

Radar Commission Report

- Executive Summary -

1. Task

Based on the possibility that their health could be jeopardised due to former activities at radar units, diseased – mostly former – soldiers of the Federal Armed Forces and the National People's Army (NVA) and civilian employees filed applications for acknowledgement of a disease caused by practising their occupation.

On request by the Defence Committee of the German *Bundestag* the Radar Commission was appointed by the Federal Ministry of Defence. Its objective was

- to contribute to elucidate the former workplace conditions, taking into account the interim results already available
- to submit a report on the exposure values taken as a basis in the *Dienstbeschädigungsverfahren* (procedures concerning injuries sustained in the course of one's duties)
- if required, to process additional and new findings on health effects in case of radiation exposure due to radar units and
- to determine the scientific state-of-the-art regarding the possibility of damages to health due to ionising radiation and HF radiation and to investigate the medical aspects of radiation damages.

2. Working method of the Commission

The Commission was constituted on 26th September 2002 under the chairmanship of Wolfram König, President of the German Federal Office for Radiation Protection. The 17 members represent a broad spectrum of scientific disciplines and opinions. The Commission did not perform independent research but concentrated on the evaluation of previous actions on the basis of the material available, of hearings and own measurements. This was particularly done under the aspects of

- conformity of risk evaluation with the state-of-the-art of science and
- the correctness or plausibility, respectively, of proceeding in view of the existing uncertainties in the reconstruction of exposures part of which having occurred already decades ago.

To fulfil its objective the Radar Commission evaluated a multitude of data, documents and scientific publications. Furthermore the report of the task force Dr. Sommer “The Federal Armed Forces and their Dealing with Hazards and Hazardous Goods – Uranium Ammunition, Radar, Asbestos” was taken into account. The Radar Commission carried out a series of hearings – in detail of employees having participated in the *Wehrdienstbeschädigungsverfahren* in the portfolio of the Federal Ministry of Defence, of soldiers and officers of the Federal Armed Forces and the NVA, of representatives of the Federal Ministry for Health and Social Security and of representatives of the trade associations and the TÜV Hannover/Sachsen-Anhalt e.V.. The Commission involved representatives of the *Bund zur Unterstützung Radargeschädigter* (Association for the Support of Radar Victims) in its investigation, in particular when visiting on site some important radar facilities still existing.

3. Results

3.1 Exposures

During the operation, maintenance and repair of radar units exposures to ionising radiation and high-frequency radiation (HF radiation) can occur. Furthermore radioactive substances can be incorporated when working with radioactive fluorescent paint.

The ionising radiation mainly consists of X-rays of so-called stray radiation sources, i. e. component parts (electron tubes) emitting X-rays as an unwelcome side effect.

External radiation exposure due to radioactive fluorescent paint is low. Incorporated radionuclides, however, can lead to a not inconsiderable dose. The weak radioactivity in some electron tubes is insignificant.

With respect to HF radiation particularly the useful beam (Nutzstrahlung) in the area of antennas is relevant from the radiation point of view.

Exposures to X-rays

With regard to the reconstruction of exposure to X-rays at the Federal Armed Forces the Radar Commission considers it reasonable to differentiate unit-specifically three phases. These phases differ with respect to the possibility of determining radiation exposure retrospectively and to the implementation of radiation protection measures.

Phase 1 is characterised by the fact that hardly any measurements of dose rates and no person-related dose values are available or can be reconstructed reliably. For Phase 1 a reliable, or even upper retrospective assessment of exposure to X-rays is not considered possible, as the data and information basis is insufficient. An application of the results of later measurements (carried out by the measuring centres of the Federal Armed Forces) and of current measured values to past exposure periods is not possible as a rule, since a multitude of influencing factors cannot be reconstructed any more. For the NVA units Phase 1 lasted until the end of the NVA, as for the NVA units sufficiently representative measurements of the dose rate and person-dosimetric monitoring are not available according to the knowledge of the Federal Armed Forces.

During the Transitional Phase 2 radiation protection measures were established and measurements of the dose rate at frequently used weapon systems were carried out. Two radiation measuring centres were established and both technical and organisational radiation protection measures were taken. This phase can be limited

for a number of important radar units to the period between approximately 1975 and 1985.

Phase 3 is characterised by the existence of adequate radiation protection, i. e. it has been proved that technical and organisational measures to reduce radiation exposure have been concluded and controls through measurements have been carried out. Enhanced radiation exposure is not to be expected during this phase.

Exposures to fluorescent paint

The determination of radiation exposure of the radar personnel to radioactive substances can be concentrated on the use of radium containing fluorescent paint. Radiologically relevant follow-up doses due to other radioactive substances are not to be expected.

Exposures to radium fluorescent paint were primarily a problem of the Federal Armed Forces. No indications are available to the Commission that radioactive fluorescent paint was used to a considerable extent with radar units of the National People's Army.

According to the investigations of the facts performed by the Commission the use of radium containing fluorescent paint in the Federal Armed Forces can be subdivided into two periods:

Period until 1980

This period is characterised by a wide use of radium containing fluorescent paint. It happened that this paint was scraped out, sanded down and reapplied by radar technicians without adequate radiation protection precautions. In single cases incorporation while carrying out such work can lead to high exposures, unlike external exposure and touching of uncovered switches with radium containing fluorescent paint.

Period from 1980 on

The Commission has found out that from 1980 on at the latest, work such as scraping out was performed with sufficient observation of radiation protection. Also later than 1980 remaining stocks of component parts with radium containing fluorescent paint existed in the Federal Armed Forces. Although their number was high enough to order picking out again in 2000 the Commission considers the risk of radium incorporation during this period low.

Exposures to high-frequency radiation

With regard to the possibility to reach or exceed a performance flux density that is sufficient for inducing a cataract (clouding of the lens) in case of chronic exposure, a categorisation according to time of use, place of use and weapon system can be made.

Accordingly, times of use prior to or, respectively, after protection regulations came into force have to be differentiated. For the Federal Armed Forces the first protection regulation came into force in 1958. The earliest regulation of the NVA known to the Commission dates from 1976.

The places of use can be subdivided into two categories: Categories where the risk of an overexposure can be classified as high and categories where it can be classified as low.

The first category comprises workplaces at a short distance of a permanent note radar and workplaces in closed rooms where the possibility of reflections of radiation at building structures cannot be excluded. This includes in particular repair halls. The second category includes places of use at radar units that were located at stationary places at a distance of radar transmitters with which critical performance flux densities can be excluded or exposure was only possible through surveillance radar elements with which duration of exposure remained low when reaching critical performance flux densities.

Eventually a categorisation according to weapon systems is possible. Weapon systems where in mobile positions permanent note radar units had been erected at

too short a distance of other components where workplaces existed, represented a risk for overexposures, which is considerable in the individual case.

3.2 Health risks

To evaluate symptoms the Federal Ministry of Defence put anonymised data at the Commission's disposal. These neither enabled an exact description of the frequency of the single diseases nor a statement on statistical accumulations of single diseases within the exposed group. The registration of the diseased is incomplete and the extent and age distribution of the population taken as a basis are not known.

The study "Investigations on the determination of health risks of members of the Federal Armed Forces in the field of work of radar from 1956 – 1985" ordered by the Federal Armed Forces, carried out as a mortality study and presented in May 2003, is unsuitable for the evaluation of health risks of members of the Federal Armed Forces due to exposure to radar because of serious methodical deficiencies. Neither can it provide data on the frequency of diseases in the affected group.

The Commission therefore bases statements and recommendations on hazards to health exclusively on the state-of-the-art of scientific research documented in international specialist literature. The biological, medical and epidemiological findings about the effect of ionising radiation and HF radiation are represented with respect to the present problem. Regarding ionising radiation it has been acknowledged that even low doses of it can induce cancer diseases. Mankind has been exposed to ionising radiation of natural origin for ages, however. In addition, cancer is not a rare disease for which a multitude of causing factors is known. With respect to HF radiation only the thermal effect is of importance according to the present state of knowledge, which can lead in high doses to a clouding of the lens (cataract).

Required research

Within a period of time justifiable in connection with the due compensation procedures further examinations, investigations, and research would not provide new decision-making bases relevant to the general evaluation. In principle there is a need

of research, however, in particular on the investigation of health effects of HF radiation and on some aspects of ionising radiation.

3.3 Previous proceeding

- (a) The analysis of the previous proceeding in the determination of the estimated dose showed a number of methodical deficiencies and deviations with regard to the proceeding of different military district administrations. The Radar Commission additionally considers the inclusion of the affected persons in the procedures insufficient. This also applies in view of the difficulties in reconstructing the workplace conditions in the early years.
- (b) The so-called "*Kannversorgung*" can lead to acknowledgement in case of radiation exposures that are in an order of magnitude corresponding to the range of the life-time dose due to natural radiation exposure.
- (c) The current proceeding includes the wholesale exclusion of certain diseases (example testicle tumour) without clear scientific basis.
- (d) Currently the applicants are not treated equally according to their (employee) status.

4. Recommendations

For further proceeding the Radar Commission gives the following recommendations:

4.1 Diseases

The following three conditions for acknowledgement must be fulfilled:

1. In principle all malignant tumours – with the exception of chronic lymphogenous leukemia (CLL) – have to be considered qualifying diseases due to exposure to stray X-ray radiation, the cataracts due to exposure to HF radiation and/or ionising radiation. In case of incorporation of radium containing fluorescent paint primarily cancer of the bones (sarcoma of bones and surrounding connective tissue) has to be considered a specific qualifying disease.

2. Prerequisite are diagnoses confirmed by a physician with pathological-histological results.
3. The occurrence of a solid tumour must be at least 5 years after the beginning of radiation exposure, in case of leukemia and bone sarcoma at least 2 years must have passed between radiation exposure and their occurrence.

4.2 Exposure

Exposure to *X-ray stray radiation sources* is evaluated according to the three phases mentioned in 3.1. During phases 1 and 2 considerable radiation exposures are possible. So in phase 1 diseases according to 4.1 should be acknowledged in all persons having worked at the SGR-103. For other persons having worked at other radar units an additional catalogue of criteria is proposed in the detailed part of the report. In phase 2 the available measurements should be taken as a basis for the determination of an estimated dose if sufficient measured values are available. Otherwise one should proceed as in phase 1. During phase 3 no relevant radiation exposures are to be expected. This must be documented for the applicants by representing the technical and organisational radiation protection measures and, if required, by assessing the dose, taking into account the suggestions for improvement made by the Commission.

With regard to the topic *fluorescent paint* the Commission recommends to check in the individual case by means of workplace case history if the respective person dealt with radium containing fluorescent paint in the form of scraping out, sanding down or reapplying prior to 1980. If the case history shows that corresponding activities had been carried out during the period before 1980 without corresponding precautions having been taken, it is recommended to measure applicants with cancer of the bones but also with other qualifying diseases in a whole-body counter and to consider the dose in the acknowledgement procedure.

Exposure possibilities to *HF radiation* are to be classified according to the categories time of use, place of use and weapon system. The cataract is considered a qualifying disease. In case of high exposure probability acknowledgement is recommended.

4.3 Regulation of proceeding

The Commission cannot recognise any technical reason which makes different evaluations in the procedures because of the applicants' ranks plausible.

If the three conditions mentioned in 4.1 are fulfilled the applicants should be heard when reconstructing the workplace conditions and before final notice is given.

An effective quality assurance should be established in the determination of the estimated dose which is possible from phase 2 on, taking into account the methodical proposals made by the Commission.

The Commission does not consider promising further investigations in the field of individual exposure reconstruction for phase 1. The Commission therefore recommends not to take up such investigations.

If organ dose values are available causation probability should be assessed. Causation probability has to be determined on the basis of epidemiological risk data. Which procedure is selected in the process of acknowledgement cannot be decided through scientific considerations but is in the end a political decision.

Wolfram König
Chairman

Berlin, July 2, 2003