

**Impacts of the Events on the 11<sup>th</sup> of September 2001 in the United States on Radiation Protection, the Nuclear Waste Management and the Nuclear Security in Germany - 9304**

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**ABSTRACT**

This report describes the effects of the terrorist attacks of the 11<sup>th</sup> September 2001, when four airliners hijacked and crashed. These attacks take effects on radiation protection, nuclear disposal and nuclear safety in Germany. Some of the measures, which were taken after the September 11, 2001 in order to improve the safety of nuclear installations are presented in the following. The taken measures increasing security against terrorist attacks are also exemplarily described in this report.

The examples include the introduction of new identity papers, which offer a higher security level as well as the prohibition of carrying liquids with more than 100 ml in the hand luggage.

Also the human security measures taken by different companies since the attack happened are subject of the contribution. Due to the necessary confidentiality regarding the threat scenarios and the taken protective measures detailed descriptions of the measures in this report are limited.

**INTRODUCTION**

The terrorist attacks on September 11, 2001 on the towers of the World Trade Centre did not only cause world-wide outrage. Our current feeling of safety was seriously questioned.

Every nation asks itself: „where will terrorist acts hit us as first?“

At first step the safety measures concerning the air traffic were increased. The air traffic was obviously in danger, because the attacks in America took place by hijacking passenger airplanes. In the next step the safety of large industry facilities was considered.

In this connection the safety of nuclear industry facilities such as nuclear power stations, interim storages and nuclear transports were inspected.

Everywhere the safety of facilities was checked and if necessary increased.

**MEASURES IN THE AIR**

The attacks with civilian airplanes entailed, that the security gaps in the air traffic were recognized quickly. These recognized security gaps led to a series of measures in order to enhance safety. For example, some companies decided as immediate action, that their managers shall no longer travel together with the same airplane to important business meetings.

**New ID Cards**

As a consequence of these safety measures new identity papers, which offer a higher security, were developed.

The European Union has on the 28<sup>th</sup> of February 2005 decided to implement electronic identity papers. These passports include so far personal data and a photograph of the passport holder, but new is that the information will be also stored on a chip.

In autumn 2007 the data of two fingerprints of passport holders were stored for the first time in German electronic passports. The possibility of a direct comparison of live recordings with stored ID data creates

a new dimension in terms of distinctive relations between documents and document holders and the protection of the personal identity of citizens expanded.

Germany obeys the technical recommendations of the EU and those of the independent and at the United Nations-based ICAO (International Civil Aviation Organization = International Civil Aviation Authority) with its passport project in order to offer an internationally recognized passport.



**Fig. 1. Biometric Passport Photograph (source: [www.trend-zeitschrift.de](http://www.trend-zeitschrift.de))**

### **Liquids in Hand Luggage**

It is well known for a long time that the baggage does not have to exceed certain dimensions and has not to be too heavy. Even pocket knives were not allowed in the hand baggage. But then it actually already stopped.

Since the 11<sup>th</sup> of September 2001 these rules were rewritten and there is meticulous focus on their content. After the 10<sup>th</sup> of August 2006 – when several planned terrorist attacks on planes failed last minute - any liquid in hand luggage is limited.

Since the 6<sup>th</sup> of November 2006 a maximum of 100 ml of a liquid or a similar substance carried in the hand luggage is allowed. All liquids must be stored together in a re-sealable (e.g. with Zipper, but not with rubber or cord) transparent plastic bags with a maximum volume of one litre. For each person only one plastic bag is allowed to carry in the hand luggage.

The limited liquids include drinks, gels, creams, sprays, shampoos, sun lotion, shaving foam, toothpaste and towels moisture, honey and other spreads, lipsticks and soups. All Passengers have to show the carried liquids at the access controls at the airport. The rules for these controls have been increased:

Passengers have to take off their jackets, coats and portable computers out of their travel bags. The Member States may be even more stringent, Britain claims, for example, that passengers must put off their shoes.



**Fig. 2. Liquids in Hand Luggage**

### **Full-body Scanner**

The next security step is the use of so-called “full-body scanners”. The EU Commission wants to plead for the use of whole-body scanners at airport security checks.

Body scanners, or even naked body scanners, are advanced devices which can map the surface of a human body. Thereby hidden objects under the clothes such as weapons or explosive substances can be made visible. This can be realized by using different methods.

The naked scanners ("naked machine") are already used in the airports of London, Zurich and Amsterdam.

The scanners work by using electromagnetic radiation and create a 3D image of the scanned person. This technology can x-ray the clothing and the scanned person is displayed completely naked.

In the U.S. the Transportation Security Administration is expanding the use of "backscatter X-ray" systems for passenger screening on human volunteers as an alternative to palpation by hand, they are already in use in Amsterdam, Zurich and London.

„Backscatter“ X-Ray Screening Technology is a electromagnetic radiation in the border area between infrared light and microwave radiation, and it is a part of the natural heat radiation.

Using the active method a focused beam scans the body and reconstructs a picture from the back scattering.

With the passive method the natural dissipation of the body is detected, and an image of the body contours can be generated. X-ray radiation causes by their ionizing effect cell damage, which can lead to cancer. For this reason, such a radiation dose should only be used if it is indispensable necessary for the improvement of security. Due to its lower energy terahertz radiation effects no ionizing. The passive mode causes absolutely no radiation source on the body.

### **MEASURES TO NUCLEAR FACILITIES**

The nuclear power plants in Germany are in varying degrees safety designed against the crash of quickly flying military airplanes. Particularly since the early'80s plants have been built in accordance with the guideline of the incident of the Nuclear Safety Commission (RSK). The building must withstand to a collision of a 20-Mg heavy and up to 780 km/h flying two engine fighter.

In 1992 the RSK evaluated the submitted analysis. As a result of this analysis a direct hit on some older equipment, which damages or a penetration of reactor buildings can not be excluded. But the massive

internal concrete structures of those buildings would prevent damage inside. So consequently a plane crash is not significant for the plant risk [source BfS]

### **Atomize of Nuclear Facilities**

In the meantime the German authorities are preparing for an attack according to the scheme of the attack on the World Trade Centre.

According to the Society of Nuclear Safety (GRS) none of the 17 active German nuclear power plants would be secure of a meltdown, if it would be attacked by a larger passenger airplane. The older German nuclear power plants are not safe of a terrorist attack from the air.

Therefore the operators of the plants think about an artificial fog wall to protect the buildings against such attacks.

For defence variant no. 1 the nuclear power plants should be flashed atomized in the case of an attack in order to ensure that the terrorists could not hit their target. The operators of nuclear power plants want to protect their facilities with fog grenades against terrorist attacks from the air. If a suspicious airplane approaches, the operators wrap the facility into a dense fog. Within 40 seconds the plants could no longer be seen.

Passenger planes are not equipped with a radar system to identify such objects in the fog.

The Federal Ministry of Environment said, that a wall of artificial fog "effectively reduces" the chance, that an airplane could hit the reactor building sufficiently and precisely."

The arms firm "Rheinmetall" on behalf of the Lower Saxony state government and the electricity company "Eon" has delivered a dozen fog lamps for the nuclear power plant Grohnde.

They surround the reactor building and in case of an alarm they catapult phosphorus smoke body's into the air, which hide the power plant "within seconds".

The Federal Environment Ministry demanded that the pitcher can be used for several fires. Otherwise the terrorists fly circles until the fog is lightly. In the case of an emergency "electronic target systems" have to be switched off.

Variant no. 2 is part of the defence in force aviation law, which became operative.

This law allows the shooting down of civilian planes in order to prevent a serious accident, even if there are hundreds of innocent people on board. For example, aircraft missiles are positioned at the nuclear facilities. The operators are not satisfied with highly impressive columns of reinforced concrete around the nuclear plants.

"The fog wall was preferred, because they are not noticeable in everyday life."

The Society for reactor safety checks the system on behalf of the Federal Ministry of Environment.

### **Building Protection**

Besides the option to „spray“ nuclear facilities structural improvements for buildings have been made. After stopping shipments of nuclear fuel for reprocessing in Sellafield and La Hague site in Germany, facilities were built safe from aircraft crashes.

The basic structures of the buildings have been optimized and the fire loads have been minimized. The damage of the environment remains limited if a terrorist attack happens. Existing buildings can be hedged with additional screening walls against a plane crash.

In this context a research project would be interesting, where scientists search for possibilities to "hide" objects. A special surface launches light rays around the object, instead of reflecting the light rays back.

This effect, which works under certain conditions for light, was now also studied in experiments on water for example in order to protect platforms against waves.

### **Container Protection**

Sometimes a better protection of existing buildings is not possible through structural measures. Here, for example, the container in which the spent nuclear fuels are stored or transported serves the safety. The results of many in the past accomplished tests on fuel tanks represent the safety of these containers.

The Federal Institute for Materials Testing (BAM) in Germany controlled the safety of such containers. The casks will receive only an approval as a Type B (U) F-package when according to the transport law all necessary tests and evidence and their positive assessment in terms of mechanical and thermal design is completed.

Due to the massive construction and the Type B (U) F properties, CASTOR ® containers for example ensure at the same time also a significant protection against terrorist attacks.

This statement is based on shelling experiments in which projectiles were fired on a CASTOR ® container. These experiments were implemented by the Company for Nuclear Safety mbH (GRS).

Regarding a specific airplane crash the following aspects or already accomplished researches have to be considered:

- The substantial building method of CASTOR ® containers potentially offers safety reserves. Shot-proof testings on a tank model underline the potential safety reserves.
- A targeted plane crash on a CASTOR ® container is due to its size and its movement difficult to achieve.
- The resilience of a specific CASTOR ® cask to an external explosion was demonstrated in one of BAM's extreme stress test in 1999 with an original container of the type CASTOR ® THTR / AVR. This container type is used in the Juelich Research Center for the storage of AVR spent nuclear fuel. In the test a tank wagon of a train was filled with propane gas and was positioned next to - the CASTOR ® cask. The tank wagon was fired until it exploded. Parts of the tank wagon hit the container with its full force. After the fire and the mechanical / thermal impact by the exploding rail - tank wagon the container showed no impairment of its security features.



**Fig. 3. Trial Building Explosion**

- A plane crash causes a "higher" fire load than the fire test, in this context the large heat capacity of the CASTOR ® cask must be taken into account.