# Implementation of European Radiation Protection

# Implementation of European Radiation Protection Legislation for Aircrew (Lufthansa Group)

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- Introduction (German Radiation Protection Ordinance)
- Who is obliged by law ?
- What has to be done by law?
- How has it been implemented within the Lufthansa Group ?
- Summary





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Starting point: Council Directive 96/29/EURATOM of the European Union

- → Article 57: This Directive is addressed to the Member States.
- Article 55: Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive before 13 May 2000.
- ✓ Article 42: Protection of aircrew

Each Member State shall make arrangements for undertakings operating aircraft to take account of exposure to cosmic radiation of aircrew who are liable to be subject to exposure to more than 1 mSv per year.





Article 42: Protection of aircrew

The undertakings shall take appropriate measures, in particular:

- $\checkmark$  to assess the exposure of the crew concerned,
- to take into account the assessed exposure when organising working schedules with a view to reducing the doses of highly exposed aircrew,
- → to inform the workers concerned of the health risks their work involves,
- → to apply Article 10 to female aircrew.

(The conditions for pregnant women shall be such that it will be unlikely that the equivalent dose to the child to be born will exceed 1 mSv during at least the remainder of the pregnancy (after reporting pregnancy).)





Germany: Amendment of the German Radiation Protection Ordinance

- It is the German implementation of the European Directive 96/29 EURATOM and a contribution to harmonising legislation within the member states of the European Union and took effect on 1 August 2001.
- The purpose of the Radiation Protection Ordinance is to protect human beings and the environment from detrimentral effects of ionising radiation.
- It regulates in particular the occupational exposure to ionising radiation.
- The Radiation Protection Ordinance used to consider only artificial sources of radiation. An essential change was the integration of natural sources of ionising radiation (e.g. cosmic rays). Thus it became applicable to aircrew as well.





Important facts:

- The Radiation Protection Ordinance is part of a law (Atomic Energy Act).
- ✓ Legal consequences: Any regulatory offence against the Radiation Protection Ordinance can result in an administrative fine of up to 50 000 € for each individual case (ca. 80 000 \$ or 40 000 £).
- The competent supervisory authority in Germany is the LBA (Luftfahrtbundesamt, Federal Office of Civil Aviation). The LBA can audit any airline / company anytime.
- Some companies / organisations offer supporting services to airlines (e.g. DLR).





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Who is obliged by law ?

- Any airline / company operating aircraft entered on the German aircraft register.
- Any airline / company with a registered office in Germany with aircraft registerd in another country which employs personnel according to German labour law.
- Air Force (same legal content with implementation within the Federal Armed Forces).
- Note: Any airline / company which can prove that the flight-related dose contributions incurred by it do not exceed 1 mSv in a calender year can apply for exemption from the fundamental obligation to implement the specified measures.





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# What has to be done by law ? German Radiation Protection Ordinance (StrlSchV)

Legal requirements of airlines as regulated in Art. 103 StrlSchV:

- ✓ Individual dose determination for the affected personnel
- → Recording of doses in individual dose accounts (special regulations)
- Dose monitoring for compliance with dose limits (ALARA)
- → Transmission of dose data to the LBA<sup>1</sup> (within 6 months)
- → Instruction of aircrew
- ✓ Notification of the LBA<sup>1</sup> & employee if infringement of any dose limit
- ✓ Medical examination if dose exceeds 6 mSv within a calender year
- ✓ Dose determination for flight operations since 1.8.2003

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# **Components of implementation**

- Dose determination and documentation (compliance with dose limits).
- → Instruction of aircrew.

 Radiation protection management (internal organisation, medical service, consultation, etc.).











**Dose determination and documentation 1** 

- The German Commission on Radiological Protection has recommended the use of calculation programs.
- The calculation programs determine the flight dose for each flight (based on the flight data) that is applied to all crew members on the corresponding flight.
- The calculation programs have to be officially approved by the LBA (based on an expert opinion by the PTB (National Metrology Institute)).
- There is 3 approved calculation programs in Germany at the moment: EPCARD, FREE and PCAIRE.

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**Dose determination and documentation 2** 

- The LBA operates a data base which records monthly dose data for all concerned aircrew members in Germany.
- The airlines must register their employees with the LBA in order to receive an ID for each employee. The employees will retain their ID during their whole career.
- Data transfers between the airlines and the LBA are encrypted. A digital signature is additionally required.



**Dose determination and documentation 3** 

- For dose determination at Lufthansa a personnel data base and a flight dose data base are used for documentation.
- The personnel data base for radiation protection is integrated in the crew management systems (CMS and Netline/Crew).
- The flight dose data base is operated at DLR (CALVADOS-system). It is a data management system which makes sure that all quality requirements are met (e.g. data integrity, flight data error management, backup, etc.).
- The CALVADOS-system can on principle be operated with any calculation program and any flight data interface.
- The dose calculation program (dose processor) currently used in the CALVADOS-system is EPCARD.





**Development of Annual Flights in the CALVADOS DB** 



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# **Instruction of Aircrew:**

 → Information brochure

 Computer Based Training (CBT)

Radiation Protection
 Coordinator







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# **Information for Aircrew:**



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**Operational Radiation Protection Management** 

Personnel management

→ Pregnant crew

members







Monitoring for medical examinations





# **Support & Services**

Medical examinations according to Art.103 StrISchV



 Support of various research activities





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# Radiation measurement on board aircraft (CALVADOS)

✓ Measuring flights since 2004.

Equipment:
 BDs, DOSTEL, SSNTDs (NRPB, UK), TLDs, TEPC & LIULINs.



No significant deviations between calculations and measurements could be observed so far.





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### Summary

- → European Legislation includes Radiation Protection for aircrew explicitly.
- Member states of the EU had to transform the basic standards stipulated in directive 96/29/Euratom into national law.
- Airlines / companies are on principle obliged to implement radiation protection measures for aircrew.
- The required measures comprise dose determination and documentation, dose monitoring for compliance with dose limits, instruction of aircrew and an annual medical examination for highly exposed personnel (> 6 mSv).
- Lufthansa and DLR offer support and services to airlines and scientists.
  Furthermore measuring devices are operated on board aircraft for verification of dose calculation.







# Thank you for your attention !



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