European ALARA Network

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European ALARA Newsletter

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Editorial

In the mid 90's the European Commission established the European ALARA Network to further specific European research on topics dealing with optimisation of all types of occupational exposure, as well as to facilitate the dissemination of good ALARA practices within European industry. This network is now established and has been operational and growing for over 2 years. Some of the more recent successes and plans for the future are listed below.

- Contact persons from the Netherlands and Norway have recently join the expert group in charge of providing guidance on the work programme of the Network.
- The Newsletter, issued every six months, now reaches a few thousand individuals or institutions and, since September 1997, has been available on a frequently visited Web site. The last two issues are directly accessible on the home page (do not forget to change your bookmark!), and it is possible to download the previous issues to your personal computer, to consult, print and duplicate them.
- The value of practical examples of lessons learned from incidents, as described in the first issues of the Newsletter using the UK IRID data base, has led other countries, eg Germany, Sweden, Spain and, in this issue, France, to provide such examples.
- The first European ALARA Network Workshop on ALARA and Decommissioning was held last December at Saclay, and allowed the identification of a set of recommendations to the European Commission (see issue number 4)
- After the success of this first Workshop, the European ALARA Network will organise a second Workshop in November 1998 on the NRPB premises at Chilton in the UK. This will be devoted to improving radiological protection practices in industry and research as it still appears that:

(i) most of the radiological accidents occur in this sector, i.e., in research and industrial uses of radiation,
(ii) a large fraction of the high individual occupational doses are in this sector, and
(iii) for occupational exposure to enhanced levels of natural radiation, there is relatively less assessment or control.

- A third Workshop devoted to ALARA and internal exposure is already envisaged for 1999 in Germany.

This 5th issue of the Newsletter gives us the opportunity to present some results of reviews of occupational exposure data from France and Spain. Comparison of such reviews can provide valuable feedback experience to identify priorities. However to achieve this the databases need to be well documented and comparable, especially in the categorisation of occupational activities and the dose ranges used.

This issue also allows us to review some matters addressed during two recent meetings in Washington and Dublin on exposure of aircraft crew to cosmic radiation. The explicit treatment of aircraft crew doses as occupational exposure is relatively new and an area of increasing interest. The doses are not trivial, the radiation fields are complex and the protection options are limited, therefore there are a number of scientific and policy issues that need developing to ensure that a coherent and consistent approach to radiation protection is taken in this industry.

Christian LEFAURE

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Exposures of Aircrew to Cosmic Radiation

D.T. Bartlett, J. Croft, NRPB United Kingdom

❑ Introduction

It is the holiday season and as we relax on a plane taking us to some far off holiday destination, the last thing on our mind is the increased radiation dose to us and aircraft crew from cosmic radiation due to the altitude and route of the plane. The existence of such exposure is not a new revelation, but as the implementation of radiation protection principles, particularly optimisation or ALARA improve, and dose distributions for conventional occupational exposure reduce, occupational exposure of aircrew to cosmic radiation takes on a higher profile. This subject was the focus of an NCRP meeting in Washington and an European Commission Meeting in Dublin. This paper briefly reviews some of the issues involved.

❑ Implementing the BSS

In the European context, it is perhaps the revised Basic Safety Standards (BSS96)[1] that are bringing the subject into focus, in that for the first time they explicitly address occupational exposure of aircrew to cosmic radiation. The requirements for the radiation protection of aircrew are separated from those for occupational exposure in general. A need for justification is not stated. There is the broad requirement to take account of the exposure of air crew whose dose might exceed 1 mSv per year, assess their exposure and inform the workers of the health risks. There are no explicit limits other than the dose objective to be applied to the ‘child to be born’. Similarly optimisation is not explicitly stated but there is the requirement to take into account the assessed exposure when arranging schedules with a view to reducing higher doses. Unlike workplace radiation exposure in general, there are no requirements for the designation of areas or categorisation of workers. The Expert Group established under Article 31 of the Euratom Treaty produced some recommendation that provide further guidance. In particular for those “whose annual dose is likely to exceed 6 mSv, record keeping in the sense of the Directive is recommended with appropriate medical surveillance”.

To those having to deal with the complexity of regulatory controls on the nuclear industry, this may sound relatively simple stuff. However the introduction of regulatory controls to a new sector where doses are not trivial and the protection options are limited and potentially costly, does pose some problems for this competitive global industry.

❑ Issues

To put the situation in perspective one needs to look at the distribution of doses. Those for the UK are shown in Figure 1. The grey bars on the chart represent the dose bands 0–1.0, >1.0–2.0, >2–5.0, >5.0–10, etc for category A workers. Overlaid on this is the estimated distribution of aircraft crew dose. This broadly falls into two groups, short haul and long haul aircraft crew with average annual doses of about 2 mSv and 4 mSv respectively. For comparison the UK data for 1996 gives the annual mean dose for all non-coal minery category A workers with non zero doses as 1.3 mSv. The comparable figures for nuclear power, nuclear fuel fabrication and general industry are 1.4, 1.5 and 0.7ÊmSv respectively.

Thus the aircraft crew doses are clearly of relevance. Importantly the upper end of the distribution for long haul puts some doses above 6 mSv and triggers consideration of dose record keeping and medical surveillance. This is already an industrial relations issue with some groups having a perceived need to treat all aircraft crew similarly. At over 100,000 in Europe this is not trivial.

BSS96 states “The conditions for the pregnant women in the context of her employment shall therefore be such that the equivalent dose to the child to be born will be as low as reasonably achievable and that it will be unlikely that this dose will exceed 1 mSv during at least the remainder of the pregnancy”. Over 50% of aircraft crew are female and thus the policies to be adopted by airlines and how they are practically implemented may be an issue both for the airlines in the costs of replacement crew and for the crew themselves in the possible loss of various bonuses.

There are significant differences between the exposure condition of aircraft crew and occupational exposure generally. At flying altitudes the radiation field intensity is predictable by latitude, time of year and part of solar cycle. Thus with the exception of rare solar events there is no risk of significant unexpected exposures. Thus the approach to assessing aircraft crew doses may be different. There is an emerging consensus that the use of personal dosemeters may not be necessary and that doses could be derived from folding staff roster information with estimates of route doses. The latter may be either an agreed average value for a given airport pairing and aircraft type, or be flight specific and would be based on measured values. These measurements and their interpretation are not without problems.

The radiation fields at flying altitude are complex and include greater ranges of radiation types and energies than in most of occupational exposure. In particular the fraction of absorbed dose which is deposited at high linear energy transfer (LET) eg, from neutrons and protons is much greater. Typically this accounts for 30 to 60% of the dose compared to about 2% for UK category A workers. Significant effort has been put into characterising these radiation fields but there are still some issues on which there is not yet a consensus. These revolve around whether the quantity to be used should be ambient dose equivalent or effective dose and if the latter the magnitude of the radiation weighting factor to be applied to the proton component. Depending on altitude these differences can be between 20 to 50%.

The protection options are limited; eg, reducing individuals flying hours, ‘dose sharing’ by rotating the crews on the higher dose routes, reducing altitude, or use lower latitude routes. All these options would produce operational problems which ultimately translate into higher costs. Also some options might result in more crowding of the airlanes and an increased risk of an accident.

❑ Summary

Overall the points identified above have indicated that there are a number of scientific and policy issues that need developing to ensure that a coherent and consistent approach to radiation protection is taken in this global industry. There are also broader issues of the acceptance of levels of risk and comparisons with approaches taken to other occupational exposure routes.

❑ References

1. *Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the changes arising from ionising radiation. Official Journal of the European Communities L159, Vol 39, 29 June 1996.*
2. *European Commission; Recommendations for the implementation of Title VII of the European Basic Safety Standards Directive (BSS) concerning significant increase in exposure due to natural radiation sources; Radiation Protection 88, 1997.*

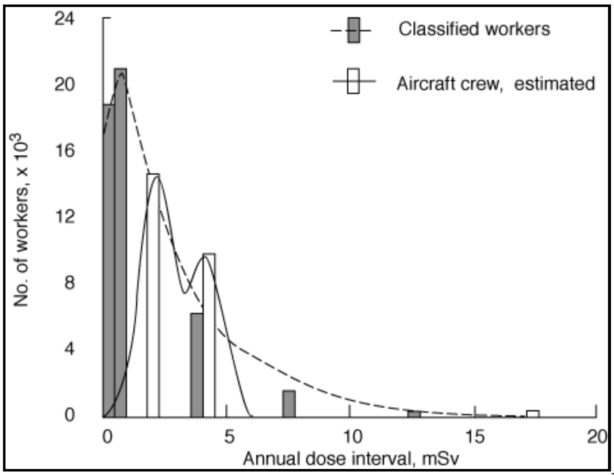

Figure 1. Annual doses of classified workers and aircraft crew

Dose Distributions in France and Spain

In many countries, such as France and Spain, the official individual occupational dosimetry is provided by several approved dosimetry services. At a national level there is a need to have an adequate database to enable regular follow up and analysis in such a way as to ensure that individual dose distributions are not inequitable within each occupational activity as well as in comparing one activity with the others. Obviously, these databases are also important tools in order to assess the effectiveness of efforts to maintain doses ALARA and reduce inequity. The papers below describe the national situations and experiences in both countries and propose improvements for the future. One lesson learned from the attempt to compare these two national situations is that an in depth knowledge of the dose accounting rules, as well as of actual practices, is necessary. For example it is interesting to note that the situations in the non nuclear industry are quite similar, but further information would be necessary to explain the differences in the medical sectors between these two countries.

The studies have been carried out in Spain by the CSN (the Spanish Nuclear Safety Council) and in France by IPSN (the French Institute for Protection and Nuclear Safety) and OPRI (the French Office for Protection Against Ionising Radiation). Both analyse the breakdown of occupational doses received in 1995 in the medical and industrial sectors.

Dose Trends in Spain (1989-1995)

A. Hernandez, A. Martin, I. Villanueva, CSN Spain

In Spain all approved dosimetry services are required to send monthly, biannual and annual summaries of doses reported for classified workers (for both categories A and B) to the National Centralised System of dose records (BDN) which has been developed and is run by the Nuclear Safety Council (CSN). The CSN is the Spanish Regulatory Authority empowered to deal with all nuclear safety and radiation protection matters, to authorise and inspect regulated activities and to enforce the legislation and regulations. One of the key reasons for the Nuclear Safety Council to develop the BDN was to provide a useful tool to aid the radiation protection of the exposed workers and in particular:

- to centralise and keep safe radiation dose records,
- to improve the surveillance and control of exposed workers by the CSN,
- to perform statistical studies on exposure trends in different occupational fields, eg. nuclear power plants, medicine or industry, to identify areas of potential concern with respect to the implementation of ALARA, and
- to support the development of epidemiological studies.

It can be seen from Table 1 that annual average doses have decreased between 1989 and 1995 for all activity sectors except for nuclear power plants and industrial radiography. Although the number of exposed workers increased during the same period the collective dose decreased.

Table 1. Selected Spain occupational data for 1989 and 1995

OCCUPATIONAL CATEGORY	Total number of workers		Average annual individual dose (mSv)		Collective dose (man.Sv)		Number of individual dose > 20 mSv	
	1989	1995	1989	1995	1989	1995	1989	1995
Medical Sector	**37750**	**56570**	**0,86**	**0,55**	**47**	**27,4**	**90**	**22**
Diagnostic Radiology	33036	41583	0,82	0,53	24,4	19,7		15
Radiotherapy	1041	1614	0,91	0,57	0,9	0,9		1
Nuclear Medicine	924	1546	1,93	1,35	1,6	2,0		1
Dental Radiology	1294	4631	1,29	0,60	1,6	2,1		2
Other	------	7196	-----	0,42	-----	2,7		3
Non-Nuclear Industry	**3031**	**5070**	**1,6**	**1,3**	**5,3**	**5,6**	**17**	**13**
Radiography	650	440	1,10	2,46	0,6	0,7		0
Gammagraphy	169	327	4,52	2,59	0,7	0,7		4
Process control	672	1871	1,58	0,99	0,9	1,6		2
Metrology		350		1,32		0,4		0
Manufacturing		1045		1,14		1,1		0
Other		1037		1,26		1,1		7
NPPs	**10807**	**8765**	**2,7**	**3,1**	**20,6**	**16,0**	**88**	**93**
Fuel Cycle	**757**	**807**	**1,2**	**0,3**	**0,6**	**0,1**	**0**	**0**
Research/Transport	**------**	**4778**	**------**	**0,7**	**------**	**2,7**	**-------**	**4**
TOTAL	**52345**	**75990**			**73,5**	**51,8**	**195**	**132**

Source: CSN

In order to correctly interpret the data concerning nuclear power plants for the year 1995, attention must be paid to the fact that during this year one Spanish Nuclear power plant carried out important design modifications. However, it is also interesting to notice that in 1995 the percentage of exposed workers exceeding 20 mSv in a year is only 1%. The medical sector contributes just over half the collective dose. In this field, there has been an important reduction of the number of exposed workers exceeding 20 mSv in a year. The major success has been in the diagnostic radiology mainly after Spanish legislation introduced in 1991 and 1995. This provided new regulations in order to improve quality control methods and optimise the protection for medical exposures (as for example: design considerations of medical devices, requirements for radiation generators and operational considerations). In the non-nuclear industrial sector there has been also a reduction of the number of exposed workers exceeding 20 mSv in a year. The category of work with the higher average doses stands the industrial gammagraphy. There has been some improvement in this area but it still requires ongoing attention.

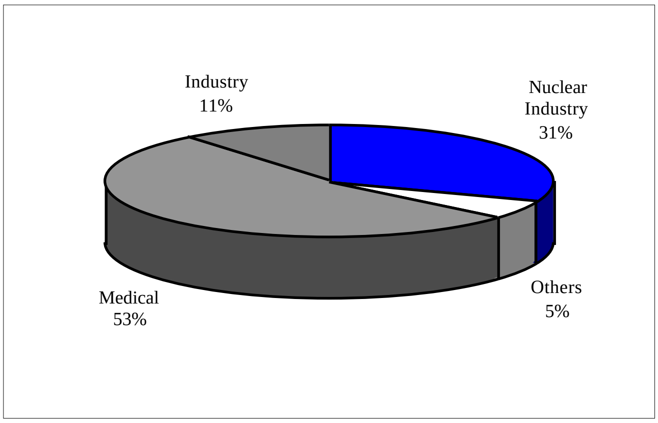

Figure 1. Sharing of collective doses by activity sectors (Spain, Year 1995)

Dose Distribution in France

Marc Champion et al., France
*(from an IPSN-OPRI Working Group *)*

In France, the monitoring of occupatonal doses is performed by several official laboratories (OPRI, LCIE, IPSN-LED, COGEMA, EDF, CERN, IPN, PHILIPS, SPRA), mainly in order to verify the compliance with individual regulatory dose limits. However, at present, it is not practicable to exhaustively re-distribute these data among precise activity sectors.

One reason is that many firms and people work in different places and for several industries during the same year or the same month. Another reason is that the activity is often unclearly identified when the dosimeters are sent to laboratories. Only the sender of the film (i.e. the employer) is easily identifiable.

An IPSN-OPRI working group has been set up by French Health Ministry to assess available data on monitored workers and also propose improvements in the knowledge of individual doses, especially by constructing a national classification of activities (see further).

The use of the national computing databases on occupational doses, such as those developed by large organisations, could be very useful to validate and improve this classification. For example, for the personnel working in the EDF nuclear power plants, the MICADO-DOSINAT operational doses recording system allows the recording of task-related individual and collective doses. In other respects, the DOSIMO « protocol », signed in 1997 by authorities and utilities from the nuclear sector, aims at solving difficulties in identification and follow-up of workers. It will necessitate a national classification of activities as well.

However, problems still remain. One of them is the difficulty in assessing internal doses incurred by workers (e.g. in the uranium mining and milling, enrichment-conversion, fuel fabrication and reprocessing plants). In other respects, the identification of the sectors where a special effort in dose reduction and optimisation is required depends on the quality of data collection, and would thus profite from any improvements (especially in the non-nuclear industry including the medical sector, transport of radioactive sources).

Table 2 displays 1995 occupational exposures results split up into large activity sectors; Figures 2 and 3 illustrate the relative contributions of these sectors in terms of number of monitored workers (category A and B), collective dose, and individual effective doses exceeding 20 mSv and 50 mSv per year.

Table 2. Number of monitored workers, collective dose, annual individual doses over 20 mSv and over 50 mSv by activity sectors (external exposures only, France, Year 1995).

OCCUPATIONAL CATEGORY	No. of Monitored Persons (category A & B)	Collective Dose (man.Sv)	Individual Dose > 20 mSv/y	Individual Dose > 50 mSv/y
1- Defence	6027	2.02	0	0
2- Medical and Veterinary Uses *(see detailed results in Table 3)*	132692	18.25	127	37
3- Transport of sources	*n.a. (item does not appear in French published statistics)*			
4- Industrial Uses	20943	15.47	120	9
5- From natural sources	*n.a. (often not monitored)*			
6- Military Nuclear Cycle	4796	0.53	0	0
7- Civil Nuclear Fuel Cycle - Utilities	33866	24.46	46	0
8- Civil Nuclear Fuel Cycle - Contractors	30537	78.40	614	0
9- Research and Teaching	17301	1.04	2	0
10-Non Identified Employers	4456	0.48	0	0
Total	**250618**	**140.65**	**909**	**46**

Source: IPSN & OPRI. Item 8: Operational dosimetry; other items: Regulatory dosimetry.

The comparison of the different data sources shows that the uncertainty on the number of monitored workers is about 10,000 individuals (for one half, employers are not identified). Uncertainty is mainly due to the lack of a national classification of occupational activities. For the same reason, some doses are not available in the French statistics because they are related to activities not clearly identified (eg. concerning the transport of radioactive sources). Some other items do not appear because of their novelty (eg. exposures from natural sources).

The average individual dose is very low (0.5 mSv/year) but it must be noted that a large number of doses are lower than the recording level (up to 80 to 90% of the monitored workers). However, particular occupational activities may lead to higher average individual doses (eg. 4 mSv/year for EDF contractors).

Therefore, our results show a large monitored population in which small groups of workers are actually exposed. A detailed data collection based on the use of a national classification of work activities will be of great interest to identify these groups.

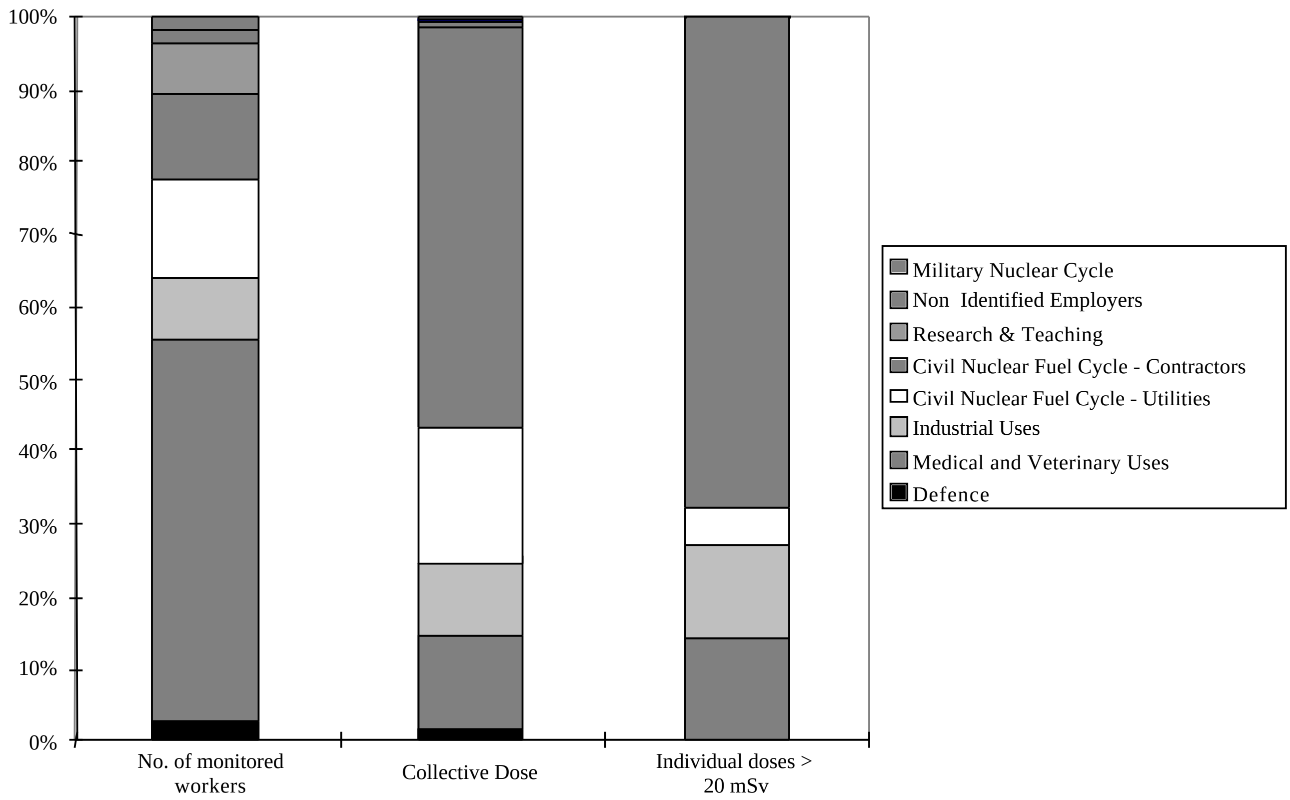

Figure 2. Relative contributions of activity sectors in the number of monitored workers, collective dose, and individual annual doses over 20 mSv (France, Year 1995)

In France, the largest component of the collective dose from occupational exposures is from the nuclear industry. Individual doses exceeding 20 mSv per year are mostly received by contractors from the civil nuclear fuel cycle (especially during NPPs maintenance).

However, this observation must not hide the fact that there is a very urgent need for optimisation in the other sectors. In this respect, it should be noted that all the cases of individual annual doses exceeding 50 mSv in 1995 occurred outside the nuclear industry: 37 cases in the medical sector, 9 cases in the non-nuclear industry. 1996 results confirm this point: 45 cases in the medical sector, 15 cases in the non-nuclear industry (see references for the OPRI 1996 Annual Report).

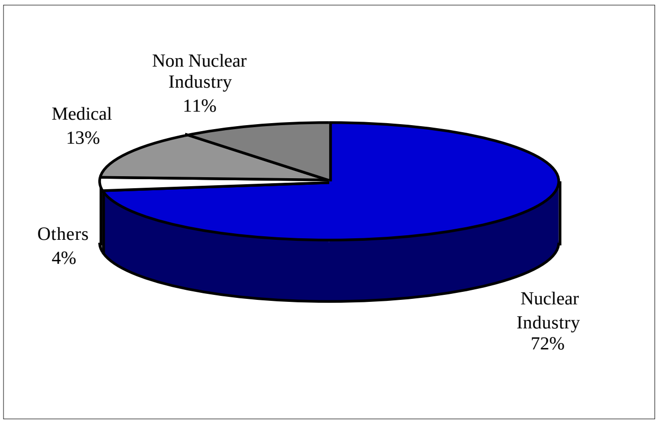

Figure 3. Sharing of collective doses by activity sectors (France, Year 1995)

Table 3. Number of monitored workers, collective doses, and individual doses over 20 mSv and over 50 mSv by activity sectors in the medical field (France, Year 1995)

OCCUPATIONAL CATEGORY	Number of Monitored Workers	Collective Dose (man.Sv)	Individual Dose > 20 mSv/y	Individual Dose > 50 mSv/y
Radiology	86607	13,0	104	31
Radiotherapy	8528	2,0	11	1
Nuclear Medicine	3998	1,5	3	0
In vitro unsealed sources	4669	0,09	0	0
Dental radiology	19759	1,0	6	3
Occupational Medicine	6172	0,39	1	1
Veterinary uses	2959	0,27	2	1
Total Medical & Veterinary Uses	**132692**	**18,25**	**127**	**37**

source: OPRI (Annual report 1995)

Conclusion

The routine and systematic collection of data on individual and collective occupational doses categorised by activity is a key tool to identify where the priorities are for dose reduction. However, the present system deserves improvements in four areas:

- relationships between employers, approved dosimetry laboratories and regulatory bodies must be formalised to provide a better identification of activities in which workers are involved,
- the classification of these activities must be done in co-ordination with employers, using a national and official classification (as detailed as possible: see Table 4 as an example),
- additional information such as the type of work contract (temporary, interim,…) , the type of exposure (internal or external, neutron), limits of detection, how lost dosemeters are dealt with etc., will be needed to improve data analyses,
- the centralisation of data by creating a national computing data base, would seem essential.

The improvement of the system is already underway and the reorganisation of radiation protection that is planned in France should accelerate this process.

Table 4. Proposed classification of occupational activities with potential radiological consequences

Occupational Activity Sectors (IPSN-OPRI's Proposal)	
1 - Defence	**6 - Military Nuclear Cycle**
11 - Atomic propulsion	61 - Installations
12 - Arms	62 - Weapons and engines assembly
13 - Health and Veterinary Services	
14 - Operation	**7 - Civilian Nuclear Fuel Cycle - Utilities**
15 - Industrial Control	71 - Mining and milling
16 - Natural Sources (Defence applications)	72 - Enrichment and conversion
	73 - Fuel fabrication
2 - Medical and Veterinary Uses	74 - Reactors
21 - Diagnostic	75 - Reprocessing
22 - Dental medicine	76 - Effluents, waste, recoverable materials
23 - Occupational medicine and dispensaries	-1. Effluents
24 - Operational radiology	-2. Waste packaging
25 - Therapy	-3. Intermediate storage
26 - Nuclear medicine	-4. Final storage
27 - Other medical uses	77 - Research installations
28 - Medical and veterinary research	78 - Maintenance staff from utilities
29 - Veterinary uses	79 - Others
3 - Transport of Radioactive Materials	**8 - Civilian Nuclear Fuel Cycle - Contractors**
31 - Military nuclear cycle	81 - Site maintenance and logistics
32 - Civilian nuclear cycle	-1. Works (non specific of control areas)
33 - Other sources (industry, medical…)	-2. Specialised works in control areas
	82 - Itinerant personnel
4 - Industrial Uses	-1. Mechanics and boilermaking
41 - Non-destructive testing	-2. Electricity, control, automatism
42 - Electron beam welding	-3. Civil engineering
43 - Radioisotopes production and packaging	-4. Chemistry
44 - Radiopolymerization and surface treatments	-5. Scaffolding, insulation, shielding
45 - Sterilization	-6. Drainage
46 - Radioluminescent painting	-7. Welding
47 - Crystallography	-8. Cleaning-up services
48 - Security control	-9. Plumbing, valves
49 - Geological detection - well logging	-10. Decontamination in situ
40 - Others	-11. Radiation protection
	-12. Dismantling
5 - Natural Sources	-13. Others
51 - Civil aircraft	83 - Inspection, regulatory and quality controls
52 - Spas	84 - Investigation after incidents or defects
53 - Mines and ores treatment	85 - Other contractors
54 - Occupational places with Rn	
55 - Oil and gas industries	**9 - Others**
56 - Processing/use of materials with Th, U, Ra	91 - Research and teaching
57 - Others	92 - Intervention after accidents

References

(*) « Bilan de la population professionnellement exposée. Rapport présenté par P. Hubert et A. Biau auprès du Bureau de Radioprotection de la Direction Générale de la Santé dans le cadre du Groupe de Travail Dosimétrie ». Note Technique SEGR 97-80.
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« La Dosimetria de los Trabajadores Profesionalmente Expuestos en España durante el Año 1995 - Estudio Sectorial »
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Prosecution Following a Contamination Incident in the United Kingdom

J. Croft, NRPB United Kingdom

Previous issues have included descriptions of incidents from the UK's Ionising Radiation Incident Database (IRID). The incident reported here is also listed on IRID but the text draws heavily on a publication, "The Radiation Protection Adviser", by the Health and Safety Executive (HSE) who are a co-sponsor of IRID. In the UK the term "Radiation Protection Adviser" (RPA) is used in place of the "qualified expert" referred to in the Basic Safety Standards. The RPA plays a key role in radiation protection in the UK and to foster this HSE produce a twice yearly newsletter "The Radiation Protection Adviser". This provides feedback from the regulators to the RPAs on topical issues including the more important incidents.

❑ Incident

This potentially serious contamination incident resulted from the poorly planned dismantling of four level gauges each containing a 3.7 GBq Am-241 source, and led to the prosecution of a disposal company by HSE. The gauges had been used in a major brewery and were safely stored at the brewery awaiting disposal. The sources were no longer covered by a Special Form Certificate and therefore needed to be transported in Type B containers.

"The Am-241 source assembly of each gauge was sandwiched between two stainless steel plates, attached to which were a shutter mechanism and mounting bracket. The radioactive material was incorporated within a thin-walled, stainless steel tube.

The company that was contracted to dispose of the sources brought only one Type B container to site. The contractor intended to dismantle the gauges on site and transport all four Am-241 sources in one trip. It was discovered that the source assemblies, which were each about the size of a 13-amp fuse, were fixed in place with adhesive. The contractor's employee prised them out of their housing using a screwdriver and placed them in the type-B container. The sources were damaged in the process. The work was carried out in the back of a small van in the visitors' car park of the brewery, adjacent to a busy main road. The van driver then went to a second location about 100 miles away to collect some more equipment for disposal before returning to base.

A few days later, it was discovered that both the container and the van itself were contaminated with Am-241. Subsequent monitoring revealed that the contamination was rather more extensive, and included other vehicles and properties. The company reported the incident and a detailed investigation commenced. The investigation showed:

- *the contractor did not discuss the job with the brewery or their RPA and had inaccurate information about the size of the gauges;*
- *alternative methods of work had not been considered;*
- *there was doubt about whether the available radiation monitoring instrument was capable of being used - when the specialist batteries of the radiation monitor were checked some days later these were found to be flat".*

❑ Prosecution

As a result of the investigation, the disposal company were prosecuted for three breaches of the Ionising Radiations Regulations 1985 (IRR85). A significant fine was imposed and the company were ordered to pay all costs in full. In total this amounted to some £35k, however the major cost penalty to the disposal operator is likely to be the costs of decontamination and the costs of disposal of the contaminated items. The RPA newsletters comments on the breaches of the regulations and the lessons to be learnt are given below, but first it may be useful to explain a few points about the relevant regulations. Regulation 6(1), Control of Exposure, is the main requirement of IRR85 that reflects ALARA. Under Regulation 25, Hazard Assessment, the employer has to assess the nature and magnitude of any reasonably foreseeable accident and to take steps to prevent any such accidents, limit their consequences and provide information instruction and training to restrict exposure. Part of the latter would be a contingency plan which must be incorporated into the employers local rules.

Regulation 6(1) Control of exposure

Alternative methods could have been used to transport the gauges without attempting to separate the sources from the plates, eg, partial dismantling of the gauges, using a second or larger type B container or making two journeys to transport them.

Regulation 11 Local rules

The local rules made no reference to method statements or contingency arrangements, nor did they provide sufficient guidance on the equipment which was needed by contractor's employees.

Regulation 25 Hazard assessment

The hazard assessment made by the company was rudimentary, gave no account to foreseeable accidents, nor was it based on the correct information about the equipment in question.

❑ Lessons learnt

Lessons to be learnt from this incident include:

- *equipment holding radioactive sources should, wherever possible, be transported with the source undistributed to suitable facilities before dismantling takes place;*
- *where removal of sources on site is unavoidable, close liaison between the companies (and their respective RPAs) should take place with a view to ensuring that adequate facilities are available for the work to proceed safely;*
- *local rules should clearly and unambiguously state what should be done (or not done) if conditions change during the work;*
- *contingency plans should be incorporated into local rules, made known to relevant employees, and practised;*
- *means should be provided for the checking of radiation monitoring instruments on-site before each use (eg, check source). Spare batteries should be carried with equipment.*

❑ *A radiography incident in France (Case no. 7)*

In February 1995, a team of two radiographers was executing the inspection of welds on a construction site, by night.

The equipment being inspected was an upright gas tank, with a diameter of 8m and open at both the bottom and the top.

This base was 1 meter above the ground on temporary supports, so that the radiographers could move easily from outside to inside of the structure. The weld to be inspected was at 10 meter above the ground which called for scaffolding and safety ladder.

The exposure device, containing 2,7 TBq Ir-192 was manually remote controlled from outside the base of the tank. For greater convenience, it was tightly fixed onto the scaffolding hand rail with a rope and 4 or 5 knots ! The 3 m projection sheath was positioned at the correct distance from the weld with a specially adapted rigid tool (2 magnets, each of 80 kg magnetic strength !).

At the start of the exposure, the radiographers heard the noise of the magnetic support falling on the scaffolding floor. It was 2 am, pitch dark and they had only portable lamps and usual radiation monitors. There was no operating phone on the site, and after study of the situation, the two radiographers, without the possibility of ready contact with their management, decided to retract the source. This was not successful as the projection sheath was severely bent. So, they decided to take down the radiographic system in its totality, to straighten the sheath and finally to retract the source into the exposure device. One of the radiographer had to go up and down 3 times (!) for this purpose. It took about 30 minutes to recover the source.

A subsequent investigation by the radioprotection safety manager assessed the doses to be approximately 38 mSv for the operator who went up and down the ladder 3 times (the last time with the equipment in his hand), and 8 mSv for the second one who had remained down stairs. These results are in agreement with the films bage results (which were a little bit higher, but included the exposures for the rest of the month).

Lessons Learnt

- *The high dose in this incident resulted from poor planning, both in respect of how the work was undertaken (without due consideration of what could go wrong and the implications) and of the actual recovery operations. Management instructions should require the radiographers to estimate doses from proposed recovery operations and should set an action level above which the advice of management should be sought - however difficult this may be.*
- *Magnet fixing systems must be easily and automatically deconnected from the ejection sheath in case of accidental situation (the system is now developed).*
- *No ropes nor knots for fixing the gamma source equipment.*
- *Mobile phone should be available on the site (especially at night) to summon assistance.*

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ALARA NEWS

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The Society for Risk Analysis-Europe organises the Annual Conference « RISK ANALYSIS: OPENING THE PROCESS »

Paris, 11-14 October 1998

A rational approach to risk analysis has been developed in the three last decades, from the risk assessment to the risk perception and management. However, there is a criticism that there is not enough stakeholder involvement in the risk assessment procedures. Institutional and managerial responses are being worked out in our societies in the domains of public health, consumer products safety, waste management, environmental risks, nuclear installations, automobile pollution, etc. To meet the growing pressures for efficiency, openness, multipartner communication, the risk must be now rendered understandable, and quantitative risk assesment must be laid open to critical analysis taking into account public perceptions and behavioural preferences.

SRA-E conferences bring together all partners involved in Risk Analysis: scientists, engineers, corporate managers, insurers, authorities and all interest groups. Conference contributions are invited in the disciplines of Risk Assessment, Risk Management, and Risk Communication. Case studies and examples of policy development are also welcome.

The official Conference language will be English.

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Feedback from the Seminar on « Optimisation of the Occupational Radiological Protection in the Nuclear Field, the Non-nuclear Industry and in Medecine » (La Rochelle June 1998)

Last June, the French Society of Radiation Protection and CEPN organised in La Rochelle the 2nd French Seminar devoted to the optimisation of radiation protection for occupational exposures in nuclear industry, medical and industrial domains. It was an opportunity to review the most recent progress made in France in the implementation of optimisation of radiological protection.

Presentations confirmed the formalisation of the optimisation principle in the nuclear industry sector. But, the main lesson of the Seminar was that this principle is now of growing importance in the medical field, as attested by a very large participation of medical doctors, medical health physicists and radiographers.

On the other hand, participation from the non-nuclear industrial sector was very low, showing a very important challenge for people aiming at promoting the optimisation of radiological protection in this domain, where quite high individual doses are received by workers.

The Swedish Radiation Protection Institute announces its home page on the Internet:

www.ssi.se

If you want to subscribe for SSI-News (no costs) please inform the editor:

E-mail: lars.persson@ssi.se

1st EC/ISOE Workshop on Occupational Exposure Management at NPPs
Malmö, 16-18 September 1998

This workshop, organised by the European Commission (EC) DGXI and the ISOE European Regional Technical Centre, and sponsored by the Nuclear Energy Agency and International Atomic Energy Agency, is targeted at radiation protection professionals (radiological protection managers and senior staff members) from all types of Nuclear Power Plant (NPPs), contractors and Radiological Protection Authorities.

Its aims are :

· to provide a large forum for the exchange of nuclear power plant occupational exposure concerns (practices, management and procedures, dosimetric results and problems, improvements, techniques and tools, etc.), and
· to allow vendors to present their recent experiences in radiological protection (measurement techniques, operating and plant design improvements, ALARA practices during operation and outages, etc.).

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Guidances to Implement the European Medical Directive 43/97
(Art.31 Group News)

During his last meeting, that was held in Lisbon 8-9 June 1998, art.31 group of experts approved three new guides in the medical field that are intended to be of help for Member Countries in implementing the EC medical directive 43/97:
- Guidance on diagnostic reference levels for medical exposure
- Guidance for protection of unborn children and infants irradiated due to parental medical exposure
- Guidance on medical and biomedical research

With the previous « radiation protection following iodine-131 therapy », Members States have now four guidances at their disposal in this field.

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European Commission « Radiation Protection »

2nd EUROPEAN ALARA NETWORK WORKSHOP « GOOD RADIATION PROTECTION PRACTICES IN INDUSTRY AND RESEARCH »

at NRPB, Oxford, UNITED KINGDOM 23-25 November 1998

PROVISIONAL PRESENTATIONS

Opening Introduction (EC, NRPB, CEPN)

- Overview of the uses of ionising radiations in industry and research and the associated risks (UK)
- Accidental irradiations; feedback from more than 40 years experience of the Curie Institute (France)
- View from EC (European Commission)

Influences of Management

- UK regulatory approach to ALARA including case studies/prosecutions (UK)
- Integration of radiation protection into total safety management (Norway)
- How do authorities encourage good practice: feedback experience (Germany)
- The problem of radiological and conventional risks: similarities and differences in prevention. trade-offs between routine doses and major accident prevention (Switzerland)

Industrial Radiography

- Actions adopted by the Spanish competent authorities to improve the radiological protection in industrial radiography series (Spain)
- Some practical aspects about the training of supervisory personnel in German industrial radiography - comments on objective requirements and economic constraints (Germany)
- UK radiation fatality and resultant initiatives to improve training (UK)
- View from a large Spanish radiography company (Spain)
- View from a radiography equipment manufacture (USA)
- When is it reasonably practicable to provide a shielded enclosure (UK)
- PREDICT: an alternative approach to radiation protection in industrial radiography (Netherlands)

Naturally Occurring Radioactive Materials (NORM)

- NRPB/CEPN study on methodology (and results) to access occupational exposures and reference levels for NORM doses (Finland)
- Case study of high doses from the manufacture of a refractory material using zircon sand (UK)
- Phospherous production and natural radionuclides; optimisation, collective dose reduction and ALARA considerations (Netherlands)
- Incorporation of radionuclides by workers in thorium processing industries; monitoring and minimising internal doses (Germany)
- Hazards from NORM in the offshore oil and gas industries (Norway)
- Occupational exposure to radon progeny: miners and water station workers (Germany)
- Occupational radiation exposure by natural radiation sources (Germany)

Research & Irradiators

- Radiological protection in medical research: perception and management, how it could be improved (France)
- View from the pharmaceuticals industry (UK)
- External radiation in Spanish Central Radiopharmacy (Spain)
- Design of radioactive installations and management of radioactive waste in a biological research centre (Spain)
- Gauges (Sweden)
- French review of industrial accelerators and irradiators: number and type of devices uses, training and risks (France)
- Dose control at a cyclotron facility (UK)
- The Forbach irradiator accident: what is the situation now; do we really use feedback experience? (France)

Feedback of information

- Occupational radiation exposures in nuclear and radioactive facilities in Spain: 1996 (Spain)
- Dosimetry statistics (Netherlands)
- Occupational radiation doses in the non-nuclear industry - a European survey (Germany)
- Radiation programme in the dismantling of radioactive lightening conductors (Spain)
- Gauging incidents (Italy)
- Unusual events in the use of radioactive materials in Germany in the years 1991 & 1997 (Germany)
- Ionising Radiation Incident Database (IRID). Experience of operation and provision of feedback (UK)

Discussion Panel

Places are limited to a total of 70 persons. The attendance fee will be £ 120 excluding accommodation. Application form on back page of this newsletter. **For further information**, contact: Mr. G. Thomas (NRPB), Fax +44 1235 822601, E-Mail: gareth.thomas@nrpb.org.uk

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PROGRAMME

Monday 23 November

Opening Introduction (EC, NRPB, CEPN)
Influence of Management
Industrial Radiography

Tuesday 24 November

Naturally Occuring Radioactive Materials (NORM)
Research
Irradiators
Gauges

Wednesday 25 November

Dose Distributions
Feedback of Information
(Panel Discussion)

The Workshop will consist of approximatively 35 invited presentations under the categories above and a number of discussion sessions. Attendance is limited to a maximum of 70 experts. If you are interested in participating in the workshop, please complete the application form below and send it by fax to the Organising Committee. The latest date for receipt of application is 1 September 1998. You will be notified if a place has been reserved for you by the 25 September 1998.

The attendance fee will be £ 120, payable upon receipt of joining instructions (do not pay now).

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APPLICATION FORM

Surname ____
First name ____
Mailing address ____
Post code ____________ City_______________________ Country________________
Business Phone ________________ Fax _______________ E-Mail ______________________
Area of Expertise ____
____
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Date: Signature:

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