What Isn't Working and New Requirements. The Need to Harmonize Safety and Security Requirements

D. Flory

Department of Nuclear Safety and Security, International Atomic Energy Agency (IAEA)

Abstract. This paper sets out the key issues for consideration at the transport conference. It will introduce each of the aspects of the framework for safe, secure and sustainable transport, building on the description of the existing situation presented in Session 1A. It will discuss purpose of the IAEA framework, and examine the scientific basis, the IAEA recommendations and requirements, the UN interface, the use of conventions, national implementation, industry compliance, communication and information, response and restoration. It will also look at the activities and related requirements outside of transport which could influence the transport frameworks either in a positive or negative manner.

1. Historical Perspective

The year 2011 marks the 50th anniversary of the publication of the first regulations governing the transport of radioactive material by the IAEA. However transport safety at the IAEA obviously predates this, since the regulations took time to develop. GC. 1/1 [1] contains some interesting references to the safe transport of radioactive material, recommending in paragraph 98 "The Agency should undertake studies with a view to the establishment of regulations relating to the international transportation of radioactive materials. In particular the Agency should obtain information on, and consider the formulation of regulations governing the international transport of radioactive materials…". This recommendation could almost be expected, but looking in more depth we see in paragraph 35 "The transport of radioisotopes and radiation sources has brought to light many problems and involves the need for uniform packaging and shipping regulations …The Agency may find it desirable to study these problems in relation to questions of international transport in consultation with other international organizations concerned…". This paragraph goes on to note the particular problems of shipping short lived radio-isotopes. This is followed in paragraph 92 where it says "the need to …facilitate the acceptance of such materials by sea and air carriers." and a further recommendation in paragraph 40. This conference reiterates the challenge given in GC. 1/1 through the sub-title "The next fifty years – Creating a Safe, Secure and Sustainable Framework".

Looking back at GC. 1/1 we can see that the sustainable framework was a goal in 1957, in other words a world where radioactive material could be transported should it be desired. Essential tools to providing sustainability were harmonised packaging and shipping standards. It was also obvious that these standards should provide adequate safety. Since these early days we have added to safety the need to ensure adequate security. However we still see the same calls today to eradicate denial of shipment, which might suggest we have not progressed. But this is not true – we have today well established requirements for safe transport of radioactive material, and the recommendations for security in transport are coming of age for all radioactive materials (being well established for nuclear materials). The outstanding issue would seem to be harmonisation, not just between safety and security in IAEA documents, but also harmonisation between safety and safety and between security and security between Member States.

2.   The Framework

The terminology used for this conference is "framework". What do we mean by this? Some might see this as regulatory systems, however paper does not make transport safe or secure, items and activities are also important. The framework has many building blocks. At the conference we want to identify the building blocks of a safe secure and sustainable framework, for each of them share openly our desires goals and visions, and together agree for each in turn how we should work to bring about an end point that respects all of our positions., such that we can deliver the harmony that will produce the required safety and security worldwide, and ensure sustainability (that denial is no longer a term of relevance).

2.1.   The elements of the Framework

Such a framework is complex and made up of many interacting parts. Some suggestions as to the major parts are set out in this paper, but perhaps producing a harmonised view of the building blocks is the first challenge faced.

The framework can be seen as building on a scientific basis, taking account of our interpretation of the world, and perhaps our principles for developing adequate controls. On top of this we have several areas of work producing requirements or recommendations within the IAEA most obviously safety and security. However there are other areas of work within IAEA such as response, but at this point it is perhaps best to focus on the framework that expects normal safe and secure transport, and is designed to ensure this safe and secure transport. Building on top of the IAEA output are the other UN bodies. Their work is then supported by international conventions. These conventions provide for national implementation of the modal requirements that are based on IAEA text. On top of this it is important to note that there must also be compliance with the national requirements. Response, recovery (liability) and communication are aspects that cover all aspects of this framework.

2.2.   The overall Framework

It is easy to look at each item in turn, but it is worth noting that it is senseless working hard to achieve harmonisation of safety and security at IAEA if this is not propagated through each level even up to the point of industry implementation. In addition to this it is important to note that the improved openness and transparency ensures that the end users have a voice at the early stages of the process, in other words industry provide advice based on experience when IAEA develop requirements and recommendations. Without any of the building blocks we fail to achieve a safe, secure and sustainable framework, and each participant needs to ensure all of the building blocks function in the best possible way. In other words the development, maintenance and implementation of this framework is in the interest of governments, regulators industry and end users alike.

Perhaps a final issue with the framework is that it is a framework for the world. The reason for this is that transport is truly international in nature, as some of the other papers in this conference will show. It is important that the framework takes into account the needs of all parts of the world, and not just the current major producers of radioactive material. In essence this is a world framework, a framework everybody can work with.

3.   Where can the Framework be improved

Earlier papers in the conference have introduced the situation we are in now. This paper looks at some of the building blocks and points to issues that may be important to achieving this world framework. Some of these issues will be explored in later papers. In addition there are outside influences that influence the framework. For example the provisions of the Basic Safety Standards [2] are important to both security and safety provisions for transport. It is important to identify these influences and ensure that an appropriate interface is developed. In some cases it is important to be aware of external influences, in other cases it is important to provide active response to other areas of work. Nowhere is this more important than in the area of the scientific basis for provisions.

3.1. The current scientific basis

There is scientific work underpinning the framework. Much of the scientific basis rests in something called the Q system, developed many years ago. This system backs safety, security, response and to some extent liability. However science is an ever progressing subject. "As I've told you before, in a job like yours, even when it's finished there's always one more thing to do."[3] is a famous quote from a film, and this applies to science. How do we ensure that the science underpinning everything remains acceptable today given that science continues to move on? In the realms of safety this is achieved through regular review of public information that can be used to validate the science. In the area of security this can be harder to achieve in an open and transparent manner. However, to the extent that security leans on safety modelling this helps ensure validation of the science behind security in a transparent manner.

One question that is open for discussion currently is *what is the indicator that shows it is time to reinforce the science, or even to rework the complete area*. The answer is obviously when the science no longer assures a safe and secure framework. Understanding what is safe and secure is the difficult proposition. What process can we use to agree on this?

3.2. The standard transport conditions assumptions

There are standard assumptions underpinning the framework, such as the frequency of transport accidents and the energy they result in being imparted to the packages carrying radioactive material. Some of these assumptions are worldwide in nature, but we know that in reality the world is variable, and the risks and threats vary across the world. Safety ensures these are acceptable through regular review, and perhaps by leaning more on the principle of precaution rather than the principle of prevention. Threat assessment forms a key part of security under the current framework. To what extent can operators be isolated from this in order to have a harmonised system for operators? Would working closer to precautionary principles assist in this?

3.3. Fundamentals for safety and security

A later paper looks at the different fundamentals in some detail. The security fundamentals are to some extent more fixed than those of safety, since they have roots in convention text. Can they be harmonised in some way (and the easier option here would be to consider whether safety could adopt fundamentals closer to those of security)?

A primary difference between safety and security is that the main wrongdoer differs (the "bad guy"). In safety the focus is mainly on the operator, while in security the focus is more on the outsider. For this reason security brings in the state as a player, with a responsibility to protect the operator. Given this key difference can the core fundamentals ever be truly merged, or is it more important to maintain clear differentiation to show the essential differences in safety and security?

Perhaps an option is to start in reverse. At the operator level safety and security in transport have been combined for a long time. In many governments we are seeing combined regultors forming, and some later papers will look at this. If we analyse this and work back to the fundamentals, what could we achieve?

3.4. Safety requirements

One of the key reasons the IAEA transport regulations have been so successful is that they are written in the form that can be applied almost without change – i.e. they are model regulations. Although a new format has been devised for safety standards it has been decided not to apply this to the transport regulations, since it could be detrimental to continued implementation. But are there other changes that could be considered.

The regulations have been developed over 50 years, and the result is a heavily cross reference document. To what extent can it be revised to maintain the same principles, but set out in a clearer way? Are there ways in which the regulations could be altered to make their uptake easier in states developing an industry that uses radioactive material – some suggestions have been made regarding specifications for packages rather than purely performance standards. This reverts to some of the methods that existed in the early editions of the regulations. Was it wrong to remove these options as we developed the requirements, have the 20 or so states that develop the requirements failed to take proper account of the other IAEA Member State's needs. A crucial change needed at this time would seem to be the involvement of more Member States in the process of developing the transport regulations.

3.5. *Security recommendations*

There have been discussions over safety standards placing requirements on states, and security places even more requirements on them. Does this suggest that we have a need to differentiate the target audience for documents between state and operator, or does this suggest there is a mezzanine level between security fundamentals and security recommendations for the operator? To enable the merging of safety and security as it moves into the other UN bodies the identification of operator requirements in security is important.

Transport is of course an area where security has been important for a long time. The ability to place explosives on an aircraft or the ability of removing radioactive material from an aircraft requires similar security gaps. Security is handled differently for different modes, much more so than safety. Can the security of radioactive material in transport lean on the security provisions provided by the modes? If so, more prescriptive text may be important.

3.6. *UN modal bodies*

There are cross cutting issues between IAEA and other UN bodies, however the ultimate goals are the same. An example is the need to provide documentation to a pilot to inform him of any dangerous goods on an aircraft. It is obvious that there is a benefit in having one format for all dangerous goods, and not different forms for different materials. The UN "Orange Book" [4] is written as model regulations for all dangerous goods, and is written with the goal of achieving harmonisation across the modes (and the different classes of dangerous goods where possible). This book sets the format for dangerous goods documentation for all modes. However, the full detail may not be required by the pilot of an aircraft (partly because of the need to react quickly in this mode), and so in air transport there is a modal variation that allows extracts to be provided to the pilot. On the other hand the specific details that are important for radioactive material are within the competence of IAEA.

There are common requirements, there are two way interfaces, and there is a need for harmonisation. One key question is how we let Member States decide once on an issue, and don't revisit the issue in another UN body. In terms of the IAEA, were the UN Orange Book to create the ability to share information in electronic format should this require the IAEA to carry out a revision to its safety and security documents (including establishment by the Board of Governors), or is there a more effective way to work?

To date the IAEA has been seen as providing input to the UN process. However, as identified under the security recommendations, there may be provisions in other UN bodies that offer benefits to transport safety and security for radioactive material. The IAEA uptake of UN concepts has not been as rigorous as it could have been. Indeed the other UN bodies introduced security requirements for the transport of radioactive material before the IAEA issued its recommendations. Is there a process to simplify the interface, perhaps through co-sponsorship, or some other cooperative mechanism?

3.7. Conventions

International conventions are in place for air and sea, with very wide coverage. These conventions require states to implement regulations for international transport which are essentially identical to the IAEA safety and security documents (as they apply to operators). This is one of the most important parts of the framework in terms of ensuring world harmonisation. But the conventions for land transport are sadly limited in take up. Conventions exist for road [5] and rail [6] transport, but these are mainly concentrated around Europe where they started. This is the obvious shortcoming in this area. How we encourage greater take up of these conventions is a question that needs to be addressed.

3.8. National implementation

Many states implement requirements for the transport of radioactive material, both for safety and security. But how do they advertise the standards they apply. In aviation states are required to identify any variations they have from international requirements. Industry often indicates that this assists them in ensuring transport is not interrupted. This does not exist for other modes. Should IAEA maintain a register for radioactive material, or should other modal bodies be encouraged to adopt the aviation practice?

But advertising the standards applied in a state is not simply for the benefit of industry. Transport is a global business. How does a transit or destination state know the standards that were applied in the state that a shipment came from? If an emergency is declared during transport how would a responding state obtain assurance of packaging standards? One way that IAEA can assist Member States in broadcasting the standards they apply is through reviews and appraisals such as TranSAS. Similar missions can be offered for security, however the ability to use the results to provide information to others is limited, since identifying safety failings in a public document is possible, but not so security failings.

3.9. Industry compliance

Taking the issue of third party assurance further, how can a state be sure of the compliance of industry from other states? While security requires confidentiality of communication this security provides benefits, in that where such assurance is necessary it can be available. However in all cases states have a role to play and improved interfaces between states, possibly through networks of some kind, offer opportunities to understand compliance standards in other states. Further papers in this conference will explore that area.

A much more difficult aspect is for industry to understand the compliance record of other parts of industry. The industry that transport nuclear material are proud of their record, however the vast majority of shipments of radioactive material are carried by general carriers and the good record rightly has a lot to do with them. How does this general cargo industry know that the radioactive material packages it is being offered are compliant with international requirements? Is there a third party accreditation scheme available, or perhaps a known or quality shipper scheme? Indeed could such a scheme offer benefits for consignors by enabling faster handling of quality assured shipments?

3.10. Response

Without a doubt this is an area under current scrutiny, although not generally in the transport area. However, there are differences between IAEA provisions and modal provisions, particularly in relation to response to emergencies that are not transport related. Some work has started on this in relation to contaminated persons that need to be transported, however further work on general cargo and emergency shipments could be an advantage.

This is also an area where safety and security need to review the interface. Modal requirements often provide a security based exemption for transport, including for radioactive material. Likewise, the safety conditions applicable when exercising the security exemption is an area of essential interface. In

general it seems that an important area of work here is to cooperate with other UN bodies at incorporating effective provisions in IAEA documents.

3.11. Liability

Liability or compensation regimes tend to be wider than simply the transport of radioactive material. For example there is a convention on compensation related to dangerous goods transport (although this has very few signatories), there are nuclear liability conventions that cover the transport of nuclear materials (but exclude many radioactive materials), and there are modal conventions for other dangerous goods. Papers at the conference will open these areas for discussion. Do the existing compensation regimes that cover radioactive material compare well with other similar regimes? Does the lack of a focused regime cause problems for the shipment of radioactive material? In this area it seems that international interest is hard to achieve even when the scope is broad, and it would seem unlikely that transport of radioactive material would be a viable stand-alone compensation area. The result of this is the main question would seem to be how transport of radioactive material issues can be adequately represented in the development of the existing regimes.

3.12. Communication

This is perhaps not a specific building block, but an issue that covers the entire framework in one way or another. In many places the communication between different players in the framework has been highlighted as being essential to having an effective framework. This also extends to the operational aspects of transporting radioactive material. Communication is important. In some states it could be argued that the trefoil on packages is an important communication mechanism in relation to human rights, in that a person close to a package should be informed that they are being exposed to radiation.

At present a graded approach exists informally between some states, with large maritime shipments being subject to confidential information sharing. There are questions as to whether this could be formalised in some way, and perhaps the nature of the safety and security provisions offers some guidance in terms of the graded approach, and in identifying information which need not compromise security.

It is clear that familiarity information should be widely available to workers and the public, and this might be seen as the duty of operators and of no relevance to the state. At the opposite extreme information might be seen as being exchanged state to state, certainly in the realms of security this would be the case.

There are difficult questions to answer in this area, for example which state is responsible for which particular area of international waters. The question as to who talks to whom provides the need to interface with safety and security provisions. For example, should a state be required to communicate information it will then be important to generate regulatory requirements for the state to be able to obtain the information without producing security concerns.

Perhaps the most difficult issue is that some communication is most likely to be state to state for the most significant shipments, and formalising this as requirements creates the need for an international body to be identified to adjudicate in disputes. Past disputes in this area have resulted in complications over adjudication.

As a result, if operational communication is to be formalised it would seem preferable to "piggy back" on existing agreements to avoid having to resolve issues that are not primarily related to radioactive material, but rather related to international transport. The search and rescue convention [7] provides an example of one such existing agreement.

4. Conclusions

The transport of radioactive material has an enviable record. This is all the more surprising if it is considered that transport is an activity that carries significant risk, or indeed threat. Estimates vary by mode and by country, but the number of people that die each year in transport accidents is of the order of a million, in 2002, an estimated 1.18 million people died from road traffic crashes [8]. The carriage of radioactive material does not contribute to this number.

The global picture of the transport of radioactive material is that it is normal (and if such a term existed perhaps one would probably say very normal) for transport of radioactive material to be uneventful. As a result it is essential that the provisions that are there to protect against the abnormal (the safety and security events) should be balanced against the need for normal transport. Perhaps the question should be asked as to whether an adequate balance is in place for all aspects of transport of radioactive material, or whether it requires re-examination. Again this comes back to the difficult question of defining what is safe and secure, and comparing our framework to this target. There seems no doubt that we currently exceed the target, the only question is by how much. This is not simply a question of whether provisions are excessive, but it is a question of being aware as to whether provisions are in risk of needing improved.

Perhaps the greatest risk we face today is that compliance is often achieved through respect for the regulatory system. If we agree to an acceptable system of provisions with the involvement of industry, and then do nothing when these provisions are adjusted by individual states or individuals within the transport industry then the risk of respect being lost exists. The "denial of shipment" issue is truly a safety and security relevant issue. It is incumbent on us collectively, if we establish a framework that we can all agree to, to ensure that we all work to ensure the framework is implemented by all involved.

To specify the changes desired to achieve this framework is the challenge given to this conference, and to put this in place is perhaps the challenge for the next ten years.

REFERENCES

[1]   REPORT of the Preparatory Commission of the International Atomic Energy Agency, NEW YORK – 1957.

[2]   BSS

[3]   FILM QUOTE "The Bridge on the River Kwai"

[4]   UN Orange Book

[5]   ADR

[6]   RID

[7]   SAR convention

[8]   World report on road traffic injury prevention :summary, World Health Organization Geneva 2004 ISBN 92 4 159131 5 © World Health Organization 2004