Emergency response preparedness:
The French experience of large scale exercises

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ABSTRACT

In compliance with the IAEA regulations for the transport of radioactive material in the event of accidents during transport of radioactive material, emergency provisions to protect persons, property and environment have to be established and developed by the relevant national organisations.

In France, the prefect of the department where the accident occurs is responsible for decisions and measures required to ensure the protection of both population and property at risk owing to the accident.

During an accident, the ministers concerned provide the prefect with recommendations and information, in order to help him take the requisite decisions.

On their side, the nuclear industry and transport companies also have to be prepared to intervene and to support the authorities at their request, depending on their capacities and their specialities.

To prepare the emergency teams properly and acquire effective emergency plans, training exercises have to be conducted regularly with every ministerial department involved, the nuclear industry and transport companies, members of the public and the media. Then, the feedback from such exercises shall be taken into account to improve the emergency procedures.

This paper will introduce :

- emergency response preparedness : what is required by the relevant regulations ?
- emergency response preparedness : how is France organised ?
- the French experience of conducting large training exercises simulating accidents involving the transport of radioactive material ;
- the main difficulties and lessons learned ;
- the perspectives.

EMERGENCY RESPONSE PREPAREDNESS : WHAT IS REQUIRED BY THE RELEVANT REGULATIONS?

1. International fundamental principles

One of the principles among those developed by the IAEA for the safe transport of radioactive material is that emergency preparedness enables to reduce the radiological consequences to persons and the environment, in case of accident.

The IAEA Regulations for the Safe Transport of Radioactive Material require that emergency provisions, as established by relevant national organizations, shall be observed to protect persons, property and the environment.

To help public authorities in charge of emergency response to establish adapted emergency plans, the IAEA published a Safety Guide. This Safety Guide was published for the first time in 1988. The current edition was published in 2002 under the reference TS-G-1.2.

2. French regulation

In France, emergency provisions were required by law No 87-565 on 22 July 1987 concerning civil security Organisation. This law has been recently repealed by law n°2004-811, on 13 August 2004, improving civil security in France.

The emergency organisation is made up of general arrangements, which apply to any kind of situation. These are set down into an “ORSEC plan”, which lists public and private means of rescue liable to be put in place to face major risks and catastrophes.

For particular risks, these general dispositions are completed by specific arrangements, written down into special emergency plans and detailed by decree n°88-622, on 6 May 1988.

These plans are activated by local authorities (prefects), according to the situation.

EMERGENCY RESPONSE PREPAREDNESS: HOW FRANCE IS ORGANISED ?

1. Local actors

France is divided into 96 departments (and 4 overseas departments) and 3 maritime regions ; each of them is administered by a prefect.

The prefect of the department where the accident occurs is responsible for decisions and measures required to ensure the protection of population, property and the environment at risk owing to the accident.

Thus, the prefect is in charge of establishing and developing emergency response arrangements for responding to transport accidents involving radioactive material.

In close relationships with the prefect, the departmental fire and rescue services (SDIS[i]), especially its radiological intervention team (CMIR[ii]), is involved in the application of the countermeasures.

2. National actors

During an accident, the ministers concerned provide the prefect with recommendations and information, in order to help him take the requisite decisions. The main bodies involved in radiological emergency response and preparedness – as far as civil[1] radioactive material transport is concerned – are :

- Ministry of the Interior : the Directorate for Civil Security and Defence (DDSC[iii]) has at its disposal the Operational Centre for Interministerial Emergency Provisions (COGIC[iv]) and the Nuclear Risk Management Aid Mission (MARN[v]). The DDSC can place at the disposal of the prefect the human reinforcements and supplies he requires to manage the emergency situation ;
- Ministry for Health : the Directorate General for Nuclear Safety and Radiation Protection (DGSNR[vi]), the French nuclear safety authority (ASN) is responsible for the health protection of people with regard to ionising radiation effects ;
- Ministry for the Environment and Ministry for Industry : the DGSNR supervises the safety of radioactive material transport, with the technical assistance of the Institute for Nuclear Safety and Radiation Protection (IRSN[vii]). The DGSNR also collects and summarises information with a view to issuing the notifications and information required by the international conventions on informing foreign countries of radiological emergency ;
- The Secretary General for National Defence (SGDN[viii]): the SGDN is responsible for co-ordinating the action of the ministries concerned regarding the planned measures in the event of an accident.

3. Operators (consignor and carrier)

The consignor and the carrier can provide the authorities with :

- the knowledge of the carried nuclear materials ;
- the knowledge and evaluation of the packaging status and transport means ;
- the evaluation of contamination and irradiation risks ;
- the setting up of an equipped vehicle being able to go on site immediately with experts well-versed, after the knowledge of the accident and allowing a proximity expertise and evaluation;
- communication support.

4. Technical crisis organisation

The diagram below (fig.1) introduces the overall emergency response simplified structures – designed for nuclear safety and radiation protection management – set up in case of an accident involving radioactive material transport. It shows that both local and national authorities (the prefect, the DGSNR) activate a management control post (MCP). So do the consignor and carrier.

All of the above actors have a technical team to help them make a decision, except the prefect. One of the main function of the DGSNR is to advise the prefect, concerning the countermeasures.

The actors can send a mobile crisis team around the scene of the accident.

The various connections shown on the diagram indicate information exchanges.

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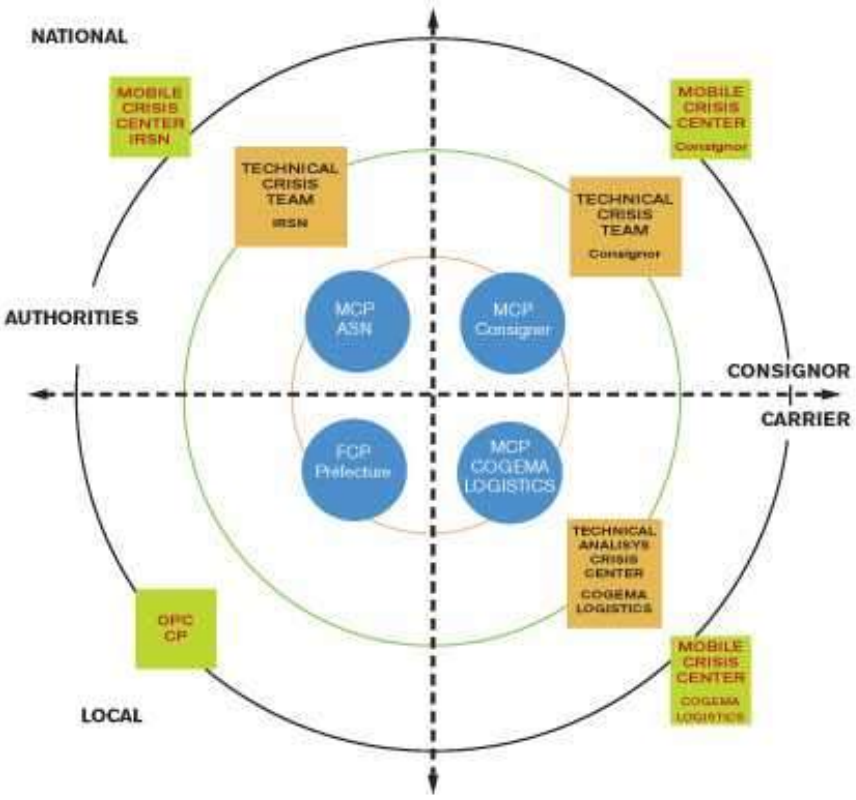
[1] Other ministries and ministerial directorates are involved in radioactive material transports which concern French National Defence. This article does not deal with this specificity.



1st circle :! Management Command Posts
2nd circle : Technical Analysis Crisis Teams
3rd circle : Resources on Site

fig. 1: technical crisis organisation

5. The specialised emergency plans

To carry out the intervention, the prefect relies on the following plans :

- "PSS-TMR"[ix] (specialised radioactive material transport emergency plan) : it describes the authorities emergency response to an accident during a radioactive material transport by air, road, train or river on French territory.
- "NUCMAR" plan (emergency plan for an accident during a radioactive material transport by sea) : it is associated to maritime or air accident leading to consequences at sea and on the coast.

When PSS-TMR or NUCMAR plans are activated, the rescue operations are placed under the prefect's authority.

The PSS-TMR, as the other plans established in accordance with law, schedules to use the departmental means, but also:

- national means, particularly the help of national entities such as DDSC, DGSNR, IRSN or CEA[x];
- means from other departments ;
- means from other industries established outside of the department.

The PSS-TMR are established in a homogeneous manner on the basis of a guide established by the DDSC with the help of the DGSNR, the IRSN and main French nuclear industry stakeholders (CEA, EDF, COGEMA, COGEMA LOGISTICS).

This guide has been reviewed in the beginning of 2004 ; it gives some criteria with limits indicating when the PSS-TMR should be activated.

These criteria are presented on the following table (tab.1).

<table>
<tr><th rowspan="2">Progression of diagnostic steps</th><th colspan="2" rowspan="2">Packaging description</th><th colspan="2">Stress factors</th><th rowspan="2">Protection actions (*)</th></tr>
<tr><th>Severe fire</th><th>DR>1mSv/h over 100 m</th></tr>
<tr><td>1. immediate diagnostic</td><td colspan="2">Accident involving transport of dangerous goods</td><td>NO</td><td>Measures not made yet</td><td>Exclusion over 100 m minimum</td></tr>
<tr><td rowspan="4">2. the package's type is known</td><td rowspan="4">Accident involving a radioactive material transport (class 7)</td><td>Industrial package (except uranyl nitrate tank or UF6 cylinders) Type A packages</td><td>NOT SIGNIFICANT</td><td>Measures not made yet</td><td>Exclusion over 100 m minimum</td></tr>
<tr><td>Type B, B (fissile), C, C (fissile) packages
Special arrangements</td><td rowspan="3">YES</td><td>Measures not made yet</td><td>PSS-TMR activation
Exclusion over 100 m
SA over 500 m</td></tr>
<tr><td>LSA II material package (uranyl nitrate tanks)</td><td rowspan="2">Measures not made yet</td><td rowspan="2">PSS-TMR activation
Exclusion over 100 m
SA over 1000 m</td></tr>
<tr><td>UF6 transport</td></tr>
<tr><td>3. the first measures are available</td><td>Accident involving a radioactive material transport with dose rate over 1mSv/h</td><td>NOT SIGNIFICANT</td><td>Dose rate measures DR >1mSv/h over 100m</td><td>PSS-TMR activation
Exclusion within a radius of 500 m</td></tr>
</table>

DR → Dose rate in mSv/h (milli-sievert per hour)
SA → Sheltering area
(*) → In the case of a particular transport under the responsibility of the Defence Minister the nuclear area corresponds to a total exclusion zone of a 500 m radius.

tab.1: Activation of actions planned in PSS-TMR
Table of the diagnostic steps

THE FRENCH EXPERIENCE OF CONDUCTING LARGE SCALE TRAINING EXERCISES SIMULATING ACCIDENTS INVOLVING A RADIOACTIVE MATERIAL TRANSPORT

1. Planification

The SGDN, the DGSNR and the MARN plan and direct national radiological emergency drills.

Today the radioactive material transport crisis exercises are planned once a year, following a proposal from the DGSNR and the DDSC and following a decision of the candidate prefectures.

Before the year 2002, different emergency drills regarding radioactive material transport of were carried out by COGEMA LOGISTICS, on the one side, and by DGSNR the consignor and COGEMA LOGISTICS, on the other side. These exercises allowed an improvement in organisation, procedures and means to answer the need.

Since the year 2002, the exercises have been set up at a national level including all the different national involved bodies. During these drills, a media pressure is simulated.

2. 2002 national exercise

The May 16th 2002 national drill was the first exercise involving a prefecture : the prefecture of Yonne. The simulated accident happened close to the town of Auxerre.

The scenario (accident between a truck transporting an IU04 package with 36 research spent fuel assemblies - MTR - from Saclay to Cadarache OSIRIS Reactor and a tank trailer transporting 30 000 l. of petrol) was prepared by a team made up of the IRSN, the CEA and COGEMA LOGISTICS.

This exercise enabled the test of the new edition of the draft of the "PSS-TMR" guide.

It was also an opportunity to test COGEMA LOGISTICS response plan, which consists of :

- raising the alarm : COGEMA LOGISTICS monitors transports by a tracking system (GPS, INMARSAT) and a duty officer is on an assignment of 24 hours a day and 7 days a week ;
- analysing the situation : the Emergency committee is made up of :
    - a command section,
    - a communication section,
    - a technical section,
    - a mobile team to reach quickly the scene of the accident ;
- operating emergency means.

3. 2002 national exercise: step by step – the view of COGEMA Logistics

- 8.10 am – the COGEMA LOGISTICS tracking centre noticed that a truck had changed its itinerary and, then, detected a stop of the shipment ;
- 8.30 am – the two vehicles collided and a hole of 2 m^2 opened up in the 20 feet container ;
- 8.32 am – the driver was not reachable by mobile phone. A witness informed firemen of a road accident ;
- 9.28 am – the "CODIS[xi]" team (firemen) arrived at the scene of the accident ;
- 11.00 am – security area: The "CMIR" measured a gamma dose rate of 2.5 µSv, 150 meters from the vehicles. A security area of 200 m around the convoy was set up ;
- 11.30 am – media pressure : calls from journalists ;
- 12.00 am – the COGEMA LOGISTICS' mobile section arrived at the scene of the accident, checked the situation, took photos and reported to the command section.
- 13.00 pm – check Point : the IRSN mobile team (specialised team for radiological protection) put in place a check point to go in and out of the security area.
- 15.20 pm – radiological control : the "ZIPE[xii]" team (CEA) entered the security area to take measurements around the cask ;
- 16.30 pm – recovery of the cask: the COGEMA LOGISTICS teams (command section + technical section) proposed the Authorities a scenario to recover the cask . Based on the good results, the French Authorities decided to end the exercise.

The duration between the event and the alert was correct. The COGEMA LOGISTICS crisis organisation was raised quickly after the accident. The other crisis organisations were raised almost simultaneously thanks to a reactivity of the COGEMA LOGISTICS tracking centre. Thanks to the exercise, some paths for improvement, and optimisation at step one were identified.

non-contamination area check with journalist invited for the exercise

area accident

COGEMA LOGISTICS crisis room

COGEMA LOGISTICS mobile section

4. 2003 national exercise

For the second time, a national emergency drill was organised on September 23rd, 2003 in the department of Eure-et-Loir, close to the town of Chartres.

The scenario (accident between an agricultural tractor transporting straw and a truck transporting solid radioactive waste in metallic drums in a DV78 packaging from Cogema-La Hague to Marcoule – CENTRACO of SOCODEI) was prepared by a team made up of IRSN, CEA and COGEMA LOGISTICS.

This exercise enabled a second test of the whole emergency organisation in France and the implementation of the above mentioned PSS-TMR guide integrating the lessons learned from the previous national exercise.

5. 2003 national exercise: step by step – the view of COGEMA Logistics

- 7.35 am – accident. The truck which transports straw is on fire ;
- 7.50 am – the first emergency team arrives on site. They take in charge the truck driver and begin to stop the fire ;
- 8:30 am – set up of the COGEMA LOGISTICS crisis team ;
- 8.40 am – the fire is stopped. The drums are burned and their lids are bumped. Set up of a security area and meeting of all the first stakeholders (policemen, firemen and emergency medical staff) waiting for specialised nuclear teams ;
- 9.23 am – departure of the mobile team COGEMA LOGISTICS ;
- 9.55 am – the specialised nuclear teams arrive and set up a management cell at 500 meters of the accident. They send a first team to make a reconnaissance ;
- 10.10 am – contamination checks of the first emergency team ;
- 10.30 am – the special Gendarmerie's helicopter controls the accident area and takes photos and videos ;
- 10.50 am – the mobile team COGEM LOGISTICS arrives on site ;
- 10.40 am to 12.00 am - contamination checks of people and accident area and irradiation measures by the specialised team ;
- 12.00 am – in order to go back under safe conditions, COGEMA LOGISTICS, in accordance with the authority, sends a big mobile crane and special handling materials on site, with a clear process of recovery elaborated by the COGEMA LOGISTICS technical section in accordance with the technical section of the authorities ;
- 12.00 am to 3.35 pm – definition of the scenario for recuperation and return to safety situation of the site ;
- 15.43 pm – end of the exercise.

THE MAINS DIFFICULTIES AND LESSONS LEARNED FROM NATIONAL EXERCISES

1. Main lessons learned from the 2002 national exercises experience

- alert procedure must be re-examined in order to shorten the alert delay ;
- each intervention team role (regarding all the stakeholder)s has to be defined more clearly ;
- co-ordination between headquarters and technical team has to be improved ;
- measurements on site have to be broadcast to all actors concerned, as soon as possible ;
- photos or scheme of the accident area have to be sent to the prefecture and be communicated to all stakeholders.

2. Main lessons learned from the 2003 national exercises experience

- each body has to make an effort to present itself and clearly specify its role, as of the beginning of the crisis ;
- communication between all the stakeholders is the most difficult issue in most exercises ;
- the issue of quick transmission of measurements is recurrent. However, measurement results are very important data for national authorities ;
- DGSNR has to spread the medical practice in case of nuclear accidents.

3. Detailed observations

- **Organisation :**

Global organisation

It is difficult to co-ordinate all the decision making teams, technical analysis and communication.

Large training exercises, organised on a regular basis, can help improve the co-ordination.

Moreover, in order to train people from other areas, we recommend to bring them in as observers (training and exterior vision) during the exercises.

Authorities organisation

The latest two drills enabled the authorities to improve the “PSS-TMR” guide, which led to start a global review of the PSS-TMR emergency plans in France.

COGEMA LOGISTICS organisation

Drills are the main “crisis situation” where we emergency organisation, response time and good practices can be tested. National crisis exercises began 2 years ago. COGEMA LOGISTICS has improved and simplified its procedures and organisation.

Decision missions, technical and communication centres are clearly defined by the procedures and each person in each team knows his task. Between the first and the second crisis exercises, reflex sheets were created for each job so as not to forget important tasks when under pressure during the crisis. They still need to be improved. Knowing that a crisis can occur whenever, we have trained for each job 2 or 3 persons capable of doing the job. Different observers are trained during each exercise.

- **Knowledge of the accident :**

The information can arrive by several sources :
- driver ;
- eyewitness of the accident ;
- safety or police services ;
- tracking system room of COGEMA LOGISTICS ;
- IRSN transport section (EOT[xiii]).

We must have a good communication circuit to react quickly and obtain many information about the accident.

- **Stakeholders information :**

Once the crisis cell is constituted, one of its main tasks is to inform quickly and correctly all the stakeholders concerned. And the main issue at this time is that we don’t know all the details regarding the accident. One problem could be that some information might be false or different depending on sources. It is very important to verify the important information before communicating it to the other actors.

- **Input :**

Being able to make the right decision is based on a very quick estimation of the potential consequences of the accident. These consequences depend on the input of the particular transport of nuclear materials based on the transport file : type of nuclear materials and quantities and the accident conditions : accident (drop, fire, immersion, etc), duration of the accident, area with the impact on the population and the environment.

It is very important to verify and check all the information before broadcasting it.

During the latest exercises, all the crisis centres concerned would have needed the results of radioactive measurements fast enough to confirm the first hypotheses of contamination and irradiation risk area. For the next exercise, this will be closely taken into account.

- **Communication making:**

Internal communication

Internal communication is very important between the different sections – command, technical and communication – and must be clearly defined int the beginning of each event alert.

External communication

Each party is in charge of its own communication in its field of knowledge. The main issue is the veracity of the information exchanges and this must be checked before broadcast.

It is obvious that human and social information and communication are as important as technical information and action.

- **Return under safe conditions :**

While evaluating the consequences of the accident, the technical section has also to work at a scenario of recovering the damaged package.

We need to note that the first main step in an exercise is to ensure the return to normal condition in the area. Package recovery can not be performed if its safety is not guaranteed. When the safety of the package is confirmed by technical sections, we have more time in order to recover the package.

PERSPECTIVES

The authorities decided to organise a national drill involving a radioactive material transport by rail in September 2004.

They also intend to take part in an exercise concerning a radioactive material transport accident in an airport zone.

These exercises will involve new actors (railways and airport companies) and should enable the authorities to validate their emergency response organisation – initially built around a road accident.

CONCLUSIONS

French authorities and involved operators have to keep on improving their emergency response organisation. This is why true national crisis exercises (and not desk top exercises) must be steadily arranged.

The aim is to train all the teams and to improve their procedures so that they may be able to cope with a radioactive material accident and :

- to obtain quickly the best knowledge of facts, actions and measures on site ;
- to optimise the communication between each other ;
- to give to the authorities, as soon as possible, the best recommendations for people and environment safety.

All the stakeholder test all parts or some parts of their own organisation, during the year.

National crisis exercise enables them to validate their models and to improve the communication between all the actors, which is one of the main key of the crisis management.

An adapted organisation helps reducing the consequences of an hypothetical event to protect people and environment, which is the aim of nuclear safety and radiation protection.

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[i] SDIS : Service départemental d'incendie et de secours
[ii] CMIR : Cellule mobile d'intervention radiologique
[iii] DDSC : Direction de la défense et de la sécurité civiles
[iv] COGIC : Centre opérationnel de gestion interministérielle des crises
[v] MARN : Mission nationale d'appui au risque nucléaire
[vi] DGSNR : Direction générale de la sûreté nucléaire et de la radioprotection
[vii] IRSN : Institut de radioprotection et de sûreté nucléaire
[viii] SGDN : Secrétariat général de la défense nationale
[ix] PSS-TMR : plan de secours spécialisé – transport de matières radioactives
[x] CEA : Commissariat à l'énergie atomique
[xi] CODIS : Centre opérationnel départemental d'incendie et de secours
[xii] ZIPE : Zone d'intervention de premier échelon
[xiii] EOT: Echelon opérationnel de transport