

## ACCIDENTS AND INCIDENTS OUTSIDE THE NUCLEAR ENERGY SPHERE

Jack Valentin and Lars Upphed  
National Institute of Radiation Protection, Stockholm, Sweden

In summary, we show that 10-20 incidents that do not at all involve nuclear power are reported to us each year. The doses are usually trivial, but one or two of the incidents could - with a bit of bad luck - have turned into rather nasty accidents.

All radiation incidents/accidents in Sweden must be reported to the licensing authority (i.e., us). Table 1 lists the reports received 1984-87. 5 of the 47 reports are trivial false alarms.

The remaining 42 incidents should be compared to our 3 500 industrial nuclear gauges etc, 800 radiography devices for non-destructive testing, 700 laboratories using radioactive substances and medical and dental services for 8.3 million people.

Only some three reports concern doses exceeding ICRP limits for workers, and no dose causes real concern. Others handling radiation incidents, such as NAIR in the UK, similarly observe that most events have trivial consequences (1). Nevertheless, some incidents could have turned rather worse.

Thus, both staff and members of the public could have been seriously overexposed in accidents quite similar to the incidents which actually occurred in industrial radiography. Most other industrial incidents are not potentially serious, but rather show that industrial users tend to report even trivial events. However, the case where a source torn from its holder in a mechanical accident wound up in a workman's pocket could have led to substantial damage. The policeman who allowed a person to pass through an X-ray machine for luggage inspection showed surprising lack of judgment, even if the likelihood of serious exposure was remote.

The package handling system at railway stations, where trucks repeatedly run over containers of radioactive substances, could be worth a closer look. Careless handling of radioactive substances led to contamination in a number of laboratories and hospitals, but there is no obvious common denominator.

Electrical faults occur repeatedly in diagnostic X-ray machines, particularly dental ones. Besides overexposure, such faults could cause electrical shock as well as overheating and mechanical damage (X-ray equipment sometimes hurts patients by literally dropping onto them).

### REFERENCE

1. Roberts, G C: National arrangements for incidents involving radioactivity (NAIR), 1984-86. Radiol Prot Bull 85 (1987) 16.

Table 1. Incidents reported to NIRP 1984 - 1987 (15 November)

<u>Event</u>	<u>Source</u>	<u>Consequence</u>
<u>Industrial radiography:</u>		
1985: Source jams in tube due to incorrect mounting	Ir-192 350 GBq	No person dose
1986: Military airfield guard lets 30 visitors into locked hangar during radiography	Ir-192 600 GBq	30 WB doses of max 0.4 mSv each
1986: Technician enters radiography area, believes his alarm dosimeter to be faulty when it sounds	X-ray tube	WB dose 12 mSv
1987: Operator changes films during exposure	X-ray tube	Hand dose 2 mSv
<u>Industrial and similar equipment:</u>		
1984: 3 persons enter field of radiation of level gauge	Co-60 7.4 GBq	3 WB doses of 0.03 mSv each
1985: Lead shield melts when level gauge overheats due to fan failure	Co-60 11 GBq	No person dose
1985: Malfunction of thickness gauge shutter when operator inserts object	X-ray tube	No skin damage detected
1985: Technician enters X-ray room during operation (inter-lock failure)	X-ray tube	WB dose 0.1 mSv
1985: Operator adjusts X-ray diffractometer cameras while X-ray is on	X-ray tube	No person dose
1985: Operator holds X-ray fluorescence analyzer with shutter failure to palm of hand	Fe-55 + Cd-109 1.7 + 0.19 GBq	Skin dose a few mSv
1986: Customs policeman allows person who claims to have metal object in body to pass through luggage X-ray inspection device	X-ray tube	WB dose 0.01 mSv
1986: 3 persons enter field of radiation of level gauge	Co-60 740 MBq	3 WB doses of 0.01 mSv each
1986: Sheet metal tears area thickness gauge from holder on production line	Kr-85 9.3 GBq	No person dose
1986: Worker puts area thickness gauge, torn from production line by sheet metal, in pocket	Kr-85 9.3 GBq	Skin dose max 6 Sv, no skin damage detected
1987: 1 person enters field of radiation of level gauge	Co-60 740 MBq	WB dose 0.1 mSv

(table 1, cont'd)

1987: Radar device emits X-rays after rewiring	Electronic vacuum tube	No person dose
<u>Transport, loss, theft:</u>		
1984: Truck crushes dropped package on railway platform	I-125 5 x 3.7 MBq	No person dose, no
1985: Density gauge gone (with burglar 1982?)	Cs-137 110 MBq	?
1985: Sealed source for re-search work stolen	Ra-229 95 MBq	?
1985: Car with 2 radiography machines stolen	X-ray tubes	?
1985: 3 area thickness gauges gone (properly scrapped?)	Tl-201 3 x 930 MBq	?
1986: Car with static electricity eliminator stolen	Po-210 6.2 GBq	? (Car and source found unharmed)
1987: Truck crushes dropped package on railway platform	Tl-201 74 MBq	No person dose
1987: Truck crushes dropped package on railway platform	Tl-201 74 MBq	No person dose
1987: Truck crushes dropped package on railway platform, 10 MBq released	Cr-51 200 MBq	No person dose, local health physicist de-contaminates
<u>Other mishaps with open sources:</u>		
1984: Iodine therapy patient vomits 40 MBq on carpet at home	I-131 400 MBq	60-yr old husband inhales max 2 ALI
1985: Nurse gets spray in face during ventilation scintigraphy and 200 kBq do not wash off	Tc-99m 1 MBq	Skin dose 2 mSv (area 200 cm <sup>2</sup> )
1985: Wrong label causes overdose to 8 clinical trial volunteers	Fe-55 240 MBq	8 WB doses of 0.08 instead of 0.01 mSv
1985: 1 person contaminated with 850 Bq after cleaning chemical hood	I-125	WB dose 0.01 mSv
1985: Bottle falls on hospital floor and bursts	Tc-99m 23 GBq	No person dose
1985: Bottle bursts during thawing	I-125 2.7 GBq	No person dose
1986: Dirt in leak detector causes release of 200 GBq	Kr-85 740 GBq	No person dose
1986: Nurse accidentally squirts 65 MBq from syringe	Y-90	No person dose
1986: Faulty seal causes leak of max 3.7 GBq from tritium	H-3	No person dose

(table 1, cont'd)

device at radiation lab

1986: Researcher gets contamination on skin, all washes off	I-131	No person dose
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1987: Researcher gets slightly contaminated when melting metal	Yb-169 190 MBq	No person dose
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Medical X-rays and similar:

1984: Engineer makes faulty connection, gets exposed	Dental X-ray tube	WB dose max 1 mSv
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1985: Therapy patient gets overdose due to incomplete notes	Linear accelerator	Patient complains of diarrhoea
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1985: Engineer makes faulty connection, exposes himself, pregnant dentist and 2 nurses	Dental X-ray tube	4 WB doses of max 1 mSv
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1986: Shortcut causes continuous exposure to dentist and 1 patient	Dental X-ray tube	2 WB doses of 1 mSv + 0.6 Gy skin, 20 mGy salivary and 5 mGy thyroid patient dose
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1987: Relay failure causes continuous patient exposure	Fluoroscopy X-ray tube	50 mSv skin dose
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1987: Shortcut causes continuous exposure to 1 nurse and 2 patients	Dental X-ray tube	3 WB doses of 1 mSv + 50 mSv to head of 1 patient
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False alarms and hoaxes:

1984: An informant to the police claims that a named person has stolen a sealed source and will use it for sabotage purposes

1984: 40 MBq I-131 reported lost during transport are later found in addressee's own store-room

1986: Worker stands close to thickness gauge for a few seconds (dose rate 0.02 mSv/h), fears overexposure

1986: Operator of X-ray fluorescence analyzer complains of erythema (calculated skin dose 0.01 mSv)

1986: Film dosimeter exposed to 60 mSv turns out never to have been worn by anybody