vehicle will be necessary at the non German port, the armoured NCS semi-trailer can be hooked to the new towing vehicle inside the ship's hold.
The utilisation throughout the transport of the NCS High-Security-Truck, which consists of an armoured towing vehicle of the highest security class and of a specially armoured semi-trailer, is advantageous, because this assures that the security barriers must neither be opened nor changed during the transport.
The alarm devices installed in the NCS High-Security-Truck (incl. Semi-trailer) are also used during the maritime transport, and their status is automatically communicated to the NCS transport control centre, together with the ship's position during the journey.
An essential part of the security concept is the above mentioned continuous surveillance of the transport, beginning when the transport leaves the shipper's nuclear facility and lasting until it reaches the receiver's nuclear facility. This surveillance, which is assured by the NCS transport control centre, will be effective as long as the transport remains under the jurisdiction of the German Nuclear Act, that is, on German territory, or on board a ship running under the German flag. The surveillance of the transport on U.K. territory is assured by the competent U.K. authorities.

AGREEMENT OF THE SECURITY CONCEPT BETWEEN THE GERMAN AND THE BRITISH AUTHORITIES

At the end of 1993, NCS presented preliminary explanations and held first consultations with the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (German short term: BMU) concerning this new transport route of Security Category I between Germany and the United Kingdom. After the BMU officials consulted their colleagues of the corresponding competent U.K. authorities, it soon became clear that the authorisation for this kind of transport would not be easily, and that it would in any case not be obtained in the short term, because next to the details of the security concept for the maritime transport, the opinion of the U.K. Authorities, which at that time still clearly favoured air transport, being thus in clear opposition to the ideas of the German Authorities, had to be discussed.
The further course of the agreement consultations was characterised by the fact that, invisible to us, official bureaucracy, started running. This was caused among others additionally by notices in daily newspapers and inquiries in the German Federal Parliament, concerning projected air transports of Security Category I leaving Germany.

Nevertheless, NCS continued with the preparatory work to obtain the required authorisations. The first draft of a safety report was worked out and the possibilities for the installation of probably required supplementary security and safety equipment on the ship were discussed

with the ship's command and with the shipping firm which owns the ship without going into details.
About mid 1995, the ideas of the U.K. Authorities and those of the German Authorities were known more precisely, so that the above mentioned safety report could be completed This report had about 60 pages, plus technical drawings of the ship, and an extensive photographic documentation.
This safety report was discussed in meetings with the representatives of the competent authorities from Germany and the United Kingdom and finally agreed after required changes was worked in. To round off the theory, the required transport means, technical equipment and facilities, as well as the necessary transport control centre, were inspected by the representatives of the U.K. Authorities.
The result of agreement consultations are presented below; however, we can give no details for reasons of confidentiality:

Security measures which must be assured by the carrier:
- use of a Ro-Ro ship in order to minimise loading and unloading times in port,
- use of diverse communication equipment,
- automatic position-finding of the ship and automatic transmission of this position-data and of the status of the alarm system of the NCS High-Security-Truck to the NCS transport control centre at determined time intervals,
- continuous transport surveillance outside the U.K. onshore territory through the NCS transport control centre,
- communication with the transport control centre of the United Kingdom Energy Authority Constabulary at defined time intervals and over secured paths,
- continuous use of the NCS High-Security-Truck semi-trailer,
- surveillance of the ship's hold by technical means and guards,
- securing of the hold and of the wheelhouse in order to impair the intrusion of non authorised persons,
- armed escort personnel on board the ship in order to assure the continuous surveillance of the ship and of its cargo,
- installation of supplementary safety and communications systems on the wheelhouse,
- high quality radar system on the wheelhouse,
- full charter of the ship,
- emergency and alarm plans for the ship's master, for the escorting personnel, and for the personnel of the transport control centre, and
- measures to find and salve the ship and its cargo again after sinking of the ship.
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Measures which must be agreed to between the states by an exchange of notes:
- communications between the competent authorities before and during the transport,
- carrying of weapons by the NCS guard in U.K. territorial waters,
- mutual assistance in case of an armed attack against the transport in international waters or in U.K. territorial waters,
- in case of an attack against the transport in U.K. territorial waters, previous agreement for the use of British armed forces,
- information of the British armed forces about the technical details of the German ship and, if necessary, complimentary administrative regulations, and
- confidential handling of information concerning the transports.

Within half a year, the technical security and safety systems which had to be provided by NCS in collaboration with the shipping company, were installed and tested. The relatively long time for the installation of supplementary security and safety systems on the ship was actually not due to long terms of delivery of the equipment, but to the fact that the ship had to carry out other transports in the mean time, so that is was not fully available for installation work.
A further very time consuming and work intensive point was the working out of instructions for the ship's master (Captain and 1st Officer), for the NCS escort personnel, for the personnel of the NCS transport control centre and for the responsible and authority exerting personnel. This at last mentionedpersonnel must be kept in stand-by reserve by NCS during the transport in case of an event (e. g. attack against the transport), to take over the command of the transport control centre. The most important points for working out of this instructions was to define the following interfaces and preparations in case of an event (attack against the transport):

- transfer from road to maritime transport and vice-versa,
- authority and competence of the ship's master for the safety and security of the transport, and agreement of the necessary consultation-and action-possibilities of the armed NCS guard, which does not belong to the ship's crew,
- definition of responsibilities to assure the security of the transport during routine journeys,
- transfer of responsibilities during the change of national responsibilities between Germany and the U.K. and vice-versa, and
- alarm plans and instructions concerning immediate measures to be taken by the ship's master/NCS guard to protect the transport in case of an attack.
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The three sets of instructions worked out by NCS concerning the above mentioned points fill about 180 pages. These instructions are part of the German transport authorisations according to the German Nuclear Act; they were checked and approved by a group of persons belonging to the Ministries of Domestic Affairs of several Federal States. Procedures and actions indicated in the instructions were agreed to with the U.K. authorities.
About 1 ½ years passed before the security and safety measures were available to the above mentioned extent, both in soft- and hardware, ready to be licensed. It must be said in defence of both the German and the U.K. licensing authorities, as well as of NCS, that the licensing of an international Security Category I maritime transport was a new matter, which had never been tackled before by both authorities. This required the clearing of many prinicipal points (e.g., what German military forces would be competent to take measures on the spot in case of an attack against the transport?). Without the dedicated and competent collaboration of the U.K.-and German authorities, the time required to obtain an authorisation would surely have been much longer.
However, assuring security was not the only requirement to be fulfilled in addition to the road transport, in order to be able to carry out the maritime transport. In November of 1993, the International Maritime Organisation (IMO) had passed the INF Code, which had to be taken into account for the foreseen transports of MOX material. The application of this regulation will be discussed in the following section.

FULFILMENT OF THE INF CODE REGULATIONS

For the planned maritime transports of MOX fuel assemblies and of MOX fabrication residues, the ship had to be equipped according to Class INF 2.
The approval of the ship according to INF 2 required the participation of the Germanic Lloyd (GL) as the ships classifier, and of the German Maritime Trade Association(Deutsche Seeberufsgenossenschaft) as the licensing authority.
According to the INF 2 regulations, the essential points were the control of damage stability of the ship, of the solidity of the fastening points for the foreseen stowage positions, of fire fighting equipment and of emergency power supplies. For these examinations, the Germanic Lloyd required calculations of the ship's stability against the springing of leaks, inspections of the hold ventilation system, measurements of the amounts of water vaporised by the fire fighting equipment, etc. The following adaptations resulted from these examinations:

- several doors within the hull of the ship had to be made water tight,
- an exact description for the water tight fitting of the stern ramp had to be worked out,
- the ship's emergency power supply had to be modified to the INF 2 regulations concerning the operation of the fire fighting equipment and of the ventilation system within the cargo hold,
- the efficiency of the fire-fighting equipment in the cargo hold had to be improved,
- a special INF 2 transport manual was to be worked out, taking into account the required safety precautions,
- a training programme had to be worked out for the ship's master and crew,
- an emergency plan had to be worked out, concerning especially the transport of radioactive materials; this plan was to be submitted for approval to the German Agency for Protection against Radiation(Bundesamt für Strahlenschutz). This emergency plan was written by NCS and fills 28 pages.
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After all the certifications from the Germanic Lloyd and the approval by the Federal Agency for Protection against Radiation were in the hands of the Maritime Trade Association, the latter granted the INF 2 certification. This certification must be renewed annually.

EXPERIENCE OBTAINED WITH MARITIME TRANSPORTS BETWEEN GERMANY AND THE UNITED KINGDOM BETWEEN OCTOBER OF 1996 AND APRIL OF 1997

Between October of 1996 and April of 1997, NCS carried out a total of 4 combined transports between Germany and the United Kingdom. It can be mentioned to start with, that these transports fortunately were carried out without events of particular importance as far as transport security was concerned. At the beginning of 1997, an action carried out by Greenpeace at the German port can be mentioned as a non security relevant event. This action was carried out according to the usual pattern, that is, a small number of Greenpeace "activitsts" intruded onto the ships berth position and chained themselves to bollards and to a securing cable with a sitting belt held by means of mountain climbing safety attachments.
The usual posters were unrolled, under the eyes of the press and of radio and television. The whole action was peaceful and hardly disturbed the transport itself, because a small police unit could end the action peacefully by the time the transport was to proceed. On this occasion too, the NCS conception of using a Ro-Ro ship proved successful, as the High-Security-Truck was

not visible, either inside or outside the ship, during the whole action. This Greenpeace action was thus of no major interest for the media.

The unhindered collaboration with all institutions form the United Kingdom (e. g. United Kingdom Energy Authority Constabulary, English port authorities) and from Germany (e. g. German police, German Frontier Protection Forces - Sea, German port authorities) must be mentioned as a particularly positive aspect. This certainly also was due to the good agreement reached before the transports, which covered even petty matters.

We should finally point out to the fact that at the end and at the beginning of a year, the North Sea usually is not as flat as a pancake, so that it is wise to foresee that one or the other member of the escort personnel will not be able to perform his duty, due to sea-sickness.

SESSION 9.2

Back-End Transport