

System Design and Assessment Notes

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The Swiss EMP Concept of General Defense

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THE SWISS EMP CONCEPT OF GENERAL DEFENSE

ABSTRACT

The Swiss concept of general defense has been outlined in a report on the security policy of Switzerland in 1973 (1). General defense forms the instrument of the security policy by which the strategic goals can be achieved. The development of the international situation and the military threats are analysed in an interim report of 1979 (2). Recognizing the enormous damage potential of EMP, a special Board of experts had to study the large scale effects of EMP on a national level. As a result the EMP concept of general defense has been established.

The vulnerability of essential systems to High Altitude EMP (HAEMP) and Low Airburst EMP (LEMP) has been investigated. By governing principles and protection priorities the EMP concept outlines the procedures to reach the goals of EMP protection. These goals are mainly a functioning government, a continued existence of the population and the maintenance of military defense. However, harder conditions and severe limitations in every field have to be accepted in EMP situations.

As a result of the EMP concept of general defense a series of EMP protected systems are required. These include systems of public information, communication, power and food supply, transports etc. At the same time the program of EMP protected constructions and EMP hardened weapon systems has to be carried on (3).

The EMP concept of general defense is illustrated by examples.

REFERENCES

- (1) Report of the Federal Council to the Federal Assembly on the Security Policy of Switzerland (Concept of General Defense), 27 June 1973
- (2) Interim Report of the Federal Council to the Federal Assembly on the Security Policy of Switzerland, 3 December 1979
- (3) W.Jöhl, J. Gut, W. Buchmann; A Swiss View of NEMP Protection Principles, EMC Rotterdam 1979 (FMB 79-3)

TABLE OF CONTENTS

	page
1. Introduction	4
2. EMP and Security Policy	8
3. The EMP Concept of General Defense	14
3.1. SREMP/LAEMP	14
3.2. HEMP	16
3.3. Objectives	16

LIST OF FIGURES

Fig. 1	Switzerland in the heart of Western Europe	6
Fig. 2	Swiss EMP Committee	9
Fig. 3	SREMP/LAEMP	15
Fig. 4	HEMP	17

LIST OF TABLES

Table 1	The security policy objectives of Switzerland	8
Table 2	Our strategic means	10
Table 3	The 6 strategic cases	11
Table 4	Required EMP protected basic systems and functions	18

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1. Paper: THE SWISS EMP CONCEPT OF GENERAL DEFENSE
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(in slightly revised form)

1. INTRODUCTION

Mister Chairman, Ladies and Gentlemen:

In an article of IEEE Spectrum about Military Electronics and EMP that appeared some 3 years ago, the author had written the following passage: "Some idea of the expense of protecting against EMPs can be obtained from the example of the Swiss government, which has been extremely conscious of the problem. Since the Swiss, with their long-standing policy of neutrality, do not expect to be targeted in the event of a nuclear war, they have devoted considerable attention to avoiding the side effects of nearby explosions. For their most sensitive computer centers, *presumably those containing banking records* (emphasis added), they have chosen deep burial, 1800 feet under an alpine mountain, as cheaper than through surface shielding". (IEEE Spectrum, May 1981, "EMPs: Potential Crippler", by Eric J. Lerner, page 44).

With respect to the deep burial of banking records, the author was wrong, whereas the other statements were quite correct. Therefore it is a pleasure for me to present today some essential elements of the "Swiss EMP Concept of General Defense". With this concept all EMP protection measures are put into the framework of General Defense or Total Defense. The official

report of the special EMP committee has been approved by the government in 1983. But before going into a few details of the concept, let me describe shortly the characteristics of my country and explain in a few words the notion of General Defense.

Switzerland, as most of you know, is a small country lying in the heart of Europe, surrounded by the Federal Republic of Germany, Austria, the tiny principality of Liechtenstein, Italy and France (Fig.1). Politically Switzerland is neutral, more precisely, the neutrality of the country is an everlasting and armed one. The geographical situation and the particular topography give the country a certain strategic importance.

A total of 6.2 million people are living in an area of about 16'000 sqm ($41293 \text{ km}^2 \hat{=} 15'943 \text{ sqm}$), which corresponds to a mean population density of ~ 400 persons per sqm ($157 \text{ E/km}^2 \hat{=} 408/\text{sqm}$). Merely two thirds of the soil consist of productive farmland, one third is mountainous country. Bern is the capital of Switzerland, but the biggest city and the economic center is Zurich. According to its geographical situation and due to the historical development the population of the various parts of the country speaks different languages. About two thirds, mainly in the northern part, speak German. Approximately one fifth of the population located in the western part, speaks French. Geneva, known as international conference town, is the centre of the French-speaking part of the country. A typical town where both languages, French and German, are spoken simultaneously, is Biel, known earlier as the city of watchmakers, lying in the fertile middlelands where many lakes and rivers can be found.

Italian is spoken in the southern part of Switzerland, which is topographically separated from the rest of Switzerland by the alps. And finally, a very small part of the population in the Southeastern part of the country speaks the fourth language, the Reto-Romance.

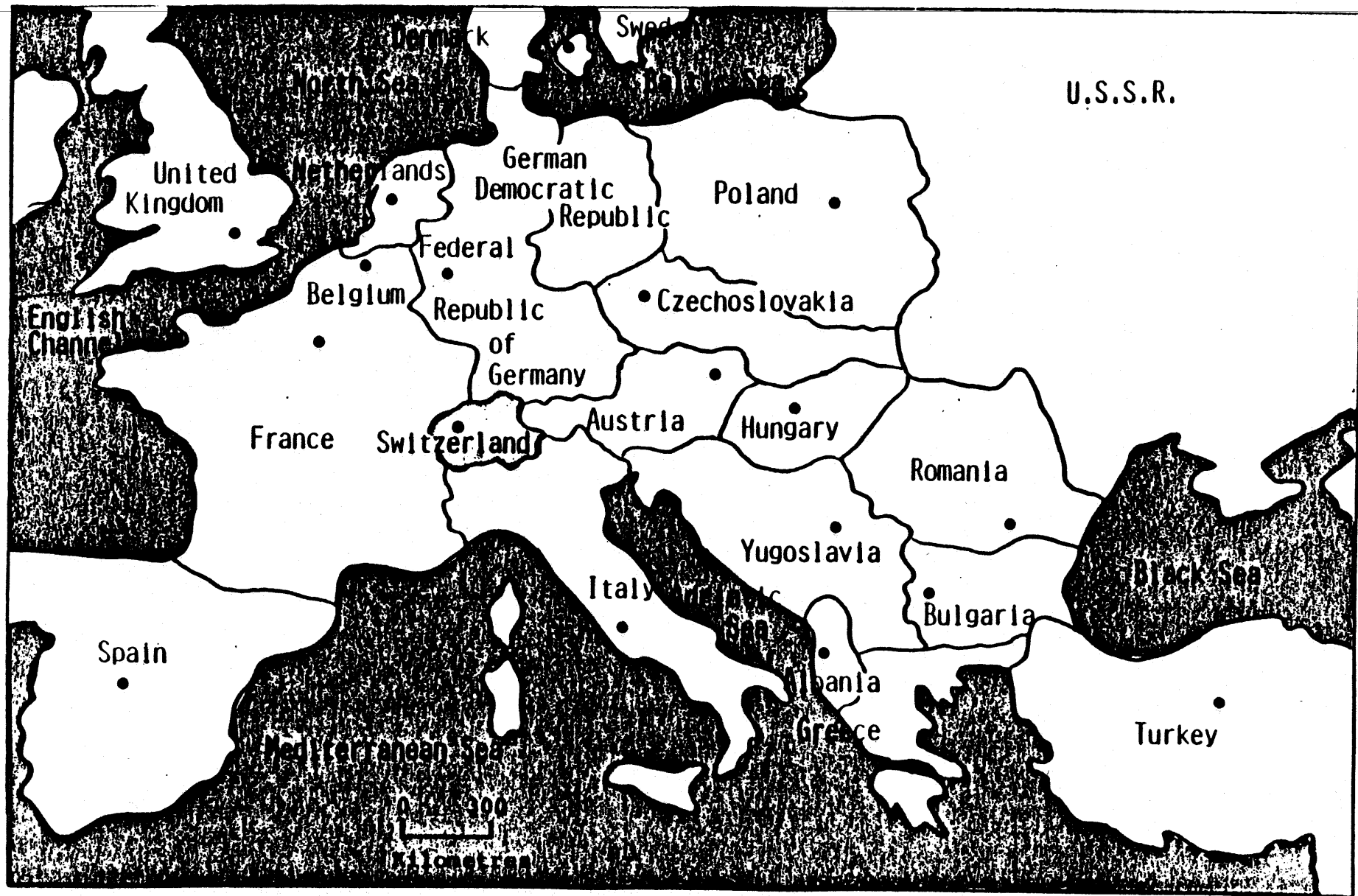


Fig. 1 Switzerland in the heart of Western Europe

Switzerland of course has many places of natural beauty. Excursions to the Lower Alps and on top of the snow covered mountains are very popular. Almost everywhere you can go by electric trains. Even the highest railroad station of Europe is located in Switzerland: it is the Jungfrauoch-station at an altitude of 11'333 ft.

Electric energy is of utmost importance for Switzerland. Hydraulic power, the so called "white coal", is systematically exploited. There are dozens of dams in the alps. However, also five nuclear power stations are generating an ever growing percentage of the required electric power. The federal railroad system is the most important public transport organisation of the country. It is 100% electrified.

More than one half of the working population is employed in the service industries, about 40% in various branches of the industry and only 7 % in the primary sector of agriculture and forestry. Corresponding to that, the standard of living in Switzerland is rather high: as an example for that serves the fact that the density of cars is about 380 per 1000 persons, of telephones about 460, of TV's about 320. The country shows one of the highest densities of computers in the world. These findings bring us back immediately to the problems of EMP and General Defense.

2. EMP AND SECURITY POLICY

The particular strategic situation and the smallness of the country as well as the high technical standard of the infrastructure make Switzerland extremely vulnerable by EMPs of High Altitude nuclear explosions (HAEMP or HEMP). Therefore some years ago the government decided that the security-political situation with respect to EMP be analysed within the scope of General Defense and a comprehensive EMP concept be established. This task has been assigned to a special EMP committee, wherein all relevant federal offices are represented (Fig. 2).

Let me now say some words about the Swiss security policy and general defense. The security policy is embodied in an official document, entitled: "Report of the Federal Council to the Federal Assembly on the Security Policy of Switzerland". It outlines the concept of general defense. Based on this document the objectives of the security policy may be summarized as follows (Table 1).

Table 1 The security policy objectives of Switzerland

- 1 PRESERVATION OF PEACE IN INDEPENDENCE
- 2 PRESERVATION OF OUR FREEDOM OF ACTION
- 3 PROTECTION OF THE POPULATION
- 4 DEFENSE OF OUR TERRITORY

FEDERAL COUNCIL

GENERAL DEFENSE STAFF

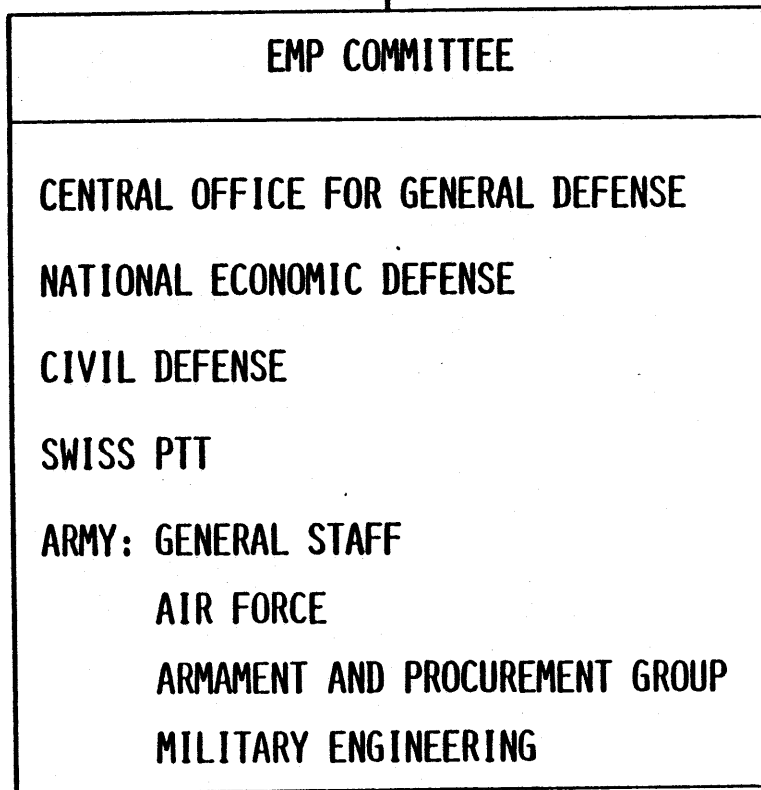


Fig. 2 Swiss EMP committee

General defense is the mean to reach these goals. The following strategic means, characterized by keywords in Table 2, are at our disposition.

Table 2 Our strategic means

FOREIGN POLICY	Armed neutrality
ARMY	Compulsory military service Militia system Dissuasion
CIVIL DEFENSE	Protection, rescue and care A shelter place for everybody
NATIONAL ECONOMIC DEFENSE	Economic preparations and war economy for alimentation and agriculture, industry, traffic, energy, etc.
INFORMATION AND PSYCHOLOGICAL DEFENSE	
STATE SECURITY	
GENERAL DEFENSE MANAGEMENT AT FEDERAL AND CANTONAL LEVEL	General defense staff, committees, situation conference coordinated services for communications, medical care, NC-protection, logistics, transportation etc.

Conflicts, which at the moment of outset are merely characterized by increased tensions, may develop into crises and finally into open war in all its different forms. Among all levels and organs of the general defense organisation unanimity is aimed at, concerning the measures to be taken in a particular case. The following six strategic cases relevant to Switzerland have therefore been designed (Table 3).

Table 3 The 6 strategic cases

1	NORMAL	State of relative peace
2	CRISIS	State of increased tension or serious disorders
3	NEUTRALITY PROTECTION	Open conflicts in Europe
4	DEFENSE	Military operations against our country
5	CATASTROPHE	Events resulting in great damages
6	OCCUPATION	Occupation of parts of the country

The various *EMP threats* have been evaluated by the EMP committee for these strategic cases. This procedure has led to the following main results:

- EMPs of high altitude nuclear explosions represent a national if not European threat independently of the actual strategic case, although the probability for HAEMP's seems to be low in the normal case. However, a strategic surprise by probably more than one simultaneously or successively released HAEMP, cannot be completely ruled out.
- EMPs of near surface or surface explosions comparably create electromagnetic effects of rather limited extension, but are accompanied by all other destructive nuclear weapons effects. The probability for this kind of EMP - termed as Source Region EMP (SREMP) and Low Altitude EMP (LAEMP) - seems to be very small for normal and crisis situations, but may grow substantially in the case of open conflicts in Europe and especially in the case of defense.
- Another case of importance is *nuclear blackmail*. Nuclear blackmail by HEMP is taken very seriously in Switzerland. This country has a firmly rooted sense for freedom and independence. Blackmail of any kind is a very dangerous matter and HEMP is therefore included automatically in the list of threats.

In the first row of means to encounter the EMP threat are measures to mitigate damages and ensure the survival of the population. The concept of general defense clearly states that the most effective mitigation of damages and the protection of the population is of no minor strategic importance than are military operations. Today's technical capabilities as for instance the release of High Altitude EMPs would create situations, in which assured survival gets absolute preeminence.

In this context the outstanding importance of an excellent *Civil Defense* (what is called "Civil Protection" in Switzerland) becomes evident. It is the only effective measure to protect the population against the effects of modern weapons of mass destruction. A well organised and functioning civil protection

not only enhances the chances of survival but also turns out to be an essential element of physical and psychological staying power. Also very important are executive functions to be carried on in crisis situations. Therefore federal, cantonal and local authorities dispose of underground facilities equipped with the necessary installations.

3. THE EMP CONCEPT OF GENERAL DEFENSE

A comparison of the above described EMP threats with the main strategic missions of Switzerland (i.e. general defense in the state of relative peace and crisis-management; keeping out of war through defense readiness (dissuasion); conduct of war; damage-limitation and the securing of survival; resistance in occupied territory) has led to the formulation of a couple of *guiding principles* for the EMP protection. These principles constitute the key note of the EMP concept of general defense. Mainly the two cases of SREMP/LAEMP and HEMP are distinguished.

3.1. SREMP/LAEMP (Fig. 3)

1. The military defense capacity and the survivability of the country have to be preserved by providing protective constructions and military equipment with EMP protection measures, that are in balance against all relevant weapons effects.
2. To ensure the military defense capacity and the political leadership on the three levels of the nation, the cantons and the municipalities, this kind of balanced protection has to be provided to the following protective constructions and systems in the specified order of priority:
 1. Military protective constructions (e.g. command posts on the levels of the supreme command, army corps, divisions etc., logistical constructions, shelters etc.)
 2. C³I-systems and weapon systems of army and air force
 3. Civil defense facilities, i.e. protective constructions of the civil protection organisation, e.g. command posts, hospitals etc., but no family shelters.
 4. Broadcasting systems on the national, regional and local level
 5. Federal EDP systems.

Fig. 3

SREMP/LAEMP

OBJECTIVE	PRESERVATION OF MILITARY DEFENSE AND SURVIVABILITY OF THE COUNTRY
GOVERNING PRINCIPLE	BALANCED PROTECTION AGAINST EMP AND OTHER NUCLEAR WEAPONS EFFECTS
PRIORITIES	1. MILITARY PROTECTIVE CONSTRUCTIONS 2. C³I AND WEAPON SYSTEMS OF THE ARMY 3. CIVIL DEFENSE FACILITIES 4. BROADCASTING SYSTEMS (NATIONAL, REGIONAL, LOCAL) 5. FEDERAL EDP SYSTEMS

3.2. HEMP (Fig. 4)

1. Protection against the effects of HEMPs has to be provided in such a manner that control and survivability of the country and the military defense capacity are ensured, with the important restriction that protection measures be limited to the imperative functions.
2. To ensure executive functions of federal, cantonal and communal authorities, military defense capacities and a minimum of economic services, for the following systems sufficient EMP protection measures, in order of decreasing priority, are required:
 1. Broadcasting systems on the national, regional and local level
 2. Communication systems of general defense
 3. Public electric power supply system
 4. Public transport system
 5. C³I- and weapon-systems of army and air force
 6. A number of civil production facilities and national economic supply systems
 7. Federal EOP systems
 8. Electronic and EOP systems of business, trade and industry.

3.3. OBJECTIVES

For general defense purposes SREMP- and HEMP-priorities have been assessed, taking into account ongoing EMP protection programs and financial limits. As consequence emphasis for EMP protection measures was layed on the following basic systems and functions (Table 4):

Fig. 4

HEMP

OBJECTIVE	PRESERVATION OF CONTROL AND SURVIVABILITY OF THE COUNTRY AND MILITARY DEFENSE
GOVERNING PRINCIPLE	HEMP PROTECTION LIMITED TO THE IMPERATIVE SYSTEMS
PRIORITIES	<ol style="list-style-type: none">1. BROADCASTING SYSTEMS (NATIONAL, REGIONAL, LOCAL)2. COMMUNICATION SYSTEMS OF GENERAL DEFENSE3. PUBLIC ELECTRIC POWER SUPPLY SYSTEM4. PUBLIC TRANSPORT SYSTEM5. C³I AND WEAPON SYSTEMS OF THE ARMY6. CIVIL PRODUCTION FACILITIES, NATIONAL ECONOMIC SUPPLY SYSTEMS7. FEDERAL EDP SYSTEMS8. ELECTRONIC AND EDP SYSTEMS OF BUSINESS, TRADE AND INDUSTRY

Required EMP protected basic systems and functions:

- INFORMATION OF THE PUBLIC
- COMMUNICATION SYSTEM FOR THE PRINCIPAL AUTHORITIES
- ELECTRIC POWER SUPPLY
- PUBLIC TRANSPORTS
- EDP SYSTEMS
 - An EMP protected *broadcasting system* is required for the information of the population and the leadership of the authorities. This program was started some years ago. A series of EMP protected broadcasting stations has been built or is under construction. By 1990 the majority of the population will be attainable. In addition, the federal office of civil protection has developed an EMP protected broadcasting system for the local authorities of the civil protection organisation. However, procurement has been postponed due to financial problems.
 - It is well known that the existing public *telephone system* is extremely vulnerable by EMP effects and will probably break down in an HEMP situation. Therefore some kind of restricted resistant communication system has to be set up. A project for such a system is actually worked out by a special committee of the general defense staff in close collaboration with the Swiss PTT. This emergency communication network will connect a limited number of participants (civil authorities, important national economic power stations, military command posts etc.). Technically it will be based on fiber optics. Under favourable conditions the realization of this project can be foreseen for the end of the 1980s.

- Electricity is a necessary basic energy for all vital functions in Switzerland. The public *electric power supply* will almost certainly break down in a HEMP situation. As it is not feasible to protect the whole system against EMP effects, an organisation for repairing and restarting parts of the power system in case of an EMP-emergency has to be prepared. This work is going on under the auspices of the Union of Swiss Power Facilities. A program to study theoretically and practically the whole spectrum of EMP effects on the power system in detail is not feasible regarding to the severe limits of manpower in Switzerland. However, as we heard recently about a new 5 year program of the US Dept. of Energy in this field we have been very impressed. Now, as the problems of EMP susceptibility are probably very similar for all electric power systems of the industrialised countries, I would like to suggest an international collaboration in this program. Who does take the initiative?

- Another important matter is the *transport system*. Public transports are essential for the economic supply of the population, but also for the military needs. The fully electrified Swiss railroad system is vulnerable by EMP effects. In emergency situations a reduced militarised railroad service will be responsible for the necessary transports. EMP susceptibility studies have been made and first consequences for emergency operations have been drawn.

- *EDP systems* with fast running computers and peripheries are among the most susceptible systems in case of EMP. But they are almost indispensable for the continued existence of the nation and its economy. Therefore it is absolutely necessary to dispose of EMP protected EDP-installations and data banks within the framework

of general defense. There exist already some EMP protected computer centers of the government; these have to be exhausted in the first place after an EMP event. With great attention we observe a growing interest in the effects of the Electromagnetic Pulse on EDP systems by our business, trade and industry. Banks and insurance companies are taking the initiative for the protection of new computer centers and data banks.

Beyond the above mentioned systems and functions that have to be protected, the EMP concept of general defense specifies the following series of accompanying measures which are indispensable for progress and success in this field:

- EMP research and technical knowledge
- EMP training
- EMP tests
- International contacts in the field of EMP effects and protection measures.

To further advance all the EMP activities in Switzerland, a legal basis for EMP protection measures will be prepared by the EMP committee. In each of the seven federal departments a responsible EMP staff has been assigned and formed. Several meetings with the EMP committee have already been held.

Although numerous installations and facilities have been protected against EMP for many years, Switzerland is still far away from the goal we strive for. However, with the EMP Concept of General Defense, we hope to pursue a successful direction to achieve the mentioned objectives in the foreseeable future.