

1974

Air Transportation of Radioactive Materials

Douglas Keith Eyberg

Recommended Citation

Douglas Keith Eyberg, *Air Transportation of Radioactive Materials*, 40 J. AIR L. & COM. 681 (1974)
<https://scholar.smu.edu/jalc/vol40/iss4/6>

This Case Note is brought to you for free and open access by the Law Journals at SMU Scholar. It has been accepted for inclusion in Journal of Air Law and Commerce by an authorized administrator of SMU Scholar. For more information, please visit <http://digitalrepository.smu.edu>.

Notes

AIR TRANSPORTATION OF RADIOACTIVE MATERIALS

On January 4, 1972, the New York Times reported radioactive leakage from a package aboard a commercial airliner and the resulting contamination of passengers, baggage, and aircraft. After delivery of the package, the aircraft had made eight more passenger flights before the consignee informed the airline of the leakage.¹ The aircraft had been contaminated,² and 917 people had traveled on the plane before the discovery of the leak. The Atomic Energy Commission (AEC) reported "considerable contamination" in the baggage compartment, but said the passenger areas were "basically clean."³ By telephone contacts and press releases, passengers were notified of opportunities to check the extent of their own exposure.⁴

Over a year later, congressional hearings publicly revealed the extent of the contamination, which was hardly "basically clean." The affected passengers had been subjected to amounts of ionizing radiation far in excess of that which federal guidelines permit per year.⁵ Two and a half days after the containers were loaded on the aircraft and long after they had been removed, AEC readings showed an emission level of three rems⁶ per hour at the passenger

¹ N.Y. Times, Jan. 4, 1972, at 14, col. 6. Delta Airlines flight 925 on December 31, 1971, was carrying radioactive medical isotopes in two containers weighing 860 lbs., most of which was lead shielding.

² The access route for air movement between the cargo compartment and the aircraft ventilating system was a hole provided to allow for pressure equalization. Contamination could result from airborne particulate matter and, of course, by direct penetration through the cabin floor. NTSB, REPORT OF AIRCRAFT RADIOACTIVE CONTAMINATION INCIDENT, DELTA AIRLINES, INC. (Dec. 31, 1971). [hereinafter cited as NTSB REPORT]

³ N.Y. Times, Jan. 4, 1972, at 14, col. 6.

⁴ NTSB REPORT.

⁵ The level is fairly arbitrarily set at 170 millirems per year to govern exposure to man-made radiation. Variable amounts of natural radiation are absorbed by every human being each year which, of course, are not regulated.

⁶ The measurement of dose rates is calibrated in terms of the rem, or "Roentgen equivalent, man." It is the absorbed dose of any ionizing radiation which has the same biological effect as one rad of X-ray radiation. A rad is a basic unit of absorbed dose of radiation. See ELLET, STATE CONTROL AND ADMINIS-

seats nearest the containers.⁷ Anyone sitting in that general area would have received his yearly acceptable level of radiation exposure in less than an hour, and that was days after the leaking package had been removed.

RADIATION AND ITS EFFECTS

Radiation's presence is not easily perceptible to human senses. An individual may be receiving excessive dosages of radiation and remain completely oblivious of the fact, and yet the impact can be devastating.⁸ Radiation affects the atoms comprising the human body by ionization or orbital displacement of electrons from an atom's nucleus.⁹ The amount of radiation received is a function of intensity, duration, and frequency of the exposures.¹⁰ A reduction of any of these functions will measurably reduce the consequences of exposure to radiation. The quantum of radiation escaping will also depend on the type of radiation. All radiation can prove damaging to the human body if sufficient quantity, duration, and frequency is involved; within certain limits, the body can repair this damage with no noticeable effects. Hence, all exposure standards should be geared toward keeping within those limits.

Under accepted federal guidelines,¹¹ exposure to man-made radio-

TRATION OF ATOMIC RADIATION 17 (1957); AM. JUR. PROOF OF FACTS *Radiation Injuries* at 735-39.

⁷ *Hearings on the Transportation of Hazardous Materials by Air before a Subcomm. of the House Comm. on Government Operations*, 93d Cong., 1st Sess. 38 (1973) [hereinafter cited as *1973 Hearings*].

⁸ See AM. JUR. PROOF OF FACTS *Radiation Injuries* at 720-39 for discussion of radiation and its effects; see also ELLET, *supra* note 6, at 9-21; HUTTON, LEGAL CONSIDERATIONS OF IONIZING RADIATION 3-9 (1966).

⁹ Nuclear radiation is basically of two types: particulate matter from the nucleus of an atom and high energy electromagnetic radiations known as gamma rays. Alpha particles are relatively easy to shield—a piece of paper will absorb them and they travel only short distances. Beta particles are not much more powerful. Gamma particles, however, present the greatest danger. They travel great distances and, for some isotopes, five inches of lead is not effective as a shield.

¹⁰ R. LOWENSTEIN, *The Role and Establishment of Safety Standards*, CONFERENCE ON ATOMIC RADIATION AND THE LAW, at 22 (U. of Chicago Law School, 1961).

¹¹ The National Committee on Radiation Protection formulates the recommended guidelines and publishes them through the National Bureau of Standards. It is generally accepted that exposure to 450 rems of gamma radiation will be fatal to 50 per cent of those so exposed. The minimum exposure which can produce noticeable effects on the body is about 25 rems. The minimum exposure

active sources per year should not exceed 170 milli-rems. It is estimated that Americans receive about 100 milli-rems per year from natural radiation, including cosmic rays and radioactive material in the earth. A person flying coast-to-coast would expect an additional three to five milli-rems per flight because he would be subjected to more cosmic radiation than at ground level.¹²

The effects of radiation may be classified either as somatic, the effect on the individual, or genetic, the effect on future generations. Radiation criteria for individual members of society are based on somatic effects, while criteria for the public as a whole are governed by possible genetic effects. Somatic damage can result both from relatively low level radiation, for which there is not much data, and from acute radiation. It is also thought that such pathological effects as shortened life span and specific diseases may be enhanced by radiation exposure.¹³ At least one report has concluded that .17 rems per person per year for a generation would lead to significant increases in disease, perhaps up to as much as six thousand resultant cancer deaths per year.¹⁴

It is accepted that the federal guidelines are not based solely on scientific or biomedical considerations but are also based partly on value judgments with respect to an acceptable risk level. It is inevitable that the possible risks must be weighed against the benefits that society obtains from radioactive substances, particularly in the energy-producing and health industries.

THE REGULATORY AGENCIES

The carriage of hazardous materials has been a fact of life in the United States since 1946. The magnitude of the problem associated with hazardous materials is readily apparent from the frequency of

below which no genetic damage will occur is not known. The allowable exposure for individuals varies according to age, occupation, and the part of the body exposed. Occupational workers are permitted whole body doses of five rems per year for their entire careers; individual members of the public may be permitted as much as .5 rems per year but the average for all members of the public must not exceed .17 rems per year. *Hearings Before the Subcomm. on the Study of the Transportation of Hazardous Materials of the House Comm. on Government Operations*, 92d Cong., 2d Sess., at 309 (1972) [hereinafter cited as *1972 Hearings*]; see HUTTON, *supra* note 8, at 26-34.

¹² N.Y. Times, Nov. 16, 1972, at 1, col. 6, and at 35, col. 2.

¹³ R. LOWENSTEIN, *supra* note 10, at 22.

¹⁴ N.Y. Times, Nov. 16, 1972, at 1, col. 6, and at 35, col. 2.

their movement in the channels of commerce. Several authorities have indicated that at least one of the eight major classifications of hazardous materials¹⁵ is carried on board almost every commercial airline flight today. It is estimated¹⁶ that there are between 500,000 and 800,000 shipments of these hazardous materials each year in all modes of transportation, including air, rail, highway, and water. Approximately 90 per cent of these shipments are comprised of radioisotopes, three-quarters of which are shipped by air. Thus, according to these estimates, between 300,000 and 540,000 air shipments of radioactive materials are made each year, most on regularly-scheduled aircraft.

The nuclear industry is undergoing rapid expansion which is expected to continue throughout the decade—understandable in light of the present energy situation. The overall annual growth rate is approximately fifteen per cent while the radio-pharmaceutical field is expanding at twenty-five per cent per year.¹⁷ These radioisotopes used for medical purposes usually have short half-lives¹⁸ and consequently must be shipped by air to maximize efficient use. Other isotopes are used in industrial applications such as radiography, measuring devices, self-illuminating devices, and isotopic power devices, and are undoubtedly essential to large segments of modern industry. Nonetheless, in order to enjoy the full benefit these materials can bring, every reasonable precaution must be utilized to insure the safety of the public.

Administratively there have been myriad attempts at regulating¹⁹ the transportation of hazardous substances.²⁰ The so-called hazard-

¹⁵ Hazardous materials, or "dangerous articles," are the materials defined and regulated by the DOT, 49 C.F.R. §§ 170-89 (Supp. 1974). They include: explosives, flammable liquids and solids, oxidizing materials, corrosive liquids, compressed gases, poisons, etiological agents, and radioactive materials.

¹⁶ 1972 *Hearings supra* note 11 at 310.

¹⁷ *Id.*

¹⁸ The half-life of radioactive material is the rate of decay or disintegration undergone; it is the period of time required for a certain amount of such substance to decay to one-half of its original value. HUTTON, *supra* note 8, at 8-9.

¹⁹ The Interstate Commerce Commission (ICC) originally had jurisdiction over both safety and economic aspects of radioactive carriage by land. After DOT was created, jurisdiction over safety was transferred to DOT; ICC, for land shipments, and the Civil Aeronautics Board, for air shipments, continue to exercise control of economic aspects by means of the issuance of operating authority and regulation of rates.

²⁰ The problems connected with the transportation of radioactive materials are similar to problems associated with transporting other dangerous articles.

ous materials function includes regulation, enforcement, accident investigation, and research and development. Formerly, the Federal Aviation Agency (FAA) regulated the carriage of such substances by air.²¹ With the promulgation of the Department of Transportation Act on October 15, 1966, most of these administrative and regulatory functions were delegated to the Department of Transportation (DOT).²² The functions, powers, and duties relating to aviation safety were vested in the Secretary of Transportation,²³ with statutory delegations of authority given to the Administrator of the FAA. The various operating administrations of DOT, including the Federal Aviation Administration, Federal Highway Administration, Federal Railroad Administration, and United States Coast Guard, control shipments of radioactive materials in their various modes of transportation.

The Administrator of the FAA has responsibility for establishing and enforcing regulations in all facets of air transportation under the 1958 Act.²⁴ The FAA, whose responsibility to enforce begins when a carrier is offered something for shipment, must insure compliance by the air carriers in transporting the goods and by the shippers when cargo is tendered for air carriage. In 1973, the FAA had over 800 inspectors,²⁵ none of whom dealt exclusively with radioactive materials. This staff comprised a decentralized system of regional control centers which have been part of a hazardous mater-

There must be labels that will inform handlers of potential dangers, instructions on how to handle them, steps to take to minimize damage and injury in event of accident, and packaging requirements to ensure the least amount of handling by experts. There are corresponding hazards: carrier personnel shielding is required, certain critical masses may not be brought together, and packages must be constructed with the view of possible leakage following a crash. W. BERMAN & L. HYDEMAN, *FEDERAL AND STATE RESPONSIBILITY FOR RADIATION PROTECTION: THE NEED FOR FEDERAL LEGISLATION* (1959).

²¹ This was accomplished under the Federal Aviation Act of 1958, 49 U.S.C. § 1301 *et seq.* (1970).

²² The Department of Health, Education, and Welfare controls shipments of etiological agents, 42 U.S.C. § 241 (1970), and household hazardous substances, 15 U.S.C. §§ 1261-73 (1970); the Department of Agriculture regulates pesticides, 7 U.S.C. § 135 (1970); the Atomic Energy Commission regulates special nuclear materials and byproducts, 42 U.S.C. § 2011 (1970); chemical and biological warfare is administered by the Department of Defense, 50 U.S.C. §§ 1511-16 (1970).

²³ The Department of Transportation Act, 49 U.S.C. § 1655 (1970).

²⁴ Sec. 902(h).

²⁵ 1973 *Hearings*, *supra* 7, at 36.

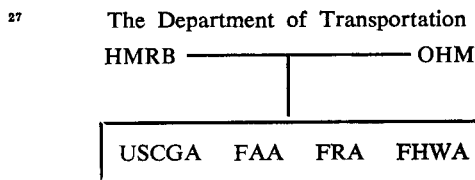
ials reporting system since 1946 and a national system since 1971.²⁶

The Department of Transportation hierarchy is somewhat fragmented.²⁷ The Office of Hazardous Materials (OHM) is primarily concerned with the surveillance and enforcement of the regulations on the manufacturers and shippers who are an integral part of the transportation chain acting as initiators. Under the original Federal Aviation Act of 1958, the FAA had this duty, but it was delegated to OHM in 1969.²⁸ OHM is comprised mostly of technical staff qualified in radiation matters²⁹ who attempt to coordinate the development of regulations.

Another DOT branch, the Hazardous Materials Regulations Board (HMRB),³⁰ was established to insure the consistency of the regulations among each of the transportation modes, and consequently is composed of a representative from each mode of DOT and from OHM. The HMRB is the only formal mechanism for dealing comprehensively with any aspect of hazardous materials control. It establishes departmental policy for the promulgation of regulation amendments.

The other major regulatory body involved is the Atomic Energy Commission (AEC). Under the Atomic Energy Act of 1954,³¹ the AEC has responsibility for licensing and safety in the possession, use, and transport of byproduct, source, and special nuclear materials.³² The AEC has established requirements for licensees to deliver licensed materials for transport if fissile material or large radioactive sources are involved.

²⁶ *Id.*



²⁸ 1973 *Hearings*, *supra* note 7, at 134.

²⁹ OHM requested budget allocations for 40 employees in FY 1975, an increase of three. *Hearings on the Department of Transportation and Related Agencies Appropriations for 1975 before a Subcomm. of the House Comm. on Appropriations*, 93d Cong., 2d Sess., at 104-5 (1974) [hereinafter cited as 1974 *Hearings*].

³⁰ HMRB was established by order of the Secretary of Transportation. DOT Order 1100.11 (July 27, 1967).

³¹ The Atomic Energy Act of 1954, 42 U.S.C. §§ 2011 *et seq.* (1970).

³² 42 U.S.C. §§ 2061-2112 (1970).

The AEC also assists DOT in establishing national safety standards and in reviewing and evaluating packaging designs. In 1973, the AEC and the DOT re-defined their roles in the handling of radioactive materials. According to the understanding reached, the DOT was to regulate handling and shipping and to set standards for packages in small quantities shipments; the AEC would continue its work in evaluating and approving package designs and in maintaining standards for containers destined to hold fissionable materials and larger quantities of radioactive materials.³³

Finally, the National Transportation Safety Board (NTSB) co-exists autonomously with DOT. It was created in the DOT Act of 1966 and given responsibilities that extend to the fields of aviation, railroad, pipeline, highway, and marine safety. Its main purpose is to investigate and determine the probable causes of transportation accidents.³⁴ Though the NTSB is not actually a part of the regulatory scheme, it does perform investigatory functions which can have a substantial effect on causes of action brought for radiation injury.³⁵ Recently, Congress empowered the Board to evaluate the adequacy of safeguards and procedures concerning the transportation of hazardous materials, as well as the performance of the other government agencies in dealing with their own responsibilities in this area.³⁶

THE REGULATIONS

Of all the hazardous materials regulations, those governing radioactive materials are perhaps most misunderstood by those who most need to understand them, that is, the personnel involved in manufacturing the containers, shipping the materials, and storing or load-

³³ N.Y. Times, March 25, 1973, at 67, col. 8.

³⁴ Though the NTSB's accident investigations are theoretically non-adversary inquisitions in an attempt to uncover the facts, the investigations sometimes devolve into adversary events as the various vested interests compete—*e.g.*, the airline's vested interest to learn the facts first and then withhold the information in self-defense. NTSB has full authority to investigate accidents under Title VII of the Federal Aviation Act of 1958. Lederer, *Ideal Safety System for Accident Prevention*, 34 J. AIR L. & COM. 336 (1968).

³⁵ Although the NTSB as originally created was under the aegis of the DOT, Congress reiterated the Board's independent stature in the Transportation Safety Act of 1974 § 302 (P.L. 93-633; 88 Stat. 2156) after finding that it could not properly perform its functions unless totally separate and independent of any other federal department.

³⁶ Transportation Safety Act of 1974 § 304(a)(8).

ing the materials in the proper place. The regulations pertinent to the transport of such substances by air are found in the Federal Aviation Regulations (FAR), Title 14 of the Code of Federal Regulations, Part 103, and are essentially supplementary; that is, most of the regulations are in fact accomplished by reference to appropriate sections of 49 C.F.R. Parts 170-189 (1973) dealing with rail and highway transportation. The standards for the packaging of large sources and fissile materials³⁷ are contained in the AEC regulations, 10 C.F.R. Part 71 (1972), and pertinent postal regulations are in 39 C.F.R. Parts 124-125 (1970). The regulations cover the various areas that need control: classification, marking, labelling, placarding, packaging, shipping papers, compatibility, stowage, transit routing and handling, enforcement, surveillance, accident investigation, research, data collection and compilation, and international and interagency coordination.

Part 103 of the Federal Aviation Regulations prescribes rules for the loading and carrying of dangerous articles in civil aircraft.³⁸ There are, however, exceptions. The regulations do not apply to radioactive materials shipped in cargo-only aircraft which are supervised by the Atomic Energy Commission or the Department of Defense.³⁹ Similar shipments made for national security reasons are also excused.⁴⁰ Any radioactive materials that would be exempted from packing, marking, or labelling requirements for shipment by rail express⁴¹ are also beyond the scope of FAR 103. In addition, the regulations are calculated to allow carriage of innocuous shipments of hazardous materials, which the Department of Transportation has determined to present a low risk to the public,⁴² with virtually no regulation at all.⁴³

Although the FAA places primary responsibility on the air car-

³⁷ 49 C.F.R. § 173.389(a) (1972); 49 C.F.R. § 173.396 (1972).

³⁸ 14 C.F.R. § 103.1(a) (1972).

³⁹ 14 C.F.R. § 103.1(b)(3) (1972).

⁴⁰ *Id.*

⁴¹ See 49 C.F.R. §§ 172, 173 (1973).

⁴² 1973 *Hearings*, *supra* note 7, at 36.

⁴³ *E.g.*, 14 C.F.R. § 103.1(c)(4) (1972) is intended to exclude from regulation "small quantities of radiopharmaceuticals with a low level of radioactivity extending over relatively short periods." 35 Fed. Reg. 5320. These would typically be used by medical researchers and physicians. 14 C.F.R. § 103.1(c)(5) (1972) excludes certain small quantities of "dangerous articles" carried in crewmembers' bags (*e.g.*, aerosol cans).

rier by requiring that it exercise the highest degree of care,⁴⁴ most violations are caused, in the first instance, by the shippers.⁴⁵ Much of the actual burden may be removed from carrier personnel by FAR 103.3 which requires the shipper to provide a statement accompanying the shipment certifying compliance with the FAR 103 requirements. Shippers may not offer, and carriers may not knowingly accept, any dangerous article for shipment without the shipper's certificate.⁴⁶ Since there is little positive assurance that the package is in complete compliance, the regulations allow the aircraft operator to rely on the certificate as *prima facie* evidence of compliance.⁴⁷ In effect, the use of the required certificate shifts the burden of compliance to the shipper in all situations except those in which the carrier knows of non-compliance.

Items otherwise prohibited from air carriage may nonetheless be shipped when other forms of transportation are impracticable; in an emergency the FAA may authorize deviations⁴⁸ subject to various safety precautions, particularly for dangerous articles capable of lethal effects over an appreciable area.⁴⁹ Any shipment which exceeds hazard classifications or maximum quantities⁵⁰ requires either a waiver or an exemption from FAR 103 requirements. Exemptions and waivers are generally issued solely for cargo-only aircraft when to do so is considered to be in the public interest;⁵¹ issuances are made for passenger-carrying aircraft on rare occasions deemed "humanitarian"⁵² which would include emergency medical situations. Whereas waivers are given on a one-time basis, exemptions⁵³ are broader and typically last for a renewable two-year period. A major exception to the power of a shipper or carrier to deviate from the FAR 103 requirements involves the shipment of

⁴⁴ 1973 *Hearings*, *supra* note 7, at 48.

⁴⁵ *Id.* at 120.

⁴⁶ 14 C.F.R. § 103.3(a) (1968).

⁴⁷ *Id.*

⁴⁸ 14 C.F.R. § 103.5(a) (1972).

⁴⁹ 14 C.F.R. § 103.5(a)(6) (1972).

⁵⁰ *See*, 49 C.F.R. § 172.5 (1973).

⁵¹ 1973 *Hearings*, *supra* note 7, at 97.

⁵² *Hearings on Appropriations before a Subcomm. of the House Comm. on Appropriations*, 93d Cong., 1st Sess., at 150 (1973).

⁵³ Exemptions are controlled by 14 C.F.R. § 11.25 (1972), and may encompass specific sections of the regulations or a particular series of trips or periods of time.

radioactives in civil aircraft leaving the country, for shippers or carriers involved in exporting radioactives are precluded from applying for waivers⁵⁴ and must instead seek full-fledged exemptions which necessitate authorization by any affected nation.⁵⁵

Also, the DOT may issue "special permits" which constitute special waivers of the FAR 103 requirements. These special permits are justified to allow for exceptions to authorized packaging designs and the like when technology outpaces the regulations. The DOT claims it garners a valuable fund of transportation experience on novel forms of packaging, shipping conditions, and carrier operations.⁵⁶

The regulations provide different standards for passenger-carrying aircraft⁵⁷ and cargo-only aircraft. Radioactive materials may be carried in passenger aircraft, subject to the quantity limitations of FAR 103.19(b), if they are packaged, marked, and labelled in accordance with requirements for shipping dangerous articles by rail express.⁵⁸ Standards are less stringent for cargo-only aircraft.⁵⁹

Radioactive materials packages must comply with the standard requirements for all hazardous materials containers⁶⁰ to be shipped by rail express.⁶¹ These packaging regulations are detailed and comprehensive, with consideration given to the type of hazardous material involved, its quantity, its potency, and the integrity of the container in various hypothetical emergency situations.⁶²

⁵⁴ 14 C.F.R. § 103.5 (1972).

⁵⁵ FAA Air Carrier Operator's Bulletin 69-12.

⁵⁶ *Hearings on Transportation of Hazardous Materials before a Subcomm. of the House Comm. on Government Operations*, 92d Cong., 1st Sess., at 59 (1971) [hereinafter cited as *1971 Hearings*]. The Transportation Safety Act of 1974 107(a) provides the Secretary of DOT may grant an exemption if the end result is the achievement of a level of safety greater than or equal to that level required by the Act, or a level consistent with the public interest. Exemptions will last two years and are renewable, but to get a renewal the operator must provide a safety analysis justifying the exemption.

⁵⁷ "Passenger-carrying" is defined as "any person other than a crew-member, company employee, authorized representative of the United States, or a person accompanying the shipment." 14 C.F.R. § 103.3(c) (1968).

⁵⁸ 49 C.F.R. § 171-73 (1972); 14 C.F.R. § 103.7(b)(6) (1971).

⁵⁹ See 14 C.F.R. § 103.9 (1961); Cargo-only planes may carry all that a passenger plane is allowed to carry as well as anything meeting requirements of 49 C.F.R. §§ 172.5, 173 (1973).

⁶⁰ 49 C.F.R. §§ 172, 173, 178 (1973).

⁶¹ 14 C.F.R. § 103.11 (1967).

⁶² For the packaging requirements, see 49 C.F.R. § 173.389 (1972); 49 C.F.R.

The DOT labelling system, corresponding substantially to international standards,⁶³ requires labels for air commerce even though an article is exempt from rail express labelling requirements because of quantity and packing limitations.⁶⁴ Each package of radioactive materials must be labelled on at least two opposite sides with the standard radiation symbol.⁶⁵

The quantity limitations imposed by the regulations are found in FAR 103.19. The amount of radiation emitted from a sealed package is expressed in terms of its Transport Index (TI). The TI unit is the highest dose of radiation expressed in milli-rem per hour that one could receive three feet from the surface of any package. The maximum TI permitted for one package is ten (ten milli-rem per hour), and packages of radioactive materials bearing a cumulative total TI of more than fifty may not be placed on board an aircraft.⁶⁶ Shippers are charged with the responsibility of checking the dose rate of a particular radioactive material to determine the proper labelling in terms of TI. The shippers must also conduct a wipe test on the outside of the package for loose radioactive contamination.⁶⁷






The regulations also require special approval before any package which contains a large radioactive source⁶⁸ may be loaded on an aircraft. Other special limitations pertain to packages bearing the coded Yellow II or Yellow III labels denoting highly toxic substances. There are special storage control regulations based on the

§ 173.393 (1972); 49 C.F.R. § 173.394 (1972); 49 C.F.R. § 173.395 (1972); 49 C.F.R. § 173.396 (1972); 14 C.F.R. § 103.15 (1963).

⁶³ In spite of the fact the labelling system is based on the international standards and labels, at the time the DOT adopted the international system, some critics felt American standards should have been stricter. 33 Fed. Reg. 14918 (1968).

⁶⁴ 14 C.F.R. § 103.13 (1967).

⁶⁵ 49 C.F.R. § 173.399 (1968):

	on accessible surface	3 ft. distance
Radioactive White I label	 .5 mrem/hr	0.0
Radioactive Yellow II label	 10.	 0.5
Radioactive Yellow III label	 200	 10.

⁶⁶ 14 C.F.R. § 103.19(d) (1973); The TI limit was increased in 1968 from 40 to 50. 33 Fed. Reg. 14918 (1968); Several carriers objected at the time, but the DOT claimed the hazard potential was not increased, only the amount of radioactive material that could be carried per flight. More stringent segregation of such materials from passengers and undeveloped films was also added to compensate. 33 Fed. Reg. 14918 (1968).

⁶⁷ 49 C.F.R. § 173.393(h) (1972).

⁶⁸ 49 C.F.R. § 173.389(b); 14 C.F.R. § 103.19(d) (1973).

total TI⁶⁹ and on minimum separation distances from unexposed film, passengers, or the nearest cargo bin partition.⁷⁰ In order for the carrier properly to comply, consideration must be given to the physical arrangement of the particular warehouse or baggage compartment.⁷¹

The operator of the aircraft must always notify the pilot in command of the presence and location of any radioactive materials on the plane.⁷² No person may carry radioactive materials into the cabin of a passenger plane,⁷³ and if carried in the cargo hold the materials must be inaccessible to everyone but crewmembers.⁷⁴ In a cargo-only aircraft, hazardous materials packages must likewise be accessible to the crew; in the event of rupture, fire, or spills, inaccessibility would prove disadvantageous to all.⁷⁵

The carrier has responsibility for reporting any incident⁷⁶ that occurs with respect to radioactive materials during the course of transportation including loading, unloading, or temporary storage.⁷⁷ In addition a carrier must notify the shipper as soon as possible after the detection of any breakage, spillage, or radioactive contamination. Aircraft in which such an incident has occurred may not be put in routine use again until the radiation dose rate at any

⁶⁹ 14 C.F.R. § 103.23(a) (1971); Fissile class III materials are also subject to special limitations. These materials may be transported by air only if special arrangements are made between consignor and carrier for a specific shipment on a cargo-only aircraft for sole use by the consignor, or by special arrangement between shipper and carrier for a shipment on any aircraft on which there are no other packages of radioactive materials required to bear a label. 14 C.F.R. § 103.24 (1973).

⁷⁰ *Id.*; in addition, the FAA amended the regulations in 1973 to insure against radioactive packages shifting in flight which would permit them to move closer than allowable under 14 C.F.R. § 103.23(a) (1973). See 14 C.F.R. § 103.31(e) (1973).

⁷¹ The regulations allow 50 TI's in one bin as long as they are positioned at least seven feet from the nearest partition. The only type of aircraft this is possible in is a DC-10's aft-belly compartment. 1973 *Hearings*, *supra* note 7, at 64.

⁷² 14 C.F.R. § 103.25 (1973).

⁷³ 14 C.F.R. § 103.31(a) (1974).

⁷⁴ 14 C.F.R. § 103.31(f) (1973).

⁷⁵ 14 C.F.R. § 103.31(b) (1965); 30 Fed. Reg. 13381 (1965).

⁷⁶ "Incidents" include the death of any person, injuries requiring hospitalization, carrier or other property damage exceeding \$50,000, fire, breakage, spillage, or suspected contamination resulting from a radioactive cargo, or any other situation in which a continuing danger exists or the carrier believes should be reported to DOT. 14 C.F.R. § 103.28(a) (1974).

⁷⁷ 14 C.F.R. § 103.28(a) (1974).

accessible surface is once again within acceptable federal guideline limits. As with other hazardous materials spills, the air carrier has the primary responsibility for clean-up operations, though the AEC often is called in to advise carrier personnel.⁷⁸

REGULATORY INADEQUACIES

The consensus is that the current regulations are, with minor exceptions, adequate if followed. Officials are quick to point out that the last twenty-five years of aviation have resulted in only three incidents involving radioactive materials,⁷⁹ and no known injuries or significant radiation over-exposures to transportation workers or the general public have occurred. This record does not, of course, reflect any possible long-term effects such as shortened life-spans or increased incidences of cancer. In any event this testimony is deceiving. There have been no officially reported suits arising out of radiation over-exposures on aircraft, due, no doubt, to the physical difficulties of detecting radiation poisoning and the carrier's desire to avoid adverse public reaction by settling the case out of court.

The DOT's hazardous materials program is characterized by lack of sufficient data on movements of hazardous materials, an inadequate inspection effort, and sporadic and ineffective enforcement actions.⁸⁰ The findings of reports by the NTSB, and allegations by the Air Line Pilots Association, are corroborative⁸¹ and cite as specific shortcomings in the regulatory scheme the absence of uniformity among DOT's modal regulations,⁸² variance in permissible levels of risk allowed by the regulations with respect to different commodities and modes of transportation,⁸³ and the inadequacy of

⁷⁸ 14 C.F.R. § 103.23(b) (1973).

⁷⁹ 1973 Hearings, *supra* note 7, at 11.

⁸⁰ 1974 Hearings, *supra* note 29, at 119.

⁸¹ See, e.g., NTSB SPECIAL STUDY, *Risk Concepts in Dangerous Goods Transportation Regulations*, Report No. STS-71-1, at 4.

⁸² The recently enacted Transportation Safety Act of 1974 authorizes the Secretary of Transportation to formulate regulations applicable to manufacturers, container manufacturers, shippers, and carriers. This should rectify the fragmentation of regulatory bodies and the lack of uniformity of regulations among the various transportation modes. The present system will remain effective until abrogated by the newly authorized regulations which will be many months in the making. Transportation Safety Act of 1974 § 105(a).

⁸³ Most shippers depend heavily on the tariffs (such as T.C. Georges Tariff

concepts of risk. Federal Aviation Administrator Alexander Butterfield admitted that there was a long period during which the regulatory agencies were lackadaisical, and ascribed this attitude to lack of proof of any personal injuries or fatalities resulting from radioactive materials being transported in airplanes.⁸⁴ It has also been conceded by agency officials that only a small portion of reportable incidents are, in fact, being reported.⁸⁵ It has been estimated that of the approximately 14,000 daily flights in the United States as many as 11,000 may harbor FAR 103 violations.⁸⁶

Violations of the regulations are pervasive among shippers, packers, manufacturers, and carriers.⁸⁷ A carrier's flight and ground operations personnel have been found to be totally unaware of FAR 103.25 which requires that the pilot in command be informed of any radioactive materials on board.⁸⁸ Pilot and carrier representatives have asserted that shippers routinely mislabel radioactive materials.⁸⁹

The NTSB reported in its findings on the Pan American incident in the fall of 1973 that the combination of a coincidental series of human errors as elementary as failure to tighten bottle tops and a disregard for the applicable regulations brought about the contamination.⁹⁰ Such errors and "ignorance" could be significantly

No. 23) which pertain to rail and highway shipments and know little or nothing about 14 C.F.R. § 103. Statement by Capt. H. R. Trimble (ALPA), Dec. 1, 1971.

⁸⁴ *Hearings on Appropriations for the Department of Transportation before a Subcomm. of the House Comm. on Appropriations*, 93d Cong., 1st Sess., at 149 (1973).

⁸⁵ Secretary of Transportation's Annual Report as cited in 1973 *Hearings*, *supra* note 7, at 67.

⁸⁶ *Id.* at 62.

⁸⁷ Letter from NTSB to Alexander Butterfield, FAA Administrator, March 22, 1974.

⁸⁸ FAA Air Carrier Operations Bulletin 69-12.

⁸⁹ N.Y. Times, April 26, 1974, at 8, col. 5. The Air Line Pilots Association (ALPA) testified that, when making a telephone inquiry as to why a package labelled as a restricted article but not listed in the tariff (and therefore not to be carried) was offered for shipment, the manufacturer's supervisor indicated that "the tariff book couldn't possibly list every chemical because it would make the book too big." 1971 *Hearings*, *supra* note 56, at 207-08.

⁹⁰ NTSB report concluded: (1) re-usable packaging did not fulfill container requirements of the regulations; (2) the manufacturer did not have a maintenance procedure for checking the condition of returned containers before re-use; (3) human errors combined to cause the incident (plastic bottle top too loose and the package rolled on its side during transport); (4) the carrier's training program for handling radioactive materials had not reached all cargo-handling personnel; (5) routine delay in pickup of shipment by consignee prevented timely discovery.

diminished with strict compliance on the part of all concerned. Unfortunately, the lack of tangible signs or effects of radioactive leakage compounds current complacency.

Assuming that compliance with the regulations would provide adequate safety and accepting the fact that many thousands of violations occur every day, proposals to rectify the present inadequacies should be directed at the regulatory agencies. Regulation, beyond the promulgation phase, involves two elements: inspection and enforcement; these are the areas to which the proposals must be directed.

Although shipper and carrier noncompliance with the regulations is commonplace at the majority of facilities inspected,⁹¹ the number of inspections per flight is miniscule. The policy of the agencies' inaction is buoyed by the prevalent attitude that the materials present no immediate threat to the safety of the air passenger.⁹² When congressional interest in the transportation of hazardous materials first arose in 1969, the DOT had no systematic method for ensuring compliance with the regulations and instead relied on spot checks.⁹³ At present, the two field inspectors of the Office of Hazardous Materials checks shippers and manufacturers of containers used to transport radioactive materials. The level of noncompliance arising from this extremely insignificant inspection effort either at the factory site or at the carrier's terminal has been as high as 90 per cent of all packages examined.⁹⁴ The FAA conducts virtually no field inspection of radioactive materials packages. Though the FAA has over 800 inspectors, each is responsible for a lengthy list of other duties besides radioactivity inspection, and most of the inspectors lack the technical hazardous material training that the OHM staff

⁹¹ 1973 *Hearings*, *supra* note 7, at 2. Most non-compliance situations cited by William Burns, director of OHM, involved labelling, documentation, false or misleading certification, and failure to meet packaging requirements. It is clear that, in radioactive materials transport, the "weakest link in the chain" principle applies to measure the effectiveness of the safeguards established by DOT.

⁹² 1973 *Hearings*, *supra* note 7, at 2-3.

⁹³ *Hearings on Transportation of Hazardous Materials before a Subcomm. of the House Comm. on Government Operations*, 91st Cong., 1st Sess., at 36 (1969) [hereinafter cited as 1969 *Hearings*].

⁹⁴ 1973 *Hearings*, *supra* note 7, at 2, 6, 7. In 1973 inspections the following is a sample of results found at selected U.S. airports: Kennedy—20 violations out of 24 packages inspected; Philadelphia—11/12; O'Hare—10/14; LaGuardia—7/8; Baltimore—5/6; Newark—6/6. *Id.* at 80.

claims.⁹⁵ FAA inspections were significantly increased in 1973 up to about 9000; though this total is not even the equivalent of one day's flights, 229 violations were reported.⁹⁶ The obvious inference from such figures is that a staggering number of violations go undetected, all potentially harmful to the passenger and the cargo handlers. The FAA acknowledges it is unfortunate that an inspector cannot be put in every key point in the course of transportation of radioactive materials.⁹⁷ Public policy would seem to dictate that a manpower shortage is a weak excuse.

Unfortunately, the second of the inseparably linked elements of radioactive materials regulation, enforcement, is likewise maintained at a less than efficacious level. Here again, there is limited manpower possessing the requisite technical skills. Problems are inherent in the nature of what little enforcement activity is conducted by the regulatory authorities. Nearly all enforcement is "after the fact"—initiated as a follow-up to an incident or accident rather than as a result of an on-going inspection or monitoring program. Whether addressing enforcement of the regulations or violations of the regulations, experts have suggested that the entire question of shipping radioactive materials is presently based on some kind of an "honor system."⁹⁸

Lack of enforcement can lead to the disregard of any honor system. For example, as a result of FAA-granted exemptions and waivers given to air taxi operators, thousands of shipments are made without strict regard to the hazardous materials regulations. Exemption holders are not required to report the volume of materials carried. There is no restriction on carriage proportionate to violations perpetrated by the particular carrier. Exemptions have even been granted when little or no information was supplied by the carrier, and have been renewed even though a carrier had violations outstanding against it.⁹⁹

⁹⁵ *Hearings on Appropriations for the Department of Transportation before a Subcomm. of the House Comm. on Appropriations*, 93d Cong., 1st Sess., at 150 (1973).

⁹⁶ 1974 *Hearings*, *supra* note 29, at 612.

⁹⁷ *Hearings on Appropriations for the Department of Transportation before a Subcomm. of the House Comm. on Appropriations*, 93d Cong., 1st Sess., at 149 (1973).

⁹⁸ 1973 *Hearings*, *supra* note 7, at 14

⁹⁹ *Id.* at 114-16.

Too often the profit incentive nullifies the self-imposition of an honor system, a situation which makes strong outside enforcement even more urgent. The OHM claims lack of enforcement authority; the OHM can simply notify the FAA of violations and request a report from the shipper involved concerning the corrective action taken. No criminal or civil forfeiture authority lies with the OHM though that office has considered proposing some kind of uniform forfeiture authority for enforcement purposes for several years.¹⁰⁰ The OHM's referral service to the FAA is not very active either; over a two year period during which the OHM reported approximately 500 violations, only fourteen were reported with requests for action.¹⁰¹ The FAA is equally deficient in enforcement activities. No criminal cases were brought by the FAA during the same two year period and no fines were levied. There were civil forfeitures after referral to the FAA; three fines were levied for radioactive material regulations violations, and the remaining cases were handled administratively.¹⁰² Even these actions were not taken until months after the primary danger to passengers and plane had dissipated, and the outrage, like the radiation, had dissipated as well.

PROPOSALS

In any regulatory system designed to prevent aircraft incidents and accidents there are several vested interests which must be reconciled, including the individual, his property, corporate pride, and national prestige.¹⁰³ Accepting the mandate of the Federal Aviation Act of 1958 which sets as a goal "the highest degree of safety in the public interest,"¹⁰⁴ one must inevitably sacrifice and compromise the various interests until the optimum position is reached. The most extreme and undoubtedly most efficient solution is to refuse to allow the carriage of radioactive materials by air under any circumstances. The Air Line Pilots Association, among others, has urged this position in the past,¹⁰⁵ but the NTSB has determined that

¹⁰⁰ *Id.* at 19-20.

¹⁰¹ *Id.* at 22-25.

¹⁰² *Id.* at 25, 61; In 1972, seventy-three enforcement actions were prosecuted by the FAA for all hazardous materials violations. *Id.* at 48.

¹⁰³ Lederer, *The Ideal Safety System for Accident Prevention*, 34 J. AIR L. & COM. 336 (1968).

¹⁰⁴ Federal Aviation Act of 1958 § 601(b), 49 U.S.C. § 1301 *et seq.* (1970).

¹⁰⁵ Letter from NTSB to Alexander Butterfield, FAA Administrator, March 22, 1974, cited in 1974 *Hearings*, *supra* note 29, at 613.

conscientious compliance would avoid such a drastic step and recommends instead a simple compliance checklist to facilitate that objective.¹⁰⁶ Others have advocated banning these items from passenger-carrying aircraft.¹⁰⁷ With its very recent passage of the Transportation Safety Act of 1974,¹⁰⁸ the Congress has followed these admonitions and provided for the curtailment of radioactive materials carriage on passenger aircraft beginning in July of 1975.¹⁰⁹ However, radioisotopes used for medical purposes may still be carried on passenger planes providing they do not pose an unreasonable hazard to health and safety.¹¹⁰ It must be remembered that even before the passage of this Act ninety per cent of all radioactive materials carried by air were the same radioisotopes exempted from the proscriptions of the present Transportation Safety Act of 1974.

It is acknowledged that the public is potentially endangered by the violation of the regulations. Despite the enormous potential harm, it is argued that it is in the national interest to transport radioactive materials by air, particularly in the medical radioisotope area. This public interest theory is buttressed by the widespread need for radioisotopes in the medical industry, many of which have very short half-lives necessitating rapid transportation methods. To carry radioisotopes solely on cargo-only aircraft would drastically reduce the potential exposure to the general public, but unfortunately, most United States cities do not have exclusive airfreight service.¹¹¹ If radioisotopes are to be useful in protecting the health of the public, it is necessary to further compromise and allow their carriage by passenger aircraft.

If one concedes that radioactive materials must be transported by air, regulation is the remaining tool. The standards on which the regulations are based can always be made stricter, but their efficacy remains embedded in enforcement. If the shipment is properly packaged, and if the shipper and carrier comply with the regulations, there will be little threat to the passengers.¹¹² Enforcement is

¹⁰⁶ *Id.*

¹⁰⁷ 1973 *Hearings*, *supra* note 7, at 54.

¹⁰⁸ Transportation Safety Act of 1974 (P.L. 93-633; 88 Stat. 2156).

¹⁰⁹ *Id.* at § 108(a).

¹¹⁰ *Id.*

¹¹¹ In fact, fewer than 50 U.S. cities are so equipped. 1972 *Hearings*, *supra* note 11, at 545.

¹¹² 1973 *Hearings*, *supra* note 7, at 11.

the crux of the matter; unfortunately, an honor system approach will not work satisfactorily. The intermediate step of augmenting and reinforcing the standards of the regulations is certainly worthwhile if only to increase the protection the regulations will provide when they are conscientiously enforced. Nevertheless, the primary problem in this area has been the fragmented nature of the regulatory bodies, a problem that is compounded by regulations which are essentially supplementary. The problem is particularly acute when the commodity is entering intermodal transport. The Transportation Safety Act of 1974 authorizes the Secretary of the Department of Transportation to formulate new regulations which will consolidate the hazardous materials regulations and provide for one controlling authority, the DOT.¹¹³ When this objective is effectuated, the current problem of finding the correct regulation should considerably diminished.

Other areas of concentration by the DOT should include regulations designed to preclude the private rule-making apart from public scrutiny that exists in the waiver, exemption, and special permit devices. Under the Transportation Safety Act of 1974, the Secretary of DOT is authorized to grant exemptions only if the level of safety achieved is equal to or greater than that required by the regulations.¹¹⁴

One method of curtailing the shipment of radioactive materials would be the imposition of a surcharge on each shipment.¹¹⁵ These economic controls are unwise if for no other reason than they might encourage incognito shipments and thereby provide even greater potential for noncompliance with the regulations.

The shortcoming of any proposal to strengthen the standards on which the regulations are based is inherent in the system into which a new proposal must fit. Without adequate enforcement none of these proposals can ever be efficacious. There are two methods by which to stimulate the enforcement of the regulations. The first is the inclusion of a genuine "consumer" representative on the relevant regulatory bodies. The impetus behind providing regulation for the transportation of radioactives is, in the first instance, due to an overriding consideration for protection of the general public,

¹¹³ Transportation Safety Act of 1974 § 105(a) (P.L. 93-633: 88 Stat. 2156).

¹¹⁴ *Id.* at § 107(a).

¹¹⁵ 1973 *Hearings*, *supra* note 7, at 66.

particularly the captive innocent bystander called a passenger. Nowhere else than in air transportation is a passenger less able to exercise personal precautions to protect himself from the dangers associated with travel in concert with the carriage of hazardous materials.

It is safe to say that there has been an inadequate appraisal of and consideration for the interests of the passenger.

Who is to represent these interests? Unquestionably, all parties to past and present proceedings to change the dangerous goods regulations consider the public interest, but upon whom does the burden for representing these interests fall? Under the present regulatory scheme this responsibility must be borne by the regulators, because the other parties must, by their nature, give priority to representing their own interests.¹¹⁶

The primary beneficiary of the safety regulations has no adversary representative on the decision-making agencies. Without incessant motivation, bureaucracy grinds to a comfortable standstill; who could better motivate than the intended beneficiary of the safety restrictions?¹¹⁷

Monitoring, the second method by which to enhance enforcement, is derived from the fact that radioactive contamination may not be readily apparent; a need exists to assure the timely discovery of any contamination in order to protect the public, traveling or otherwise, from exposure to the hazards. The need for timely discovery was made very apparent by the Delta incident involving some 917 passengers over the course of a two-day period.¹¹⁸ The radiation exposure rate was so great that passengers could have been exposed to their yearly acceptable dose in one sitting.

Radiation is impossible to detect without the proper instruments, and with so little present surveillance there is a general lack of knowledge of the full extent of the radioactive materials hazard. Neither the number of shipments or violations is known, nor is the significance or magnitude of the dangers that exist. It is reasonable to believe that many more incidents occur than the few that have

¹¹⁶ 1972 *Hearings*, *supra* note 11, at 444.

¹¹⁷ There are admittedly problems involved in the selection of a representative, the biggest being credibility. It is submitted that neither the President of the United States nor any of the vested interests involved in air commerce should be consulted.

¹¹⁸ See note 1 *supra*.

been reported, based on the number of carriages, the lack of inspection, and the inherent public relations pressures that would be exerted by any carrier to keep radiation leakage incidents out of the public eye. The propensity of the shippers and carriers not to comply with the regulations¹¹⁹ necessitates more than a mere re-education of the principal parties. What is most needed is a mechanical surveillance system to monitor the shippers' compliance and to allow the carrier to effectuate a competent screening system.

Under the assumption the standards set by the regulations are adequate if followed, it is clear the methods used to insure compliance have not been at all adequate. Enforcement is the key to compliance and inspection is the key to enforcement. Most air carriers have neither the equipment nor the staff to properly inspect even an insignificant portion of radioactive materials shipments. The DOT has in the past argued against the feasibility of a full inspection program on the basis of manpower and other economic restrictions.¹²⁰ The most efficient method to accomplish inspection and enforcement is through on-the-spot monitoring by radiation sensitive equipment.¹²¹ Since a shipment is most likely to be damaged or spilled during its movement, shipments should be monitored for leakage on loading and unloading at the various carriers' receiving terminals, and prior to and immediately after loading or unloading from the plane at its destination. Prior to take-off, the floor of the passenger cabin should be scanned to recheck for harmful radiation emissions. This is precisely the type of monitoring needed to provide for the safety of passengers and carrier ground personnel.¹²²

¹¹⁹ Pilot spokesmen claim the vast majority of shippers and freight forwarders are not aware of or simply do not comply with the regulations, and seem to encourage airline disregard of the regulations by applying economic pressures. The airlines are accused of adopting an "everything goes" policy primarily due to lack of qualified radioactive materials personnel. 1973 *Hearings*, *supra* note 7, at 73.

¹²⁰ 1969 *Hearings*, *supra* note 93, at 36.

¹²¹ The AEC is considering augmenting safety devices by amending 10 C.F.R. § 34 to provide for the use of thermoluminescent dosimeters or film badges by their radiographers. Not only are dosimeters sometimes more accurate than the conventional film badge but the direct-reading pocket dosimeters allow a person to easily determine the extent of his own exposure. 39 Fed. Reg. 36601 (1974).

¹²² Under the Transportation Safety Act of 1974, a program of monitoring radioactive materials packages will go into effect on July 1, 1975. Although the regulation as originally proposed would have required scanning the passenger cabin prior to take-off, and scanning the individual packages at acceptance, trans-

In order to make the new system completely effective, primary liability should be shifted to the shippers. Shippers derive the most economic benefit from air carriage of radioactive materials and are the source of most of the regulations violations. Consequently, they seem to be the logical focal point of any regulatory scheme as initiators of the entire process. The foundation of the FAR 103 safety system lies in the labeling and packaging requirements, and this area is the one in which the enforcement should be strictest. If the labels are improper, the Transport Index tables cannot be utilized effectively,¹²³ and if the containers are faulty, contamination potentiality is greatly enhanced. Strong civil and criminal sanctions should be imposed making both carriers and shippers absolutely liable for violations of the regulations. The monitoring function conducted by the carrier should be merely a secondary check, though a vital one.

The radioactive materials regulations are aimed at reducing the hazard to the public "within the limits of economic feasibility."¹²⁴ A foolproof monitoring system seems not only economically realistic but it accomplishes better than any other method the goal of full compliance with the regulations. The one-time initial cost of establishing this system would be high, though probably not by government standards. The long-term cost would be minimal. Regulatory manpower problems would be negligible as the carrier personnel would operate the monitoring devices on an everyday basis. There would be a need for additional agency personnel to supervise and re-check compliance on an irregular basis, but the imposition of sufficiently high penalties as a deterrent would not necessitate agency personnel at every airport.

The public's awareness of the magnitude of radioactive materials transport is increasing. Indignation and resentment will be widespread if the "consumer" feels his welfare has been derogated in favor of the vested interests—shippers and carriers. The federal government has the opportunity and the responsibility to protect

fer points and destinations, complaints by the carriers and others led to the dilution of the proposed amendment to the regulations. Beginning July 1st, the packages will be scanned only when loaded, and the cabin will not be scanned at all. Transportation Safety Act of 1974 § 108(a) (P.L. 93-633: 88 Stat. 2156); 40 Fed. Reg. 5140 (1975).

¹²³ See note 66 *supra*.

¹²⁴ 33 Fed. Reg. 11862 (1968).

the innocent bystander/passenger. The government, in having regulations at all, acknowledges its assumption of a duty to safeguard against over-exposure to radiation in air commerce. Experience has shown that regulation without enforcement, or regulation by the "honor system," does not work. Radiation monitoring is the most efficient and economical method to insure that the human being is adequately protected.

In summary, there should be centralization of regulatory and enforcement functions instead of the present fragmented approach. The regulations should allow only radioisotopes needed for medical purposes to be transported on passenger-carrying planes. As an immediate measure, monitoring should be carried out at each juncture in the regulatory transportation process, and this system should be enforced by increasing inspection, strict liability for violations and stiffer penalties. In the long-term, the Department of Transportation and Congress should effectuate a plan for the selection of a consumer representative for the decision-making regulatory bodies with respect to the regulations. Also, the DOT should begin compiling records of shipments and violations, to be used for purposes of levying penalties, considering applications for waivers, exemptions, and special permits, and facilitating public awareness. Public awareness and the corresponding possibility of public censure for violations will undoubtedly provide the greatest impetus for compliance by the air carrier. It is perhaps the lack of public awareness that has enabled the present state of radioactive materials transportation to exist.

Douglas Keith Eyberg