Consignor's Part and Multimodality of the Packages of RAM

M. Grenier

Commissariat à l'Energie Atomique, Institut de Protection et de Sûreté Nucléaire, Département de Sécurité des Matières Radioactives.

I HISTORICAL ASPECTS

Already in 1961, for every package, the tests, as they were kept until now, appear without consideration of the foreseen transport mode, not in the regulations themselves, but in the "Notes on certain aspects of the Regulations" (SS07) under the signature of M. GRANGE about the "most severe possible accident" which itself does appear in SS06 Regulations.

In 1964, these tests became regulatory. They were then, multimodal.

In 1968, it can be read in the conclusion of an Euratom Report (EUR 3485, 1988) about the tests required for type B packages in Regulations SS06 : "It is eventually stated in the present study that, from the carried out assessments, come out no criteria or tests asserting themselves instead of one of the tests taking place in the Regulations".

In 1976, M. BROBST in his introductive speech to the symposium which took place in Vienna in August 1976, was wondering whether the time has not come to set up better adapted tests (he quoted in particular a possible crush test) but insisting also on the opportunity to avoid what A. FAIRBAIRN called "testamania".

In 1977, the advisory group meeting in Vienna from 28 March to 1 April, under the chairmanship of M. BROBST, arrived however to this conclusion :
Although the current tests are certainly less severe for air transport conditions than for the three other modes, it seemed necessary to continue to keep only one set of tests for all the transport modes.

In May 1978 in Las Vegas Symposium, several papers were given about modal aspects, and among them : the one by Rhoads et al. who pointed out research fields like :

- Investigation of the probability that a ship carrying radioactive material will be involved in an accident at sea.
- Analysis of the response of shipping containers to the accident forces and the stresses present in ocean environment.
- Behaviour of radioactive material in the ocean and its transport to man from the latter.
- Design of shipping packages to withstand the accident forces in the marine transport environment.
- Studies to reduce the exposure of containers to accidental conditions and for possible recovery.

That was also the time of manufacture and presentation of specific packaging for air transport of Pu, as a

following of the American law of 9 August 1975 (Scheuer Amendment) which forbade air transport of Pu, until the development of a packaging withstanding an air crash and the time of regulations Nureg 360, as we were reminded by M. Mc LURE and LUNA in Washington in 1989.

In 1979 the Technical Commitee TC 272 of AIEA proposed a crush test but without questioning the multimodality of packages, as the criteria of applicability depended only upon the package itself and its content.

Eventually, IAEA regulations of 1985, with the exception of one or two requirements on pressure and temperature conditions on packages for air transport, stayed in line with the general principle of multimodality (Fig.I). If for instance they required that the packagings for spent fuel withstand a water depth of 200 m it was without explicit consideration of the transport mode.

So, the IAEA Regulations kept until now the multimodality of tests representing severe accidental conditions.

II RECENT EVOLUTIONS

Nevertheless, the growing care of protection of the environment and the possibility of more important and frequent transport of large activities of radiotoxical nuclides has brought again, since 1985, the problem of severe and unlikely accidents and in December 1988, took place in IAEA, the first Technical Committee on this subject. This process is still in evolution, but the result will probably be specific tests above certain limits of mass or activity, for packages transported by air.

This represents the evolution which is occuring in the framework of IAEA.

In another connection, in 1987 in the frame of IMO, some maritime Trade Unions and some States put on the floor the question of carriage of spent fuel on board ships without special features and proposed to require in that case more or less specialized ships.

What is common in these two attitudes is the questioning of the adequacy of accidental tests of SS06 in two particular cases : the crash of an aircraft, the fire and wreck of a ship, but many aspects are different in them.

It seems interesting to analyse these attitudes and the proposed solutions in regard to the principles of IAEA Regulations and from the point of view of the consignor.

In the case of air transport the probability of accident is extremely low. It is obvious that air transport with its human implications and the catastrophic character of any severe accident, presents the greatest safety that it is possible to obtain.

The only way to go further is therefore to act on the packaging, referring not to the global risk which is already very little, but to the resistance and measures against an assumed occurred accident. That was discussed at length in Vienna.

Some people think that the safety of the maritime case is different for two reasons :

1) it is not absolutely sure that the tests are not adequate,
2) it is almost certain that the safety of some ships can be improved.

If it is assumed that a package, in line with SS06 will not withstand certain maritime fire, it is possible in principle either to improve the package or to improve the ship, in order for example to lessen the severity and the probability of a maritime fire.

In this condition, let us see what possible directions are to be taken.

III THE POSSIBLE FUTURE DIRECTIONS

A) Packagings

We have seen that it is foreseen to require more severe tests for air transport. Let us assume, for a time, the requirement of more severe tests for maritime transport.

Now, the packaging will not depend only on its content, as is practically the case at the moment, but also upon the foreseen transport mode.

Several ways are possible :

1) A hierarchy of the modes, coherent in every accidental characteristic, i.e, with a similar gradation, in every field of tests and also the consideration of the same fields of tests for each transport mode.

For example, starting from the most demanding : air, sea, rail, road that means that all the criteria of acceptance of an air package are higher than all the criteria of a sea package, and so on...(Fig. II)

2) Accidental tests with a different hierarchy in each mode, or even different tests. For example a more severe impact for air transport, a longer fire for sea transport.
It is obvious that the first of these ways still allows the control of the global safety of the transport by the package (it is sufficient to forecast the most demanding possible mode).

The second way no longer allows it : a package design for rail transport will no longer be able to be used, in the general case, neither by air, nor by sea (it will not, indeed, present a sufficient resistence to impact, in the first case, and not a sufficient withstanding to fire, in the second case) and a package designed for air transport will not be allowed on sea : it will be indeed insufficient in case of a fire of long duration (Fig. III).

B) Conveyances

Let us consider now a safety grounded at least partially on the mode of transport.
The intention is to improve the safety. Therefore, obviously, the transport mode has to add its safety to the packages one, not to replace it.
In the practice, we know that specialized ships are currently used in transport of irradiated fuels for example. But a short experience shows us that bringing this practice into the regulations is very much more complex. The efforts made these last years in IMO, involving almost all the subcommittees, outside the dangerous goods one (Fire protection, Design, Stability etc...) show it clearly. It is indeed more difficult to define a safe ship than a safe package, for many reasons, and overall to give to a ship requirements of result as it is the case for a package.

Anyway the consequences of regulatory use, i.e, compulsory use in some cases, of purposely designed ships, are heavy for the consignor and perhaps not only for him.

SETS OF MODAL REQUIREMENTS FOR PACKAGES

FIG. I

CURRENT SITUATION

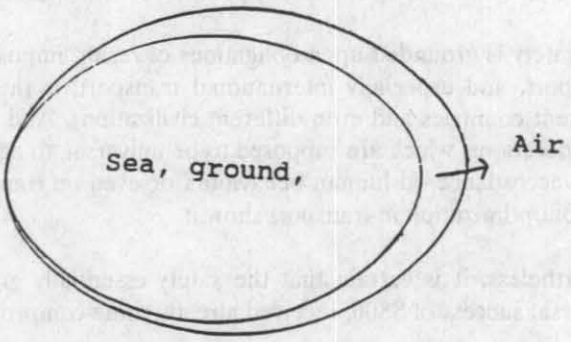


FIG. II

GRADUATED MODALITY

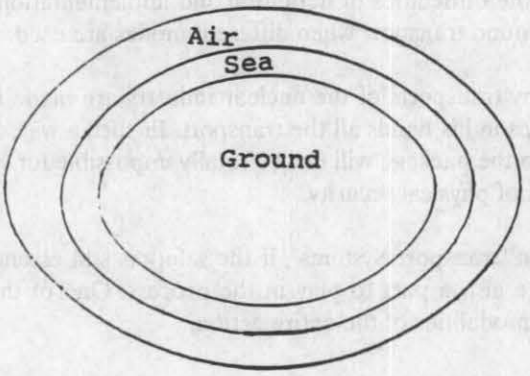
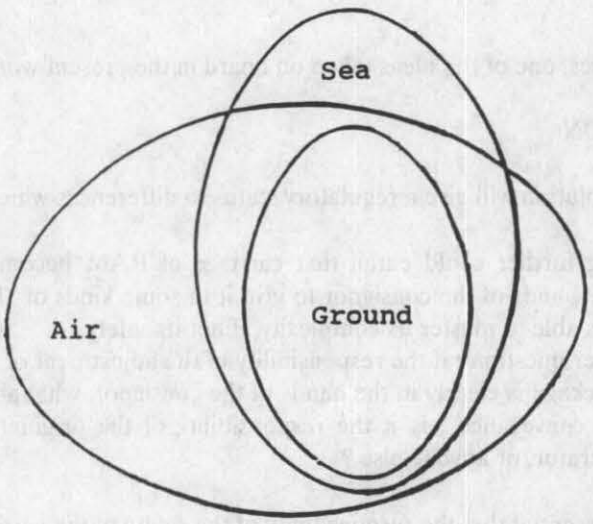


FIG. III

UNGRADUATED MODALITY



IV CONSEQUENCES FOR THE CONSIGNOR

The classical safety, in previous and current SS06 is essentially grounded on the package safety.

That means an action which is placed as near as possible of the material we have to protect against, the more possible "up stream" in the entire operation of carriage, based on as scientific and objective as possible criteria, by the operator who knows (or is supposed to know) the best the involved material, the consignor. Actually, he is the only one in the position of really knowing it.

The safety is grounded upon obligations of result, imposed, in advance, to the carried object. In such a way, transport, and especially international transport, is the movement of an object, inherently safe, through different countries and even different civilizations. And it is certainly less difficult, on the basis of scientific considerations, which are supposed to be universal, to agree on the material performances of a thing, than to be in accordance on human behaviours or even on transport mode, as perhaps the present debates on the part of optimization in transport show it.

Nevertheless, it is certain that the safety essentially grounded on the package, which made possible the universal success of SS06, received already some compromises.

On of them is the concept of exclusive use, giving to the consignor (or sometimes to the consignee) the control of all the carriage.

But we know the difficulties of definition and implementation of exclusive use in maritime and air transport and even in ground transport when different modes are used.

However, many transports of the nuclear industry are made in exclusive use, and often in this industry, the consignor keeps in his hands all the transport. In such a way, adapting either the package to the conveyance, or the mode to the package will not be totally impossible for him. Besides that was already often imposed by considerations of physical security.

In the foreseen "transport Systems", if the safety is still essentially grounded of the packaging, the transport mode will have also a part to play in the process. One of the conditions is that the consignor has a good control of the modalities of the entire action.

But what about the use of public transport ? We have seen that, if we have no more a complete intermodality we must keep compatibility ; we have to keep in mind that SS06 were aimed at the use of this transport for the shipment of radioactive materials. There must be a level in activity until which that remains simply possible.

That was, besides, one of the ideas taken on board in the present work of IAEA.

V CONCLUSION

The present evolution will give a regulatory status to differences which often already exist in the real world.

However, going further could entail that carriage of RAM becomes rather difficult, or that it could be retired from the hands of the consignor to give it to some kinds of "Travel Agencies for RAM", which could be the only ones able to master its complexity, if not its safety.
That sets another question : if the responsibility of the adjustment of the packaging to the content and of the safety of the package is clearly in the hands of the consignor, what about, for example, the adaptation of the package to the conveyance : is it the responsibility of the original consignor, the captain of the ship or aircraft, the operator, or anyone else ?

It is obviously essential that the responsibility of the safety of the carriage remain in the hands of one person,

and it is really difficult to imagine that he could be somebody else than the consignor.
In a different field, but in close relation with our problem here, we may recall that from the insurance view point, one of the essential principles of Paris and Vienna Conventions is what we call in French the "canalisation" of the liability on the consignor.

In conclusion, it is certainly wishable and likely unavoidable, to improve the safety by consideration of the transport mode, in addition to the packaging, but we have to be conscious that the price to pay for it is for the consignor, a much larger and more complex part to play at least in the case of large quantities and activities.

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